



Indian Journal of Public Health Research & Development

An International Journal

SCOPUS IJPHRD CITATION SCORE

Indian Journal of Public Health Research and Development
Scopus coverage years: from 2010 to 2017 Publisher:
R.K. Sharma, Institute of Medico-Legal Publications
ISSN:0976-0245E-ISSN: 0976-5506 Subject area: Medicine:
Public Health, Environmental and Occupational Health
CiteScore 2015-0.02
SJR 2015-0.105
SNIP 2015-0.034



Website:

www.ijphrd.com

Indian Journal of Public Health Research & Development

EXECUTIVE EDITOR

Prof Vidya Surwade

Associate Professor, Dr Baba Saheb Ambedkar, Medical College & Hospital, Rohinee, Delhi

INTERNATIONAL EDITORIAL ADVISORY BOARD

1. **Dr. Abdul Rashid Khan B. Md Jagar Din** (*Associate Professor*)
Department of Public Health Medicine, Penang Medical College, Penang, Malaysia
2. **Dr. V Kumar** (*Consulting Physician*)
Mount View Hospital, Las Vegas, USA
3. **Basheer A. Al-Sum**,
Botany and Microbiology Deptt, College of Science, King Saud University,
Riyadh, Saudi Arabia
4. **Dr. Ch Vijay Kumar** (*Associate Professor*)
Public Health and Community Medicine, University of Buraimi, Oman
5. **Dr. VMC Ramaswamy** (*Senior Lecturer*)
Department of Pathology, International Medical University, Bukit Jalil, Kuala Lumpur
6. **Kartavya J. Vyas** (*Clinical Researcher*)
Department of Deployment Health Research,
Naval Health Research Center, San Diego, CA (USA)
7. **Prof. PK Pokharel** (*Community Medicine*)
BP Koirala Institute of Health Sciences, Nepal

NATIONAL SCIENTIFIC COMMITTEE

1. **Dr. Anju Ade** (*Associate Professor*)
Navodaya Medical College, Raichur, Karnataka
2. **Dr. E. Venkata Rao** (*Associate Professor*) Community Medicine,
Institute of Medical Sciences & SUM Hospital, Bhubaneswar, Orissa.
3. **Dr. Amit K. Singh** (*Associate Professor*) Community Medicine,
VCSG Govt. Medical College, Srinagar – Garhwal, Uttarakhand
4. **Dr. R G Viveki** (*Professor & Head*) Community Medicine,
Belgaum Institute of Medical Sciences, Belgaum, Karnataka
5. **Dr. Santosh Kumar Mulage** (*Assistant Professor*)
Anatomy, Raichur Institute of Medical Sciences Raichur(RIMS), Karnataka
6. **Dr. Gouri Ku. Padhy** (*Associate Professor*) Community and Family
Medicine, All India Institute of Medical Sciences, Raipur
7. **Dr. Ritu Goyal** (*Associate Professor*)
Anaesthesia, Sarswathi Institute of Medical Sciences, Panchsheel Nagar
8. **Dr. Anand Kalaskar** (*Associate Professor*)
Microbiology, Prathima Institute of Medical Sciences, AP
9. **Dr. Md. Amirul Hassan** (*Associate Professor*)
Community Medicine, Government Medical College, Ambedkar Nagar, UP
10. **Dr. N. Girish** (*Associate Professor*) Microbiology, VIMS&RC, Bangalore
11. **Dr. BR Hungund** (*Associate Professor*) Pathology, JNMC, Belgaum.
12. **Dr. Sartaj Ahmad** (Assistant Professor),
Medical Sociology, Department of Community Medicine, Swami Vivekananda Subharti
University, Meerut, Uttar Pradesh, India
13. **Dr Sumeeta Soni** (Associate Professor)
Microbiology Department, B.J. Medical College, Ahmedabad, Gujarat, India

NATIONAL EDITORIAL ADVISORY BOARD

1. **Prof. Sushanta Kumar Mishra** (Community Medicine)
GSL Medical College – Rajahmundry, Karnataka
2. **Prof. D.K. Srivastava** (*Medical Biochemistry*)
Jamia Hamdard Medical College, New Delhi
3. **Prof. M Sriharibabu** (*General Medicine*) GSL Medical College, Rajahmundry,
Andhra Pradesh
4. **Prof. Pankaj Datta** (*Principal & Prosthodontist*)
Indraprastha Dental College, Ghaziabad

NATIONAL EDITORIAL ADVISORY BOARD

5. **Prof. Samarendra Mahapatro** (*Pediatrician*)
Hi-Tech Medical College, Bhubaneswar, Orissa
6. **Dr. Abhiruchi Galhotra** (*Additional Professor*) Community and Family
Medicine, All India Institute of Medical Sciences, Raipur
7. **Prof. Deepti Pruthvi** (*Pathologist*) SS Institute of Medical Sciences &
Research Center, Davangere, Karnataka
8. **Prof. G S Meena** (*Director Professor*)
Maulana Azad Medical College, New Delhi
9. **Prof. Pradeep Khanna** (*Community Medicine*)
Post Graduate Institute of Medical Sciences, Rohtak, Haryana
10. **Dr. Sunil Mehra** (*Paediatrician & Executive Director*)
MAMTA Health Institute of Mother & Child, New Delhi
11. **Dr Shailendra Handu**, *Associate Professor*, Phrma, DM (Pharma, PGI
Chandigarh)
12. **Dr. A.C. Dhariwal**: *Directorate of National Vector Borne Disease*
Control Programme, Dte. DGHS, Ministry of Health Services, Govt. of
India, Delhi

Print-ISSN: 0976-0245-Electronic-ISSN: 0976-5506, Frequency: Monthly

Indian Journal of Public Health Research & Development is a double blind peer reviewed international journal. It deals with all aspects of Public Health including Community Medicine, Public Health, Epidemiology, Occupational Health, Environmental Hazards, Clinical Research, and Public Health Laws and covers all medical specialties concerned with research and development for the masses. The journal strongly encourages reports of research carried out within Indian continent and South East Asia.

The journal has been assigned International Standards Serial Number (ISSN) and is indexed with Index Copernicus (Poland). It is also brought to notice that the journal is being covered by many international databases. The journal is covered by EBSCO (USA), Embase, EMCare & Scopus database. The journal is now part of DST, CSIR, and UGC consortia.

Website : www.ijphrd.com

©All right reserved. The views and opinions expressed are of the authors and not of the Indian Journal of Public Health Research & Development. The journal does not guarantee directly or indirectly the quality or efficacy of any product or service featured in the advertisement in the journal, which are purely commercial.

Editor

Dr. R.K. Sharma
Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Printed, published and owned by

Dr. R.K. Sharma
Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Published at

Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)



Indian Journal of Public Health Research & Development

www.ijphrd.com

CONTENTS

Volume 9, Number 11

November 2018

1. Is there any Difference between Revised Indian and WHO BMI Classification? A Study on Male Desk Job Workers 01
Akilesh Anand Prakash, B M S Nagraj
2. Dermatophytosis in a Tertiary Care Teaching Hospital of Odisha: A Study of 100 Cases of Superficial Fungal Skin Infection 07
Ajaya Kumar Jena, Rajesh Kumar Lenka, Mahesh Chandra Sahu
3. Evaluation of Deferral Pattern among Blood Donor Population in a Hilly Terrain of Solan Region, North India 12
Sushant Kumar Meinia, Anuj Sharma
4. Evaluating the Impact of HR Practices on Employee Deviant Behavior: An Exploratory Study on Employees of IT Industry 17
Sainath Malisetty, Malathi Narayanan, CH.Bala Nageswara Rao
5. Role of Physical Activity in Management of Musculoskeletal Disorders: An Association with BMI 22
Pooja Sharma, Supriti Aggrawal, Sadhana Meena
6. An Empirical Study on Retail Demand for Store Brand Pickles in Tirunelveli, Tamil Nadu 27
Varadarajan Rangarajan, K Thulasi Krishna
7. Knowledge of Disease Management among Maintenance Hemodialysis Patients in Coastal Karnataka – A Cross Sectional Pilot Study 33
Bryal D'Souza, Rajesh Kamath, Ravindra Prabhu, Unnikrishnan, Sagarika Kamath
8. Study on Global Public Health Threats due to Emerging or Re-Emerging Infectious Diseases and the Strategies to Reduce Threats 38
Manas Kumar Kundu, Tarit Kr Mandal, Malavika Bhattacharya
9. A Study to Compare the Efficacy of Dynamic Soft Tissue Mobilization Vs Self Myofascial Release Techniques for Hamstring Tightness in Healthy Male 44
G Yasmeen Imtiaz, S Prabhakar, V Balachander
10. Estimation of Vitamin D Levels in Children with and without Early Childhood Caries – A Case Control Study 51
Anitha Jayakumar, Deepa Gurunathan, EMG Subramainan

11. Clinical, Echocardiographic and Risk Profile of Five Hundred Cases of Dilated Cardiomyopathy in a Tertiary Care Centre: Our Experience 57
Srikant Kumar Dhar, Akshaya Kumar Samal Chandan Das, Sobhitendu Kabi, Swati Samant, Kamalkant Jena, Mahesh Chandra Sahu
12. Interdependence of Communicable and Non-Communicable Diseases among Elderly Population in Declared Slum in Mysuru City, Karnataka 62
Meghana Narendran, Savitha Rani B B, Praveen Kulkarni, Renuka M, Narayana Murthy M R
13. Intimate Partner Violence: Factors and Types of Abuse Women Face in and around Coimbatore District, Tamilnadu 67
Suji Prasad, Rangasami Periyana
14. Stress Level and Coping Strategies of IT Sectors 71
15. Factors Affecting Dental Attitudes of the Adults of South India: A Cross Sectional Study 77
Nishu Singla, Shashidhar Acharya, Prajna Nayak, Ritesh Singla
16. Regional Dimensions of Health Status of Children in Haryana 82
Manju Sharma, Sandeep Kumar
17. Effectiveness of Structured Exercise Program on Insulin Resistance in Type 2 Diabetes Mellitus – A Pilot Study 88
A Sampath Kumar, Arun G Maiya, B.A. Shastry, Vaishali K, Animesh Hazari, Radhika Jadhav
18. Postural Pain in Computer Users: Role of Preventive and Curative Physiotherapy 92
Pooja Sharma, Supriti Aggrawal, Sadhana Meena
19. Management of Patient with Pneumonia and Hypothyroidism – A Case Study 97
Manisha Vikrant Mistry, A Seeta Devi
20. Prevalence of Chronic Obstructive Pulmonary Disease (COPD) and Risk Factors in Non-Smokers at a Tertiary Care Teaching Hospital of Eastern India 100
Banani Jena, Rabi Narayan Mania, Pritam Chhotray, Syed Umer Ahmed, Mahesh Chandra Sahu
21. Assessment of Self-Care Practices among Diabetic Patients, Suraram, Telangana State, India 105
Suguna Dumpala, Padmavathi Vutukuru
22. Comparison of Stress Patterns in the Edentulous Mandibular Bone around Four Implant Retained Over Denture and All-On-Four Concept – A Three Dimensional Finite Element Analysis 111
Puneeth Hegde, Dhanasekar B, Satish Shenoy, Aparna I.N, Lokendra Gupta, Shobha J Rodrigues, Thilak Shetty
23. Enablers of Telemedicine Technology Adoption: A Case-Based Conceptualization in Indian Context 116
Samyadip Chakraborty, Vaidik Bhatt
24. An Empirical Relationship between Organisational Culture and Performance Management 121
M Jayanthi, G.S. Maheswari
25. Three Dimensional Finite Element Stress Analysis of Two and Four Implant Supported Prosthesis 126
Puneeth Hegde, Dhanasekar B, Satish Shenoy, Aparna I.N, Lokendra Gupta, Umesh Y, Mahesh M

26. Awareness of Smoke-free Legislation (Section 4 of COTPA) among Owners or Person in-Charge of the Public Places in Ramanagara City	132
<i>Usha S, Sindhu R</i>	
27. Dens Evaginatus on a Permanent Mandibular Molar-Report of a First Case	139
<i>Karuna Y M, Shailaja Datta, Arathi Rao</i>	
28. Knowledge and Perception of Patients in a Tertiary Hospital about Radiation and its Effects –A Survey	142
<i>Suveen, Fatema M Satchoo, Sachin Davis, Suresh Sukumar</i>	
29. Uncovering the Burden of Healthcare Associated Infections (HAIs) in Indian Hospitals: A Review	148
<i>Soumya Christabel, Christopher Sudhaker, Muralidhar Varma, Anice George, Elsa Santatombi</i>	
30. Women Empowerment through Step Programme of Government with Special Reference to Kanpur (Uttar Pradesh)	154
<i>Monica Tiwari, P Shalini</i>	
31. A Mixed Method Study on Utilization of Maternal Health Services and Barriers among Women of Reproductive Age in Gujarat State- Pilot Study	159
<i>Sapnaben Bhavin Patel, Anil Sharma, Jogindra Vati</i>	
32. A Study on Stress and its Effect on Private School Teachers	165
<i>S Kosalai, G S Maheswari</i>	
33. Evaluation of the Influence of Surface Treatment of Artificial Tooth on the Adhesive Bond Strength to a Commercially Available Denture Base Resin-In Vitro	169
<i>Gurkaran Singh, Veena Hegde</i>	
34. Prevalence of Depression among the Post-Menopausal Women in the Field Practice Area of Saveetha Medical College and Hospital, Thirumazhisai, Tamil Nadu	175
<i>Ruma Dutta, Prashanth Rajendran, S.Ramya, Navukkarasu Sabapathy, S.Kesava, S.Senthilraja</i>	
35. Is India Ready for Telerehabilitation?	180
<i>Sona Ayanikalath, Mershen Pillay, M. Jayaram</i>	
36. Impact of Government Policies on Job Insecurity in Alcoholic Beverages & Its Allied Industries in Tamil Nadu	187
<i>A Shanmugam, N Kalyanaraman</i>	
37. Effectiveness of Social Media Marketing	192
<i>R Sharmila, M.Kavitha</i>	
38. Clinical Profile and Antibiotic Sensitivity Pattern in Pediatric Urinary Tract Infection of a Tertiary Care Hospital in Bhubaneswar, Odisha	197
<i>Chinmay Kumar Behera, Manas Kumar Nayak, Seba Ranjan Biswal, Natabar Swain, Sibabrata Pattnaik</i>	
39. Effectiveness of Nutritional Ball among Adolescent Girls with Anemia in Selected Government Schools, Greater Noida	204
<i>Renu Gurung, Pauline Sharmila</i>	
40. Analysis of Heavy Metal Distribution and Content in Coastal Area of Makassar, Indonesia	210
<i>Ridwan Bohari, Sukri Palutturi</i>	

41. Knowledge of Critical Care Nurses on Cardiac Medications-Need For Reinforcement Workshop.. 214
Melita Sheilini, Elsa Sanatombi Devi, Janet Pramila D'souza
42. Knowledge on Practice of Urinary Catheter Care and Compliance to Urinary Catheter Care Guidelines- A Hospital based Study 218
Maryl Candida Cutinho, Melita Sheilini, Harish B
43. TB Iris: A Clinical Outcome among HIV Patients Receiving Antiretroviral Therapy in a Tuberculosis Prevalent Area 225
Yadlapati Sujani, Achappa Basavaprabhu, Bajpai Sukrit, Mahalingam Soundarya, Jain Simran
44. The Use of Education Booklet for Anemia Prevention on Teenage Girls 230
Riyanti, Riny Natalina
45. A Preliminary Host Toxicity Study of *Pterocarpus Marsupium* on Lymphocytes Isolated from Cord Blood 235
Sujita Pradhan, Santosh Kumar Sahu, Mahesh Chandra Sahu, Sudhansu Sekhar Mishra, Prafulla Kumar Chinara
46. Comparative Study of Indian Hospital Planning Guidelines for Inpatient Wards 239
Lalit Varma, A P Pandit
47. Correlation of Hematological Profile with CD4 Counts in Human Immunodeficiency Virus-Positive Patients in a Rural Area of South India 247
Abilash Sasidharananir Chandrakumari, Pammy Sinha, Shreelakshmidevi Singaravelu, Jaikumar S
48. Mammogram Analysis using Diffusion Wavelets 252
G.Prathibha , B.Chandra Mohan
49. Two Phase Therapy for Skeletal Class II Malocclusion – A Case Report 259
Ritesh Singla, Arun S Urala, Nishu Singla
50. In Vitro Study of Antimicrobial Activity of *Lactobacillus Fermentum* against Germ Tube Positive *Candida* spp 262
Suresh P, V Sreenivasulu Reddy, V Praveen Kumar, P Vamsimuni Krishna
51. Effect of Auditory Verbal Working Memory Training on Speech Perception in Noise in Older Adults 268
Ashwini Sandra, Somashekara Haralakatta Shivananjappa, Arivudai Nambi Pitchaimuthu
52. Cognitive Functions after Neonatal Encephalopathy in a Coastal City of South India-A Retrospective Cohort Study 274
Aby Dany Varghese, Vaman Kulkarni, Sowmini P.Kamath, Rathika D Shenoy, Shanthram Baliga B
53. Evaluation of Differentiation Tests for *Mycobacterium tuberculosis* from *Non tuberculous Mycobacteria* by MPT64 TB Rapid Test and Selective Inhibition with p-nitrobenzoic Acid 281
V Praveen Kumar, V Sreenivasulu Reddy, P Suresh, P Vamsi Muni Krishna, E Prabhakar Reddy
54. Effect of Flexibility with Resisted Exercise on Foot Vibration Perception Threshold in Diabetic Neuropathy in Type II Diabetes : A Pilot Study 285
Kannan Dhasaradharaman, Prathapsuganthirababu, K Mohanraj
55. Bone Grafts in Periodontal Regeneration 289
Prabhu Manickam Natarajan

56. Improvement Efforts of Hazardous Waste Management Implementation in Karimun Regency Fabrication Yard, Indonesia	293
<i>Sharyne Sylvani, Haryoto Kusnopranto</i>	
57. Distribution and Seasonal Variations of Copepoda in Euphrates River at Samawah City, Iraq	298
<i>Sahib Shanon Ibrahim</i>	
58. Sociodemographic the Characteristics of “Slum and Urban Area” Customer Behavior Depot and Identification of Escherchia Coli with RT-PCR by Gen EF-Tu	304
<i>Alfina Baharuddin, Anwar Daud, Thahir Abdullah, Mochammad Hatta</i>	
59. Prevalence and Determinants of High-Risk Women in Pregnancy, Labor and Postpartum with Premarital Screening in Semarang City, Central Java, Indonesia	311
<i>Dewi Puspitaningrum, Nuke Devi Indrawati, Indri Astuti Purwanti</i>	
60. Mothers’ Behaviour Regarding School-Aged Children’s Nutrition: in Indonesia	317
<i>Eka Mishbahatul Marah Has, Della Febien Prahasiwi, Sylvia Dwi Wahyuni, Nursalam, Ferry Efendi</i>	
61. Spatial Variation of Human Cancer Incidence across Babylon State in (2010)	323
<i>Samah Ibrahim Shamki, Afrah Ibrahim Shamki</i>	
62. Characteristics of Overweighed and Obese Adults attended Nutritional Clinic in Al-Qadisiyah Governorate, Iraq, 2014	329
<i>Fatima A. Alkhalidi, Rami S. Alshemerty</i>	
63. Floating Prostitution and the Potential Risk of HIV Transmission in a Religious Society in Indonesia	334
<i>Hardisman Dasman, Firda Firdawati, Ilma Nuria Sulrieni</i>	
64. The Effect of Training on Efforts to Reduce Maternal Mortality Risk to Behavior of Community-Based Safe Motherhood Promoters (SMPs)	339
<i>Yusriani, Muhammad Khidri Alwi, Heru Santoso Wahito Nugroho</i>	
65. Medulloblastoma of the Posterior Fossa in Children: Perioperative Surgical Complications	346
<i>Asa’ad F. Albayati, Ahmed Hilal Kamel, Yaseen M. Taher, Sadiq Fadhil Hammoodi, Hayder Adnan Fawzi</i>	
66. Chemical Synthesis and Characterization of Silver Nanoparticles Induced Biocompatibility for Anticancer Activity	352
<i>Ali Ibrahim Shkhair, Mohammed Kareem Jabber, Murtadha M-Hussein A-kadhim, Abdullah Hasan Jabbar</i>	
67. Relationship Analysis of Noise to Hypertension on Workers at Pharmaceutical Products Factory X in 2018, Depok City, West Java Province	358
<i>Andreas Billy Falian, Haryoto Kusnopranto</i>	
68. The Effect of Blended Learning and Self-Efficacy on Learning Outcome of Problem Solving (Learning Strategy Improvement for Health Students)	365
<i>Saifuddin, Punaji Setyosari, Waras Kamdi, Wasis Djoko Dwiyoogo, Heru Santoso Wahito Nugroho</i>	
69. Association between the Fundal Site of Placenta and Duration of Stages of Labour	370
<i>Yusra Noaman Mohammed, Ekhlis Jabar Kadhim, Hanaa Mohammed Haider, Hayder Adnan Fawzi</i>	
70. Contributing Factors of Neonatal Death from Mother with Preeclampsia in Indonesia	375
<i>Ernawati, Kristanti Wanito Wigati, Austana Nur Hafizh, Budi Santoso, Nursalam</i>	

71. Elderly Immunity Improvement after Getting Sinbiotic and Zinc Combinations	380
<i>Rudy Hartono, Agustian Ipa, Bambang Wirjatmadi, Aswita Amir, Gaurav Kapoor, Heru Santoso Wahito Nugroho</i>	
72. The Prevalence of Depression in Primary Health Care Centers in Iraq	384
<i>Ali Obaid Al-Hamzawi, Zainab Ali Abed</i>	
73. The Rate of Thyroid Tumor among Patients with Goiter Referred to Al-Diwaniyah Teaching Hospital	391
<i>Adel Mosa Al-Rekabi, Huda Ghazi Habban</i>	
74. Missed Opportunities for Immunization among Young Children in Baghdad/AlKarkh	396
<i>Waleed Arif Tawfeeq, Ihab Raqeeb Akef</i>	
75. Forensic Physician and the Role in Achievement of the Criminal Justice	403
<i>Fadel Radhi Mohammed</i>	
76. Relationship of Bishop Score and Cervical Length by Trans-Vaginal Ultrasound with Induction of Labor in Pregnant Lady	408
<i>Ban Amer Mousa</i>	
77. Nurse Managers' Utilization of Fayol's Theory in Nursing	413
<i>Joel Rey U Acob, Heru Santoso Wahito Nugroho, Wiwin Martiningsih</i>	
78. The Relationship of Smartphone Addiction with Teenagers Mental Health in Vocational High School Padang Indonesia 2017	419
<i>Meri Neherta, Trivini Valencya, Yoshi Hernanda</i>	
79. Evidence of Hyperglycemia in Patients Using Statin Therapy	423
<i>Hassan Raji Jallab, Noor Khaled Mohamed</i>	
80. Prevalence of Color Vision Blindness at Al-Qadisiyah University	429
<i>Furkaan Majied Hamied, Hyfaa Hussin Jabar</i>	
81. Youth Resilience Capabilities Avoid Free Sex, HIV/AIDS and Drugs based on <i>Sekaa Teruna</i>	435
<i>GA Marhaeni, IGA Surati, Ni Wayan Armini, I Putu Suraoka</i>	
82. Effect of Salpingectomy on Anti Müllerian Hormone, Follicle-Stimulating Hormone and Inhibin B Hormone	441
<i>Wassan Wajdi, Hayder Adnan Fawzi</i>	
83. The Effect of Transformational Leadership and Organizational Climate with Satisfaction Partnership at Hospital RSUD Pariaman Indonesia in 2017	447
<i>Siska Sakti Anggraini, Rahmi Fahmy Dewi Murni, Rika Fatmadona</i>	
84. The Correlation between Age, Gender, and Nutritional Status with Pesticide Poisoning at Holtikultura Farmers in Cikajang Sub-District, Garut District, West Java	452
<i>Suyud Warno Utomo, Fahmi Rasyidah, Haryoto Kusnoputranto</i>	
85. The Relationship between Self-Efficacy and Social Support with Effective Breastfeeding among Postpartum Mothers in Padang West Sumatera Tahun 2017	458
<i>Vetty Priscilla, Meri Neherta</i>	

86. Seroprevalence and Histological Study of *Toxoplasma gondii* in Chicken (*Gallus domesticus*) in Tikrit City, Iraq 463
Hanan Adhoi, Omaima Ibrahim Mahmood
87. Presence of ABO Antigens of Blood Types in Saliva of Women with Urinary Tract Infection 468
Salma L Dahash, Azhar Hatif Oleiwi Al-Kuraishi, Zainab Abd Al-Amir
88. Does the Overweight Trend of Children Aged 0-24 Months in Indonesia Tend to be Increasing and What Factors are Related?: (IFLS Data Analysis Study of 2000, 2007, and 2014) 475
Rifda Wulansari, Rini Meidayati, Laily Hanifah, Endang L. Achadi
89. Physiological Blood Parameters of Young University Adults with Blood Glucose, Blood Pressure and Smokers 481
Nada Saad Naji Al-Tae
90. NIHL that Affected by High Frequency Noise on Workers at Production Area in Water Supply Company PT. X 488
Sjahrul Meizar Nasri, Dimas Brilliant Sunarno, Laksita Ri Hastiti
91. Analysis of Factors Related to Behavior Cognition and Effects on Pregnant Women in Maternal and Child Health (Mch) Handbook Utilisation 492
Rekawati Susilaningrum, Sri Utami, Nursalam Nursalam, Rr Dian Tristiana
92. Road Accident Investigation in Indonesia: An Analysis from Human Aspect Perspective 498
Mufti Wirawan, Ridwan Zahdi Syaaf, Indri Hapsari Susilowati
93. The Association between Eat Culture and Obesity among Adolescents in Tana Toraja 502
Erni Yetti R, Muhammad Safar, Andi Zulkifli, Rahayu Indriasari, Zadrak Tombeg, Saskiyanto Manggabarani, Anto J. Hadi
94. Analysis of Environmental Risk Factors and Dynamics of Transmission with Incidence of Filariasis in Kubu Raya District West Kalimantan Province 508
Suyud Warno Utomo, Wiyono, Haryoto Kusnoputranto
95. Correlation between Food Hygiene Sanitation and Escherichia Coli (*E.coli*) Contamination on Snacks Sold around Elementary School in Jatiasih Subdistrict, Bekasi Indonesia 517
Clara Andyna Hazairin, I Made Djaja, Budi Hartono
96. Hypertension in Chefs: Prevalence and Relationship with the Characteristics of People 522
Novita Medyati, Ridwan Amiruddin, Syamsiar Russeng, Stang Abdul Rahman
97. Profile of Bile Duct Injuries Following Laparoscopic Cholecystectomy 527
Warsingih, Ihwan Kusuma, Debby Sumaraw, Prihantono Prihantono
98. Participatory Approaches in Creating a Concept of Healthy Public Transport Facilities Toward Healthy Community 532
Andi Surahman Batara, Muhammad Syafar, Sukri Palutturi, Stang Abdul Rahman, Darmawansyah, Veni Hadju, Amran Razak
99. Meeting the Unmet Need with a Fit Model for Contraception Mix 538
Dyah Utari, Tris Eryando

100.	The Analysis of Safety Culture of Welders at Shipyard	544
	<i>Rizky Maharja, Abdul Rohim Tualeka, Tjipto Suwandi</i>	
101.	The Mediation Effect of Emotional Labor between Customer Orientation and Posttraumatic Growth	549
	<i>Eun-Kyung Lee, Jin-Hwa Park</i>	
102.	Control of Hazardous Chemical as an Effort for Compliance Criteria of OHS Management System : A Cross-Sectional Study at PT. X Surabaya, Indonesia	555
	<i>Fransisca Anggiyostiana Sirait, Abdul Rohim Tualeka, Indriati Paskarini, Samsul Arifin</i>	
103.	Balanced Nutrition Menu Intervention for Toddlers in Children Daycare Center	560
	<i>Dhini, Munifa, Ismi Rajiani</i>	
104.	The Effectiveness of Acupressure at LI 4 and SP 6 Point on Uterine Contraction in the First Stage of Labor on Primiparous Women	565
	<i>Christi Kusuma Wardani, Melyana Nurul Widyawati, Suryono Suryono</i>	
105.	Soft Tissue Dental Lasers	571
	<i>Prabhu Manickam Natarajan, Mohamed Said Hamed, Sura Ali Ahmed Fuoad Al-Bayati, Dusan Surdilovic, Pooja Narain Adtani</i>	
106.	The Efficiency of Conducting Pregnancy Session toward Reducing the Level of Anxiety to Deliver Baby	577
	<i>Oktaviani, Heti Ira Ayue</i>	
107.	Determination of the Safe Duration of Benzene Non-Carcinogenic Exposure in Motor Workshop Area	582
	<i>Ramdhoni Zuhro, Abdul Rohim Tualeka, Ratna Ayu Harsetianingrum</i>	
108.	A Short Review about Electrophysiology and Bioimpedance: History and Perspectives	587
	<i>Luigi Santacroce, Donato D'Agostino, Ioannis Alexandros Charitos, Lucrezia Bottalico, Andrea Ballini</i>	
109.	The Use of IUD, Passive Smoker and the Risks of Cervical Cancer: A Cross-Sectional Study at Female Workers in Surabaya City, Indonesia	592
	<i>Abdul Rohim Tualeka, Febi Dwirahmadi, Arief Wibowo, Fransisca Anggiyostiana Sirait</i>	
110.	A Proposed Monitoring and Evaluation Conceptual Framework for the Management of South African Private Sector HIV-AIDS Programmes	597
	<i>Shayhana Ganesh, Renitha Rampersad</i>	
111.	Logistic Management Analysis of Medical Equipment in Padang Port Health Office	602
	<i>Magdalena, Rizanda Machmud, Hardisman</i>	
112.	The Effects of Extract Andaliman Fruit (<i>Zanthoxylum acanthopodium</i> Dc) to CAMP mRNA expression and Bacterial Load in Mice Balb-C after <i>Gardnerella vaginal</i> Infection	607
	<i>Lenny Irmawaty Sirait, Muh Nasrum Massi, Mochammad Hatta, Prihantono</i>	
113.	Effect of Bibliotherapy on Self-Concept in Children with Mental Retardation in SLB	612
	<i>Nursalam Nursalam, Kartika Harsaktiningtyas, Iqlima Dwi Kurnia, Harif Fadhillah, Ferry Efendi</i>	

114. Gender Differences in Relationship between Commuting and Health Outcomes in Jakarta Metropolitan Area, Indonesia 617
Milla Herdayati, Tris Eryando
115. Ventilation with Risk Quotient (RQ) Benzene Non-Carcinogen in the Shoes **Home Industry** of Romokalisari, Surabaya 624
Ratna Ayu Harsetianingrum, Abdul Rohim Tualeka

Is there any Difference between Revised Indian and WHO BMI Classification? A Study on Male Desk Job Workers

Akilesh Anand Prakash¹, B M S Nagraj²

¹Primary Care Sports Physician, Department of Sports Medicine, ²Associate Director of Medical Services (CSR), Department of Corporate Social Responsibility (CSR), Apollo Hospitals, Greams Lane, Off Greams Road, Chennai, India

ABSTRACT

Background: To determine the effect of revised Indian BMI guidelines on the prevalence of obesity in male desk job workers and to analyze cardiovascular risk factor distribution under the revised guidelines.

Method: A retrospective cross-sectional study was carried out utilizing health records of male desk job workers from a week-long onsite medical health screening camp held at two different corporate organization in Chennai, India in 2015. Statistical analysis was done assessing the distribution and association of smoking, hypertension and diabetes across BMI categories based on WHO and revised Indian BMI guidelines, using Pearson's Chi-square test of association at statistical significance of $p < 0.05$.

Results: The prevalence of obesity increased from 10.7% based on WHO guideline to 52.7% by revised Indian guideline, translating into one in five male workers being added to the pool of cardiovascular risk. Though the behavioral risk factor of smoking became a significant association with revised Indian BMI guideline in comparison to WHO guideline, the significance of association of hypertension and diabetes with BMI categories was maintained irrespective of the guidelines.

Conclusion: Increase in the number of obese male desk job workers was noted with the revised Indian BMI guideline, with retention of cardiovascular risk factor association with obesity.

Keywords: BMI, Desk job, Indian, Obesity, WHO, Workplace

INTRODUCTION

Obesity, a major global public health concern^{1,2}, has been an established risk factor for various non-communicable diseases including diabetes mellitus, hypertension and cardiovascular diseases [CVD]³⁻⁶. As per 2014 global statistics, based on WHO classification of body mass index (BMI), around 600 million adults were obese (BMI 30 kg/m² or more)⁷. In India, an estimated 30-65% of the adult urban population has been reported to be either overweight or obese⁸.

Several studies have reported a higher prevalence of obesity in the workplace, exerting adverse health concerns^{9,10}. The higher prevalence of workplace obesity is of significance as an adult spends a substantial time of a day at work. Further obesity has been reported to be associated with an indirect cost at the workplace in the form of reduced productivity, work impairment, increased absenteeism and hence increased health care (direct) cost^{9,11-13}. At employee level, obesity may be associated with reduced functionality, increased sickness, diminished quality of life and greater risk of workplace injury, illness and disability^{3,12,14,15}.

Body Mass Index (BMI) is most commonly used to define obesity in clinics, and large scaled population-based studies, owing to its simplicity, ease of measurement and inexpensiveness¹⁶. It is expressed in units of weight and height as kilogram per meter square.

Corresponding author:

Dr. Akilesh Anand Prakash

Department of Sports Medicine,
Apollo Hospitals, 21 Greams Lane, Off Greams Road,
Chennai – 600 006, India.
Email: akilesh.dr@gmail.com;
Phone: (91) 44 2829 6572

A BMI of 30 or more is considered obese as per WHO standards³ (Table 1). But then the WHO guidelines were reported based on Caucasian white population, thereby limiting its use universally across ethnic groups¹⁷⁻¹⁹. Hence the BMI standards were revised for Asian Indians^{20,21} defining BMI of 25 or more as obese (Table 1). Further studies have also reported gender-based variations in BMI^{22,23} with men reported to be at greater risk for developing CVD at a given BMI in comparison to women, regardless of ethnicity^{22,23}.

Thus, routine workplace health screening using WHO standards may underestimate those at risk of CVD. Hence the aim of this cross-sectional retrospective study is to analyze the influence of the revised BMI guidelines on the obesity prevalence in desk job male workers and to analyze the distribution of hypertension, and diabetes as per the revised BMI.

Additionally, the aim was also to analyze the distribution of smoking as per the revised BMI, as in India, tobacco consumption has been reported mostly

in men²⁴, which may be due to the social and cultural restraints about tobacco usage in women. Further in the last decade, there has been a substantial increase in the number of male smokers with the projected overall tobacco-related mortality being around 13% by 2020^{24,25}.

MATERIALS & METHOD

A retrospective cross-sectional study was carried out utilizing health records from a week-long onsite medical health screening camp held at two different corporate organization in Chennai, India in 2015. For the current study only male participants were included in the survey. A structured in-person interview was carried out by medical personnel at the camp and data were collected on behavioural-demographic characteristics and medical history including diabetes and hypertension status. Anthropometric measures (weight and height) were measured according to the NHANES Anthropometric Standardization Reference Manual²⁶. BMI was then calculated from Quetelet's index (Kg/m^2), and the weight status classified based on WHO and revised Indian guidelines (Table 1).

Table 1: BMI Guidelines – WHO and Indian Standards

Classification	WHO Standards	Indian Standards
Normal Weight	18.5 to <25	18 to <23
Overweight	25 to <30	23 to <25
Obese	≥ 30	≥ 25

Strata for the presentation of statistics include age group (under 30, 30 to 49, 50 to 59, or 60 and above years), BMI status (underweight, normal weight, overweight, and obese), smoking status (yes or no), hypertension status (yes or no), and diabetes status (yes or no). Participants who reported current smoking (at least once per month) were defined as smokers, while participants who are on drug therapy for or have self-reported hypertension and diabetes were recorded as having the particular risk factor, irrespective of the laboratory data. The study protocol was approved by the Institutional CSR Review Board and adhered to the tenets of the Declaration of Helsinki.

The statistical analysis was done using IBM SPSS 23.0 software. Descriptive analyzes were conducted to

determine the distribution of age, smoking, hypertension, and diabetes in general and across BMI categories. To assess the association of BMI groups with its potential correlates like age, smoking status, diabetes, and hypertension, Pearson's Chi-square test of association was performed, with the statistical significance set at $p < 0.05$.

RESULTS

2444 males were identified in the study through health records, with the mean age of 43.5 years ($SD=9.8$) and mean BMI of 25.4 ($SD=3.8$). Descriptive statistics is shown in Table 2-4.

Table 2: Descriptive summary of the study participants

Characteristics	Sample Size (%)
Total participants	2444 (100)
Age (in years)	
18-29	237 (9.7)
30-39	634 (25.9)
40-49	770 (31.5)
50-59	772 (31.6)
≥60	31 (13)
Smoking Status	
Smoker	331 (13.5)
Non-Smoker	2113 (86.5)
Diabetes Status	
Diabetics	389 (15.9)
Non-Diabetics	2055 (84.1)
Hypertension Status	
Hypertensives	395 (16.2)
Non-Hypertensives	2049 (83.8)

Results of statistical tests determining the association, based on Pearson’s Chi-square test, between age group, diabetes and hypertension status with BMI categories was found to be significant with $p < 0.05$, irrespective of the BMI guideline followed. On the other hand, the association between smoking status and WHO BMI guidelines were found to be insignificant ($p > 0.05$), while with the revised Indian BMI guideline, the association was found to be significant ($p < 0.05$).

Table 3: Distribution based on WHO BMI guidelines [n(%)]

BMI Category	Underweight	Normal Weight	Overweight	Obese
BMI WHO Guidelines				
Sample Size	62 (2.5)	1094 (44.8)	1026 (42)	262 (10.7)
Age in Years				
18-29	17 (7.2)	131 (55.3)	72 (30.4)	17 (7.2)
30-39	20 (3.2)	288 (45.4)	280 (44.2)	46 (7.3)
40-49	10 (1.3)	335 (43.5)	322 (41.8)	103 (13.4)
50-59	15 (1.9)	324 (42)	339 (43.9)	94 (12.2)
≥60	0 (0)	16 (51.6)	13 (41.9)	2 (6.5)
Smoking Status				
Smoker	14 (4.2)	144 (43.5)	136 (41.1)	37 (11.2)
Non-Smoker	48 (2.3)	950 (45)	890 (42.1)	225 (10.6)
Diabetes Status				
Diabetics	1 (0.3)	164 (42.2)	179 (46)	45 (11.6)
Non-Diabetics	61 (3)	930 (45.3)	847 (41.2)	217 (10.6)
Hypertension Status				
Hypertensives	1 (0.3)	138 (34.9)	191 (48.4)	65 (24.8)
Non-Hypertensives	61 (3)	956 (46.7)	835 (40.8)	197 (9.6)

Table 4: Distribution based on Revised Indian BMI guidelines [n(%)]

BMI Category	Underweight	Normal Weight	Overweight	Obese
BMI WHO Guidelines				
Sample Size	41 (1.7)	559 (22.9)	556 (22.7)	1288 (52.7)
Age in Years				
18-29	9 (3.8)	92 (38.8)	47 (19.8)	89 (37.6)
30-39	13 (2.1)	143 (22.6)	152 (24)	326 (51.4)
40-49	8 (1)	145 (18.8)	192 (24.9)	425 (55.2)
50-59	11 (1.4)	168 (21.8)	160 (20.7)	433 (56.1)
≥60	0 (0)	11 (35.5)	5 (16.1)	15 (48.4)
Smoking Status				
Smoker	12 (3.6)	75 (22.7)	71 (21.5)	173 (52.3)
Non-Smoker	29 (1.4)	484 (22.9)	485 (23)	1115 (52.8)
Diabetes Status				
Diabetics	1 (0.3)	77 (19.8)	87 (22.4)	224 (57.6)
Non-Diabetics	40 (1.9)	482 (23.5)	469 (22.8)	1064 (51.8)
Hypertension Status				
Hypertensives	1 (0.3)	56 (14.2)	82 (20.8)	256 (64.8)
Non-Hypertensives	40 (2)	503 (24.5)	474 (23.1)	1032 (50.4)

DISCUSSION

The prevalence of overweight and obese male desk job workers were found to be higher with the revised Indian BMI guidelines in comparison to WHO guidelines while retaining the significant association with cardiovascular risk factors namely hypertension and diabetes. The behavioral risk factor of smoking was found not only to be increased in prevalence, but also to exhibit a significant association with obesity based on revised Indian BMI guidelines. In this study, the revised guideline reduced the number of male desk job workers classified as normal based on WHO guidelines to half (22.9% from 44.8%), thereby substantially increasing the percentage classified obese from 10.7% based on WHO guidelines to 52.7%. Thus, almost one in five male workers was added to the pool of employees at risk for cardiovascular risk factors. Further the percentage of obese individuals being a smoker or having diabetes or hypertension increased by approximately 41%, 46% and 48% respectively based on revised Indian BMI guidelines in comparison to WHO guidelines.

Obesity has been associated with various cardiac and non-cardiac health risks^{1,2,15,27} and has been shown to exhibit higher prevalence at the workplace^{2,5,9,10}. This association with adverse health outcomes stresses on the need for workplace interventions focusing on prevention and early management. Workplace hence offers a unique opportunity to implement interventions and wellness programs targeting overweight and obese populations at risk of CVD risk²⁸, and to exert policy changes promoting healthy workforce²⁹ benefitting both employee and employer improving productivity and bringing down health care expenses³⁰.

The results of this study can help inform future worksite interventions and wellness programs; however, our study has several limitations. Firstly the study is retrospective with sampling and reporting bias and temporal ambiguity. Secondly, only BMI was used in the current study, while combined use of both BMI and waist circumference have been shown to identify people at CVD risk²⁰ better. Thirdly, various confounding factors, which may contribute to obesity like environmental, cultural, psychological, economical

and genetical factors³¹ weren't accounted for. However, the risk factors weren't studied due to the time-restricted camp setting of the study.

Despite these limitations, the study results provide for potentially actionable information on addressing obesity at worksites taking into consideration the revised Indian BMI guideline. Further research is warranted with the revised guidelines in working Indian population to determine the direction and strength of associations with behavioral and cardiovascular risk factors, and workplace illness, injury and disability.

Acknowledgement: None

Conflict of Interest: None

Funding Agency: None

Ethical Clearance: The study was approved by the CSR Ethics committee at Apollo Hospitals, Chennai.

REFERENCES

- Seidell JC, Halberstadt J. The global burden of obesity and the challenges of prevention. *Ann Nutr Metab.* 2015;66(2):7—12. [PMID: 26045323]
- Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980—2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet.* 2014;384:766—81. [PMID: 24880830]
- World Health Organization. Obesity. Preventing and managing the global epidemic. Report on a WHO consultation on Obesity. Technical Report Series Number 894. Geneva. World Health Organization; 2000.
- Lavie CJ, Milani RV, Ventura HO. Obesity and cardiovascular disease: risk factor, paradox, and impact of weight loss. *J Am Coll Cardiol.* 2009;53:1925—32. [PMID: 19460605]
- Abdullah A, Wolfe R, Stoelwinder JU, De Courten M, Stevenson C, Walls HL, Peeters A. The number of years lived with obesity and the risk of all-cause and cause-specific mortality. *Int J Epidemiol.* 2011;40(4):985-96. [PMID: 21357186]
- Flegal KM, Graubard BI, Williamson DF, Gail MH. Cause-specific excess deaths associated with underweight, overweight, and obesity. *JAMA.* 2007 Nov 7;298(17):2028-37.[PMID: 17986696]
- Global status report on non-communicable diseases 2014. World Health Organization; Geneva 2015. <http://www.who.int/nmh/publications/en/> (accessed 17 December, 2016).
- Misra A, Khurana L. Obesity and the metabolic syndrome in developing countries. *J Clin Endocrinol Metab.* 2008;93(11):S9-30. [PMID: 18987276]
- Shrestha N, Pedisic Z, Neil-Sztramko S, Kukkonen-Harjula KT, Hermans V. The Impact of Obesity in the Workplace: a Review of Contributing Factors, Consequences and Potential Solutions. *Curr Obes Rep.* 2016;5(3):344-60. [PMID: 27447869]
- Solovieva S, Lallukka T, Virtanen M, Viikari-Juntura E. Psychosocial factors at work, long work hours, and obesity: a systematic review. *Scand J Work Environ Health* 2013; 39(3):241–58. [PMID: 23592217].
- Sanchez Bustillos A, Vargas III KG, Gomero-Cuadra R. Work productivity among adults with varied Body Mass Index: results from a Canadian population-based survey. *J Epidemiol Glob Health.* 2015;5:191–9. [PMID: 25922329]
- Lehnert T, Sonntag D, Konnopka A, Riedel-Heller S, König HH. Economic costs of overweight and obesity. *Best Pract Res Clin Endocrinol Metab.* 2013;27:105–15. [PMID: 23731873]
- Dee A, Kearns K, O'Neill C, Sharp L, Staines A, O'Dwyer V, Fitzgerald S, Perry IJ. The direct and indirect costs of both overweight and obesity: a systematic review. *BMC research notes.* 2014;7(1):1. [PMID: 24739239]
- van Duijvenbode DC, HoozemansMJ, van PoppelMN, Proper KI. The relationship between overweight and obesity, and sick leave: a systematic review. *Int J Obes (Lond).* 2009;33:807–16. [PMID: 19528969]
- Nowrouzi B, Gohar B, Nowrouzi-Kia B, Mintsopoulos V, McDougall A, Jordan G, Casole J, Lariviere M, Tremblay A. Lost-time illness, injury and disability and its relationship with obesity in the workplace: a comprehensive literature review. *Int J Occup Med Environ Health.* 2016;29(5):749-66. [PMID: 27518885]
- Willett WC, Dietz WH, Colditz GA. Guidelines for healthy weight. *N Engl J Med* 1999;341(6):427-34. [PMID: 10432328]

17. Misra A. Revision of limits of body mass index to define overweight and obesity are needed for the Asian ethnic groups. *Int J Obes & Relat Metab Disord* 2003;27:1294-96. [PMID: 14574337]
18. Nishida C. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet* 2004;363:157-163. [PMID: 14726171]
19. Razak F, Anand S, Vuksan V, Davis B, Jacobs R, Teo KK, Yusuf S. Ethnic differences in the relationships between obesity and glucose-metabolic abnormalities: a cross-sectional population-based study. *Int J Obes*. 2005;29(6):656-67. [PMID: 15782225]
20. Misra A, Chowbey P, Makkar BM, Vikram NK, Wasir JS, Chadha D, Joshi SR, Sadikot S, Gupta R, Gulati S, Munjal YP. Consensus statement for diagnosis of obesity, abdominal obesity and the metabolic syndrome for Asian Indians and recommendations for physical activity, medical and surgical management. *J Assoc Physicians India*. 2009;57:163-70. [PMID: 19582986]
21. NICE. Assessing Body Mass Index and Waist Circumference Thresholds for Intervening to Prevent Ill Health and Premature Death among Adults from Black, Asian and Other Minority Ethnic Groups in the UK. London: National Institute for Health and Care Excellence, 2013.
22. Cheong KC, Yusoff AF, Ghazali SM, Lim KH, Selvarajah S, Haniff J, Khor GL, Shahar S, Rahman JA, Zainuddin AA, Mustafa AN. Optimal BMI cut-off values for predicting diabetes, hypertension and hypercholesterolaemia in a multi-ethnic population. *Public Health Nutr*. 2013;16(3):453-9. [PMID: 22647482]
23. Dankner R, Shanik M, Roth J, Luski A, Lubin F, Chetrit A. Sex and ethnic-origin specific BMI cut points improve prediction of 40-year mortality: the Israel GOH study. *Diabetes Metab Res Rev*. 2015;31(5):530-6. [PMID: 25689480]
24. Mishra S, Joseph RA, Gupta PC, Pezzack B, Ram F, Sinha DN, Dikshit R, Patra J, Jha P. Trends in bidi and cigarette smoking in India from 1998 to 2015, by age, gender and education. *BMJ Global Health*. 2016 Apr 1;1(1):e000005. [DOI: 10.1136/bmjgh-2015-000005]
25. WHO global report: mortality attributable to tobacco. [cited 2016 Dec 17]. Available From: http://www.who.int/tobacco/publications/surveillance/rep_mortality_attributable/en/.
26. National Center for Health Statistics. (2007). NHANES: Anthropometry procedures manual.
27. Koeppe GA, Snedden BJ, Levine JA. Workplace slip, trip and fall injuries and obesity. *Ergonomics*. 2015;58(5):674-9. [PMID: 25532054]
28. Strickland JR. Enhancing workplace wellness efforts to reduce obesity: A qualitative study of low-wage workers in St Louis, Missouri, 2013-2014. *Prev Chronic Dis*. 2015;12. [PMID: 25950574]
29. Kahn-Marshall JL, Gallant MP. Making healthy behaviors the easy choice for employees: a review of the literature on environmental and policy changes in worksite health promotion. *Health Educ Behav* 2012;39(6):752-76. [PMID: 22872583]
30. Finkelstein EA, DiBonaventura MdC, Burgess SM, Hale BC. The costs of obesity in the workplace. *J Occup Environ Med*. 2010;52(10):971-6. [PMID: 20881629]
31. Aronne LJ, Nelinson DS, Lillo JL. Obesity as a disease state: a new paradigm for diagnosis and treatment. *Clin Cornerstone*. 2009;9(4):9-25. [PMID: 19789061]

Dermatophytosis in a Tertiary Care Teaching Hospital of Odisha: A Study of 100 Cases of Superficial Fungal Skin Infection

Ajaya Kumar Jena¹, Rajesh Kumar Lenka², Mahesh Chandra Sahu³

¹Department of Skin & V.D, ²Professor, Dept. of Microbiology, ³Directorate of Medical Research, I.M.S & SUM Hospital, Siksha 'O' Anusandhan Deemed to be University, Bhubaneswar, Odisha, India

ABSTRACT

Introduction: Dermatophytosis is common superficial fungal infection of the skin. Recurrent dermatophytosis has become a troublesome entity in a tropical country like India and also carries a great psychosocial problem. The present study was undertaken with the aim to isolate and identify different species of dermatophyte and to study their clinical pattern.

Materials and Method: The study was conducted in a tertiary care teaching hospital over a period of 1 year taking 100 cases of suspected superficial fungal skin infection. Isolation and identification of causative species was done by various methods like macroscopic, microscopic, culture and biochemical tests.

Results: The present study found *Tinea corporis* to be the commonest clinical type with 45 cases (45%) followed by *Tinea cruris* 31 cases (31%). Out of 100 cases males were more in number 58(58%) compared to female 42(42%). Out of 100 cases which were subjected for KOH mount, 57 cases were positive and 43 cases were negative for fungal elements on direct microscopy. Culture was positive in 47 cases which included 42 KOH positive cases and 05 KOH negative cases. *Trichophyton rubrum* was the commonest isolate in 70.21% of isolates.

Conclusion: This study highlighted that *Tinea corporis* is the commonest clinical type with *Trichophyton rubrum* as the most common aetiological agents and males are more frequently affected. Though various species of dermatophytes produce clinically different characteristic lesions, but a single species may produce various types of lesions depending upon site of infection.

Keywords: *Tinea*, *Trichophyton*, *Dermatophytes*, *Dermatophytosis*

INTRODUCTION

Dermatophytosis is a common superficial fungal infection of skin. Dermatophytosis is generally called as "Tinea" which is a Latin word for "ring worm". The second part of the name of the dermatophytosis identifies

the part of the body infected¹. *Tinea corporis* and *tinea cruris* are the common types of dermatophytic skin infection. Dermatophytes are aerobic fungi that produce proteases that digest keratin and allow colonization, invasion and infection of the stratum corneum of the skin, the hair shaft, and the nail. Dermatophytosis is more prevalent in tropical and subtropical countries including India, where heat and moisture play an important role in promoting the growth of these fungi. In India which is a tropical country, the cause of dermatophytosis is adversely influenced by economic factors like poverty, poor hygiene and social conditions like overcrowding. Nature of dermatophytosis may change with passage of time,

Corresponding author:

Dr. Rajesh Kumar Lenka

Professor, Dept. of Microbiology
I.M.S & SUM Hospital, Siksha 'O' Anusandhan
Deemed to be University, Bhubaneswar, Odisha
Email: rajeshlenka@soa.ac.in

living population, evolution of preventive measures and hygienic conditions in society. *Trichophyton rubrum* is the predominant isolate in most clinical types. Infection is generally cutaneous and restricted to the nonliving cornified layers because the fungi is not able to penetrate the deeper tissue or organ of healthy immunocompetent host. The degree of immunosuppression and the number of immunosuppressed patients are increasing at an unprecedented pace, the management of dermatophytosis would be a definite challenge to mankind in the years to come. Dermatophytic infections are of major importance, as they are widespread and cause discomfort. Reactions to dermatophyte infection may range from mild to severe. The mildness and severity depend on a variety of factors such as the host reactions to the metabolic products of the fungus, the virulence of infecting species or particular strain, anatomical location of the infection and local environmental factors². Since these infections are often confused with other skin disorders, it is therefore, necessary to make early laboratory diagnosis for better management of these conditions³. The present study was undertaken with a aim to find out the incidence of dermatophytosis and species prevalence in clinically suspected cases of dermatophytosis in this part of our state.

MATERIALS & METHOD

This study was undertaken taking 100 clinically suspected patients having dermatophytosis randomly selected from the Dermatology outpatient department of Institute of Medical Sciences & SUM Hospital, Bhubaneswar from July 2014 to June 2015. Clinical history including age, sex, socioeconomic status, occupation, duration of disease, history of recurrence and type of lesion, similar complaints in the family and contacts with animals or soil were elicited and recorded in all cases. General physical examination and systemic examination was conducted and investigations like hemoglobin, total count, differential count, blood sugar, and liver function test were done whenever necessary. Infants, patients above 60 years, immunocompromised patients, secondarily infected, and those who have taken other modality of treatment like steroid were excluded from the study. Samples were collected after cleaning the affected surface with 70% alcohol. From skin lesions, scales were collected from erythematous growing margins of the lesion with a sterile blunt scalpel. Samples were collected in sterilized Whatman filter paper envelope and transported to the microbiological laboratory. Material

was subjected to direct microscopic examination using 10% KOH. Two sets of medium were used. Sabourauds dextrose agar (modified) and Sabourauds dextrose agar with cycloheximide and chloramphenicol were incorporated to avoid contamination with saprophytic fungi and bacteria. The clinical material were inoculated into one each of the above two media. The inoculated agar slants were incubated in room temperature and at 37°C in incubator and observed daily for growth. If no growth was noticed by four weeks culture was considered negative and discarded. Slide culture was done to study the morphology of microconidia and macroconidia, nature of the sporulation, special structures such as spirals, pectinate, racquet hyphae, and chlamydo spores. Special tests were performed when necessary for species identification.

RESULTS

A total of 100 patients were taken in the study, out of which 58 were males and 42 females. Maximum numbers of cases were in the age groups of 14 - 40 years (49 cases). The youngest patient was a 9-year-old girl and the eldest was a 60-year-old man. From this study it was seen that dermatophytosis was more common in males (58%) than in females (42%). Table 1.

Table 1. Age & sex distribution of dermatophytosis

Age in years	Male	Female	Total
1 – 10	04	03	07
11 – 20	09	06	15
21 – 30	14	08	22
31 – 40	10	12	24
41 – 50	12	07	19
51 – 60	09	04	13
Total	58	42	100

Tinea corporis was found to be the commonest clinical presentation with 45 cases followed by tinea cruris and tinea pedis with 31 and 12 cases respectively. Tinea capitis was mostly observed in children and girls were predominantly affected than boys (Fig 1, Table 2).

Table 2. Clinical types of dermatophytosis

Clinical type	No of cases	Percentage
Tinea corporis	45	45
Tinea cruris	31	31
Tinea pedis	12	12
Tinea capitis	07	07
Tinea mannum	03	03
Tinea facieie	02	02

Table 3. Results of KOH and culture

	KOH positive	KOH negative	Total
Culture positive	42	05	47
Culture negative	15	38	53
Total	57	43	100



Tinea corporis



Tinea cruris



Tinea faciei



Tinea mannum

Fig 1 Clinical types of dermatophytes

Fungal elements by KOH mount were observed in 57 cases and culture was positive in 47 cases.

Out of 57 KOH positive cases 42(73.68%) yielded growth in culture. Among 43 KOH negative cases, 5(11.62%) were culture positive. Thirty-eight cases were negative by both KOH mount and culture. Table 3.

From the culture positive cases the commonest species isolated was Trichophyton rubrum with 33(70.21%) followed by Trichophyton mentagrophytes with 12(25.53%) and Epidermophyton floccosum with 2(4.26%) (Table 4, Fit 2).

Table 4. Isolation of various species

Causative species	No of isolates	Percentage (%)
Trichophyton rubrum	33	70.21
Trichophyton mentagrophytes	12	25.53
Epidermophyton floccosum	02	04.26
Total	47	100

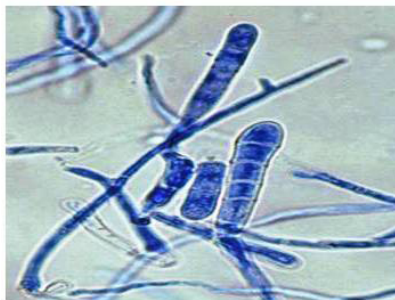
From the clinical types *T. rubrum* was isolated from 18 cases of tinea corporis followed by 10 cases of tinea cruris. *T. mentagrophytes* was isolated from equal number of 5 cases of tinea corporis and tinea cruris. *Epidermophyton floccosum* was isolated from 2 cases one each from tinea corporis and tinea capitis. Tinea pedis cases showed 2 isolates each of *T. rubrum* and *T. mentagrophytes* and one case of tinea mannum showed *T. rubrum* species. Table 5.



Trichophyton rubrum



Trichophyton mentagrophytes



Epidermophyton floccosum

Fig 2 Microscopic view of dermatophytes with cotton blue staining

Table 5. Causative species in different clinical types of tinea

Species	T. corporis	T. cruris	T. pedis	T. capitis	T. mannum
Trichophyton rubrum	18	10	02	01	01
Trichophyton mentagrophytes	05	05	02	00	00
Epidermophyton floccosum	01	00	00	01	00
Total	24	15	04	02	02

DISCUSSION

In the present study of 100 cases, highest incidence of dermatophytosis was observed in the age group of 14–40 years and in males. This may be due to greater outdoor physical activity and increased sweating in this age group favoring the growth of dermatophytes. This was in correlation with other studies^{4,5}. From the study following clinical forms were observed: tinea corporis, tinea cruris, tinea pedis, tinea capitis, tinea mannum and tinea faciei of which tinea corporis was the commonest form which is in line with other studies done by Bindu *et al* and Belukar *et al*.^{6,7} However in the studies by Verma *et al*.⁸ and Sardari *et al*.⁹ it has been reported that tinea cruris was the most common clinical type but in our study tinea corporis was common in comparison with tinea cruris. Tinea capitis was more common in girl children below the age group of 12 years, which was also observed in some other studies^{10,11}. In another study of superficial mycosis in a hospital in north-east India it was observed that tinea pedis (29.2%) as the most common dermatophytosis followed by tinea cruris (26.2%), which differs from other studies¹². Out of 100 cases which were subjected for KOH mount, 57 cases were positive and 43 cases were negative for fungal elements on direct microscopy. Culture was positive in 47 cases which included 42 KOH positive cases and 05 KOH negative cases. Similar type of observation was also made in some other studies¹³. However, a study by Belukar *et al*.⁷ showed culture positivity of 71%, which was much higher and a study done at Aurangabad showed low rate of culture positivity of 22.8%¹⁴. *Trichophyton rubrum* was the main organism isolated with a percentage of 70.2%. This is similar to reports of other workers from different regions of India. *Trichophyton mentagrophytes* (25.5%) isolates were found second in frequency similar to the study from Calicut by Bindu *et al*, which are relatively more prevalent in south India. *E. floccosum* was the most common etiological agent of dermatophytosis in a study by Pashkir at Karaj city, Tehran¹⁵. However, in the study by Grover *et al*.¹² in north-east India *T. tonsurans* was the most common dermatophyte followed by *T. rubrum*, which differs from other studies that reports *T. rubrum* as the most common fungal pathogen. In the present study *E. floccosum* was isolated in 4.3% of cases which was similar to findings of other studies of 8.49% by Kumas S *et al*. in 2014¹⁶, Singh S *et al* in 2003 reported - 7.75%⁵ and Peerapur BV *et al* in 2004 - 7.8%¹⁷ and Gupta BK in 1993 - 15.15%.¹⁸ Although Dermatophytosis is caused by all three i.e. *Trichophyton*, *Epidermophyton* and *Microsporum* but our study did not isolate *Microsporum*

as causative agent in any of the patients which was also corroborated in other studies by Poluri et al in 2015 and Bindu et al in 2002^{2,6} and studies by Parameswari et al isolated *Microsporum gypsum* as causative agent in 4.3% cases of dermatophytosis.¹⁹ In most of the inflammatory lesions *T. mentagrophytes* was isolated and *T. rubrum* was isolated in most of the non inflammatory lesions. Other significant finding from the study was that most of the patients were of low socioeconomic status and close family members of patients were also affected.

CONCLUSION

Dermatophytosis is a very common problem encountered in a tropical country like India and outdoor physical activities which causes excessive sweating is a major aggravating factor in these patients. However this can be tackled with patient education about maintaining a good personal hygiene. Even though dermatophytosis is a trivial disease but it is associated with lot of psychological effects especially in recurrent cases. Early diagnosis and treatment is the key in tackling the menace and also preventing in lot of expenditure in the treatment.

Ethical Clearance: This study is approved from our institutional ethics committee.

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Fran Fisher, Norman B. Cook "Fundamental of diagnostic mycology". W.B. Saunders company 1998;118-156.
2. Poluri LV, Indugula JP, Kondapaneni SL. Clinicomycological study of dermatophytosis in South India. J Lab Physicians 2015;7:84-9.
3. Huda MM, Chakraborty N, Bordoloi JNS. A clinico-mycological study of superficial mycoses in upper Assam. Indian J Dermatol Venereol Leprol 1995;61:329-332.
4. Mohanty JC, Mohanty SK, Sahoo RC, Sahoo A, Praharaj N. Incidence of dermatophytosis in Orissa. Indian J Med Microbiol 1998;16:7880.
5. Singh S, Beena PM. Profile of dermatophyte infections in Baroda. Indian J Dermatol Venereol Leprol 2003;69:2813.
6. Bindu V, Pavithran K. Clinico-Mycological study of dermatophytosis in Calicut. Indian J Dermatol Venereol Leprol. 2002;68:259-61.
7. Belukar DD, Barmi RN, Karthikeyan S, Vadhavkar RS. A Mycological study dermatophytosis in Thane. Bombay Hosp J. 2004;46:2.
8. Verma BS, Vaishnav VP, Bhat RP. A study of dermatophytosis. Indian J dermatol Venereol Leprol.1970;36:182.
9. Sardari L, Sambhashiva RR, dandapani R. clinico mycological study of dermatophytes in a coastal area. Indian J Dermatol Venereol Leprol. 1983;49:2:71-5.
10. Madhavi S, Rama Rao MV, Jyothsna K. Mycological study of dermatophytosis in rural population. Ann Biol Res 2011;2:8893.
11. Balakumar S, Rajan S, Thirunalasundari T, Jeeva S. Epidemiology of dermatophytosis in and around Tiruchirappalli, Tamilnadu, India. Asian Pac J Trop Dis 2012;2:2869.
12. Grover SC, Roy PC. Clinicomycological profile of superficial mycosis in a hospital in North East India. Medical Journal Armed Forces India. 2003;59:114-16.
13. SS Sen, ES Rasul. Dermatophytosis in Assam. Indian Journal of Medical Microbiology. 2006;24(1):77-78.
14. Patwardhan N, Dave R. Dermatophytosis in and around Aurangabad. Indian J Pathol Microbiol.1999;42:455-62.
15. Pakshir K, Hashemi J. Dermatophytosis in Karaj, Iran. Indian J Dermatol. 2006;51:262-4
16. Kumar S, Mallya PS, Kumari P. "Clinico-Mycological Study of Dermatophytosis in a Tertiary Care Hospital". Int J of Sci Study. 2014;1(6):27-32.
17. Peerapur BV, Inamdar AC, Puspha PV, Shrikant B. Clinico mycological study of dermatophytosis in Bijapur. Indian J. Med Microbiol.2004;273-274.
18. B. K. Gupta et al. Mycological aspects of Dermatophytosis in Zudhiana. Indian J. Pathol Microbiol 1993;36(3):233-237.
19. Parameswari K, Prasad Babu KP. Clinico-Mycological study of dermatophytosis in and around Kakinada. Int J Med and Dent Sci 2015; 4(2):828-833.

Evaluation of Deferral Pattern among Blood Donor Population in a Hilly Terrain of Solan Region, North India

Sushant Kumar Meinia¹, Anuj Sharma²

¹Senior Resident, Dept. of Transfusion Medicine, A.I.I.M.S Rishikesh, ²Associate Professor, Dept. of Pathology, Maharishi Markandeshwar Medical College and Hospital, Solan, Himachal Pradesh

ABSTRACT

Introduction: Safe donors are encouraged to donate their blood while at-risk donors are encouraged to self defer from blood donation. The purpose of present study was to evaluate deferral pattern among blood donor population in the hilly terrain of Solan region, North India.

Materials and Method: The present study was conducted to analyse the retrospective data for various causes of deferral of whole blood donors over a period of one year, from June 2015 to May 2016, among different age groups of both the sex at the Department of Transfusion Medicine, Maharishi Markandeshwar Medical College and Hospital, Solan

Results: Out of 2195 whole blood donors, 105 (4.78%) were deferred. Most common cause of temporary deferral was Low Hemoglobin (17.58%) followed by antibiotics intake (14.23%), alcohol intake (13.19%), jaundice (10.9 %) and typhoid (8.79 %). The most common cause of permanent deferral was Hypertension (57.14%) and Asthma (14.28%).

Conclusion: A deferral study in blood donors sheds light on the health status of the general population that affect the blood supply.

Keywords: Donor deferral, Transfusion Medicine, temporary deferral, permanent deferral

INTRODUCTION

Safe blood inventory is a challenging job especially in developing countries. According to World Health Organization factsheet 2017, around 112.5 million blood donations are collected worldwide and more than half of these are collected from high-income countries having population of only 19 percent and the median annual donations per blood centre is 5400 in the low and middle-income countries in contrast to 16000 in the high-income countries.¹ Blood donor has to pass through stringent donor selection criteria and screening,

and many of them get deferred due to various reasons.² Donor screening and donor deferral are important for the supply of safe blood as regular transfusion transmitted infection screening is done for only five infections and other diseased conditions can be identified at the time of donor screening. Sometimes the deferred donors feel de-motivated and have negative experience in blood donation thus preventing them to become regular voluntary donors.³ Deferred donors can be divided into temporary or permanent deferrals and it is the temporary deferrals which add to the larger pool of deferrals. So it is very important to recognize, counsel and motivate prospective temporary deferred donors, so that they can become regular voluntary donors in future. Most of the donor deferral studies are done in plain regions of India. The aim of our study was to evaluate deferral pattern among donor population in a hilly terrain in northern part of India.

Corresponding author:

Dr. Anuj Sharma

Associate Professor, Dept. of Pathology
Maharishi Markandeshwar Medical College &
Hospital, Solan (H.P)

Email: dranujsharma81@gmail.com

MATERIAL AND METHOD

A retrospective study was conducted on Whole blood donors to evaluate the various causes of Deferral, over a period of one year, from June 2015 to May 2016. The study was approved by the institutional ethics committee. The donors were screened through donor questionnaire followed by physical examination and hemoglobin estimation. The deferred donor’s data was then collected according to the criteria laid down by the Directorate General of Health Services guidelines, Ministry of Health and Family Welfare (2003).⁴ Deferred donors data was then analysed and was categorised

into permanent and temporary causes. The deferred donor’s data thus collected was calculated and analysed statistically using SPSS software.

RESULTS

Out of 2195 whole blood donors who were screened, 2090 (95.22%) were eligible for donation and 105 (4.78%) were deferred. The deferral rate among male population was 3.97% and female population was 11.84%. (Table 1). Out of the total 105 deferred donors, 91 (86.67%) donors were deferred because of temporary reasons whereas 14 (13.33%) donors were deferred because of permanent reasons (Table 2).

Table 1: Distribution of Male and Female Whole Blood Donors

Donor Category	Male	Female	Total
Total Selected Donors	1889 (96.03%)	201 (88.16%)	2090 (95.22%)
Total Deferred Donors	78 (3.97%)	27 (11.84%)	105 (4.78%)
Total Registered Donors	1967 (100%)	228 (100%)	2195 (100%)

The most common cause of temporary deferral was Low Hemoglobin (17.58%) followed by antibiotics intake (14.3%), alcohol intake (13.19%), jaundice (10.9 %) and typhoid (8.79 %) (Table 3). The most common cause of permanent deferral was Hypertension (57.14%) followed by Asthma (14.28%) (Table 4).

Table 2: Frequency of Permanent and Temporary Deferrals.

Type of Deferral	No. of Deferrals	Total deferrals (%)	Deferrals of total registration (%)
Temporary	91	86.67 %	4.15 %
Permanent	14	13.33 %	0.63 %
Total Deferrals	105	100%	4.78 %

The various causes of temporary and permanent deferrals along with their relative proportions are shown in Table 3 and Table 4 respectively.

Table 3: Causes of temporary deferrals with their relative proportions

Temporary Deferrals	18-29		30-41		42-53		54-65		Total Male	Total Female	Grand Total
	M	F	M	F	M	F	M	F			
Low Hemoglobin	1	8	2	2	0	2	0	1	3	13	16(17.6%)
Alcohol intake	4	0	8	0	0	0	0	0	12	0	12(13.2%)
Antibiotics	7	0	4	0	2	0	0	0	13	0	13(14.3%)
Hypotension	1	1	0	1	0	0	0	0	1	2	3(3.3%)
Underweight	0	2	0	2	0	1	0	0	0	5	5(5.5%)
Typhoid	3	1	3	0	1	0	0	0	7	1	8(8.8%)
Jaundice	4	0	4	0	0	1	1	0	9	1	10(11%)
Dogbite	0	0	2	0	0	0	0	0	2	0	2(2.2%)
Previous Donation	3	0	1	0	0	0	0	0	4	0	4(4.3%)
Tattoo	1	0	1	0	0	0	0	0	2	0	2(2.2%)
On ATT intake	1	0	1	0	0	0	0	0	2	0	2(2.2%)
Fever	0	0	4	0	0	0	0	0	4	0	4(4.3%)
Allergic Disease	1	0	0	0	1	0	0	0	2	0	2(2.2%)
Dengue	0	0	1	0	0	0	0	0	1	0	1(1.1%)
Malaria	1	0	0	0	0	0	0	0	1	0	1(1.1%)
Abortion	0	0	0	1	0	0	0	0	0	1	1(1.1%)
Lactation/Recentdelivery	0	0	0	1	0	0	0	0	0	1	1(1.1%)
Poor vein	0	1	0	0	0	0	0	0	0	1	1(1.1%)
Recent surgery	1	1	0	0	1	0	0	0	2	1	3(3.3%)
Total	28	14	31	7	5	4	1	1	65	26	91(100%)

Table 4: Causes of permanent deferrals with their relative proportions

Permanent Deferrals Cause	18-29 Yrs		30-41 Yrs		42-53 Yrs		54-65 Yrs		Total Male	Total Female	Grand Total
	M	F	M	F	M	F	M	F			
Hypertension	0	0	4	0	4	0	0	0	8	0	8(57.14%)
Malignancy	0	0	0	0	0	1	0	0	0	1	1(7.14%)
Heart Disease	0	0	0	0	0	0	1	0	1	0	1(7.14%)
Diabetic	0	0	0	0	1	0	0	0	1	0	1(7.14%)
Asthma	0	0	1	0	1	0	0	0	2	0	2(14.30%)
Epilepsy	0	0	1	0	0	0	0	0	1	0	1(7.14%)
Total	0	0	6	0	6	1	1	0	13	1	14(100%)

DISCUSSION

Healthy and safe donor selection is the first and important step towards safe transfusion services. This is achieved through proper donor counseling and screening questionnaire before donation and is an important process to recruit and retain regular voluntary non remunerated donors. The pattern of donor deferral is an important tool for blood safety and also provides key areas to focus on a region or policy formulation nationally for donor selection as well ensure donor safety.⁵

Our study focused on various blood donor deferral patterns amongst the population of hill region of Solan district as this region lacked any such previous study. In the present study the overall total donor deferral rate was 4.78% (105/2195) which was similar to studies conducted in New Delhi (North India) and South India whose total donor deferral rates were 5.1% and 5.04% respectively.^{6,7} However, in studies conducted in Central, Eastern and Western India deferral rates were considerably higher than our study (11.5%, 9.7% and 33%).^{5,8,9} This emphasizes the need for region wise donor deferral studies in order to establish region wise deferral criterias in our country. In this study total donor deferral rate among females was three times higher than the males (11.84 % vs 3.97%) and there was a statistically significant difference between between the two ($p < 0.05$). This was similar to other studies conducted in North, South and Eastern and Western India.^{6,7,8,10} Temporary reasons were the commonest cause of deferrals amongst the total donors deferred in current study (86.67%) which was analogous to studies by Shrivastava et al (62.8%)⁵, Pisudde et al (77.8%)⁸, Vimal et al (78.7%)¹¹, Kasraian et al (95.5%)¹² and Chauhan et al (95.16%).¹³ The majority of temporarily deferred donors were <41 years of age

(80/91 i.e. 87.91%) comparable to the Western Indian study (80.80% <40 years).⁹ Contrastingly, majority of permanently deferred donors were >41 years (8/14 i.e. 57.14%). Agnihotri also found that deferral percentage increased significantly as the age of the donor increased to >40 years.¹⁰ However, our study could not find any statistically significant association between age of temporary deferrals. On the contrary, there was a highly statistically significant association between temporary deferral and gender ($p < 0.001$) that was similar to the significant female preponderance among temporary deferred donors in Western Indian study i.e. in present study, 11.40% of total female and 3.30% of total male donors were deferred temporarily similar to 15.05% female vs. 2.51% male donors deferred temporarily in Western Indian study.⁹

Low hemoglobin (<12.5g%) was the commonest cause of temporary deferrals in our study which was similar to many studies but the total percentage of temporary deferrals due to low hemoglobin was much lower in comparison to many studies. Low hemoglobin constituted only 17.6% (16/91) of the Temporary causes of deferrals and only 15.23% (16/105) of all causes of Deferral. This was totally different from most of studies including those by Pisudde et al⁸, Shah et al⁹, Agnihotri¹⁰, Vimal et al¹¹ and Chauhan et al¹³ in which Low hemoglobin constituted 52.6%, 78.3%, 55.8%, 31.5% and 42.26% of the total temporary deferrals respectively. However, our overall total rate of low hemoglobin deferral of 15.23% was closest to Shrivastava et al who also found 19.4% donor deferral due to low hemoglobin.⁵ This observation of Less temporary as well as Total deferral percentage due to low hemoglobin may be explained by the fact that in the Hill State of Himachal Pradesh hemoglobin in people is higher as an adaptation to higher altitude. This finding

is corroborated by the National Family Health Survey 2015-16 in which only 20.1% men age 15-49 years are anaemic (<13.0 g/dl) in the state of Himachal Pradesh.¹⁴ Bharati et al also stated that Women from Himachal Pradesh were less anemic (32.2%) compared with those from other states in India and mean hemoglobin in Women was 12.47 g%.¹⁵ Therefore, in our study also although low hemoglobin was a commonest cause of blood donor deferral in Females but overall it constituted less than 50% of the total deferrals. The commonest cause of Permanent Deferrals was Hypertension which was akin to most studies.^{7,8,10,11,13}

CONCLUSION

A shortage of safe blood donors is frequent and it is important to understand the causes of deferral of potential donors to improve recruitment campaigns aiming at the quality and availability of donors. A deferral study in blood donors not only sheds light on the health status of the general population that affect the blood supply but also gives diverse region wise donor deferral data emphasising the need for region centric donor deferral studies. As temporary deferrals are higher than permanent deferrals, they should be appropriately counselled, educated and encouraged for repeat donation which can compensate the ever increasing demand of Healthy blood donors.

Source of Funding : None

Conflicts of Interest – Nil

Ethical Clearance: Taken from the Ethical Committee.

REFERENCES

1. WHO factsheet June 2017 available from: <http://www.who.int/mediacentre/factsheets/fs279/en/> Accessed December 15, 2017
2. Arslan O. Whole blood donor deferral rate and characteristics of the Turkish population. *Transfus Med.* 2007;17:379–83.
3. Halperin D, Baetens J, Newman B. The effect of short-term, temporary deferral on future blood donation. *Transfusion* 1998; 38(2):181-3.
4. Saran RK. *Transfusion Medicine Technical Manual.* 2nd ed. New Delhi: Mehta Offset Pvt. Ltd; 2003.
5. Shrivastava M, Shah N, Navaid S, Agarwal K, Sharma G. Blood donor selection and deferral pattern as an important tool for blood safety in a tertiary care hospital. *Asian J Transfus Sci* 2016;10:122-6.
6. Sharma T, Singh B, Bhatt GC. Profile of deferral of blood donors in regional blood transfusion center in North India. *Asian J Transfus Sci* 2013;7:163-4.
7. Sundar P, Sangeetha SK, Seema DM, Marimuthu P, Shivanna N. Pre-donation deferral of blood donors in South Indian set-up: An analysis. *Asian J Transfus Sci* 2010;4:112-5.
8. Pisudde PM, Shyam S, Rekha D, Gon S (2015) Evaluation of Pre-donation Deferral Reason among the Blood Donors Visiting ESIC Hospital in Eastern India. *J Blood Disorders Transf* 6: 255. doi:10.4172/2155-9864.1000255
9. Shah R, Tulsiani S, Harimoorthy V, Mathur A, Choudhury N. Analysis of efforts to maintain safe donor in main donor pool after completion of temporary deferral period. *Asian J Transfus Sci* 2013;7:63-7.
10. Agnihotri N. Whole blood donor deferral analysis at a center in Western India. *Asian J Transfus Sci* 2010;4:116-22.
11. Vimal M, Sowmya S, Nishanthi A, Ramya G. Evaluation of blood donor deferral causes: a retrospective study from South India. *Annals Pathol Lab Medic.* 2016;3(6):A605-611
12. Kasraian L, Negarestani N, Kasraian L, Negarestani N. Rates and reasons for blood donor deferral, Shiraz, Iran. A retrospective study. *Sao Paulo Med J.* 2015 Feb;133(1):36–42.
13. Chauhan C, Chauhan R, Awasthi S, Dutta S, Joshi H. Pattern and outcome of donor deferral -? need of hour. *Int J Res Med Sci* 2018;6:289-92.
14. State Fact Sheet Himachal Pradesh - National Family Health Survey – 4 2015 -16 available from: <http://www.rchiips.org/nfhs> Accessed Jan 6, 2018
15. Bharati P, Som S, Chakrabarty S, Bharati S, Pal M. Prevalence of Anemia and Its Determinants Among Nonpregnant and Pregnant Women in India. *Asia Pac J Public Health* 2008 20(4): 347-359

Evaluating the Impact of HR Practices on Employee Deviant Behavior: An Exploratory Study on Employees of IT Industry

Sainath Malisetty¹, Malathi Narayanan², CH.Bala Nageswara Rao³

¹Research Scholar, Department of Management Studies, VELS University, Chennai,

²Research Scholar, ³Director, Saveetha School of Management, Saveetha University, Chennai

ABSTRACT

Purpose – The purpose of this study is to evaluate the impact of Human Resource Practices on Workplace Deviance. Given the paucity of existing research on the role of HR practices in shaping workplace deviance, the present study aimed to explore the issue further specifically by extending the work through consideration of broader types of deviant behavior possibly exhibited by employees at work.

Design– This article analyses the link between Organization HR Practices and Employee workplace deviance. Toward this objective, a survey was carried out among 372 IT employees in the Southern region of India. Factor analysis revealed four distinct dimensions of HR practices i.e. job description, employment security, internal career opportunities, and result-oriented appraisal.

Findings – Deviant workplace behavior resulted in one dimension only, i.e. interpersonal deviance. Multiple regression analysis shows that all dimensions of HR practices but result-oriented appraisal were found to influence negatively organizational deviance.

Originality– Till date, an attempt was never made to link the HR Practises and Workplace Deviance of IT employees. Therefore this article would be valuable to the researchers and academicians who wish to acquire a paradigm of the present writing, particularly pursuers who don't have practical experience in the branch of knowledge. The

Present study has been able to provide initial understanding on the issue of workplace deviance and the determining role of HR practices.

Keywords –HR Practices, Workplace Deviance, Organisational behavior, IT employees, India.

INTRODUCTION

Deviant work behavior refers to voluntary behavior that violates significant organizational norms. And, in thus doing, so is perceived as threatening the nicely-being of the firm and its contributors^[1]. Examples of such behavior are coming back in overdue to figure without earlier permission, stealing organization Belongings, and harassing others at work. Attributable to the nature of its negativity, the topic has step by step gained attention every of academics and practitioners. In effect, analysis on the matter is step by step increasing with emphasis given on analyzing the contribute factors. However, upon assessment of the literature, little is recognized of

the role of Human Resource (HR) practices on deviant work behavior, in spite of the existing evidence at the result of such practices on shaping worker attitudes and behavior consisting of structure Dedication, method satisfaction, and task overall performance^{[2], [3], [4], [5]}.

To date, an attempt became created to link human resource practices with deviant behavior^[6]. The usage of statistics from a nationally representative survey of over 300 US Work establishments, Arthur set empirical support that companies with HR structures defined with the help of bigger use of internal diligence markets and far less crew autonomy are related to decrease frequencies of advised social deviance behaviors. At identical time as his work is ready to shed some insight

into the perform of HR practices on deviant behavior, it become finished on the organizational stage of analysis, and targeted on a specific sort of deviant conduct best. Such an affected cognizance is unlucky as personnel are expressed to own interaction in varied styles of deviant behavior at work and Research are required to appear at why they act in such dangerous behaviors ^{[1], [7]}. An observe at the gender level analysis of research is bonded as deviant behaviors are committed by method of people at intervals the Organization, and it's miles apt to know however the HR practices applied might want to create their notion on this issue.

Given the scarceness of existing studies on the role of HR practices in shaping place of work deviance, the Present study aimed to get the problem any.

METHOD

Study Sample and Procedure

To achieve the analysis objective explicit earlier, a survey was applied amongst producing employees of varied service levels in IT corporations in India.

Questionnaires were distributed with the help of human resource departments. As a result of this method of distributing the questionnaires might compromise the honest opinions of the participants, the researchers guaranteed their obscurity. They were additionally told that the finished questionnaires ought to be sealed in an accompanying envelope before returning to the human resource department for assortment, which their responses would be collective. The survey took about twenty minutes to finish.

All in all, four hundred self-reported questionnaires were distributed to the staff. Once 3 months of knowledge collection from October 2017 till December 2017, 372 completed questionnaires were came either by mail or by personal assortment, yielding a decent response rate of ninety three. All came questionnaires were valid for final knowledge analysis. The participants of the study were principally created of male (74.7%), married (62.5%), of Indian origin (90.8%), and had high school diploma or certificate (82.8%). Most of them were non-executive workers (73.1%). The mean age was 30.79 years, and therefore the mean length of service was 6.97 years.

Measures

Deviant work behavior was measured using the

work Deviance questionnaire developed by Bennett and Robinson ^[1]. The 17-item instrument has been widely used in previous studies (e.g. [8], [9]), and have reportable re-liabilities starting from .74 to .94 ^[10]. Deviant workplace behavior is categorized into 2 groups: social deviance and structure deviance. Social deviance is characterized by norm-violating behaviors directed at co-workers, whereas structure deviance refers to those counter normative behaviors aimed specifically at the organization itself ^[11]. Out of seventeen things, seven measured interpersonal deviance, and therefore the remaining things structure deviance. Participants were asked to point, while within the job, however typically they apprehend of any of their workmates, who, for instance, "Made fun of somebody (other workmates, guests, etc.) whereas at work," "Took property from work while not permission," "Came in late to figure while not permission," and "Dragged out add order to induce overtime." The variable was measured on five-point scale, starting from '1' "never," to '5' "all the time."

HR practices were measured mistreatment an instrument containing twenty three things ^[12]. All things used a five point scale starting from '1' "strongly disagree" to '5' "strongly agree". Participants were asked to point their level of agreement (or disagreement) with regards to the human resource practices in their organization on things like "Employees during this job can usually bear coaching programs each few years," "Performance appraisals are supported objective, quantitative results" and "Job security is nearly warranted to workers during this job."

FINDINGS

Before testing the impact of HR practices on workplace deviance, an element analysis with principle component analysis using an orthogonal varimax rotation was allotted to determine the validity of the measures. To spot and interpret factors, the factors that every item ought to load .50 or bigger on one issue and .35 or lower on the opposite issue were used ^[13]. Supported the analysis, a four issue answer that designates 67.9% variance in hour practices was found. The Kaiser-Meyer-Olkin (KMO) line of sampling adequacy was .841 whereas the Bartlett's take a look at of sphericalness was important ($\chi^2 = 1544.494$, $p < .01$), indicating sufficient inter-correlations for the correlational analysis. The four factors found are description, employment

security, result-oriented appraisal, and internal career opportunities. Every issue was treated as distinct variables to be thought-about as inputs for correlation analysis later.

Next, cor-relational analysis with varimax rotation was run to validate the spatial property of deviant work Behavior. Unexpectedly, one issue answer explaining 68.7% variance was found. The Kaiser-Meyer-Olkin (KMO) line of sampling adequacy was .832 whereas the Bartlett’s take a look at of globularness was significant ($\chi^2 = 1055.942, p < .01$), indicating decent intercorrelations for the correlational analysis. As a result of the items that were loaded on one issue replicate deviance targeted at people; this issue was re-labelled interpersonal deviance

that was later thought-about within the multivariate analysis.

Table one presents that, internal reliableness worth (Cronbach α), and therefore the correlations of the variables. The Cronbach’s alphas obtained for the measures were .84 for job description, .67 employment security, .86 appraisal, .63 internal career opportunities, and .89 work deviances. Supported the table, it seems that in general participants reportable that human resource practices are being well practiced in their organizations, as indicated by the high mean values. Obviously, staffs were reportable to have interaction in work deviance sometimes within the surveyed organizations.

Table-1: Means, Reliability and Correlations (N=372)

Variables	Mean	1	2	3	4	5	Cronbach’s α
1.Job Description	3.52	-					0.84
2.Employment Security	3.29	.432**	-				0.67
3.Results oriented appraisal	3.48	.447**	.338**	-			0.86
4.Internal Career opportunities	3.32	.448**	.389**	.352**	-		0.63
5.Workplace Deviance	2.23	-.226**	-.156**	-.103*	-.130*	-	0.89

* Significant at $p < .05$; ** Significant at $p < 0.01$

As shown in Table-1, all dimensions of HR practices showed important negative correlations with workplace deviance, although the strength of the associations is quite weak [14].

RESULTS

The present study wanted to look at the connection between HR practices and work deviance because very little is thought of whether or not HR practices play a job in shaping employees’ deviant responses at work. Based on correlation analyses run, this study has provided empirical support for such relationship. As expected, HR practices are negatively associated with work deviance. Once staff understands that the organization isn’t implementing HR practices favourably, they have a tendency to have interaction in deviant behavior at work such as by creating fun of somebody (other workmates, guests, etc.), speech communication one thing hurtful,

making an ethnic, non-secular or racial remark, utter somebody, and taking part in a mean prank on somebody. The finding is consistent with previous study that found the impact of HR system on social deviance at the organization level [6].

Specifically, this study found that job description, employment security, result-oriented appraisal, and internal career opportunities are negatively associated with work deviance. Once the workers have duties that are clearly outlined and have up-to-date job description, they’re less seemingly to have interaction in deviant behaviors at work as a result of the grasp what to try and do and the way to try and do therefore. It absolutely was reportable that once staff was not further from their role at work, they might feel stressed and should interact in deviant behavior at work [15]. While work stress has been found to be a precursor to work deviance, a lot of studies

ought to be conducted to verify its impact.

As expected, employment security was found to relate negatively to deviant behavior. Employment security is a very important aspect of quality of life for several staff^[16]. Once folks feel that their job is secure, they'll be a lot of committed and impelled to table-1 and fewer seemingly to have interaction in deviant behavior. Conversely, those that feel that their job is insecure would tend to be angry and annoyed^[17].

To vent anger, they'll divert their negative emotions toward others. Despite the plausible role of emotional responses to job insecurity, a lot of studies ought to be distributed to validate it. Unfavourable appraisal system and lack of internal career opportunities may additionally increase the likelihood of staff partaking in work deviance behavior. Appraisal system is one amongst the foremost problematic HR practices because it is replete with human perspicacity and discretion, despite makes an attempt to minimize such biases. As a result, staff could understand to be below the belt assessed and once this happens they may retaliate by partaking deviant behavior at work^[18]. Once the appraisal method is seen as being unfair, the distribution of reward like promotion also will be seen as unfair^[19]. While the reason for the connection between HR practices and deviant behavior is probably going, a lot of analysis is required to validate it. Moreover, considering the emotional method like anger or frustration into the equation could facilitate understand the entire relationship higher and therefore extend the present literature on workplace deviance.

The findings of this study recommend that managers ought to confirm that HR practices are

Implemented in such some way that they might not end in unwitting, undesirable activity consequences at work. Perspective surveys, for instance, may be accustomed gauge to what extent the HR practices are perceived to be honest and favourable. To additional extend the literature, a lot of studies ought to be distributed to grasp the issue higher by investigation different factors, like individual, discourse and job-related, and that may contribute to work deviance.

The unidimensionality found of work deviance additionally warrants additional analysis into the re-examination of the size and therefore the issue additional. If so similar findings may be replicated, problems arise on why social deviance solely is exhibited at work and

not structure deviance. Such investigation is important because it has vital implications to developing tributary work surroundings.

One of the restrictions of this study is generalizability. Because the participants of this study were from Technology organisation, the findings might not be generalized to a way broader population in other structure contexts owing to the various cultures and values. Moreover, as a result of this study is correlational in nature, causative relationships between the variables are tough to establish. Notwithstanding, despite these limitations, this study has been ready to offer initial understanding on the difficulty of workplace deviance and therefore the determinant role of HR practices.

Ethical Clearance- it as not applicable

Source of Funding- Self

Conflict of Interest - Nil

REFERENCES

- [1] R.J. Bennett, S.L. Robinson. Development of a measure of workplace deviance. *Journal of Applied Psychology*.2000, 85 (3): 349-360.
- [2] C.F. Fey, I. Bjorkman. The effect of human resource management practices on MNC subsidiary performance in Russia. *Journal of International Business Studies*. 2001, 32 (1): 59-76.
- [3] G.A. Gelade, M. Ivery. The impact of human resource management and work climate on organization performance. *Personnel Psychology*. 2003, 46: 383-404.
- [4] N. Khatri. Managing human resource for competitive advantage: A study of companies in Singapore. *International Journal of Human Resource Management*. 2000, 11 (2): 336-365.
- [5] A.K. Paul, R.N. Anantharaman. Impact of people management practices on organizational performance: Analysis of causal model. *International Journal of Human Resource Management*. 2003, 14 (7): 1246-1266.
- [6] J.B. Arthur. Do HR system characteristics affect the frequency of interpersonal deviance in organizations? The role of team autonomy and internal labor market practices. *Industrial Relations*. 2011, 50 (1): 30-56.
- [7] R.C. Hollinger, J.P. Clark. Formal and informal

- social controls of employee deviance. *Sociological Quarterly*. 1982, 23: 333-343.
- [8] T.A. Judge, B.A. Scott, R. Ilies, R. Hostility, job attitudes, and workplace deviance: test of a multilevel model. *Journal of Applied Psychology*. 2006, 91: 126–138.
- [9] F. Omar, F.W. Halim, H. Zainah, R. Nasir, R. Khairudin. Stress and job satisfaction as antecedents of workplace deviant behavior. *World Applied Sciences Journal (Special Issue of Social and Psychological Sciences for Human Development)*. 2011, 12: 46-51.
- [10] M. Darrat, D. Amyx, R. Bennett. An investigation into the effects of work family conflict and job satisfaction on salesperson deviance. *Journal of Personal Selling and Sales Management*. 2010, 30 (3): 239-252.
- [11] S.L. Robinson, R.J. Bennett. A typology of workplace deviance: a multidimensional scaling study. *Academy of Management Journal*. 1995, 38 (2): 555-572.
- [12] J. E. Delery, D.H. Doty. Modes of theorizing in strategic human resource management: test of universalistic, contingency, and configurational performance predictions. *The Academy of Management Journal*. 1996, 39 (4): 802-835.
- [13] M. Igarashi, J. Iivari, H. Maragah. Why do individuals use computer technology? a Finnish case study. *Information and Management*. 1995, 5: 227-238.
- [14] J. W. Cohen. *Statistical Power Analysis for Behavioral Sciences*. Lawrence Erlbaum Associates, 1988.
- [15] P.Y. Chen, P.E. Spector. Relationships of work stressors with aggression, withdrawal, theft and substance use: An exploratory study. *Journal of Occupational and Organizational Psychology*. 1992, 65: 177-184.
- [16] T.A. Wyatt, C.Y. Wah. Perceptions of QWL: a study of Singaporean employee development. *Research and Practice in Human Resource Management*. 2011, 9 (2): 59-76.
- [17] P.J. Jordan, N.M. Asakhanasy, C.E.J. Hartel. Emotional intelligence as a moderator of emotional and behavioral reactions to job insecurity. *The Academy of Management Review*. 2002, 27 (3): 361-372.
- [18] D. P. Skarlicki, R. Folger. Retaliation in the workplace: the roles of distributive, procedural, and interactional justice. *Journal of Applied Psychology*. 1997, 82 (3): 434-443.
- [19] K. Koonmee. Fairness in the workplace: the relative effects of distributive justice and procedural justice on incentive satisfaction. *The Business Review, Cambridge*. 2011, 17 (2): 160-166.

Role of Physical Activity in Management of Musculoskeletal Disorders: An Association with BMI

Pooja Sharma¹, Supriti Aggrawal², Sadhana Meena³

¹Research Scholar, ²Assistant Professor, ABS, Amity University, Noida, ³Physiotherapist at Sports Injury Centre, Safdarjung Hospital, Delhi

ABSTRACT

Background & Objectives: Musculoskeletal disorders are usually the health issues that hinders one's working capabilities. It is the main reason for the absence from work for the employees due to pain and discomfort. It is very important to search for the risk factors of such problems and to look for the preventive measures to solve the issue. There are many factors mentioned in current literature which cause these disorders and body mass index being one of them. The overall performance of an individual is enhanced by taking part in the regular physical activity.

Method: A convenient sample of 30 IT professionals suffering from various musculoskeletal disorders constituted the study sample. The subjects were in the age range of 25 – 40 years with mean BMI range (19 to 25). The minimum hours spent daily working on computer were 5 hours. Subjects were divided into three groups, group A: normal weight (BMI 18.6 - 24.9), group B: overweight (BMI 25.0 - 29.9), group C: obese (BMI 30.0 or more).

Results: The data analysis was done using SPSS software. The paired t test showed significant improvement in normal weight individuals and non-significant improvement in overweight and obese individuals. BMI is in correlation to the level of physical activity.

Conclusion: The present study emphasizes the role of exercises in decreasing the discomfort and pain due to musculoskeletal system disorders. BMI is a crucial factor well associated with these disorders. It is highly advised for the professionals working for long hours to incorporate active lifestyle to decrease the risk factors leading to faulty postures and various musculoskeletal disorders.

Keywords: *Musculoskeletal pain, body mass index, physical activity.*

INTRODUCTION

Musculoskeletal disorders are usually the health issues that hinders one's working capabilities. It is the main reason for the absence from work for the employees due to pain and discomfort. It is very important to search for the risk factors of such problems and to look for the preventive measures to solve the issue.^{1,2} There are many factors mentioned in current

literature which cause these disorders and body mass index being one of them.³ Body mass index is termed as the body mass of an individual divided by the square of his height and is basically expressed in the units of kg/m² which is widely applied as the primary tool to estimate to rule out health illnesses in a person due to being overweight or obese. The body mass index is further categorized as underweight (BMI below 18.5), normal weight (BMI 18.5 to 24.9) and overweight (BMI 25.0 to 29.9).⁴ Individual with high BMI are at high risk for the advancement of musculoskeletal disorders.¹ Studies recommend that people need to change their eating regimen and reduce their weight in order to reduce the musculoskeletal disorders.^{3,5} These disorders lower the

Corresponding author:

Pooja Sharma,

Research Scholar, ABS, Amity University Noida

E-mail: psharma1@amity.edu

general well being status and it increases sorrow, tension, touchiness, poor social communications, and lower general wellbeing status of an individual .^{6,7} The major concern of public health these days being the decreased level of regular physical activity and sedentary life style. Less physical activity is related with the many health conditions and causes risk of many types of systemic diseases. Additionally, the overall performance as well as the cardiorespiratory wellness of an individual is enhanced by taking part in the regular physical activity.⁸ Various researches have studied and attempted to make an instructive program which will prevent the disorders by advocatong preventive measures that are conservative and effective in decreasing the incidence of musculoskeletal disorders.^{9,10} It has also been emphasized that adopting the correct posture and active lifestyle habits will decrease the prevalance of these disorders.^{11,12}

METHODOLOGY

A convenient sample of 30 IT professionals suffering from various musculoskeletal disorders constituted the study sample. The subjects were in the age range of 25 – 40 years. The minimum hours spent working daily on computer were 5 hours. The patients with nerve root compression, disc herniation, severe scoliosis, recent history of any spinal surgery, any neurological disorder,

recent fractures, severe systemic disease were excluded. Subjects were divided into three groups, group A: normal weight (BMI 18.6 - 24.9), group B: overweight (BMI 25.0 - 29.9), group C: obese (BMI 30.0 or more). An informed consent was obtained from all the participants and the purpose of the study was explained. The standard nordic questionnaire was administered to assess the musculoskeletal disorders in the participants. The most prevalent areas for pain and discomfort included the low back for majority of the sample. Pain was evaluated through short form McGill pain questionnaire¹³ and the level of physical activity through short form international physical activity questionnaire. ¹⁴ The subjects were prescribed an exercise program starting with 10 minutes of warm up which included simple stretching exercises followed by range of motion exercises for the low back. These exercises included trunk flexion, extension, lateral bending and rotation exercises. Following this strengthening exercises for the same muscle groups were actively performed by the subjects. The entire exercise session was conducted for the duration of 40 minutes four days in a week for a total of four weeks. A home program was devised for participants that empasized on an active lifestyle including avoidance of prolonged sitting for long hours at a stretch. Postural advice was given to the subjects to avoid unnecessary strain on the muscles while sitting at work settings.

RESULT

The data analysis was done using SPSS software.

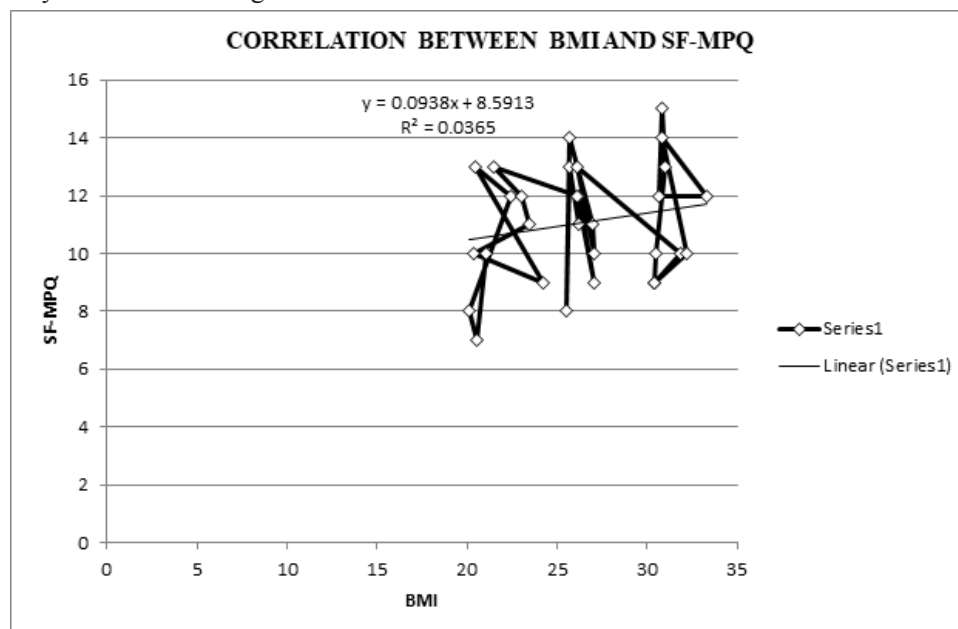


FIGURE 1 : CORRELATION BETWEEN BMI AND SF-MPQ

BMI was in correlation to SF-MPQ scores

Table 1: SF-IPAQ Pre-and post exercise program

	SF-IPAQ PRE (Mean±SD)	SF-IPAQ POST (Mean±SD)	p value
Group 1 N=10	1.7±0.483	2.5±0.516	0.001
Group 2 N=10	1.9±0.567	2.4±0.483	0.104
Group 3 N=10	1.8±0.422	2.2±0.316	0.193

SF-IPAQ score was measured on the first day and after 4 weeks. The paired t test showed significant improvement in Group A and non-significant improvement in Group B and Group C.

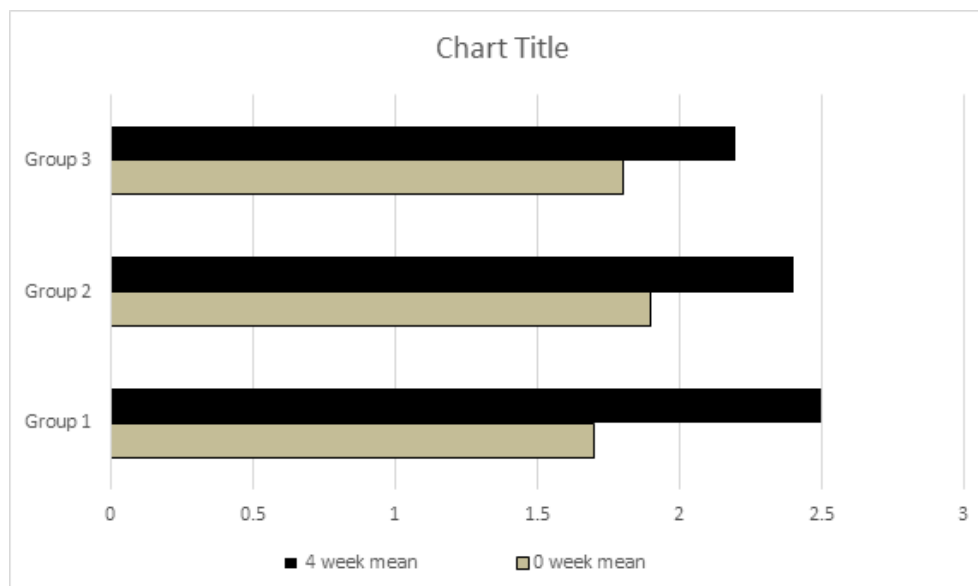


FIGURE 2 : SF-IPAQ SCORE Pre and Post exercise program

DISCUSSION

Overweight and obesity has been called a global epidemic by the World Health Organization.¹⁵ The prevalence of overweight and obesity is especially dramatic in economically developed countries and not only in adults but also in children and adolescents.¹⁶ Being overweight may originate from many different factors ranging from environmental influences on genetic variations.¹⁷ The heritability of predisposition for a high body mass index or body fat content is between 25 and 40%, which suggests that other factors such as environmental factors may also play a critical role.¹⁷ Both the family environment and genetic predisposition

influence the development of body fat content and distribution. Other crucial factors include lifestyle factors such as physical activity, nonsmoking, high-quality diet, sedentary activities and normal weight.^{18,19}

Obesity is the result of a chronic positive energy balance achieved by consuming more energy than is expended. The primary modifiable variable of the expenditure component is physical activity that is categorized into four domains: occupational, transportation, household, and leisure-time activities.²⁰ Existing literature presents conflicting findings regarding the association between physical energy expenditure and Body Mass Index .²¹ Some studies

conclude that higher BMIs are associated with higher energy expenditure²² whereas few others report no association between the two. Gender differences appear to contribute further to the controversy.²³

The present study showed improvement in pain due to musculoskeletal disorders in normal BMI individuals while there was no improvement seen in overweight and obese individuals following physical activity program. High BMI (overweight and weight) was tolerably connected with an expanded pervasiveness of musculoskeletal indications. The outcomes demonstrated noteworthy connection between's physical activity practice, BMI and musculoskeletal pain complaints. This is well in accordance with the existing literature which shows the relations between overweight or obesity and the pervasiveness of back pain symptoms more grounded for both genders.²⁴ It is advocated that obesity is a possibly modifiable hazard component for musculoskeletal disorders.

A multidisciplinary treatment approach is required for the management of musculoskeletal disorders prevalent in professionals due to sedentary lifestyle. A combined exercise protocol which include both strengthening and stretching exercises together with resistance training helps to decrease the pain and discomfort of the patient and improve their productivity. The present study emphasizes the role of exercises in decreasing the discomfort and to plan the management of these musculoskeletal system disorders. BMI is a crucial factor well associated with these disorders. It is highly advised for the professionals working for long hours to incorporate active lifestyle to decrease the risk factors leading to faulty postures.

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

- 1 Viester, L., Verhagen, E.A., Hengel, K.M.O., Koppes, L.L.J., Beek,A.J.D and Bongers, P.M. The relation between body mass index and musculoskeletal symptoms in the working population, BMC Musculoskelet Disord. 2013; 14: 238.
- 2 Sethi, J., Sandhu, J.S. and Imbanathan, V. Effect of Body Mass Index on work related musculoskeletal discomfort and occupational stress of computer workers in a developed ergonomic setup. Sports Med Arthrosc Rehabil Ther Technol. 2011; 3: 22.
- 3 Sharma P , Golchha V. Awareness among Indian dentist regarding the role of physical activity in prevention of work related musculoskeletal disorders . Indian journal of dental research. 2011 May – Jun ; 22(3) : 381-4 .
- 4 Seaman, D.R. Body mass index and musculoskeletal pain: is there a connection? Chiropr Man Therap. 2013; 21: 15.
- 5 Aggarwal, N., Anand, T., Kishore, J. and Ingle, GK. Low back pain and associated risk factors among undergraduate students of a medical college in Delhi. Educ Health (Abingdon). 2013 May-Aug;26(2):103-8 .
- 6 Kim, DJ., Cho, M., Park, Y. and Yang, Y. Effect of an exercise program for posture correction on musculoskeletal pain. J Phys Ther Sci. 2015 Jun; 27(6): 1791–1794.
- 7 Franz D.D. , Feresu S.A . The relationship between physical activity, body mass index, and academic performance and college-age students. Open Journal of Epidemiology. 2013; 3: 4-11.
- 8 Vineet Golchha , Pooja Sharma , Jitesh Wadhwa , Deepti Yadav , Rahul Paul. Ergonomic risk factors and their association with musculoskeletal disorders among Indian dentist: A Preliminary study using Rapid upper limb assessment. Indian journal of dental research. 2014 November-December ; 25(6) : 767 -771 .
- 9 Malepe, MM., Goon, DT., Anyanwu, FC. and FC Amusa, LO. The relationship between postural deviations and body mass index among university students. Biomedical Research .2015; 26 (3): 437-442.
- 10 Nilsen, TI., Holtermann, A and Mork, PJ. Physical exercise, body mass index, and risk of chronic pain in the low back and neck/shoulders: longitudinal data from the Nord-Trondelag Health Study. Am J Epidemiol. 2011 Aug 1;174(3):267-73.
- 11 Lin, CW., McAuley, JH., Macedo, L., Barnett, DC., Smeets, RJ. and Verbunt, JA. Relationship between physical activity and disability in low back pain: a systematic review and meta-analysis. Pain. 2011 Mar;152(3):607-13.
- 12 Dworkin, RH., Turk, DC., Trudeau, JJ., Benson,

- C., Biondi, DM., Katz, NP. Validation of the Short-form McGill Pain Questionnaire-2 (SF-MPQ-2) in acute low back pain. *J Pain*. 2015 Apr;16(4):357-66.
- 13 Dinger, M.K., Behrens, T.K. and Han, L.J. Validity and Reliability of the International Physical Activity Questionnaire in College Students, *Journal American Journal of Health Education*. 2006 ; 37 (6) : 337-343.
- 14 World Health Organisation: Obesity. preventing and managing the global epidemic. Report of a WHO consultation. *World Health Organ Tech Rep Ser*. 2000; 894:1–253.
- 15 Wang Y, Lobstein T. Worldwide trends in childhood overweight and obesity. *IJPO*. 2006;1(1):11–25.
- 16 Hebebrand J, Wermter A-K, Hinney A. Obesity, genetics and interaction between genes and the environment. *Monatsschr Kinderheilkd*. 2004;152(8):870–876.
- 17 Bouchard C, Malina RM, Pérusse L. *Genetics of Fitness and Physical Performance*. Champaign: Human Kinetics; 1997.
- 18 Pronk NP, Anderson LH, Crain AL, Martinson BC, O'Connor PJ, Sherwood NE, Whitebird RR. Meeting recommendations for multiple healthy lifestyle factors. Prevalence, clustering, and predictors among adolescent, adult, and senior health plan members. *Am J Prev Med*. 2004;27(2):25–33.
- 19 Wabitsch M. Children and adolescents with obesity in Germany. Call for action. *Bundesgesundhbl - Gesundheitsforsch - Gesundheitsschutz*. 2004;47(3):251–255.
- 20 Pooja Sharma, Simran Narang, Vineet Golchha. 'Technology Driven Musculoskeletal Disorder in Individuals Using Computer', *International Journal of Current Advanced Research*.2017; 06(11): 7759-7761.
- 21 Hall KD, Sacks G, Chandramohan D, Chow CC, Wang YC, Gortmaker SL, et al. .Quantification of the effect of energy imbalance on bodyweight. *Lancet* .2011 ; 378: 826–837.
- 22 Allman-Farinelli MA, Chey T, Merom D, Bauman AE. Occupational risk of overweight and obesity: an analysis of the Australian Health Survey. *J Occup Med Toxicol*. 2010 ;Jun 16;5:14.
- 23 Steeves JA, Bassett DR Jr, Thompson DL, Fitzhugh EC. Relationships of occupational and non-occupational physical activity to abdominal obesity. *Int J Obes (Lond)* .2012; 36: 100–106.
- 24 Shiri, R., Karpinnen, J., Arjas, P.L., Solovieva, S. and Juntura, E.V. The Association Between Obesity and Low Back Pain: A Meta-Analysis. *Am J Epidemiol* 2010; 171 (2): 135-154.

An Empirical Study on Retail Demand for Store Brand Pickles in Tirunelveli, Tamil Nadu

Varadarajan Rangarajan¹, K Thulasi Krishna¹

¹Department of Management Studies, MITS, Madanapalle, Chittoor District AP

ABSTRACT

Retail business has expanded quickly within a short period in India and has raised critical concerns such as management of service level while meeting consumer needs. That impact the performance of the retailers and their cost-effectiveness. The paper probes the estimation of demand for a store brand household item, namely Pickle, and demonstrates the benefits of multinomial logistic regression as a useful tool for handling categorical demographic variables very frequently used as predictors. Retailers can benefit immensely, by the methodology for other similar products. Moreover, they can enhance space optimization and achieve greater profitability per unit retail space and improve customer satisfaction. The research finds that the probability of buying the store brand pickle increases with age of customer and evinces a clear gender bias in the inclination to buy store brand Pickle.

Keywords: *inventory management, assortment planning, multinomial logistic regression, R environment*

INTRODUCTION

Economic policies changes, growth of middle class population, and higher in per capita income has spurred economic growth in India, leading to prosperity retail sector as a result now the retail sector represents 10% of India's GDP and a 8% share of employment. Additionally, food inflation is exerting pressure on the retailers to reduce operating cost to sustain business and profitability. Food price inflation has strained consumer budgets leading them to reduce frequency of visits to the stores and also their purchase volumes. Though it is well known that inflation is due to dynamics of global economic environment, and uncertain rainfall, it has certainly brought operations efficiency to retailer's attention.

The competition in the retail industry in India has been dynamic due to the emergence of retail chains and modern retail stores. The critical issues in retailing is the decision about the variety of items a retailer decides to carry for satisfying the consumer. While a wide product assortment meet every consumer's needs, it increases inventory. Additionally, it leads to shelf space allocations problems. The problems acquire intensity since retail space is expensive and limited. In view of such constraints, retailers need to use efficient assortment

strategies. This means that the retailers would strive to find an optimal mix of products to minimize cost of operations without affecting service levels. This pivots on estimating demand for products. Regression, moving average, and exponential smoothing are frequently used to estimate aggregate demand. At SKU level, logistic regression has been suggested by literature for demand estimation. Logistic regression helps in establishes link between demographics and consumer choice of products. Demographics have been found to be good predictors for retail demand. Demographic variables are categorical in nature and simple regression is not suitable. Logistic regression and multinomial logistic regression are best options. This research uses multinomial logistic regression to determine the probability of purchase as a function of demographic variables age, gender.

Pickles are an integral part of food in Indian households and are traditionally prepared at home using several spices in various combinations leading to different tastes and health benefits. The combination of spices and methodology determines the shelf life of the pickles. It pertinent to point out that homemade pickles do not use preservatives but are prepared in such a manner that they remain good for long durations (2 to 3 years). More over pickles are known to be used

only after a period of maturation, that is generally not less than 6 months. In recent times due to lack of expertise and time families have started to purchase pickles made commercially, which are known to use preservatives and other artificial ingredients. The older generation still believes that pickles made at home are better tasting, hygienic, and good for health as they are devoid of artificial chemicals. While brand owners claim that their products are equivalent to homemade pickles, consumers' trust seems to be latent. Our study does not explicitly dwell into the hygiene aspect of the off the shelf pickles, but it seems that hygiene is an intrinsic part of the consumer choice and purchase intentions. Since we have not explicitly studied the hygienic aspects of the pickle as commercial products, the research does not make any comments on that aspect

Abundant literature on studies on various aspects of supply chain management for FMCG goods including food and grocery items is available. In this study how, inventory can be smartly managed in retail outlets is presented. The retail outlets are the first point contact for consumers and they relay the consumer requirements up the supply chain to the manufacturers. Variables such as floor space, shelf space, display methodology etc. have been identified as the measures that determine selling efficiency.

LITERATURE REVIEW

Retailer's assortment of products is dependent on the target customers, shelf space availability, brand perception, financial strength, and the competitive profile. Even though many retailers claim to offer a one stop shopping experience, providing the whole range of product a random customer would want to buy is next to impossible. Moreover, there is empirical evidence that on an average customer visit at least three shops before fulfilling all their requirements. The number of consumers served by a retail outlet is so large that satisfying each customer in the target set would be difficult¹ and consumers first-choice preference changes from time to time^{2,3}. Consumer preferences are directed by factors such as fulfilment of global and local utility, estimated search cost, and availability of substitutes etc. Such changes can occur due to satiation, need for a change due to changing objectives, social position⁴, or to know^{5,6} about other items. Such changes lead customers to seek variety. Findings of the above papers means that high levels of heterogeneity in consumer preferences are

ubiquitous and a retailer may have to stock an extensive variety of products and SKUs. Stocking of inventory is limited by availability of resources. In addition, studies have evinced that offering too many choices negatively affects consumer perception about the store^{7,8} because consumers are beset with the amount of choice and find it difficult arrive at a purchasing decision and the customers may not come back to the store⁹. Moreover, apparent variety has an influence on consumers' buying decision and a mismatch between actual variety and perceived variety can potentially negatively impact buying experience and may lead to lost sales or the consumer^{10,11,12}. Perceived variety is dependent on method of display and the symmetry of the assortment¹³. Further retailers may lose sales (lost sales to extent of 4% occurs due to OOS¹⁴ due to out of stock situations in which the consumer can either buy a substitute or buy the preferred product from a competing store. The following table shows reactions to stock out situations:

Multinomial Logit model (MNL)

Theory of utility is the basis for the MNL model. Each customer relates a utility for the purchase or no-purchase of a particular category/SKU. The no-purchase decision is coded in the model as product 0, i.e. when a customer chooses product 0 it is considered a no purchase decision. The consumer's utility related to choose of a product j from $S \cup \{0\}$ the Union of set of products carried by the retailer and product 0 is represented as U_j . The utility U_j is considered to be sum of a deterministic part and a random part

$$U_j = u_j + \varepsilon_j$$

The random portion is modeled as a double exponential random variable with the following distribution:

$$\Pr \{X < \varepsilon\} = \text{Exp}(-\text{Exp} - (\varepsilon/\mu + \gamma))$$

Where γ is Euler's constant (0.57722). Its mean is zero, and variance is $\mu^2\pi^2/6$. As the degree of heterogeneity among the customers increases μ also increases. The ε_j are independent across consumers. Hence the product wise general utility for each consumer is same; the actual realized utility may be different based on the level of heterogeneity of the customer population. Additionally, unobservable factors determining the utility of the product to the individual may also be a cause. An individual maximizes utility when choosing

a product from the available set. Hence, the probability that an individual chooses product j from $S \cup \{0\}$ can be represented as

The double exponential distribution being closed under maximization we can write the probability that a random customer chooses product j from $S \cup \{0\}$ as (For proof refer Anderson et al (1992)19.

Guadagni and Little (1983)¹⁵, show how MNL model can be used for estimating demand for a group of products.

The major criticism for the MNL model is due to Independence of Irrelevant Alternatives (IIA) property. This property is true when ratio of choice probabilities for any two alternatives is independent of ratios for other such alternatives. When we compare two brands within a category, choices within one brand will only lead to cannibalization under high brand loyalty and this property would not be true. Such situations are not rare. One way of overcoming this is to use a Nested Logit Model that is the customer first makes a choice of the brand and follows it up with choosing the SKU. Probability of choosing within a brand follows an exponential distribution and hence the choice probability between two brands also follows an exponential distribution and we can write the total probability as

In which the first term on the right hand side refers to the choice between brands and the second term refers to the choice within a brand. One difficulty in using this nested logit model is that we need know the product attributes the customer uses in the choice process and how the customer prioritizes them. The MNL is also deficient in capturing intricate issues with substitution behavior. The model cannot differentiate between products that have same penetration rate but different substitution rates.

METHODOLOGY

A retail store frequented many consumers located in a residential area was chosen for the study. The name of store and Picklebrand is being kept confidential for commercial reason at the request of the store owner. Mall encounter method of sampling was used to find out purchase intention of store the brand pickle. A short demographic profile consisting only of gender and age was also collected as only these two demographic variables are used in this analysis. In total details

from 133 customers was collected and analyzed. The analysis was carried out using “nnet” package in the R environment. Chi square test function available in the generic R environment was used to perform chi square test prior to performing the multinomial regression.

RESULTS AND DISCUSSION

The sample profile is as in table 1

Table 1: Sample Profile

Total number of respondents	133
Gender ratio	62% male and 38 % female
Age group	
Group I 20-25 years	39%
Group II 26 -30 years	30%
Group III 31 -35 years	31%

As a first step the data was put through a chi square test to see if there are significant differences between the groups based on gender, age and education. The output for chi square test is given in table 2:

Table 2: Pearson’s Chi-squared test with Yates’ continuity correction for gender Vs purchase intention

data: product purchase		
Chi Square	Df	P – Value
12.032	1	0.005228

The null hypothesis that there is no gender-based difference in purchase intentions is rejected at alpha of 5%. Which indicates that there is significant difference men and women about choice of Pickle brands. A similar chi square test on age and purchase preference yielded the following results:

Table 3: Pearson’s Chi-squared test for Age group vS Purchase intention

data: purchase of product		
Chi Square	Df	P – Value
10.036	2	0.006619

Which clearly shows that the purchase preference of different age groups is different and highly significant at an alpha of 5%.

The output of the multinomial logistic regression using “multinom” function in nnet package is given below in table 4

Table 4: Multinomial Regression: logit z associated with purchase intention and independent variables Age and Gender

Coefficients:	Values	Std. Err.	P values
Intercept	3.50769445	1.225891	0.0042185035
Age	-0.09448192	0.041458	0.0226683025
Gender	-1.46494357	0.397377	0.0002273296

Residual Deviance: 165.2999

AIC: 171.2999

From the table it is clear that all the coefficients are significant at an $\alpha = 0.05$. The following regression equation (* is used as multiplication sign) can be constructed from the above

$$(\text{logit}) Z = 3.5077 - 0.0945 * \text{Age} - 1.465 * \text{Gender} \quad (1)$$

The probabilities can be calculated using equation 2

$$P = e^Z / (1 + e^Z) \quad (2)$$

From the regression equation it can be inferred that the variables age and gender have negative effect on the probability of purchase, i.e. as we move from group I to Group II in the age category the probability of purchase diminishes by a factor of 0.0945 and between men and women the change in probability is to the extent of 1.46. This is clear from the predicted probabilities for the sample.

The predicted probabilities are given in table 5

Table 5: Predicted probabilities

Age	Gender	Logit(Z)	Exp(Z)	Predicted probabilities
34	1	-1.1696	0.31	0.24
30	1	-0.7917	0.453	0.31
33	1	-1.0752	0.341	0.25
31	0	0.57875	1.784	0.64
28	1	-0.6027	0.547	0.35
30	0	0.67324	1.961	0.66
30	1	-0.7917	0.453	0.31
22	0	1.42909	4.175	0.81
24	1	-0.2248	0.799	0.44
29	1	-0.6972	0.498	0.33
20	1	0.15311	1.165	0.54
30	0	0.67324	1.961	0.66
31	1	-0.8862	0.412	0.29
21	1	0.05863	1.06	0.51
30	1	-0.7917	0.453	0.31
32	0	0.48427	1.623	0.62
31	1	-0.8862	0.412	0.29
27	1	-0.5083	0.602	0.38
27	1	-0.5083	0.602	0.38
20	0	1.61806	5.043	0.83
22	1	-0.0359	0.965	0.49
20	0	1.61806	5.043	0.83
25	1	-0.3193	0.727	0.42
23	1	-0.1303	0.878	0.47
31	0	0.57875	1.784	0.64
24	1	-0.2248	0.799	0.44
33	1	-1.0752	0.341	0.25

Gender is coded as Male = 1 and Female = 0

Summary analysis of the predicted probabilities based on gender and age group is presented in table 6. From the table it can be inferred that women of all age groups have greater preference for the store brand Pickle whereas younger men prefer the store brand Pickle than older men.

Table 6: Average Predicted Probabilities

Age group 20 - 25	
W	M
0.79	0.48
Age group 25-30	
W	M
0.68	0.35
Age group 31-35	
W	M
0.61	0.25

CONCLUSION

It has been established, how demographic data can be used to estimate demand for packaged food item such as Pickle. Additional demographic details could be used to get further clarity about the purchase intent of customers but the investigation becomes tedious and statistical significance may not be realized, thereby making the results not useful for realistic demand estimation. Additionally, the study provides direction for future research with more detailed demographic profile of customers to enable the retailers to manage their inventory and shelf space well and reduce cost of operations. Further simulation can be used to produce greater clarity into the buying behavior of consumer. Moreover, the analysis presented here can also be used by manufacturers to develop marketing plans for their merchandises. The preference for the store brand is gender as well as age dependent. Older age customers have greater preference for the store brand pickle when compared to younger customers. Women have greater preference for the store brand pickle across all age groups but men of younger age have greater preference for the store brand pickle than older age men.

Ethical Clearance- Not applicable

Source of Funding- Self

Conflict of Interest: Nil

REFERENCES

- Green, Paul E. and Abba M. Krieger (1985), "Models and Heuristics for Product Line Selection," *Marketing Science*, 4 (1), 1-19.

- McAlister, Leigh and Edger A. Pessemier(1982) "Variety seeking behavior and interdisciplinary Review", *Journal of Consumer Research*. 9 (December) 311-22
- Kahn, Barbara E. (1998), "Dynamic Relationships with Customers: HighVariety Strategies," *Journal of Academy of Marketing Sciences*, 26 (Winter), 45-53. (1999), "Introduction to the Special Issue: Assortment Retailing," *Journal of Retailing*, 75 (3), 289-93.
- Ariely, Dan and J. Levav (2000), "Sequential Choice in Group Settings: Taking the Road Less Traveled and Less Enjoyed," *Journal of Consumer Research*, 27 (December), 279-90.
- Brickman, P. and B. D'Amato (1975), "Exposure Effects in a Free-Choice Situation," *Journal of Personality and Social Psychology*, 32 (September), 415-20.
- McAlister, Leigh (1982), "A Dynamic Attribute Satiation Model of Variety-Seeking Behavior," *Journal of Consumer Research*, 9 (September), 141-50.
- Huffman, Cynthia and Barbara E. Kahn (1998), "Variety for Sale: Mass Customization or Mass Confusion," *Journal of Retailing*, 74 (Winter), 491-513.
- Iyengar, S. and M. Lepper (2000), "When Choice Is Demotivating: Can One Desire Too Much of a Good Thing?," *Journal of Personality and Social Psychology*, 6, 995-1006.
- Fitzsimons, Gavan J., Eric A. Greenleaf and Donald R. Lehmann (1997), "Consumer Satisfaction with both Product and Decision: Implications for the Supply Chain," Working Paper, UCLA.
- Broniarczyk, Susan M., Wayne D. Hoyer and Leigh McAlister (1998), "Consumers' Perceptions of the Assortment Offered in a Grocery Category: The Impact of Item Reduction," *Journal of Marketing Research*, 35 (May), 166-7.
- Kahn, Barbara E. and Brian Wansink (2004), "Impact of Perceived Variety on Consumption Quantity," *Journal of Consumer Research*, 30 (4), 519-34.
- Godek, John, J. Frank Yates and Seigyoung Auh (2001), "Evaluation of Customized Products: The Effects of Assortment and

- Control,” Working paper, University of Michigan.
14. Young, Michael E. and Edward A. Wasserman (2001), “Entropy and Variability Discrimination,” *Journal of Experimental Psychology: Learning, Memory and Cognition*, 27 (1), 78–293.
 15. Corsten, Daniel and Thomas W. Gruen (2004), “Stock-Outs Cause Walkouts,” *Harvard Business Review*, 82 (5), 26–8.
 16. Guadagni, P.M., J.D.C. Little. 1983. A logit model of brand choice calibrated on scanner data. *Marketing Science*. 2 203–238.

Knowledge of Disease Management among Maintenance Hemodialysis Patients in Coastal Karnataka – A Cross Sectional Pilot Study

Bryal D'Souza¹, Rajesh Kamath¹, Ravindra Prabhu², Unnikrishnan³, Sagarika Kamath⁴

¹Assistant Professor, Prasanna School of Public Health, Manipal Academy of Higher Education, Manipal, Karnataka, ²Professor and Head of the department, Department of Nephrology, KMC Manipal, Manipal Academy of Higher Education, ³Associate Dean and Professor, Department of Community Medicine, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Karnataka, ⁴Assistant Professor, School of Management, MIT Block 9, Manipal Academy of Higher Education, Manipal, Karnataka

ABSTRACT

Patients' understanding and knowledge of the disease condition and its management are crucial factors in achieving treatment goals and in empowering patients for self-care management. It is therefore necessary to assess knowledge levels and knowledge needs among dialysis patients and to educate them sufficiently on disease management and therapeutic regimens. Methodology: Cross sectional pilot study among 31 maintenance hemodialysis (HD) patients. Strata of three groups was developed: Patients on HD since <15 days, 15 days to 4 months, 4 months and above. A validated questionnaire covering five domains: disease knowledge, infection, dialysis treatment, fistula care and nutrition was administered to patients from the 3 strata. Results: 16.1% had poor knowledge, 23% had moderate knowledge and 3% had good knowledge regarding their disease condition. 9.7% had moderate knowledge and 80.6% had poor knowledge on infection prevention measures. 77.4% had moderate knowledge and 12.9% had poor knowledge on dialysis treatment and safety. 49.6% had moderate knowledge and 80.6% had poor knowledge on nutrition management for their disease condition. 80.6% had moderate knowledge and 9.7% had poor knowledge on fistula care. Conclusion: There is a need for a sustainable model of multidisciplinary educational intervention to educate patients on dialysis, since the cost of a multidisciplinary approach is a challenge in a limited resource setting as well as an additional financial burden for patients.

Keywords: Chronic Kidney Disease, CKD, Maintenance hemodialysis, Kidney failure

INTRODUCTION

Chronic kidney disease (CKD) is a chronic condition and a leading global health problem. CKD is characterized by gradual loss of kidney function. Diabetes and hypertension today account for 40–60% of cases of CKD in India.¹ The Indian council of medical research reports the prevalence of diabetes in the Indian

population to be 7.1%, and amongst the urban population above the age of 40 years to be 28%.^{2,3} Given India's population of more than 1.3 billion people, the rising rate of CKD is very likely to pose serious questions to health services and the economy in the future. The age-adjusted incidence rate of ESRD in India is estimated to be 229 per million population. While more than 200,000 new patients every year need renal replacement in India, only 10 percent of them actually receive some form of renal replacement.⁴ The estimated global prevalence of CKD is between 11 to 13%, with the majority being in stage 5.⁵ Millions die every year because of a lack of access to treatment and/or a lack of capacity to pay for the treatment.⁶ Globally, nearly 1.9 million patients

Corresponding author :

Dr. Rajesh Kamath,

Assistant Professor, Prasanna School of Public Health, Manipal Academy of Higher Education, Manipal, Karnataka-576104

go through renal replacement therapy every year, with continued use by 316 per million population and annual initiation by 73 per million population (31.6 per 100,000 and 7.3 per 100,000).⁷ A review of 29 published dietary intake studies on maintenance dialysis patients reported that the majority of patients were unable to meet the recommended daily dietary protein/energy intake and that there was a wide variation in the intake. Evidence of muscle wasting is seen in 18 to 75% of patients with CKD undergoing maintenance dialysis therapy.^{8,9} Patients' knowledge regarding care of kidney disease and hemodialysis care will help them to be better informed about the disease, and is an important factor in improving adherence to treatment. Accurate and permanent education on diet, complications of hemodialysis and prevention and care of comorbidities can increase the self-care ability, health literacy and adherence of patients.¹⁰

A quasi-experimental study in the United States which studied the effect of education on diet and patient knowledge among hemodialysis patients with sessions of 20 to 30 minutes, reported improved phosphorous levels and knowledge which further improved in the next six months, and no difference in serum calcium and serum PTH levels.¹¹ Finkelstein et al report 35% of pre-ESRD patients being unaware of any treatment modality for ESRD. Forty-three percent were unaware of hemodialysis, 56% were unaware of transplantation, 57%

were unaware of continuous ambulatory peritoneal dialysis and 66% were unaware of automated peritoneal dialysis. Patients' understanding of kidney diseases would improve with the worsening of their condition: the reason being the increased contact with the nephrologist.¹²

A significant variation exists in the capacities of patients on hemodialysis in obtaining their recommended nutrient requirements. The majority of hemodialysis patients are unable to meet their recommended daily protein and/or energy intake. Evidence of wasting was observed in between 18 and 75 percent of hemodialysis patients.^{13,14} To improve the success of hemodialysis and improve outcomes in patients undergoing hemodialysis, it is important to increase patients' nutritional education in line with the 2006 clinical practice guidelines and recommendations.¹⁵

RESULTS

As seen in table 1, 16.1% had poor knowledge, 23% had moderate knowledge and 3% had good knowledge of their disease condition. 9.7% had moderate knowledge and 80.6% had poor knowledge of infection prevention measures. 77.4% had moderate knowledge and 12.9% had poor knowledge of dialysis treatment and safety. 49.6% had moderate knowledge and 80.6% had poor knowledge of nutrition management for their disease condition. 80.6% had moderate knowledge and 9.7% had poor knowledge of fistula care.

Table 1: Levels of knowledge across various knowledge domains among hemodialysis patients.

Knowledge domains	Good N(%)	Moderate N(%)	Poor N (%)
Kidney disease	(3)9.6	(23.0)74.1	(5)16.1
Infection	(3)9.7	(3)9.6	(25)80.6
Dialysis treatment	(3)9.7	(24)77.4	(4)12.9
Fistula care	(3) 9.7	(25)80.6	(3) 9.7
Nutrition	(3)9.7	(3)9.6	(25)80.6

Table 2: Mean and standard deviation

Knowledge domain	Mean	Std. Deviation
Infection	10.2581	7.79730
Dialysis treatment	7.6129	4.22435
Fistula Care	5.2581	3.48298
Nutrition	15.2903	11.96437
Kidney disease	16.6333	9.18200

Association of knowledge domains and sociodemographic factors

Knowledge of dialysis treatment and type of vascular access

A significant association was seen among the following domains and socio demographic factors:

Knowledge of nutrition and type of vascular access

Knowledge of kidney disease and age (table 03),

Knowledge of dialysis treatment and dialysis days

Table 3: Association of knowledge domains and sociodemographic factors

Socio demographic	Knowledge of kidney disease (n=31)			p-value
	Good	Moderate	Poor	
Age (years)				
<30	0	2 (100%)	0	0.026*
31-40	1 (12.5%)	5 (62.5%)	2 (25%)	
41-50	1 (20%)	4 (80%)	0	
50 and above	1 (6.25%)	13 (81.25%)	2(12.5%)	
Vascular access	Knowledge of dialysis treatment (n=30)			
Fistula	3(13.6 %)	19(86.4%)	0	.036*
IJV	0	3(50 %)	3(50 %)	
femoral	0	2(66.7%)	1(33.3%)	
	Knowledge of nutrition (n=31)			
Fistula	3(13.5%)	18(82 %)	1(4.5%)	0.009*
IJV	0	6(100 %)	0	
Femoral	0	1(33.3 %)	2(66.7 %)	
Dialysis days	Knowledge of dialysis treatment(n=31)			
>15 days	0	6(75 %)	2(25%)	.036*
16 to 120 days	0	8(80%)	2(20%)	
120 days and above	4(30.8%)	9 (69.2%)	0	

DISCUSSION

The results have shown that there is a need to improve patient knowledge and awareness levels of infection prevention and nutrition. ie 80.6 % had poor level of knowledge.16.1% had poor knowledge of kidney disease.12.9 % had poor knowledge of dialysis treatment.9.7% had poor knowledge of fistula care. David et al reported HCV seroprevalences ranging between 0.7% and 18.1% across different countries in the Asia pacific region.The seroprevalances were generally higher in HD as compared to Peritoneal Dialysis(PD) populations. No associations were found with respect

to HBV.¹³ Standard guidelines,regular interviews and updates of policy have been used to ensure high levels of compliance and knowledge regarding vascular access infection control among nurses.¹⁵ Standard guidelines and regular reviews and updates of policies.

Systems should also be developed to ensure a high level of compliance standard guidelines and regular reviews and updates of policies.

Systems should also be developed to ensure a high level of compliance

Patients with improved knowledge showed better adherence to treatment and a lower infection rate. This was achieved through ongoing evaluation, training and home visits.¹⁶ Assessment of nurses' and patients' knowledge regarding modes of transmission has been determined to be an important factor. A study conducted in Saudi Arabia in a setting with different infection prevalence rates in dialysis units explored the knowledge of nurses regarding the modes of transmission for HCV on a 10 point scale. In the high prevalence unit, nurses ranked blood transfusion at 9 and contaminated HD machines at 7. Nurses in the low prevalence unit ranked dialysis in other centers at 7.8, nurse transmitting the virus from patient to patient at 6.6, blood transfusion at 6 and contaminated HD machines at 6.¹⁷

Malnutrition can contribute to mortality among dialysis patients. The major causes of malnutrition are metabolic acidosis, restricted diet, loss of appetite as a side effect of the drugs, uremia leading to anorexia, chronic volume overload, dialysis and the presence of acute and chronic systemic disease causing an inflammatory response.¹⁴ The present study found patient knowledge levels of nutrition management to be very poor (80.6% of patients had poor knowledge levels). This clearly indicates that patients require intensive nutritional counselling, diet recalls and diet plans to improve their knowledge and practice. Adequate nutrition is very important for dialysis patients for a better overall outcome. Protein energy malnutrition is highly prevalent (25-50%) among dialysis patients and is associated with increased morbidity and mortality. Adequate and safe intake of protein, calories, sodium, potassium, phosphorus and fluid are important for the wellbeing of dialysis patients. Nutritional intervention that is tailored specifically considering barriers can result in improved albumin levels even among patients with high levels of C reactive proteins. These barriers could be a lack of knowledge, poor appetite, inadequate dialysis or support to cook.¹⁸ A nurse led intervention educating patients on CKD, hyperphosphatemia, signs and symptoms, treatment, phosphate binder use, dietary care, benefits, risks and options for improving health-related quality of life ineffectively reduced hypophosphatemia and improved albumin levels.¹⁹

Teaching and weekly reinforcement about diet, fluids and control of weight gain reduced interdialytic weight gain and improved adherence. However it did not improve

mean blood pressure²⁰. Since nephrology nurses have a long term relationship with patients, educating patients through them would be ideal.²⁰ A nurse working on a protocol and administering patient education on disease management brought about improved hemoglobin and albumin levels of patients.²¹ A unique study focussing on public health dimensions and perspectives to improve hyperphosphatemia concluded that vigorous public marketing campaigns to promote fruits and vegetables may alter food preferences. Availability of junk food high in phosphorus, proximity to stores and vending machines influence dietary intake among patients. Phosphorus content being listed on food labels enables dialysis patients to monitor their intake.²²

An educational intervention is as effective as oral supplementation to prevent malnutrition and treatment of malnutrition. Improved creatinine and protein serum values, and other biochemical parameters were the markers of effectiveness.²³ A nurse administered protocol, training received through theoretical input, case training and review and guided readings on related content resulted in both the study and the control groups improving over time, with significant intragroup improvements and no intergroup differences.²⁴

Ethical Clearance- Taken from Institutional ethics committee of Manipal Academy of Higher Education.

Source of Funding- None

Conflict of Interest - None

REFERENCES

1. National kidney foundation. A to Z health guide: About Chronic Kidney Disease. Available at :<https://www.kidney.org/atoz/content/about-chronic-kidney-disease#ckd>
2. Rajapurkar MM et al. What do we know about chronic kidney disease in India: First report of the Indian CKD registry. *BMC Nephrol.* 2012;13:10.
3. Raman R et al. Prevalence and risk factors for diabetic retinopathy in rural India. *BMJ Open Diabetes Res Care.* 2014;2
4. Wei SY et al. (2010) Chronic kidney disease care program improves quality of pre-end-stage renal disease care and reduces medical costs. *Nephrology (Carlton)* 15: 108–115.
5. Hill et al. Global Prevalence of Chronic Kidney

- Disease – A Systematic Review and Meta-Analysis. *PLoS One*. 2016; 11(7): e0158765. Published online 2016 Jul 6. doi: 10.1371/journal.pone.0158765. Available at : <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4934905/>
6. World Kidney Day: Chronic Kidney Disease. 2015; Available at:<http://www.worldkidneyday.org/faqs/chronic-kidney-disease/>
 7. Anand et al.The Gap between Estimated Incidence of End-Stage Renal Disease and Use of Therapy. *PLoS One*.2013;8(8):e72860.Published online 2013 Aug 30. doi: 10.1371/journal.pone.0072860. Available at:<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3758352/>Accessed on 20-1-17
 8. Lincemon L.Effectiveness of a Nurse -Led Program Regarding Self Care Management among Hemodialysis Patients [Internet]. http://www.ijhsr.org/IJHSR_Vol.5_Issue.6_June2015/58.pdf. 2017
 9. Impact of Knowledge,Attitude and Behavior among Maintenance Hemodialysis Patients for Adherence to Dietary Regimen – A Single Centre Experience [Internet]. *International Journal of Humanities and Social Science*.2017 [cited 21 March 2017]. Available from:http://www.ijhssnet.com/journals/Vol_4_No_12_October_2014/29.pdf
 10. Study to assess knowledge on self-care among patients on HD, Punjab , 2014 [Internet]. 1st ed. *international research journal*; 2017 [cited 22 March 2017].Available from: <http://irj.iars.info/volumes/828002012012/pdf/828002012012021.pdf>
 11. Shrestha BK,Rajbanshi L,Lopchan M(2016)Self Care Knowledge among Chronic Kidney Disease Patients Undergoing Maintenance Hemodialysis. *Ann Nurs Pract* 3(5): 1061.
 12. Finkelstein F et al.Perceived knowledge among patients cared for by nephrologists about chronic kidney disease and end-stage renal disease therapies. *Kidney International*. 2008;74(9):1178-1184
 13. Johnson D et al.Frequencies of hepatitis B and C infections among haemodialysis and peritoneal dialysis patients in Asia-Pacific countries: analysis of registry data. *Nephrology Dialysis Transplantation*. 2008;24(5):1598-1603
 14. Sontakke S et al.Evaluation of adherence to therapy in patients of chronic kidney disease.*Indian Journal of Pharmacology*. 2015;47(6):668.
 15. Higgins M,Evans D.Nurses’ knowledge and practice of vascular access infection control in haemodialysis patients in the republic of Ireland.*Journal of Renal Care*.2008;34(2):48-53.
 16. Sayed S et al.Effect of the Patient’s Knowledge on Peritonitis Rates in Peritoneal Dialysis. *Peritoneal Dialysis International*.2012;33(4):362-366.
 17. Leon J et al.Can a nutrition intervention improve Albumin levels Among Hemodialysis patients? A Pilot Study.*Journal of Renal Nutrition*.2001;11(1):9-15.
 18. Akpele L,Bailey L J. Nutrition counseling impacts serum albumin levels.*Journal of renal nutrition*. Volume 14,Issue 3,July 2004,Pages 143-148.
 19. Stumm E et al.Nursing educational intervention to reduce hyperphosphatemia in hemodialysis patients.*Brazilian journal of nursing*.2017.Vol.70 no.1.Available at: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0034-71672017000100031
 20. Barnett T eta al.Fluid compliance among patients having hemodialysis: can an educational programme make a difference? *J Adv Nurs*.2008 Feb;61(3):300-6. doi: 10.1111/j.1365-2648.2007.04528.x.
 21. Lee W et al.Effectiveness of a chronic kidney disease clinic in achieving K/DOQI guideline targets at initiation of dialysis—a single-centre experience. *Nephrol Dial Transplant* (2007) 22: 833–838 doi:10.1093/ndt/gfl701
 22. Sehgal A et al.Public Health Approach to Addressing Hyperphosphatemia Among Dialysis Patients. *Journal of Renal Nutrition*. 2008;18(3):256-261
 23. Morante J et al.Effectiveness of a Nutrition Education Program for the Prevention and Treatment of Malnutrition in End-Stage Renal Disease.*Journal of Renal Nutrition*.2014;24(1):42-49
 24. Wong et al.Evaluation of a nurse-led disease management programme for chronic kidney disease: A randomized controlled trial.*Int J Nurs Stud*.2010 Mar;47(3):268-78. doi: 10.1016/j.ijnurstu.2009.07.001

Study on Global Public Health Threats due to Emerging or Re-Emerging Infectious Diseases and the Strategies to Reduce Threats

Manas Kumar Kundu¹, Tarit Kr Mandal², Malavika Bhattacharya³

¹PH Specialist, Airport Health Organisation, Kolkata & Research Scholar, Techno India University, West Bengal,

²Airport Health Officer, Airport Health Organisation, Thiruchirapally, Tamilnadu, ³Assistant Professor & HOD, Department of Bio-Technology, Techno India University, West Bengal

ABSTRACT

The occurrence of emerging and re-emerging infectious diseases in humans has increased in the recent past and imposing a serious public health threat globally. Despite remarkable advances in medical science and treatment during 20th century, infectious diseases remain the leading cause of death worldwide. Over 30 new infectious agents have been detected worldwide in the last 20 years and 60 per cent of these are of zoonotic origin. Recent world events, such as the 2014 Ebola epidemic, have brought public attention to challenges imposed by emerging and re-emerging infectious diseases. Evolution of pathogenic infectious agents with genetic change, antimicrobial resistance, insecticide resistance, human demographic and behavioral change, human susceptibility to infections, poverty and social inequality, climate and changing ecosystem, urbanization and deforestation, increase international travel and trade, deterioration in public health surveillance and breakdown of public health measures are the main contributing factors of emerging and re-emerging infections. Coordinated, well-prepared and well-equipped health systems; partnerships among clinicians, microbiologists and epidemiologists; improved methods for detection & epidemiological surveillance & laboratory capabilities and services; screening on international travels and trades; effective preventive & therapeutic technologies; strengthened response capacity; political commitment & adequate resources to address underlying socio-economic factors and international collaboration & communication are utmost important for managing emerging and re-emerging diseases worldwide

Keywords: *Ebola epidemic, Emerging and re-emerging infectious diseases, Public health threats, Zoonotic diseases.*

INTRODUCTION

Over the last two centuries, science has made huge progress in the fight against infectious diseases. But the biggest battles may still be to come. With tens of thousands of people taking planes every day, contagious illnesses have unprecedented opportunities to spread farther and faster. Antibiotics that once cured diseases like tuberculosis now do not always have an

effect. Old enemies like polio refuse to go away. Others like smallpox threaten a devastating comeback if released. Since the 1970's new diseases have been identified at the unprecedented rate of one or more per year, and scientists are warning of a possible worldwide epidemic involving a killer virus that they believe does not even exist yet¹. Global public health security is defined as the activities required to prevent and respond to threats that endanger the collective health of people across different regions and nations. Lack of global public health security may also have consequences in terms of economic or political stability, trade, tourism, access to goods and services and demographic stability. Global public health security covers a wide range of complex and daunting issues, including health consequences of human

Corresponding author:

Dr. Manas Kumar Kundu

PH Specialist, Airport Health Organisation, Kolkata & Research Scholar, Techno India University, West Bengal, Email: kundum2000@yahoo.com

behavior, climate change and weather-related events, infectious diseases, natural catastrophes and man-made disasters². There is strong evidence to suggest that this income inequality or disparity between the different socioeconomic classes is associated with worse health outcomes. The high burden of disease, disability and death can only be addressed through an effective public health system. However, the growth of public health has been very slow due to low public expenditure on health, very few public health institutes and inadequate national standards for public health education³.

MATERIALS & METHOD

This study aimed to give an overview on global public health threats due to emerging or re-emerging infectious diseases and the strategies to reduce threats. This study reviewed and analyzed various publications and reports pertinent to emerging infectious diseases burden and its global impact. The incidence of emerging infectious diseases in humans has increased within the recent past or threatens to increase in the near future. In the recent past, world has seen outbreaks of various organisms of emerging and re-emerging diseases in various parts of the world and most of these are of zoonotic origin. Prevention and control of emerging infectious diseases will increasingly require the application of sophisticated epidemiologic and molecular biologic technologies, changes in human behaviour, a national policy on early detection of and rapid response to emerging infections and a plan of action.

FINDINGS

Pandemic Risk

Among policymakers who worry about it at all, optimists think a severe pandemic is a once-in-a-century event. But before the onset of the 2014 Ebola epidemic, most people, including policymakers, seldom thought about pandemics (worldwide epidemics)—which explains why the risk of contagion is undermanaged and the Ebola crisis is here at all. Ebola is still largely confined to three small West African countries, where the human, social, and economic damage is already high. If the crisis is not contained, damaging health and economic impacts would be replicated in other developing countries and even on a global scale in the case of a pandemic. Contagion surprises and then worsens because the authorities and the public are unaware of the risk and implications of exponential spread. Even without

a global spread, disease outbreaks can be very costly. They occur with unnerving frequency. Recent years saw Severe Acute Respiratory Syndrome (SARS) and H5N1 and H7N9 avian flu—and now we face the Ebola crisis. With current policies, one of these, or another pathogen, will cause a pandemic⁴.

Emerging Infectious Diseases:

These include new, previously undefined diseases as well as old diseases with new features. These new features may include the introduction of a disease to a new location or a new population (*e.g.* it may present in youth where previously it was only seen in the elderly); new clinical features, including resistance to available treatments; or a rapid increase in the incidence and spread of the disease. Emergence may also be due to a new recognition of an infectious agent in the population or the realization that an established condition has an infectious origin. Over 30 new infectious agents have been detected worldwide in the last three decades; 60 per cent of these are of zoonotic origin, and more than two-thirds of these have originated in the wildlife. Epidemics or pandemics caused by these emerging and re-emerging infections often take a heavy toll of life and by rapidly spreading across borders are responsible for much concern and panic. Besides health, emerging infections also present a grave economic, developmental and security challenge⁵.

Re-emerging infectious disease

Infectious agents that have been known for some time, had fallen to such low levels that they were no longer considered public health problems & are now showing upward trends in incidence or prevalence worldwide or have appeared in areas where they were not previously found. Reappearance of a disease which was once endemic but had since been eradicated or controlled, would classify it as a re-emerging infectious disease.

Factors Contributing to Emergence:

Evolution of pathogenic infectious agents (microbial adaptation & change), Mutations, Development of resistance to drugs, Resistance of vectors to pesticides, Antimicrobial Drug Resistance are the main agents. Human demographic change (inhabiting new areas) leading to increase contact with animals and natural environment, human behavior (sexual, drug use by

sharing needles), human susceptibility to infection (Immunosuppression) due to stress and lifestyle changes, nutritional changes, more use of pesticides, poverty & social inequality, wars, civil unrest, agricultural practices such as pig or poultry farming, breakdown of public health measure, globalization of travel and trade etc. contribute to emergence.

Emerging Infections in the World

1973 Rotavirus	Enteritis/Diarrhea	1990 Guanarito virus	VHF
1976 Cryptosporidium	Enteritis/Diarrhea	1991 Encephalitozoon	Disseminated dz
1977 Ebola virus	VHF	1992 Vibrio cholerae O139	Cholera
1977 Legionella	Legionnaire's dz	1992 Bartonellahenselae	Cat scratch dz
1977 Hantaan virus	VHF w/ renal Failure	1993 Sin Nombre virus	Hanta Pulm. Synd.
1977 Campylobacter	Enteritis/Diarrhea	1994 Sabia virus	VHF
1980 HTLV-I	Lymphoma	1994 Hendra virus	Respiratory dz
1981 Toxin prod. S.aureus	Toxic Shock Synd.	1995 Hepatitis G	Hepatitis
1982 E.coli 0157:H7	HUS	1995 H Herpesvirus-8	Kaposi sarcoma
1982 HTLV-II	Leukemia	1996 vCJD prion Variant	CJD
1982 Borreliaburgdorferi	Lyme disease	1997 Avian influenza (H5N1)	Influenza
1983 HIV	AIDS	1999 Nipah virus	Encephalitis
1983 Helicobacter pylori	Peptic ulcer dz	1999 West Nile virus	Encephalitis
1988 Hepatitis E	Hepatitis	2001 BT Bacillus anthracis	Anthrax
1989 Hepatitis C	Hepatitis	2003 Monkeypox	Pox
		2003 SARS-CoV	SARS

Emerging Virus	Re-emerging Virus
2001 - Nipah Virus(Bangladesh, India) 2003 - SARS Coronavirus 2004 - Avian Influenza(H5N1), Thailand,Vietnam 2006 - Influenza H5N1(Egypt, Iraq)- New Human Rhinovirus(USA) 2007 - Nipah Virus(Bangladesh)- LCM like Virus(Australia)- Polyoma like virus(Australia) 2009 - Influenza H1N1 2011 - Crimean Congo HemorrhagicFever (India)	<ul style="list-style-type: none"> • Ebola • Marburg • Dengue • Yellow fever • Chikungunya • Chandipura • West Nile Virus • Rift Valley Fever • Human Monkey Pox

Emerging Bacteria	Re-emerging Bacteria
<ul style="list-style-type: none"> • Drug resistant MTB- BothMDR and XDR • MRSA • VRE • CR – GNB esp. Klebsiella • E. coli O104: H4 • <i>Stenotrophomonasspp.</i> • Extended spectrum betalactamaseproducingpathogens 	<ul style="list-style-type: none"> • Cholera, H. pylori, • Neonatal tetanus • Yersinia pestis • Rickettsia • Cl. Difficile • Cl. Botulinum • Bacillus anthracis (due to bioterrorism) • Fransciella

Global trends and burden of Emerging Infectious Diseases

Emerging infectious diseases (EIDs) are a significant burden on global economies and public health. Their emergence is thought to be driven largely by socio-economic, environmental and ecological factors, but no comparative study has explicitly analysed these linkages to understand global temporal and spatial patterns of EIDs. EID events are dominated by zoonoses (60.3% of EIDs): the majority of these (71.8%) originate in wildlife (for example, severe acute respiratory virus, Ebola virus), and are increasing significantly over time. It was found that 54.3% of EID events are caused by bacteria or rickettsia, reflecting a large number of drug-resistant microbes in our database. The emerging infectious diseases account for 26 per cent of annual deaths worldwide. Nearly 30 per cent of 1.49 billion disability-adjusted life years (DALYs) are lost every year to diseases of infectious origin. The burden of morbidity and mortality associated with infectious diseases falls most heavily on people in developing countries, and particularly on infants and children ⁵

SARS: Severe acute respiratory syndrome (SARS) is a viral respiratory illness caused by a coronavirus, called SARS-associated coronavirus (SARS-CoV). SARS was first reported in Asia in February 2003. Over the next few months, the illness spread to more than two dozen countries in North America, South America, Europe, and Asia before the SARS global outbreak of 2003 was contained. According to the World Health Organization (WHO), a total of 8439 people worldwide became sick with SARS during the 2003 outbreak. Of these, 812 died⁶. It caused tremendous negative economic impact on trade, travel and tourism, estimated loss of \$ 30 to \$150 billion. High level commitment is crucial for rapid containment. Global partnerships & rapid sharing of data/information is utmost important to enhance preparedness and response.

Highly Pathogenic Avian Influenza (H5N1): Since Nov 2003, avian influenza H5N1 in birds affected 60 countries across Asia, Europe, Middle-East & Africa. More than 220 million birds killed by AI virus or culled to prevent further spread. Majority of human H5N1 infection due to direct contact with birds infected with virus. Total 860 cases and 454 deaths among human reported in 16 countries, mostly in Egypt, Indonesia, Vietnam, Cambodia, China & Thailand.

Novel Swine origin Influenza A (H1N1): After early outbreaks in North America in April 2009 the new influenza virus spread rapidly around the world. By the time WHO declared a pandemic in June 2009, a total of 74 countries and territories had reported laboratory confirmed infections. To date, most countries in the world have confirmed infections from the new virus. The global impact of the current pandemic has not yet been estimated. Typically, the numbers of deaths from seasonal influenza or past pandemics are estimated using statistical models. By contrast, the currently reported counts of over 16,000 deaths from pandemic H1N1 represent individually tested and confirmed deaths, primarily reported from countries with adequate resources for widespread laboratory testing⁷

Ebola Virus Disease (EVD)

Ebola virus disease (EVD), formerly known as Ebola haemorrhagic fever, is a severe, often fatal illness in humans. The virus is transmitted to people from wild animals and spreads in the human population through human-to-human transmission. The average EVD case fatality rate is around 50%. Case fatality rates have varied from 25% to 90% in past outbreaks. The first EVD outbreaks occurred in remote villages in Central Africa, near tropical rainforests. The 2014–2016 Ebola outbreaks in West Africa Ebola was the largest in history, affecting multiple countries in, and beyond, West Africa which involved major urban areas as well as rural ones. A total of 28 616 confirmed, probable and suspected cases have been reported in Guinea, Liberia and Sierra Leone, with 11 310 deaths. Good outbreak control relies on applying a package of interventions, namely case management, infection prevention and control practices, surveillance and contact tracing, a good laboratory service, safe burials and social mobilization ⁸.

Zika Virus Disease: It is a mosquito-borne flavivirus that was first identified in Uganda in 1947 in monkeys through a network that monitored yellow fever. It was later identified in humans in 1952 in Uganda and the United Republic of Tanzania. Outbreaks of Zika virus disease have been recorded in Africa, the Americas, Asia and the Pacific. From the 1960s to 1980s, human infections were found across Africa and Asia, typically accompanied by mild illness. The first large outbreak of disease caused by Zika infection was reported from the Island of Yap (Federated States of Micronesia) in 2007. In July 2015 Brazil reported an association between Zika

virus infection and Guillain-Barré syndrome. In October 2015 Brazil reported an association between Zika virus infection and microcephaly. From 2007 to 5 February 2016, Zika viral transmission has been documented in a total of 44 countries and territories⁹.

International Health Regulations to combat the international spread of diseases

In order to contain diseases through control measures at international borders, the International Health Regulations (IHR) were adopted in 1969. In the globalized world of the 21st century, borders alone cannot stop the international spread of diseases. With increased air-travel and trade, an outbreak or epidemic in any part of the world is only a few hours away from becoming a threat somewhere else. Responding to these new global challenges, Member States of the United Nations (UN) agreed on a new set of regulations, which came into force in June 2007. The focus of the 2005 International Health Regulations is not to control diseases at borders but to quickly tackle any outbreak at its source. The 2005 International Health Regulations address public health threats such as infectious diseases, as well as the accidental or intentional release of chemicals, radioactive materials and of any microorganism that may cause health effects and sickness. The WHO responds to incidents reported by official sources or which are detected by its own networks. International measures to prevent the spread of infectious diseases are still essential in the 21st century. WHO coordinates international outbreak response using resources from Global Outbreak Alert and Response Network (GOARN)¹⁰.

Recommended strategies to reduce threats

- Improve Global Response Capacity: WHO and National Disease Control Units can play important role

- Improve Global Surveillance: By improving diagnostic capacity (training, regulations), communication systems (web, e-mail etc.), rapid data analysis, developing innovative surveillance and analysis strategies, utilizing geographical information systems, global positioning systems and the Global Atlas of Infectious Diseases (WHO)

- Use of Vaccines: Increase coverage and acceptability (e.g., oral), new strategies for delivery, develop new vaccines, decrease cost, decrease dependency on “cold chain”.

- New Drug Development: Decrease In appropriate drug Use, improve education of clinicians and public, decrease antimicrobial use in agriculture and food production

- Improve vector and zoonotic control: Develop new safe insecticides and develop more non-chemical strategies e.g. organic strategies

- Better and more wide spread health education

CONCLUSION AND THE WAY FORWARD

There is an urgent need for global help to Developing countries Commitment to technology transfer and global collaboration is essential if we are to have the agility required to keep pace with emerging infectious diseases. Pathogen surveillance and discovery can promote global interaction via collaborations on matters that know no national or political boundaries but simply reflect our common goals. Humans, domestic animals and wildlife are inextricably linked by epidemiology of Emerging infectious diseases (EIDs). It will continue to emerge, re-emerge and spread. Human-induced environmental changes, interspecies contacts, altered social conditions, demography and medical technology affect microbes' opportunities. Prevention and control of emerging infectious diseases will increasingly require the application of sophisticated epidemiologic and molecular biologic technologies, changes in human behaviour, a national policy on early detection of and rapid response to emerging infections and a plan of action. WHO has made several recommendations for national response mechanisms. A meaningful response must approach the problem at the systems level. A comprehensive global strategy on infectious diseases cutting across all relevant sectors with emphasis on strengthened surveillance, rapid response, partnership building and research to guide public policy is needed.

Conflict of Interest: Nil

Source of Funding: Own

Ethical Clearance: Not applicable

REFERENCES

1. World Health Organization. World Health Report 2007– A safer future: global public health security in the 21st century): World Health Organisation; 2007
2. Global Public Health Threats. Available from

- <https://www.greenfacts.org/en/global-public-health-threats/1-2/1-health-risks-globalization.htm>, accessed on December 24, 2017
3. Chauhan L S. Public health in India: Issues and Challenges. *Indian J Public Health* 2011;55:88-91
 4. Olga Jonas, World Bank Economic Advisor. Global Health Threats of 21st of Century: Dec, 2014. P 17-18
 5. T. Dikid, S.K. Jain, A. Sharma, A. Kumar, J.P. Narain. Emerging & re-emerging infections in India: An overview : *Indian J Med Res* 138, July 2013, pp 19-31
 6. SARAS: <https://www.cdc.gov/sars/about/fs-SARS.pdf>, accessed on December 24, 2017
 7. H1N1 2009: http://www.who.int/csr/disease/swineflu/frequently_asked_questions/about_disease/en/, accessed on December 24, 2017
 8. Ebola : www.who.int/mediacentre/factsheets/fs103/en/, accessed on December 24, 2017
 9. Zika: <http://www.who.int/mediacentre/factsheets/zika/en/> accessed on December 24, 2017
 10. GOARN: www.who.int/csr/outbreaknetwork/, accessed on December 24, 2017

A Study to Compare the Efficacy of Dynamic Soft Tissue Mobilization Vs Self Myofascial Release Techniques for Hamstring Tightness in Healthy Male

G Yasmeen Imtiaz¹, S Prabhakar², V Balachander³

¹Assistant Professor, SRM College of Physiotherapy, SRM University, Chennai, India,

²Associate Professor, ³Principal Jaya College of Physiotherapy, Chennai, India

ABSTRACT

Background: Hamstring tightness is one of the most common sports-related injury, Hamstring tightness is the asymptomatic problem and it predisposes to the heel pain, knee pain and low back pain due to compensatory mechanism for the controlling excess lumbar lordosis, Though it is asymptomatic, should be prevented to avoid further risk of problem, According to this, the study was designed to improve the flexibility of hamstring muscles.

Objective: To find the efficacy of dynamic soft tissue mobilization in increase hamstring flexibility, To find the efficacy of self myofascial release technique in increase hamstring flexibility, To compare the efficacy of dynamic soft tissue mobilization and self myofascial release technique in hamstring flexibility.

Results: On comparing both dynamic soft tissue mobilization (DSTM) and self myofascial release technique (SMRT) there is no significant difference in AKET scores on both right and left side. But both are equally significant in improving the hamstrings flexibility as individual techniques. By the comparing the AKET right side ($t(28df)=1.03$, $p=0.3098>0.005$) the mean difference in AKET right between before and after treatment for group A is 18.73 and that group B is 17.53. By the AKET left side ($t(28df)=1.05$, $p=0.3041>0.005$) the mean difference in AKET left between before and after treatment for group A is 16.27 and that group B is 15.07.

Conclusion: On the basis of analysis, both dynamic soft tissues mobilization and self myofascial release technique are individually effective on hamstring tightness subjects in terms of active knee deficit or extension lag through AKET scores.

Keywords: active knee extension testing, self myofascial release technique, dynamic soft tissue mobilization.

INTRODUCTION

The hamstring is the posterior compartment of thigh muscle. Muscle tightness is due to a reduction in the ability of the muscle to deform. The term has also been used to denote a slight to moderate decrease in muscle length; Muscle tightness usually results from inadequate or improper rehabilitation following sustained muscle injury or low levels of physical activity in individuals². The hamstrings play a crucial role in daily activity such as walking, running, jumping and controlling some movement of the trunk. The complete range of knee flexion rarely occurs in activity of daily living therefore

the complete contraction and stretching of this muscles group is rare³

Hamstring tightness may be measured using the active unilateral SLR test, passive unilateral SLR test, sit and reach test and the active knee extension test. The AKET measures hamstring tightness by the angle subtended by knee flexion after a maximum active knee extension, with the hip stabilized at 90 degrees. The test-retest reliability coefficient for the AKET was reported to be 0.99 for both lower limbs and this has been attributed to the strict body stabilization method, the well-defined end point of motion and accurate instrument placement

of the test.⁹

Flexibility has defined as ability of the muscles to lengthen and allow one joint to move through a range of motion that is influenced by muscles, tendon, ligaments and bones ¹⁶It has also been documented that maximum popliteal angle (180 degrees) is measurable from birth to age 2 years after which it decreases steadily to an average of 155 degrees by age 6 years, and then remains steady. Dynamic soft tissue mobilization (DSTM) It is a soft tissue manipulation technique to restore a tissue's ability to cope with the load placed upon it result in lengthening (or) tightened muscle and fascia, normalize abnormal neuromuscular relationship, improve local circulation and restore joint mobility improving flexibility.¹⁷Self myofascial release (SMR) technique involves the objects such as foam roller or massage sticks, tennis ball, medicine ball to be rolled across a muscle group.¹⁸ Self myofascial release is popular because it can be done by the athlete when active release or deep tissue massage is not available it claims to improve mobility and ROM reduce adhesions and scar tissue, and improve over all movement.¹⁹Active knee extension test [AKET] is reliable and valid scale will be used to measure hamstring tightness as part of orthopaedical assessment , with normal values of knee motion to within 20° of full extension being quoted.

METHODOLOGY

This study received institutional ethical approval from Outpatient department of jaya college of physiotherapy permission to recruit subjects and access to medical records were granted by the participating hospital and all participants provided informed written consent. Inclusion criteria were Asymptomatic subject, Age 18-25 years ,Males, >15° degrees active knee extension loss

Exclusion criteria includes Females patients, Fracture of the hip and knee. Dislocations of the lower limb hamstring injuries ,Hypermobility of the lower limb joint ,Nerve lesions of the lower limb, Subject suffering from low back pain in the last 2 months, Metal pins, plates, screws in the femur, Neurological abnormalities.

Total of 30 subjects with Hamstring tightness were taken by convenience sampling. All the subjects were explained about their condition & mode of assessment and written informed consent was obtained from them. Subjects were taken up for the study after

they fulfilled the inclusion criteria. All subjects were evaluated prospectively in the Hospital. Active knee extension test using universal goniometer. Measure were assessed initially in the Hospital Outcome measures were reassessed after two weeks of first assessment: Functional measures were assessed using Active knee extension test using universal goniometer.

DATA ANALYSIS

The details collected from the questionnaire ICIQ-SF was entered in MS-Excel sheet and collected data was used for statistical analysis in the SPSS-20 software and the descriptive tabled were generated to demonstrate the findings. Paired T-test was used to compare the difference between the groups.

TABLE 1: Shows Testing difference between right AKET Before and AKET right After for Dynamic Soft Tissue Mobilization (Group A)

t-Test: Paired Two Sample for Means		
	Pre Test	Post Test
	AKET_RIGHT_1	AKET_RIGHT_2
Mean	27.93	9.20
Variance	7.78	5.46
Observations	15	15
Pearson Correlation	0.0351	
Hypothesized Mean Difference	0	
Df	14	
t Stat	20.2945	
P(T<=t) one-tail	0.0000	
t Critical one-tail	1.7613	
P(T<=t) two-tail	0.0000	
t Critical two-tail	2.1448	

TABLE 2 shows Testing difference between AKET left Before and AKET left After for Dynamic Soft Tissue Mobilization (Group A):

t-Test: Paired Two Sample for Means		
	Pre Test	Post Test
	AKET_LEFT_1	AKET_LEFT_2
Mean	23.73	7.47

Cont... TABLE 2: Shows Testing difference between AKET left Before and AKET left After for Dynamic Soft Tissue Mobilization (Group A):

Variance	8.78	8.27
Observations	15	15
Pearson Correlation	0.4851	
Hypothesized Mean Difference	0	
Df	14	
t Stat	21.2605	
P(T<=t) one-tail	0.0000	
t Critical one-tail	1.7613	
P(T<=t) two-tail	0.0000	
t Critical two-tail	2.1448	

Table 3: Shows Testing difference between AKET right Before and AKET right After for Myofascial Release Technique (Group B):

t-Test: Paired Two Sample for Means		
	Pre Test	Post Test
	AKET_RIGHT_1	AKET_RIGHT_2
Mean	25.733	8.200
Variance	12.638	6.171
Observations	15.000	15.000
Pearson Correlation	0.645	
Hypothesized Mean Difference	0.000	

Table 5 Shows Testing the difference between the efficacy of “Dynamic soft tissue mobilization” (Group A) and “Self myofascial release techniques”(Group B) in hamstring flexibility in terms of AKET Right:

Diff_AKET_R_A	Diff_AKET_R_B	t-Test: Two-Sample Assuming Equal Variances		
22	15			
15	18		Diff_AKET_R_A	Diff_AKET_R_B
17	22	Mean	18.73	17.53
16	19	Variance	12.78	7.41

Cont... Table 3: Shows Testing difference between AKET right Before and AKET right After for Myofascial Release Technique (Group B):

Df	14.000	
t Stat	24.947	
P(T<=t) one-tail	0.000	
t Critical one-tail	1.761	
P(T<=t) two-tail	0.0000	
t Critical two-tail	2.145	

Table 4: Shows Testing difference between AKET left Before and AKET left After for Myofascial Release Technique (Group B):

t-Test: Paired Two Sample for Means		
	Pre Test	Post Test
	AKET_LEFT_1	AKET_LEFT_2
Mean	22.267	7.200
Variance	4.638	7.600
Observations	15.000	15.000
Pearson Correlation	0.111	
Hypothesized Mean Difference	0.000	
Df	14.000	
t Stat	17.655	
P(T<=t) one-tail	0.000	
t Critical one-tail	1.761	
P(T<=t) two-tail	0.0000	
t Critical two-tail	2.145	

Table 5 Shows Testing the difference between the efficacy of “Dynamic soft tissue mobilization” (Group A) and “Self myofascial release techniques”(Group B) in hamstring flexibility in terms of AKET Right:

15	23	Observations	15	15
23	15	Pooled Variance	10.10	
18	14	Hypothesized Mean Difference	0.00	
22	20	Df	28	
18	15	t Stat	1.03	
20	18	P(T<=t) one-tail	0.15	
15	18	t Critical one-tail	1.70	
22	15	P(T<=t) two-tail	0.3098	
13	15	t Critical two-tail	2.05	
20	18			
25	18			

Table 6: Testing the difference between the efficacy of “Dynamic soft tissue mobilization” and “Self myofascial release techniques” in hamstring flexibility in terms of AKET Left:

Diff_AKET_L_A	Diff_AKET_L_B	t-Test: Two-Sample Assuming Equal Variances		
20	20			
10	15		<i>Diff_AKET_L_A</i>	<i>Diff_AKET_L_B</i>
17	16	Mean	16.27	15.07
15	20	Variance	8.78	10.92
13	10	Observations	15	15
15	18	Pooled Variance	9.85	
13	14	Hypothesized Mean Difference	0.00	
18	15	Df	28	
19	17	t Stat	1.05	
20	10	P(T<=t) one-tail	0.15	
18	15	t Critical one-tail	1.70	
16	18	P(T<=t) two-tail	0.3041	
15	10	t Critical two-tail	2.05	
20	15			
15	13			

DISCUSSIONS

The present study intended to compare the efficacy of dynamic soft tissue mobilization versus self myofascial release technique for hamstring tightness in healthy

males in terms of change in hamstrings flexibility. The sample of 30 subjects have been randomized into two groups in 1:1 ratio that is 50% of subjects received Dynamic soft tissue mobilization (Group A)and the remaining 50% of subjects received Self myofascial

release technique (Group B). The subjects undergone active knee extension test (AKET) to confirm the hamstring tightness and the measurement of the extension lag or active knee deficit (AKD) evaluated using goniometer. Participants received treatment 6 sessions of treatment for 2 weeks duration. Only the subjects who have an extension lag of 15° and more were included in this study. Group A subjects were given dynamic soft tissue mobilization for 2 weeks and Group B were given with self myofascial release technique using a foam roller for 2 weeks. In Group A, received Dynamic soft tissue mobilization shows improvement in hamstrings flexibility in terms of AKET Score Right Side. Based on statistical analysis using **Paired sample t test results**, AKET Score Right Side ($t(14df) = 20.29$, $p = 0.000 < 0.05$). The mean AKET score on right side before treatment is 27.93 and it is reduced to 9.20 after the treatment. There is **significant effect** of “Dynamic Soft Tissue Mobilization” in increasing hamstring flexibility in terms of AKET right side. Flexibility is key components for injury prevention and rehabilitation, which promotes performance, lessen the post-exercise soreness, and also improves coordination.²⁷ As we know Hamstring flexibility leads to development of hamstring strain,²⁸ patella tendinopathy,²⁹ patella-femoral pain, low back pain with altered posture,³⁰ and symptoms of muscle damage following eccentric exercise.³¹ (15) Flexibility can be achieved by many static and ballistic stretching as well as proprioceptive neuromuscular facilitation.³² In our study reported the similar findings in improvement of the hamstring flexibility, in the pre and post test results of Group A (Table :

3) shows the mean AKET score on left side before treatment is 23.79 and it is reduced to 7.47 after the treatment. There is **significant effect** of “Dynamic Soft Tissue Mobilization” in increasing hamstring flexibility in terms of AKET left side.

In our study reported the similar findings in improvement of the hamstring flexibility. In Group B, received self myofascial release technique shows improvement in hamstrings flexibility in terms of AKET Score Right Side. Based on statistical analysis using (Table 4) **Paired sample t test results**, AKET Score Right ($t(14df)=24.95$, $p=0.000<0.005$). The mean AKET score on right side before treatment is 25.73 and it is reduced to 8.20 after the treatment. Similarly by the (table-5) Group B the pre-test and post-test values of AKET left side ($t(14df)=17.66$, $p=0.000<0.05$).the mean

AKET scores on left side before treatment is 22.27 and it is reduced to 7.20 after the treatment There is **significant effect** of “Dynamic Soft Tissue Mobilization” in increasing hamstring flexibility in terms of AKET right side

On comparing both dynamic soft tissue mobilization (DSTM) and self myofascial release technique (SMRT) there is no significant difference in AKET scores on both right and left side But both are equally significant in improving the hamstrings flexibility as individual techniques. By the (table-6) AKET right side ($t(28df)=1.03$, $p=0.3098>0.005$) the mean difference in AKET right between before and after treatment for group A is 18.73 and that group B is 17.53. By the (table-7) AKET left side ($t(28df)=1.05$, $p=0.3041>0.005$).the mean difference in AKET left between before and after treatment for group A is 16.27 and that group B is 15.07

This results of this study concludes that both dynamic soft tissues mobilization and self-myofascial release technique equally significant in improving the hamstring flexibility.

CONCLUSION

On the basis of analysis, both dynamic soft tissues mobilization and self myofascial release technique are individually effective on hamstring tightness subjects in terms of active knee deficit or extension lag through AKET scores.

Conflict of Interest: authors don't have any conflict of interest

Source of Funding: Nil

REFERENCES

1. Zachezewski IE. Improving flexibility. In Physical Therapy. Sally RW and Barnes MR (Eds.) Philadelphia:
2. Gossman MR, Sahnmann SA, Rose SJ. Review of length-associated changes in muscle. Physical Therapy 1982; 62: 1799-1807.
3. Bohannon RW. Effect of repeated 8 minutes loading on the angle of straight leg raising. Physical Therapy 1984; 64: 491-497.
4. Davies JG, Malone T, Basset FH. Knee examination. Physical Therapy 1980; 60: 1565-1573.
5. Moore KL. Lower limbs. Clinically Oriented

- Anatomy. 3rd Edition. Baltimore: William and Wilkins, 1992; 421-423.
6. Markos PD. Ipsilateral and contralateral effects of proprioceptive neuromuscular facilitation techniques on hip motion and electromyographic activity. *Physical Therapy* 1979; 59: 1366-1373.
 7. Moore MA, Hutton RS. Electromyographic investigation of muscle stretching techniques. *Medical Science Sports* 1981; 12: 322-329.
 8. Chung PK, Yuen CK. Criterion related validity of sit-and reach test in university women in Hong Kong. *Perpetual and Motor Skills* 1999; 88(1): 304-316.
 9. Gajdosik RL, Lusin G. Hamstring muscle tightness: Reliability of an active knee extension test. *Physical Therapy* 1983; 63: 1083-1090.
 10. Bohannon RW. Cinematographic analysis of the passive straight leg raising test for hamstring muscle length. *Physical Therapy* 1982; 62: 1269-1274.
 11. Webright WG, Randolph BJ, Perrin DH. Comparison of non-ballistic active knee extension in neural slump position and static stretch techniques on hamstring flexibility. *Journal of Orthopaedic and Sports Physical Therapy* 1997; 26(1): 7-13.
 12. Bandy WD, Irion JM, Briggler M. The effect of time and frequency of static stretch on flexibility of the hamstring muscles. *Physical Therapy* 1997; 77: 1090-1096.
 13. Kuo L, Chung W, Bates E, Stephen J. The hamstring index. *Journal of Paediatric Orthopaedics* 1997; 17(1): 78-88.
 14. Morgan-jones R, cross T, cross M et.al. hamstring injuries. critical reviews in physical and rehabilitation medicine. 2000; 12(4): 277-82.
 15. Zachezewaski JE. Improving hamstring flexibility. in :scully RM, Barnes M.R, Eds. *Physical therapy* Philadelphia, PA: JB Lippincott; 1989:698-699.
 16. Hopper D.(2004) A new dynamic deep muscle tissue model (DDMT). in: proceedings of the annual scientific conference in sports medicine. caberra. ACT.
 17. Hopper D,(2005) evaluation of the effect of two massage technique on hamstring muscle length in competitive female hockey players. *Physical therapy in sports* 6 (2005) 135-145.
 18. Robertson M. Self- myofascial release purpose, methods and techniques. Indianapolis: Indianapolis fitness and sports training; 2008.
 19. Cameron DM, Bohannon RW. Relationship between active knee extension and active straight leg raise test measurements. *Journal of Orthopaedic Sports Physical Therapy*. 1993 May; 17(5):257-60.
 20. Teddy W. Worrell, Michael K. Sullivan, Joseph J. DeJulia Reliability of an Active-Knee-Extension Test for Determining Hamstring Muscle Flexibility. *Journal of sports and rehabilitation*, Volume 1, Issue 3, August. 181-187.
 21. Tiidus P, Shoemaker J. Effleurage massage, muscle blood flow and long-term post-exercise strength recovery. *Int J Sports Med* 1995; 16: 478-83.
 22. Smith L, Keating M, Holbert D, et al. The effects of athletic massage on delayed onset muscle soreness, creatine kinase, and neutrophil count: a preliminary report. *J Orthop Sports Phys Ther* 1994; 19: 93-8.
 23. Hilbert J, Sforzo G, Swensen T. The effects of massage on delayed onset muscle soreness. *Br J Sports Med* 2003; 37: 72-9.
 24. Cafarelli E, Sim J, Carolan B, et al. Vibratory massage and short-term recovery from muscular fatigue. *Int J Sports Med* 1990; 11: 474-8. [Medline] [Web of Science]
 25. Rodenburg J, Steenbeek D, Schiereck P, et al. Warm-up, stretching and massage diminish harmful effects of eccentric exercise. *Int J Sports Med* 1994; 15: 414-9. [Medline] [Web of Science]
 26. Weijer CD, Gorniak PT. The effect of static stretch and warm-up exercises on hamstring length over the course of 24 hours. *J Orthop Sports Phys Ther*. 2003; 33: 727-33.
 27. Tabary JC, Tabary C, Tardieu C, Tardieu G, Goldspink G. Physiological and structural changes in the cat's soleus muscle due to immobilization at different lengths by plaster casts. *J Physiol*. 1972; 224: 231-
 28. Best TM, Garrett WE. Hamstring strains: Expediting return to play. *Physician Sports Med* 1996; 24(8): 37-44
 29. McHugh MP, Connolly DA, Eston RG, Kremenik IJ, Nicholas SJ, Gleim GW. The role of passive muscle stiffness in symptoms of exercise-induced muscle damage. *Am J Sports Med*. 1999; 27: 594- 9.

30. Witvrouw E, Lysens R, Bellemans J, Cambier D, Vanderstraeten G. Intrinsic risk factors for the development of anterior knee pain in an athletic population. A two-year prospective study. *Am J Sports Med.* 2000;28:480-9.
31. Witvrouw E, Bellemans J, Lysens R, Danneels L, Cambier D. Intrinsic risk factors for the development of patellar tendinitis in an athletic population. A two-year prospective study. *Am J Sports Med.* 2001;29:190-5.
32. Mohr et.al (2014) self-myofascial release caused increase in flexibility on Passive hip range of motion.
33. Ebrahim et.al (2013) self-myofascial release caused increase in flexibility on sit and reach distance, knee extension range of motion and knee flexion range of motion.
34. Schleip and Müller, 2013 to increase the flexibility of muscle by the application of external force (self-myofascial release)

Estimation of Vitamin D Levels in Children with and without Early Childhood Caries – A Case Control Study

Anitha Jayakumar¹, Deepa Gurunathan², EMG Subramainan³

¹Postgraduate Student, ²Associate Professor, ³Professor & HOD, Department of Pediatric Dentistry, Saveetha Dental College, Chennai

ABSTRACT

Introduction: Deficiency in vitamin D during the development of both primary and permanent teeth leads to enamel hypoplasia, which is a significant risk factor of ECC. Enamel defects have retentive areas that lead to the bacterial plaque colonization, facilitating the progression of carious lesions.

Aim: To determine the association between the vitamin D level and the severity of Early Childhood Caries in children of age less than 72 months.

Materials and Method: A case control study was carried in 196 children. After obtaining informed consent, oral examination was done and a questionnaire was filled from parents. Venipuncture was done for the estimation of vitamin D levels in blood.

Result: Among the study population, children with type 2 ECC had lower level of vitamin D than the type 1 and type 3 ECC.

Conclusion: Within the limitation of the study, there is no significant association between the vitamin D levels and the three types of early childhood caries. However there is lower level of vitamin D level in the moderate to severe early childhood caries children.

Keywords: Early childhood caries, Vitamin D, Children

INTRODUCTION

According to AAPD, early childhood caries (ECC) is “the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger”. In children younger than 3 years of age, any sign of smooth surface caries is indicative of severe early childhood caries (S-ECC). From age 3 through 5, one or more cavitated, missing (due to caries) or filled smooth surface in primary maxillary anterior teeth or a decayed, missing or filled score of ≥ 4 (age 3), ≥ 5 (age 4) or ≥ 6 (age 5) surfaces constitutes S-ECC. There is high

prevalence of ECC (40.6%) in 0-3 year old children from rural areas of South India and there is a need to consider early diagnosis and specific preventive interventions¹. Acs et al, 1999 reported that, following completion of comprehensive dental rehabilitation, children with ECC demonstrated the “catch up growth” phenomenon (weight gain).

Vitamin D deficiency during childhood causes delay in appearance of permanent dentition and creates problems in the sequence of teeth eruption. Vitamin D status in childhood also plays an important role in dental caries^{2,3}. Deficiency in vitamin D during the development of both primary and permanent teeth leads to enamel hypoplasia, which is a significant risk factor of ECC^{4,5}. Enamel defects are common in primary dentition^{6,7} and teeth with enamel defects have retentive areas that lead to the bacterial plaque colonization, facilitating the progression of carious lesions⁸.

Corresponding author:

Anitha Jayakumar,

Postgraduate Student, Department of Pediatric & Preventive Dentistry, Saveetha Dental College, Chennai
E-mail id: anitha.jayakumar89@gmail.com

Though majority of population in India live in areas receiving ample sunlight throughout the year, vitamin D deficiency is very common in all the age groups and both the sexes across the country^{9,10}. Vitamin D deficiency is common in infancy due to decreased dietary intake, religious practices, seasonal variation, practice of not taking the child out, increasing rate of exclusive breast feeding and low maternal vitamin D¹¹.

There are studies which support that children with severe ECC are deficient in important vitamins and nutrients, including vitamin D^{12,13}. Hence this study was carried out to determine the association between the vitamin D level and the severity of Early Childhood Caries.

MATERIALS AND METHOD

This case-control study was carried out in the department of Pedodontics of Saveetha dental college, Chennai. The study protocol was approved by the institutional review board and ethical committee of Saveetha University (SRB/SDMDS12ORT22). The clinical trial was also registered in CTRI (REF/2015/10/009967). Total sample size of 196 were divided into two groups accounting 98 in each group.

Inclusion Criteria

Group I:

Children with early childhood caries

ASA 1 patient (healthy) and ASA 2 patient (mild systemic disease and no functional limitation)

Group II:

Children without early childhood caries

ASA 1 patient and ASA 2 patient

Exclusion criteria

Children aged equal or more than 72 months

ASA 3 or greater children (complex metabolic or medical disorder)

Parents were explained about the study, its benefits to the subject and society in general. The dentist recorded data related to the presence of decayed, missing and filled surface (dmfs); decayed, missing and filled teeth (dmft) and the severity of early childhood caries based

on Wyne's classification¹⁵ (Table 1) and AAPD criteria (Table 2).

Sample collections

After getting consent from the parents, 5ml of blood sample was collected from the participants by venipuncture by the experienced phlebotomist. The samples were transported to the diagnostic centers on the same day. Vitamin D levels were estimated using Chemiluminescence immunoassay method.

Statistical analysis

The collected data was analysed with SPSS 23.0 version. To describe about the data descriptive statistics frequency analysis, percentage analysis were used for categorical variables and the mean & S.D were used for continuous variables. To find the significant difference between the bivariate samples in independent groups the Unpaired t-test was used. For the multivariate analysis the one way ANOVA with Tukey's Post-Hoc test was used. To find the significance in categorical data Chi-Square test was used. For statistical significance, p value of <0.05 was considered.

RESULTS

Among 196 study population, 98 in the children with early childhood caries and 98 children without early childhood caries comprising of 102 (52%) were males and 94 (48%) were females. 48 males and 50 females were without ECC and 44 males and 54 females were present with ECC. In 98 children with early childhood caries, 34 children have type 1 (mild to moderate) caries, 49 children have type 2 (moderate to severe) caries and 15 children have (severe) caries based on Wyne's classification whereas based on AAPD criteria 39 children have early childhood caries, 59 children have severe early childhood caries.

The vitamin D level in children was estimated in blood. The mean value of vitamin D level in children with ECC is 20.12±5.80 and in children without ECC is 20.74±6.38 (Graph 1).

In the study population there were 34 children with type 1 ECC; 49 children had type 2 ECC and 15 children with type 3 ECC. On comparing the vitamin D level among the different types of ECC, type 3 (severe ECC) had higher vitamin D level with the mean value of 21.70±5.32; type 2 (moderate to severe ECC) had lower

vitamin D level with the mean value of 19.18 ± 6.20 whereas type 1 (mild to moderate) ECC had vitamin D level with the mean value of 20.78 ± 5.31 (Graph 2).

Among 98 children, 39 children were with ECC and 59 children were with S-ECC. On comparing the vitamin D level among these two groups S-ECC had lower vitamin D levels than the ECC group (Graph 3).

In the total study participants, 142 (72.4%) children are consuming fish regularly whereas 54 (27.6%) children are not consuming fish regularly. In the control group 20.84% had regular consumption of fish whereas in case group 19.83% had regular consumption of fish.

In 196 children, 163 (83.2%) children are consuming egg regularly whereas 33 (16.8%) children are not consuming egg regularly. In the control group 21.18% had regular consumption of egg whereas in case group 20.00% had regular consumption of egg.

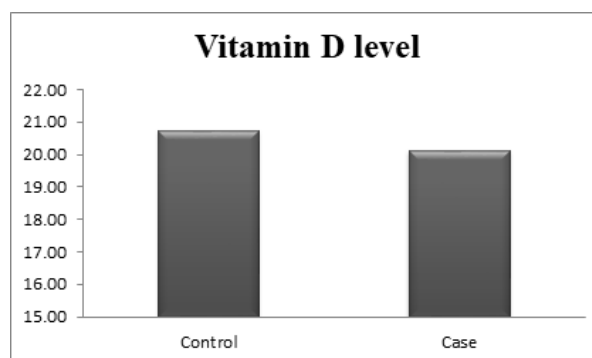
Among the total study participants, 51 (26%) mothers had consumption of vitamin D during pregnancy whereas 145 (74%) mothers did not take vitamin D during their pregnancy. In the control group 19.76% had maternal consumption of vitamin D during pregnancy whereas in case group 21.93% had maternal consumption of vitamin D during pregnancy.

Among 196 children, 59 (30.1%) children are playing outside only in the day time; 85 (43.4%) children are playing outside only after the sunset whereas 52 (26.5%) children play outside both during day time as well as after the sunset.

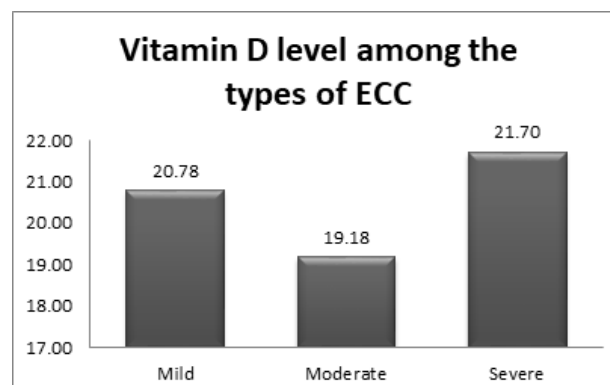
In 196 children, 129 (65.8%) children have daily sun exposure whereas 67 (34.2%) children do not have daily sun exposure. In the control group 21.42% of children had sun exposure whereas in case group 20.72% of children had sun exposure.

Among the total study participants, 20 children consumed multivitamins whereas 176 did not consume multivitamins.

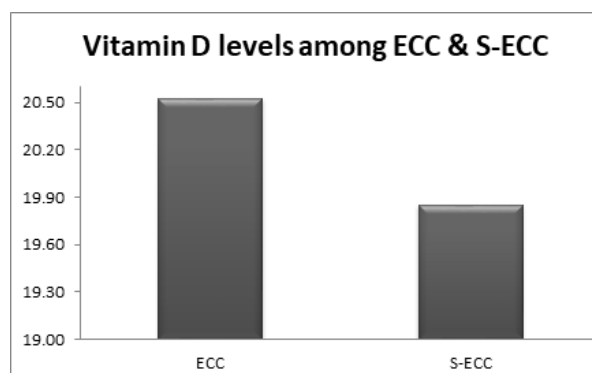
The association of oral hygiene habits and the feeding practices with the vitamin D level were given in table-3.



Graph 1: Vitamin D level in children with ECC and without ECC



Graph 2: Comparison of vitamin D levels among the 3 types of ECC (Wyne's Classification)



Graph 3: Comparison of vitamin D levels among the 2 types of ECC (AAPD Criteria)

Table 1: Wyne's Classification

Type I	Mild to Moderate ECC (Isolated carious lesion(s) involving molars and /or incisors)
Type II	Moderate to severe ECC (Labiolingual carious lesions affecting maxillary incisors with or without molar caries and unaffected mandibular incisors)
Type III	Severe ECC (Cariou lesions affecting all teeth including lower incisors)

Table 2: AAPD Criteria

Early Childhood Caries (ECC)	Presence of one or more decayed, missing or filled tooth surfaces in any primary tooth in a child under the age of six
Severe Early Childhood Caries (S-ECC)	In Children < 3 yrs of age, any sign of smooth surface caries
	From ages 3-5, one or more cavitated, missing or filled smooth surface caries in primary maxillary anterior teeth
	dmft score ≥ 4 (Age 3) ≥ 5 (Age 4) or ≥ 6 (Age 5)

Table 3: OH Habits and Feeding Practices of the Participants

Characteristic	Control			ECC			
	N	Std Deviation	p-value	N	Std Deviation	p-value	
Oral Hygiene Habits With Vitamin D Level							
Tooth brushing commencement	6-12 Months	37	19.97±5.90	0.359	24	19.75±4.44	0.728
	≥ 13 Months	61	21.20±6.67		74	20.23±6.20	
Adult supervision of tooth brushing	Yes	59	20.42±6.10	0.547	77	20.46±5.93	0.61
	No	39	21.22±6.85		21	18.85±5.25	
Use of fluoride supplements	Yes	18	20.99±6.37	0.853	7	17.74±7.98	0.0265
	No	80	20.68±6.43		91	20.29±5.62	
Feeding Practices With Vitamin D Level							
History of bottle feeding	Yes	32	18.85±5.82	0.041*	64	20.25±6.07	0.751
	No	66	21.65±6.49		34	19.86±5.34	
Sleeping with bottle during night	Yes	22	22.07±5.27	0.267	45	20.65±6.33	0.398
	No	76	20.35±6.65		53	19.65±5.33	
Consumption of sweets	Yes	71	20.55±6.48	0.644	81	20.08±5.97	0.910
	No	27	21.22±6.21		17	20.26±5.09	

DISCUSSION

Nutritional deficiencies of different metabolites and periods of starvation during dental development can result in enamel hypoplasia, which increases the risk for caries¹⁶. Individual biochemical factors such as serum vitamin D levels have been implicated as modifiers of the development of caries¹⁷. So this study was carried out to determine vitamin D levels in children with and without early childhood caries and to associate the vitamin D levels with the severity of ECC. To the author's knowledge this is the first study to associate the vitamin D levels and ECC in India.

In the present study, the vitamin D level in children with ECC is lower than in children without ECC. Children with Type 2 (moderate to severe) ECC have lower vitamin D levels than the other two types. There is no statistically significant difference in the vitamin D levels in children with ECC and without ECC after adjusting the races¹³. There is no statistically significant association between levels of vitamin D and caries after adjusting for age, sex, race, ethnicity, sugar consumption¹⁸. However on comparing the vitamin D levels in children with ECC and S-ECC, children with S-ECC have lower vitamin D levels than the children

with ECC. Children with severe ECC appear to be at significantly greater odds of having low vitamin D level compared to their caries free controls¹².

Findings reveals, both in children with ECC and without ECC, the regular consumption of fish and egg didn't affect the vitamin D level. Diet contributes only 10-15% whereas exposure to sunlight is the main source of vitamin D¹⁹. However dietary supplements might be required to meet the daily need for vitamin D in some group of people²⁰.

In this study, children without ECC on sun exposure did not influence the vitamin D level. Results also reveals that the children with ECC, on playing outside only after the sunset had lower vitamin D levels. Home bound individuals, women who wear long robes and head coverings for religious reasons and people with occupations that limit sun exposure are unlikely to obtain adequate vitamin D from sunlight^{21,22}. Children require less sun exposure to produce sufficient quantities of vitamin D because of greater capacity to produce vitamin D than the older people²³.

This study reveals that the maternal consumption of vitamin D during pregnancy did not have any influence on the vitamin D level in children with or without ECC. But there seems to be a strong relationship between maternal and cord blood vitamin D status²⁴. Adequate vitamin D intake during pregnancy is important for foetal skeletal development, tooth enamel formation and foetal growth and development.

Usage of vitamin supplements is more common in 2-5 years²⁵. Whereas in this study, only 20 children used multivitamins and the multivitamin usage did not affect the vitamin D level in children with or without ECC.

Limitation: Improved matching of case and controls would have been more helpful in knowing the factors influencing the vitamin D levels in children.

CONCLUSION

Within the limitation of the study,

There is no significant association between the vitamin D levels and the three types of early childhood caries.

However there is lower level of vitamin D level in the moderate to severe early childhood caries children.

This study may help the pedodontist to understand the vitamin D status in children with and without early childhood caries in south India population.

Conflicts of Interest: Nil

Funding: Self

REFERENCES

1. Henry JA, Muthu MS, Saikia A, Asaithambi B, Swaminathan K. Prevalence and Pattern of Early Childhood Caries in a Rural South Indian Population Evaluated by ICDAS with Suggestions for Enhancement of ICDAS Software Tool. *Int J of Paediatr Dent*. 2016.
2. Aebi H. Vitamin D Metabolism in Caries. *Bibliotheca Nutritio Et Dieta* 1964; 6: 82-99.
3. Hashizume LN, Shinada K, and Kawaguchi Y. Dental Caries Prevalence in Brazilian Schoolchildren Resident in Japan. *J Oral Sci* 2006; 48(2): 51-57.
4. Purvis RJ, Barrie WJ, MacKay GS, Wilkinson EM, Cockburn F, Belton NR. Enamel Hypoplasia of the Teeth Associated with Neonatal Tetany: A Manifestation of Maternal Vitamin-D Deficiency. *Lancet* 1973; 2(7833): 811-14.
5. Alvarez JO, Caceda J, Woolley TW, Carley KW, Baiocchi N, Caravedo L, Navia JM. A longitudinal study of dental caries in the primary teeth of children who suffered from infant malnutrition. *J Dent Res* 1993; 72(12): 1573-1576.
6. Seow WK, Humphrys C, Tudehope DI. Increased Prevalence of Developmental Dental Defects in Low Birth-Weight, Prematurely Born Children: A Controlled Study. *Pediatr Dent* 1987; 9(3): 221-225.
7. Seow WK. Enamel Hypoplasia in the Primary Dentition: A Review. *ASDC J of Dent for Children* 1991; 58(6): 441-452.
8. Oliveira AF, Chaves AM, Rosenblatt A. The influence of enamel defects on the development of early childhood caries in a population with low socioeconomic status: a longitudinal study. *Caries Res* 2006; 40: 296-302.
9. Harinarayan CV, Shashank RJ. Vitamin D Status in India - Its Implications and Remedial Measures. *J Assoc Physicians India* 2009; 57: 40-48.
10. Marwaha RK, Gopalakrishnan S. Vitamin D & Bone Mineral Density of Healthy School Children

- in Northern India. *Indian J Med Res* 2008, 127(3): 239–244.
11. Balasubramanian S, Dhanalakshmi K, Amperayani S. (2013). Vitamin D Deficiency in Childhood - A Review of Current Guidelines on Diagnosis and Management. *Indian Pediatr* 2013; 50(7): 669–75.
 12. Schroth RJ, Levi JA, Sellers EA, Friel J, Kliever E, Moffatt ME. Vitamin D Status of Children with Severe Early Childhood Caries: A Case-Control Study. *BMC Pediatr* 2013; 13: 174.
 13. Susan AM, Harmeet C, Peter CM, Lorin MB, Tegwyn B. Serum Vitamin D, PTH, and Calcium Levels in Patients with and without Early Childhood Caries. 2016
 14. Ramos-Gomez FJ, Crystal YO, NG MW, Crall JJ and Featherstone JDB. Pediatric Dental Care: Prevention and Management Protocols Based on Caries Risk Assessment. *J Calif Dent Assoc* 2010; 38(10): 746–761
 15. Wyne AH. Early childhood caries: nomenclature and case definition. *Community Dent Oral Epidemiol* 1999; 27(5): 313-318.
 16. Psoter WJ, Reid BC and Katz RV. Malnutrition and dental caries: a review of the literature. *Caries Res* 2005; 39: 441-447.
 17. Irving JT. The action of vitamin d upon the incisor teeth of rats consuming diets with a high or low ca:P ratio. *J Physiol* 1944; 103(1): 9-26.
 18. Herzog K, Scott JM, Hujoel P, Seminario AL. Association of vitamin D and dental caries in children: Findings from the national health and nutrition examination survey. *J Am Dent Assoc* 2016.
 19. Misra M, Pacaud D, Petryk A, Ferrez Collett-SP, Kappy M, and Drug and Therapeutics Committee of the Lawson Wilkins Pediatric Endocrine Society. Vitamin D Deficiency in Children and Its Management: Review of Current Knowledge and Recommendations. *Pediatr* 2008; 122(2): 398–417.
 20. Dietary Supplement fact sheet: Viatmin D. Office of Dietary Supplements, National Institutes of Health. 2011 Jun 24.
 21. Webb AR, Kline L, Holick MF. Influence of season and latitude on the cutaneous synthesis of vitamin D3: Exposure to winter sunlight in Boston and Edmonton will not promote vitamin D3 synthesis in human skin. *J Clin Endocrinol Metab* 1988; 67: 373-381.
 22. Webb AR, Pilbeam C, Hanafin N, Holick MF. An evaluation of the relative contributions of exposure to sunlight and of diet to the circulating concentrations of 25-hydroxyvitamin D in an elderly nursing home population in Boston. *Am J Clin Nutr* 1990; 51: 1075-1081
 23. Joiner TA, Foster C, Shope T. The many faces of vitamin D deficiency rickets. *Pediatr Rev* 2000; 21: 296.
 24. Hollis BW, Wagner CL. Assessment of dietary vitamin D requirements during pregnancy and lactation. *Am J Clin Nutr* 2004; 79: 717-726.
 25. Picciano MF, Dwyer JT, Radimer KL, Wilson DH, Fisher KD, Thomas PR, Yetley EA, Moshfegh AJ, Levy PS, Nielsen SJ, Marriott BM. Dietary supplement use among infants, children and adolescents in the United States, 1999-2002. *Arch Pediatr Adolesc Med* 2007; 161(10): 978-985.

Clinical, Echocardiographic and Risk Profile of Five Hundred Cases of Dilated Cardiomyopathy in a Tertiary Care Centre: Our Experience

Srikant Kumar Dhar¹, Akshaya Kumar Samal², Chandan Das¹, Sobhitendu Kabi¹, Swati Samant³, Kamalkant Jena⁴, Mahesh Chandra Sahu⁵

¹Associate Professor, Department of Medicine, ²Professor, Department of Cardiology, ³Assistant Professor, Department of Ophthalmology, ⁴Junior Resident, Department of Medicine, ⁵Assistant Professor, Directorate of Medical Research, IMS and SUM Hospital, Siksha "O" Anusandhan University, Kalinganagar, Bhubaneswar, Odisha, India

ABSTRACT

Background: Cardiovascular ailment is a common manifestation in patients with co-morbidity like diabetes mellitus, hypertension, COPD, etc. and the incidence is gradually increasing. In this study we have evaluated the Echocardiography reports of the patients attending department of medicine and cardiology and documented the demographic data of the patients.

Material and Method: In this retrospective observational study, 500 Echocardiography reports were collected from the department of cardiology and the previous clinical history and demographic data were collected from the register. All the collected data were analyzed with Excel MS office, window 7 version.

Results: Out of 500 cases 293 cases were male and 207 cases were female. The youngest cases encountered were 3 years of age and the oldest was 87 years of age. ECG was within normal limit with sinus Tachycardia seen in 80 cases. LVH with strain in 206 cases mostly in Hypertensive LBBB / LAHB was seen in 106 cases, Nonspecific ST/T changes in 108 cases. 2D- echocardiography revealed mild LV systolic dysfunction, moderate LV systolic dysfunction, severe systolic dysfunction and Mitral valve regurgitation was found 52, 145, 303 and 415 patients respectively.

Conclusion: Present study highlights significant burden of DCM in elderly population, especially males. These patients are more likely to have arrhythmia and embolic episodes. Certain echocardiographic parameters like Ejection Fraction and Left Atrial size were found to correlate with left ventricular parameters and thus may be useful in predicting prognosis in DCM. However, further multicentric studies are needed in order to find the associated features in DCM patients in India and to better elucidate the significance of different chamber dimensions.

Keywords: Echocardiogram, Dilated cardiomyopathy, Hypertrophic obstructive cardiomyopathy, Peripartum cardiomyopathy, Restrictive cardiomyopathy

INTRODUCTION

American Heart Association definition¹ (Maron et al. 2006) describes cardiomyopathies as "a heterogeneous

Corresponding author:

Dr. Chandan Das

Associate Professor, Department of Medicine,
IMS and SUM Hospital, Bhubaneswar.

Email: drchandan1204@gmail.com

group of diseases of the myocardium associated with mechanical and/or electrical dysfunction that usually (but not invariably) exhibit inappropriate ventricular hypertrophy or dilation and are due to a variety of causes and frequently are genetic. Cardiomyopathies either are confined to the heart or are part of a generalized systemic disorder often leading to cardiovascular death or progressive heart failure-related disability¹." (Maron et al. 2006) Dilated Cardiomyopathy (DCM),

whether primary or secondary remains the major cause of Chronic Heart failure² (Mann and Bristow, 2005). The DCM is by far the most common form of cardiomyopathy, comprising more than 90% of subjects referred to specialized centers⁴ (Bristow et al. 2000) and is responsible for approximately 10,000 deaths and 46000 hospitalizations each year in United State of America (USA). The lifetime incidence of DCM is 36.5/ per 100,000 population. In India though comprehensive data is not available its prevalence is much more now than the previous decades. Increases in diameter of left ventricle in both systole and diastole with Low ejection fraction (<54%) or in simple term dilatation and dysfunction of the left ventricle constitute the syndrome of Dilated Cardiomyopathy and the Renin Angiotensin Aldosterone (RAAS) system are activated to rescue the failing circulation⁵ (Falk and Hershberger, 2015). The Kidney often responds by retaining fluid (water) and sodium and fluid builds up in dependent parts, in lungs and other organs. The body becomes congested and the patients go to congestive Heart Failure.

DCM can produce no symptoms or subtle symptoms or in severe cases Congestive Heart Failure. The symptoms include progressive shortness of breath, easy fatigability, palpitation, dizziness, swelling of limbs and abdomen, orthopnea, PND, cough, Chest-pain, Pre-syncope and syncope etc.

In most of the cases DCM are Idiopathic, one third cases of Idiopathic DCM have family history of such disease, called familial DCM. Other causes of DCM includes poorly controlled Hypertension, Diabetes Mellitus, Viral myocarditis, Thyroid disease, Alcohol & Cocaine abuse, women after child birth (peri-partum DCM), valvular disease, Toxic drug to the heart like anti cancer drugs & others. Tachycardia for prolonged period can result in left ventricular dysfunction called Tachycardia induced Cardiomyopathy which improves after tachycardia is corrected. Takotsubo Cardiomyopathy is a stress induced reversible Cardiomyopathy found in post menopausal women.

MATERIALS & METHOD

We have studied 500 cases of Dilated Cardiomyopathy attended / admitted to IMS & Sum Hospital in the last 6 years i.e. from August 2011 to August 2017. The cases presenting with cardiac symptoms; breathlessness, angina, palpitation, cough,

syncope, swelling body etc were evaluated thoroughly. History of Diabetes mellitus, Hypertension, Ischemic Heart Diseases (IHD), Rheumatic Heart Disease (RHD), smoking, Alcohol intake, drug abuse, Myocarditis, family history of Hypertension, DCM, IHD, Diabetes mellitus were taken. After detailed clinical examination (Blood Pressure pulse, Height, Weight, JVP, Anaemia Oedema feet, signs of CHF, Basal Creps. Hepatomegally, Ascites, Cardiomegally, S3, S4 regurgitant murmurs), the cases were subjected to detailed blood test (CBC, FBS, Lipid profile, Urea, Creatinine thyroid functions test liver function test, Troponin T Test - Pro Brain Natriuretic Petide tests. Where required.

Electrocardiogram, Chest radiogram, Echocardiogram with Colour Doppler mapping was done in all cases. 50 cases were sent for pulmonary function test where lungs pathology was suspected. Diagnosis of DCM was made by clinical findings, (Cardiography, S3, S4, TR, MR, Basal rales) ECG, (LVH, LBBB, Non-specific ST, T changes, Tachy-cardia, Chest radiograph (Cardiography, Hilar Congestion, Bilateral hydrothrox etc) and lastly Echo Cardiogram (Chamber dilatation, Global hypokinesia, Secondary MR, PAH & TR, Low ejection fraction, E/A ratio. LV dysfunction was classified as per American Society of Echo Cardiography 2005 criteria as follows:-

Mild Dysfunction – EF- 45 to 54%

Moderate Dysfunction – EF- 30 % to 44%

Severe Dysfunction – EF - < 30%

125 cases with severe LV dysfunction & CHF were admitted to ICU and indoor wards & treated with classical anti-failure treatment (ACE Inhibitors / ARB, Diuretics, Cardio selective Beta Blockers Digoxin; with other ancillary drugs. Other 375 cases were treated as out patients at Cardiology OPD with anti-failure, decongestive treatment. All the cases were followed up an regular basis at the Cardiology OPD & records were kept. Valvular disease cases and acute Ischemic cases were excluded from the study.

RESULTS

Out of 500 cases 293 cases were male and 207 cases were female. The youngest cases encountered were 3 years of age and the oldest was 87 years of age. Age distribution of the patients is given in table No-1. Female

predominance is seen up to 50 years of age (F=74, M=53) Male dominate the scene from 50 to 80 yrs of age (M=240, F=133 Type 2 diabetes mellitus was present in 42 cases. Hypertension in 69 cases, both diabetes & hypertension was present in 41 cases. Chronic Alcohol intake (50 gram/ day for > 5 years) seen in 12 cases. Peri partum Cardiomyopathy was seen is 3 cases. One case had Duchene’s Muscular Dystrophy with DCM. Two cases had history of viral Myocarditis.

Associated CKD/CRF were founded in 13 cases mostly in diabetics, COPD was founded in 35 cases, CVA with Hemiplegia seen in 6 cases, cirrhosis of liver in 3 cases, history of anti cancer drug (Ca-Bronchous) seen in one case, Family history of DCM was found in 2 persons. Parkinsonism seen in these 2 persons. Benign Hypertrophy of Prostrate (BEP) found in 9 cases. Progressive shortness of breath was found to be the most common presenting symptom, followed by weakness, vertigo and chest pain. ECG was within normal limit with sinus Tachycardia seen in 80 cases. LVH with strain in 206 cases mostly in Hypertensive LBBB / LAHB was seen in 106 cases, Nonspecific ST/T changes in 108 cases. (Associates Atrial fibrillation in 10 cases, PSVT in 2 case & CHB in 2 cases) on followed up trial, 37 persons have expired in four years, 10 cases have fully recovered with LV EF went beyond 60% (2 peri-partum, 2 myocarditis, 6 Idiopathic cause).

2D- echocardiography findings in our study were, 52 patients had mild LV systolic dysfunction(EF 45-54%). 303 patients had moderate LVsystolic dysfunction (EF 30-44%), 145 patients had severe systolic dysfunction (EF<30%), Mitral valve regurgitation was found in 440 patients, Pulmonary artery hypertension and Tricuspid valve regurgitation was found in 415 patients, Diastolic Dysfunction A >E was observed in 455 patients.

Table – 1 Age / Sex Distribution

Age Group	Male	Female	Total
1 - 20Yrs	6	4	10
21 - 40Yrs	23	30	53
41 - 50Yrs	24	40	64
51 - 60Yrs	62	68	130
61 - 70Yrs	90	39	129
71 - 80Yrs	70	18	88
> 80 yrs	18	8	26
Total	293	207	500

Table – 2 Major Risk Factor Distribution

Risk Factor	Male	Female	Total
Diabetes mellitus	20	22	42
Hypertension	40	29	69
DM & HTN	21	20	41
Alcohol	12	-	12
Ischemic Heart Disease	8	5	13
Peri partium CM	0	3	3
MyoCarditis	0	2	2
Duchennes Muscular dystrophy	1	0	1
Functioning hypertrophy DCM	2	1	3
Anti Cancer drug	0	1	1
Family History of DCM	1	1	2

Table – 3: Conditions Associated with DCM

Risk	Male	Female	Total
COPD :	25	10	35
CKD / 1 :	8	5	13
Cirrhosis Liver :	3	0	3
CVA :	4	2	6
Parkinsonism :	2	0	2

Table – 4: Echo Findings

Mild LV Dysfunction EF(45 – 54)	52
Moderate LV Dysfunction EF (30 – 44%)	303
Severe LV Dysfunction (<30%)	145
Secondary MR	440
PAH with TR	315
Diastolic Dysfunction A >E	455

DISCUSSION

Out of 500 cases profiled, 293 cases were male and 207 cases were female, Similar finding has been reported from U.P., India, where the male: female ratio was 1.5:1 and 48% of the patients were above 60 years of age⁷. Female patients with DCM were seen up to 50 years of age (F=74, M=53) Males were found to be higher from 50 to 80 yrs of age (M=240, F=133). Similar male preponderance in DCM has also been reported in an European study by Rakar S et al.⁶

Ushasree B et al in an Indian study from Hyderabad reported that, smokers and alcoholics comprised almost 18 and 16% of DCM cases respectively⁷. Alcohol is the most common toxin implicated in chronic dilated Cardiomyopathy. In present series 12 cases were found to have chronic alcoholic. Three had cirrhosis of liver. In general, alcoholic patients consuming > 90gm of alcohol per day for more than 5 years have higher risk of developing DCM in the USA. The clinical diagnosis of alcoholic cardiomyopathy can be made when there is bi-ventricular dysfunction and dilatation is persistent in a heavy drinker without evidence of any other diseases. Hence it's a diagnosis of exclusion⁸. Toxicity of Alcohol is attributed to alcohol & its primary metabolite – Acetaldehyde, alcohol and its metabolites interfere with numerous membrane and cellular functions such as transport and binding of calcium, mitochondrial protein synthesis, excitation contraction coupling. It may also be due to associated thiamine deficiency or effect of preservative found in Alcohol⁹.

With age, comorbidities like hypertension, diabetes, malignancy or renal failure increase. These may cause DCM and heart failure. In our study causative factors or Risk factors could be ascertained in 184 cases (36.8%) leaving 316 cases (63.2%) was Idiopathic DCM. Diabetes mellitus or Hypertension alone or both was found in 152 case (30.4%). In diabetes mellitus there is increase incidence of CHF. The etiologies of this abnormality is multi-factorial and include factors such as myocardial ischemia from atherosclerosis, hypertension, myocardial fibrosis and myocardial cell dysfunction secondary to chronic hyperglycemia Heart Disease in Hypertension is the result of structural & functional adaptation leading to LV hypertrophy, diastolic dysfunction followed by LV dilatation and CHF. There may be associated atherosclerotic coronary artery disease and micro-vascular disease. Chronic Ischemic Heart Disease

can produce DCM (Ischemic Cardiomyopathy) due to Ischemic cell damage, Myocardial-Scarring, fibrosis, remodeling, dilatation of the ventricle & subsequent dysfunction. This group have better prognosis if ischemia is detected early and revascularization achieved in due time⁵.

Three case of peripartum cardiomyopathy were found 6 months post delivery, 2 cases improved and one died. A number of recent studies have provided information regarding the incidence of PPCM in the United States, ranging from 1 in 1,149 to 1 in 4,350 live births with a mean of 1 in 3,186 live births¹⁰. The cause of such cardiomyopathy is uncertain however, prolactin may play a role through pro inflammatory mechanism. Immune pathogenesis is supported by a frequent finding of lymphocytic infiltration in biopsies. Multi-parity and previous exposures to fetal antigens are also found to be significant risk factors¹¹.

Presence of COPD with resultant increase in pulmonary artery pressure and right ventricle strain compounded the LV dysfunction further Chronic Kidney Disease or CRF with retaining of water precipitated CHF further. The progress is very unfavorable in these two group of cases.

Different ECG and echocardiographic findings are found in DCM patients. In one Indian study, they found ST-T changes in 90% cases, Left bundle branch block (LBBB) in 30% and atrial fibrillation in 5% of the cases⁷. ECG findings in our study were, sinus Tachycardia seen in 80 cases. LVH with strain in 206 cases mostly in Hypertensive LBBB / LAHB was seen in 106 cases, Nonspecific ST/T changes in 108 cases, Atrial fibrillation in 10 cases, PSVT in 2 case & CHB in 2 cases. De Maria et al¹² in 1992, found out that maximum cases of DCM had ECG findings of first and second degree heart block, LBBB, low voltage QRS complexes, and other findings were ventricular tachyarrhythmias, and delayed intra-ventricular conduction¹³. C Matei et al from Romania¹⁴, found presence of increased left ventricular end-diastolic diameter (LVIDD) and mitral regurgitation as risk factors for occurrence of AF¹⁵.

CONCLUSION

This small observational study depicts the high prevalence of DCM in elderly population, especially males. These patients are more likely to have arrhythmia and embolic episodes. Certain echocardiographic

parameters like Ejection Fraction and Left Atrial size were found to correlate with left ventricular parameters and thus may be useful in predicting prognosis in DCM. However, further multicentric studies are needed in order to find the associated features in DCM patients in India and to better elucidate the significance of different chamber dimensions.

Ethical Clearance: This study is approved from our institutional ethics committee.

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Maron BJ, Towbin JA, Thiene G, et al: Contemporary definitions and classification of the cardiomyopathies: An American Heart Association scientific statement from the Council on Clinical Cardiology, Heart Failure and Transplantation Committee; Quality of Care and Outcomes Research and Functional Genomics and Translational Biology Interdisciplinary Working Groups; and Council on Epidemiology and Prevention. *Circulation* 113:1807, 2006.
2. Mann DL, Bristow MR. Mechanisms and models in heart failure: the biomedical model and beyond. *Circulation*. 2005; 111:2837-2849.
3. Ho KKL, Anderson KM, Kannel WB, et al. Survival after the onset of congestive heart failure in Framingham Heart Study subjects. *Circulation*. 1993; 88:107-115.
4. Bristow MR, O'Connell JB, Mestroni L. Myocardial diseases. In: Kelley's Textbook of Internal Medicine. 4th ed. Philadelphia, PA: Lippincott Williams and Wilkins; 2000: 464-474.
5. Falk RH and Hershberger RE. 2015. The Dilated, Restrictive, and Infiltrative Cardiomyopathies. In: Braunwalds Heart Diseases, 10th Edition, Mann DL, Zipes DP, Libby P, Bonow RO, Braunwald E (Eds). pp. 1551-1573 Elsevier, Philadelphia, USA.
6. RakarS, SinagraG, Di LenardaA, PolettiA, BussaniR, SilvestriF et al. Epidemiology of dilated cardiomyopathy: A prospective post-mortem study of 5252 necropsies. *European Heart Journal* 1997; 18: 117-23.
7. Ushasree B, Shivani V, Venkateshwari A, Jain RK, Narsimhan C, NallariP. Epidemiology and genetics of dilated cardiomyopathy in the Indian context. *Indian J Med Sci*. 2009;63:288-96.
8. Wilke A, Kaiser A, Ferency I, Maisch. Alcohol and myocarditis. *Herz*1996;21(4):248-57.
9. Preedy VR, Atkinson LM, Richardson PJ, Peters TJ, mechanisms of ethanol induced cardiac damage. *Br Heart Journal* 1993;69(3):197-200
10. Deshmukh A, Deshmukh A, Deshmukh G, Garg PK. A pilot study of dilated cardiomyopathy (DCM) in western Uttar Pradesh, India: A four year review. *Medico-Legal update* 2011; 11:
11. Elkayam U, Tummala PP, Rao K. Maternal and fetal out-comes of subsequent pregnancies in women with peripartum cardiomyopathy. *New England Journal of Medicine* 2001; 344(21):1567-71.
12. De Maria R, Gavazzi A, Caroli A, Ometto R, Biagini A, Camerini F. Ventricular arrhythmias in Dilated cardiomyopathy as independent prognostic hallmark. *Italian Multicentre Cardiomyopathy Study*. *Am Cardiol* 1992;69(17):1451-57.
13. A.G. Witlin, W.C. Mabie, B.M. Sibai. Peripartum cardiomyopathy: an ominous diagnosis. *Am J Obstet Gynecol*, 176 (1997), pp. 182-188.
14. C. Matei, Ioana Pop, Mihaela Badea, Adriana Saraolu, I. M. Coman, E. Apetrei. Predictive factors for atrial fibrillation appearance in dilated cardiomyopathy. *Romanian journal of cardiology* 2012; 22(2): 97-106
15. Yi G, JH Goldman, Keeling PJ, Reardon M, Mckeena WJ, Malik M. Heart rate variability in Dilated cardiomyopathy in relation to disease severity and prognosis. *Heart* 1997;77(2): 108-114.

Interdependence of Communicable and Non-Communicable Diseases among Elderly Population in Declared Slum in Mysuru City, Karnataka

Meghana Narendran¹, Savitha Rani B B², Praveen Kulkarni³, Renuka M⁴, Narayana Murthy M R⁵

¹Post Graduate, Department of Community Medicine, JSS Medical College, Mysuru. ²Assistant Professor, Department of Community Medicine, Sri Siddhartha Medical College, Tumkur; ³Assistant Professor, ⁴Professor, ⁵Professor and Head of Department, Department of Community Medicine, JSS Medical College, Mysuru

ABSTRACT

Background: Indian Health Care delivery system is more deviant towards productive age groups and has sidelined the veterans who constitute about 7-8% of our population. Morbidities among elderly are largely preventable and treatable if detected at early stages. The complex interactions between established communicable and emerging Non-communicable diseases(NCD)among Elderly like Diabetes and Tuberculosis, emphasizing the importance of re-thinking disease classification in the context of Health promotion, disease prevention, treatment, and care.

Objectives: 1. To determine the prevalence of coexisting Communicable and Non Communicable Diseases among the Elderly population.

2. To assess the interdependence between Communicable and Non Communicable disease among the Elderly population.

Methodology: This cross-sectional study was conducted in a declared slum of Mysuru city for a period of one month. Socio-demographic characteristics, the prevalence of Communicable and Non Communicable Diseases and associated co-morbidities were collected in a pretested structured survey schedule by interview technique.

Results: It was found that out of total 106 study subjects, 25% had Diabetes, 36% had Diabetes and Hypertension and 39% had Hypertension. There was a significant association between Comorbidities and Infectious Diseases(p-value 0.001). There was a statistically significant association when we studied the interdependence between NCD and Infectious Diseases(p-value:0.002).

Conclusion: Increasing burden of Communicable disease with pre-existing Non-Communicable disease necessitates for evolving a strategy to include screeningfor these conditions in the regular health check up among elderly.

Keywords: Geriatrics, Communicable disease, Non-communicable disease, Interdependence, Quality of life.

INTRODUCTION

Non-communicable diseases (NCD) are a major Public health problem, responsible for a high proportion of deaths and disabilities. WHO estimated that, in 2000, NCDs caused 59% of deaths and 46% of the global burden of disease.¹ Based on available trends, by 2020 NCDs are predicted to account for 73% of deaths and

60% of disease burden.²

India's elderly population contributes 8.2% of the total population according to 2011 census and is projected to increase to 10.7 percent by the year 2021 and 20 percent in 2050.³

Advancement in medical sciences with

socioeconomic improvement across the country has led to increased life expectancy among Indians, which has resulted in the increased old-age dependency ratio. The Indian healthcare delivery system is more deviant towards productive age groups and has sidelined the veterans.

NCD is the leading cause of death globally. Older people are disproportionately affected. Non Communicable diseases among elderly are largely preventable and treatable if detected at early stages. Infectious Diseases among Elderly with NCD are the most common problems which decrease Quality of Life.

However, International development and global health policies and strategies rarely give adequate attention to NCD or recognize the links between rising NCD and population aging. Services, including health promotion and prevention, at all levels of the healthcare system, especially in primary health care, often fail to respond to the needs of aging populations, including the specific needs of older people.

The present study was done with the aim to know the prevalence of communicable and non-communicable diseases and their interdependence in the elderly population.

MATERIALS AND METHODOLOGY

This cross-sectional community-based study was conducted in a declared slum of Mysuru city, Medar's block for a period of one month(January to February 2017). As there were no similar studies done in the past, a prevalence of interdependence of communicable and non-communicable diseases among elderly was assumed to be 50%, required sample size with 5% absolute precision and confidence level of 95% and with 10% absolute allowable error was found to be 100. Considering the non-response rate of 5%, 105 elderly were included in the study. From the database of Urban Health Centre, 105 subjects aged 60 years and above were selected by simple random sampling method and data were collected by a house to house survey. The house where the selected elderly was out of station/not available at the time of data collection was revisited thrice before selecting next elderly subject from the database. Institutional ethical committee approval and Informed consent from the study participants were obtained prior

to the start of the study. Data collected were entered and analyzed in SPSS version 22. Statistical analysis was done using Descriptive statistics like proportion and Inferential statistics like Chi-square test .P-value less than 0.05 was taken as statistically significant.

Inclusion criteria: subjects aged 60 years and above with NCD

Exclusion criteria: Those who are not present at home even after 3 visits and who were seriously ill

RESULTS

Among the study participants, 74(69.8%) were between the age group of 60 - 69 years. 36(34.0%) were males and 70(66%) were females. Out of 106 Elderly 77 (72.6%) were illiterate, 20(18.9%) studied till middle class. 83(78.3%) were married. Out of 106 elderly 39(36.8%) were consuming Tobacco, 56(52.8%) were in class II SES according to B.G. Prasad classification. 50(47%) were Obese and 30(28.3%) were overweight (Table 1).

It was found from the study that among 106 study subjects 27(25.5%) were having Diabetes, 41(38.7%) were having Hypertension and 38(35.8%) had both Diabetes and Hypertension. (Table 2). 105(99.1%) of the study subjects were on regular treatment. (Table 3). Out of 106 study subjects, 78(73.6%) were having Non Communicable diseases for a period of 2 to 10 years. (Graph 1). Among them, 38(36%) were not on adequate control. (Graph 2).

23(21.7%) did not have any comorbid condition, whereas, 34(32.1%) had Osteoarthritis, 13(12.3%) had Cataract, 11(10.3%) had Cardiovascular disease and Asthma each. (Graph 3). Out of 106 elderly, 68 (64%) were having Infectious Diseases among study subjects with NCD's, 24(22.6%) were having URTI, 18(17%) were having periodontitis and 13(12.3%) were having UTI. (Graph 4).

There was a significant association between the presence of Co-morbidities and NCD and Infectious disease (p-value:0.001). When we studied the association between NCD and Infectious Diseases there was a statistically significant association (p-value:0.002). (Table 4).

Table 1: SOCIO-DEMOGRAPHIC PROFILE OF STUDY SUBJECTS(n=106)

Variable	Category	Frequency(%)
Age (in years)	60-69	74(69.8)
	70-79	29(27.4)
	80&above	3(2.8)
Sex	Males	36(34)
	Females	70(66)
Education	Illiterate	77(72.6)
	Primary	9(8.5)
	Middle	20(18.9)
Marital status	Married	83(78.3)
	Widow	23(21.7)
Tobacco Usage	Yes	39(36.8)
Medical Insurance	Yes	4(3.7)
	No	102(96.2)
SES	Class I	4(3.8)
	Class II	56(52.8)
	Class III	40(37.7)
	Class IV	2(1.9)
	Class V	4(3.8)
BMI	Underweight	6(5.6)
	Normal	20(18.9)
	Overweight	30(28.3)
	Obese	50(47.1)

Table 2: DISTRIBUTION OF STUDY SUBJECTS BASED ON PREVALENCE OF NCD(n=106)

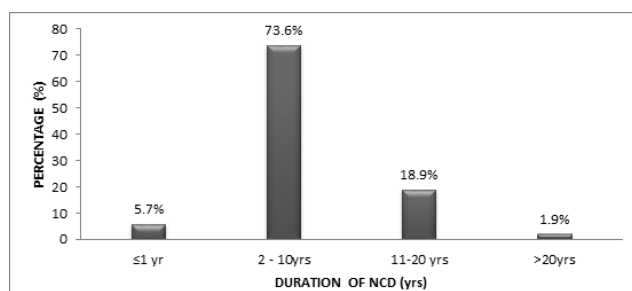
NCD	Frequency(%)
Diabetes Mellitus	27(25.5)
Hypertension	41(38.7)
Diabetes & Hypertension	38(35.8)
Total	106

Table 3: DISTRIBUTION OF STUDY SUBJECTS BASED ON PERCEIVED DRUG ADHERENCE

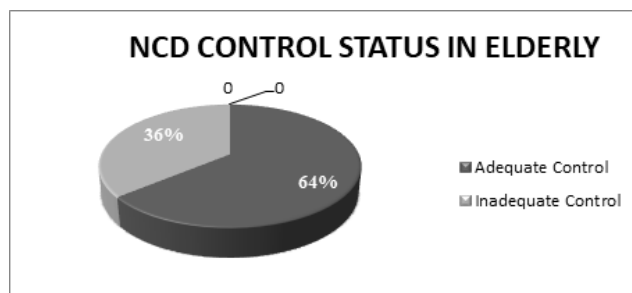
Regularity of Drug intake	Frequency(%)
No	1(0.9)
Yes	105 (99.1)
Total	106

Table 4: DISTRIBUTION OF STUDY SUBJECTS BASED ON ASSOCIATION BETWEEN CO-MORBIDITIES, NCD AND INFECTIOUS DISEASES

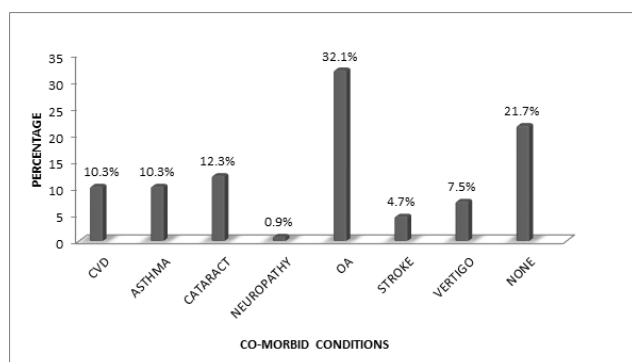
Variable	Category	Infectious Diseases		Total(%)	Chi Square	P Value
		No	Yes			
Co Morbid Conditions	CVD	5	6	11 (10.3)	47.221	0.001
	Asthma	2	9	11 (10.3)		
	Cataract	1	12	13 (12.2)		
	Neuropathy	1	0	1 (0.9)		
	OA	3	31	34 (32)		
	Stroke	1	4	5 (4.7)		
	Vertigo	8	0	8 (7.5)		
	None	16	6	22 (20.7)		
	NCD	Diabetes	5	22		
Hypertension		23	18	41(38.6)		
Diabetes and Hypertension		10	28	38(7.5)		



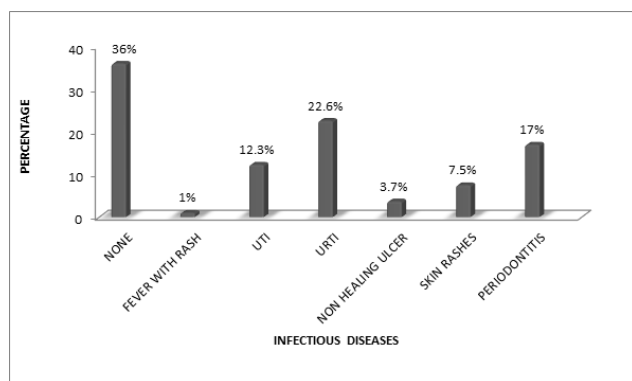
Graph 1: DISTRIBUTION OF STUDY SUBJECTS BASED ON DURATION OF NCD



Graph 2: DISTRIBUTION OF STUDY SUBJECTS BASED ON NCD CONTROL STATUS



Graph 3: DISTRIBUTION OF STUDY SUBJECTS BASED ON PREVALENCE OF CO-MORBIDITIES



Graph 4: DISTRIBUTION OF STUDY SUBJECTS BASED ON PREVALENCE OF INFECTIOUS DISEASES

DISCUSSION

Older age group are more likely than younger age group to have unrecognized comorbidities and impairments that increase their risk of medical morbidity and mortality.

In the present study out of 106 study subjects, 69.8% belonged to age group 60-69 years. A study conducted by Mohapatra et al on elderly showed 68.5% in the age group of 60-69 years.⁴

It was found in the study that among 106 study subjects, 27(25.5%) were having Diabetes, 41(38.7%) were having Hypertension and 38(35.8%) had both Diabetes and Hypertension. Globally, two out of three deaths are caused by NCD.⁵ By 2020, NCD will account for 80 percent of the global burden of disease, causing seven out of 10 deaths in low- and middle-income countries.⁶ However, International development and global health policies and strategies rarely give adequate attention to NCD or recognize the links between rising NCD and population aging. Increase burden of NCD in elderly are due to decreased immune status and “Age” itself is actually a universal risk factor for nearly every disease. It was found in the present study that 68 (64%) were having Infectious Diseases among study subjects with NCD, 24(22.6%) were having URUTI, 18(17%) were having periodontitis and 13(12.3%) were having UTI. Although aberrations of host defence mechanisms with aging are thought to be the major risk factors for acquiring the infection, other general factors may be equally important, Uncontrolled Non Communicable disease status like Diabetes is also an important factor influencing it. When we studied the association between NCD and Infectious diseases there was a statistically significant association. (P value:0.002). There was a significant association on applying chi-square test between Co-morbidities with NCD and Infectious disease(P value:0.001). Studies conducted on Elderly have shown that many low- and middle-income countries lack trained health workers to respond to the complex, multiple and often interconnected healthcare needs associated with aging. Lack of access to appropriate health services – including NCD diagnosis, treatment, follow-up and referral where necessary – not only limits the life chances of those living with NCD, but also places a strain on those caring for them.⁷ Experience in the HelpAge global network shows that, with training and education provided through older people’s associations, older people can often manage NCDs themselves and facilitate Prevention of Infectious diseases.⁸

CONCLUSION

Elderly persons appear to be prone to more frequent or serious morbidity and higher mortality from infectious

diseases than the general population associated with the Non-communicable disease. It is important that clinicians be aware of these selected diseases as well as the risk factors for infection in Elderly population to prevent and control of Infectious diseases to improve overall Quality of Life.

Source of Funding: Self

Conflicts of Interest: Nil

REFERENCES

1. Innovative care for chronic conditions: Building blocks for action. Global report. Non communicable diseases and mental health. Geneva:World Health Organization; 2002. WHO/MNC/CCH/02.01, p. 15.
2. Murray CJL, Lopez AD (eds). Global burden of disease: A comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Cambridge, Massachusetts:Harvard University Press; 1996.
3. Situation analysis of the elderly in India. Central Statistics Office, Ministry of Statistics and Implementation. Government of India, New Delhi. 2011. Available form: http://www.mospi.nic.in/mospi_new/upload/elderly_in_india.pdf. [Last accessed on 2008 June 23.
4. Mohapatra, SK Handoo, IS Gambhir, SC Mohapatra. A study of non-communicable morbidity pattern in geriatric patients attending a referral railway hospital in allahabad, uttarpradesh.July-Sept 2011; Vol 2; Issue 2,191-196.
5. NCD Alliance, Why NCDs, <https://ncdalliance.org/why-ncds> (14 July 2016)
6. WHO, Non-communicable diseases (NCDs)in developing countries: a symposium report,www.ncbi.nlm.nih.gov/pmc/articles/PMC4267750 (14 July 2016)
7. Ageing in the Twenty-First Century:A Celebration and a Challenge, New York,UNFPA and London, HelpAge International,2012, p.28
8. WHO, World Report on Ageing and Health,2015.

Intimate Partner Violence: Factors and Types of Abuse Women Face in and around Coimbatore District, Tamilnadu

Suji Prasad¹, Rangasami Periyar²

¹Ph.D. Scholar, Department of Social Work, Amrita School of Engineering, Coimbatore, India,

²Assistant Professor (SG), Department of Social Work, Amrita Vishwa Vidyapeetham, India

ABSTRACT

Intimate partner violence has become an important global public health problem. It is the most common form of violence against women in all over the world and is prevalent both urban and rural areas. Intimate partner violence is also termed as domestic violence. Women end up suffering severe physical, emotional and sexual abuse by their partner. Women suffer silently due to the fear of retaliation, lack of economic support, lack of support from family and friends and majorly due to the concern of their children. The risk factors of IPV operates at 4 levels, individual, relationship, community and societal. This study aims in understanding the risk factors influencing IPV and other types of abuse women undergo due to violence in and around the district of Coimbatore. We surveyed around 200 women out of which 78 women voluntarily agreed to participate in the one to one interview where a structured questionnaire was prepared to interview the women. The questionnaire consisted of questions to identify the socio economic and demographic status and causes of intimate partner violence. This study aims to find out and understand the effects of IPV the women face in our society and cohere it with social norms and values. The findings indicate that women suffer long term mental and physical health problems caused by intimate partner violence. If a woman has faced severe abuse it ends up having mental and physical impact over the women over a longer period of time.

Keywords: Women, Abuse, Intimate partner violence, mental health, physical health, illiteracy

INTRODUCTION

Intimate partner violence (IPV) is a preventable public health problem that affects women both in developed and developing nations. According to the World Health Organization IPV is defined as “behavior within an intimate relationship that causes physical, sexual or psychological harm, including acts of physical aggression, sexual coercion, and psychological abuse and controlling behaviors”. IPV is also commonly referred to as domestic violence and it exist in different cultures and societies all over the world. IPV has an adverse effect on the mental and physical health of women ¹. The factors

associated with IPV included early marriage, husband’s alcohol use, women’s employment to name a few. Causes of high frequency Intimate partner violence in India is driven by patriarchal societal norms which eventually causes women to be treated as their subordinates ². Other factors that associated with IPV are the cultural practice of obtaining dowry during weddings, growing up by witnessing violence, controlling behavior of the husband and social demography like age, low level of education, harmful use of alcohol and drugs, acceptance of violence and area of residence. Women in general suffer silently fearing many factors like fear of retaliation, lack of alternate financial support, lack of support from family and friends and concern for their children. In general partner violence affects whole family ³

Corresponding author:

Suji Prasad,

PhD Research Scholar, Department of Social Work,
Amrita School of Engineering, Coimbatore, India,
Amrita Vishwa Vidyapeetham, India

Email: sujirajesh19@gmail.com

The prevalence of IPV is seen in all settings, regions, and religious groups. Although there are some dissimilarity in reporting by region, studies show that

women in southern part of India report lesser physical abuse than in women from northern part of India⁴. According to the national survey 8% of married women have been subjected to sexual violence, 31% have been physically abused in a way such as slapping or pinching and 14% of Indian women have experienced psychological abuse in throughout their lives⁵. Couples disparities in educational level, marital age, dowry pressure, poverty, alcoholism are highly associated with IPV in India⁶.

The studies from various south Asian countries on IPV have identified a number of risk factors like age, education level, low income, poverty, occupation, and controlling behavior of spouse are associated with IPV which may lead to different types of abuses too. For example. Babu and Kar⁷ stated that age, education, occupation, marital duration and husband's alcoholism emerged as significant predictors of victimization and perpetration of all types of domestic violence. Meanwhile Atteraya, et.al⁸ determined that female illiteracy, low economic status, violent family history and a lack of decision making were associated with intimate partner violence. In a family back ground husband's alcoholic dependency, husbands education level, and more number of children were factors associated with violence. However, the issue of IPV is still remaining in India.

This paper is on study of IPV and its risk factors for women respondents with their characteristics such as age, education, occupation, number of years of marriage and different types of abuses faced by women.

METHOD

Qualitative approach was used to carry out the study. This was carried out in two stages among the people of Coimbatore district; Tamil Nadu, India. In first stage around 200 houses were visited and the survey was done door to door. Out of the 200 houses visited around 78 women had agreed to participate in the study. These women felt comfortable to participate in the survey and hence were chosen for the 2nd stage of the study. These 78 women were interviewed one on one with open ended questions using a semi structured questionnaire ensuring them adequate privacy during the stage 2 of the study. The questionnaire consisted of the socio-demographic characteristics of both women and her partner i.e., age, education, employment status, monthly income per month, marital status, religious background, number

of people in the household, number of years of their marriage, factors influencing partner violence and other types and frequencies of abuse these women underwent. These women were also asked about their spouse's alcohol use. This interview was carried out over a span of 4 months based on the participant's convenience. After the structured interview was completed, the data was assessed.

RESULTS

The collected data from the survey was analyzed on the participant's socio demographics, risk factors of IPV and the types of abuse the women underwent. Based on our study, figure 1 shows that around 29.49% of women are in the age group of 31-35. 24.36% are in the age group of 26-30 and 24.36% are in the age group of 36-40. 10 % are in the age group of 20-25. 6.41% of women fall in the age group of 41-45 and 5.12% belong to the age group 46-50. Different parameters featuring the educational level of the respondent from figure 1 we can infer that majority of women 65.39% only higher secondary school level education, 14.10% have college level education and 11.54% are still pursuing education in college. 8.97% of the women have completed their diploma. It is interesting to note that less educated women faced higher odds of IPV. Apart from this we also found that 51.28% of women were house wives and 37.18% were working as teacher, nurse, and beautician. Few women were employed in other sectors too. 11.54 % of the women were still continuing their studies. Based on this study we can infer that women's dependency creates more chances of violence whereas independent working women had faced less risk of partner violence. However we also studied the number of years of marriage between the couples where we found that majority 43.59% of the couples have been married for 1-5 years, 35.90% of the women were married for 6-10 years and 10.26% have been married for 11 years.

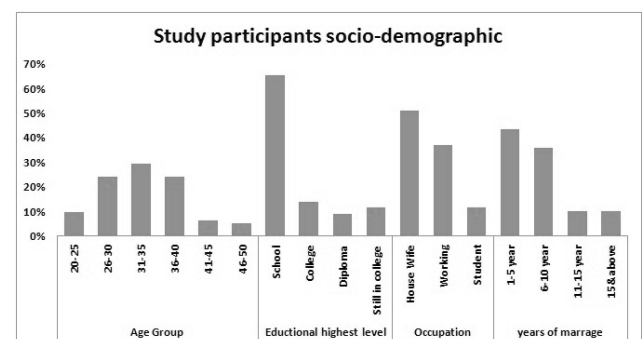


Figure 1: Study of participants' social demography

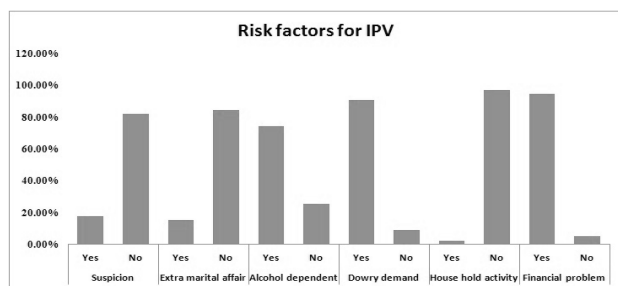


Figure 2: Risk factors involved with Intimate Partner Violence

Figure 2 shows the risk factors involved with IPV. From the graphs we can infer that 91.03% of the women had faced problem due to dowry demand. 74.36% of women abuse due to alcohol addiction in the husbands. Alcohol addiction in the men have led to conflicts in the house causing both physical and mental abuse in the women. These women end up sustaining a lot of physical injuries like bruises, broken bones etc. Victims of alcohol abuse were not confined to women alone but it also had been affecting the children in these families. Similarly we can interpret from our study and the graph that 94.87% of women underwent abuse due to financial crisis in a family. 17.95% of the women faced physical and mental abuse due to suspicion and 15.38% of women suffered as their husband had extramarital affairs.

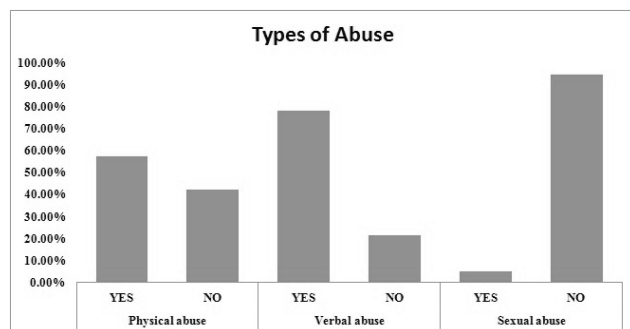


Figure 3: Different types of abuse women face

From figure 3 we can understand the different types of abuse the women underwent. From the graphs we can infer that majority of the women i.e., 78.21% of the women underwent verbal abuse. Consequently we can see that around 57.70% faced physical abuse like slapping, kicking, pinching and around 5.13% of the women had faced sexual abuse. From the study we can understand that IPV is still prevalent in the district of Coimbatore and is prevalent in both educated and uneducated population. We can infer that women are subjected to different forms of abuse both physical and mental and this has led to affecting the women psychologically.

DISCUSSION

The factors influencing IPV have been previously documented from countries in and around Asia, Africa and America with different political, economic and cultural differences. The result of the study indicated that IPV is still prevalent and the victims are women in general. From this study we have found that age, education, occupation status of women, and marital duration have influenced IPV in women in the district of Coimbatore. However in studies conducted by Babu and Kar ⁷ stated that factors like age, education, occupation, marital duration and husband’s alcoholism are significantly associated with higher odds of all types of violence. Atteraya, Gnawali, Song, ⁸ and Bhatta ⁹ in Nepal has highlighted the factors associated with IPV. The study showed that female illiteracy, low economic status, violent family history and a lack of decision making were associated with intimate partner violence in Nepal. The husband’s alcohol dependency and husband’s education level also associated with IPV in Nepal.

The findings revealed that alcohol dependency, dowry demand and economic dependency are the high risk factors for IPV. However a study by Kaur and Garg ¹⁰ stated that alcoholism in husband is the main cause for violence against women. Similarly Jennifer A. Wagman et.al ¹¹, Nair ¹², Ramadugu ¹³ stated that alcohol is the high risk factor for IPV and maltreatment of women. Similar studies conducted by Slabbert ¹⁴, Atteraya, Gnawali and Song, ⁸ mentioned that women faced abuses in lower economic groups. He also stated that poverty is associated with IPV.

Currently, verbal abuse was found to be the most common form of IPV in (78.21%) followed by physical abuse in (57.70%). A study carried out in Bangladesh stated that physical and sexual abuse was highest in rural districts than in slums. Likewise, verbal and physical abuses are at higher rates in urban districts, when compared to sexual abuse. The findings in the study highlight the complex nature of various factors that influence IPV. In this context we would like to bring into light that women are trapped into the cultural framework, molded by patriarchal system of our country which happens to be the highest risk factor involved with IPV. These results needed more information to assess the situation to give interventions as well as provide the awareness among women about the existing law.

CONCLUSION

Gender role and cultural norms contributes to partner violence. Therefore interventions need to be done in the legal and institutional level, which concentrates more on partner and relationship issues. There is a need to provide successful interventions for reducing alcohol use and strategies for women and help them protect themselves from alcohol related IPV. The IPV prevention program targeting men should include spousal abuse, alcohol use, and sexual behavior as social and public health problems and also insert the sociocultural context within which men who abuse their partners. Even female illiteracy, low economic background, childhood experiences and husband's education level and occupation influence the partner violence. In order to promote equality further study should be conducted in future to focus on male behaviors. Various researches suggest that physical and psychological abuse affect the health of the women adversely. For abused women there should be health care protocols and also screening for treatment of IPV related abuses. Thus intervention provides social support and reduces stress among abused women. Studies have stated that if the woman is suffering from any psychological disorder they should also evaluate for domestic violence. The government should undertake stringent measures to ensure gender equality and should maintain zero tolerance in bringing the perpetrator of Intimate partner violence to justice. Women's civil rights related to divorce, property, child support and custody needs to be strengthened. Economic and social empowerment of women needs to be promoted and at school level boys and men should be engaged to promote nonviolence and gender equality. These reforms might reduce the cases of IPV and help empower women rather than victimizing them.

Ethical Issues: This study obtained consent from the women before involving them in this study and informed about the importance of the study.

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. World Health Organization. Multi country study on women's health and domestic violence against women. Geneva: World Health Organization, 2007.
2. Kruttschnitt C, McLaughlin BL, Petrie CV, eds. Advancing the federal research agenda on violence against women. Washington, DC: National Academy Press, 2004
3. Mosefequr Rahman. Association between adolescent marriage and intimate partner violence. *Asia Pac J Public Health* 2014; 26:160-8.
4. Stephenson R, Koenig MA, Ahmed S. Domestic violence and symptoms of gynecological morbidity among women in North India. *Int Fam Plan Perspect* 2006; 32:201-8.
5. Plichta SB. Intimate partner violence and physical health consequences: Policy and practice implications. *J Interpers Violence* 2004;19(11):1296-323.
6. Sabri B, Campbell JC. Intimate partner violence against women in slums in India. *Indian J Med Res* 2015; 141(6):757-9. doi:10.4103/0971-5916.160693.
7. Babu BV, Kar SK. Domestic violence in Eastern India: Factors associated with victimization and perpetration. *Public Health* 2010; 24:136-48.
8. Atteraya MS, Gnawali S, Song IH. Factors associated with intimate partner violence against married women in Nepal. *J Interpers Violence* 2015; 30(7):1226-46.
9. Kaur R, Garg S. Domestic violence against women: A qualitative study in a rural community. *Asia Pac J Public Health* 2010; 22(2):242-51.
10. Bhatta DN. Shadow of domestic violence and extramarital sex cohesive with spousal communication among males in Nepal. *Reprod Health* 2014;11(1):44.
11. Wagman J.A.et.al Husband's alcohol use, intimate partner violence, and family maltreatment of low-income postpartum women in Mumbai, India. *J Interpers Violence* 2016 doi.10.1177/0886260515624235.
12. Nayar M. In the shadow of alcohol: Women's experiences from Bangalore. *Indian Anthropologist* 2009; 39(1/2):49-64.
13. Ramadugu S, et.al. Understanding intimate partner violence and its correlates. *Ind Psychiatry J* 2015; 24(2):172-8.
14. Slabbert I. Domestic violence and poverty: Some women's experiences. *Res Soc Work Pract* 2017; 27(2):223-30.

Stress Level and Coping Strategies of IT Sectors

S Kosalai¹, G S Maheswari²

¹Research Scholar, ²Associate Professor, Department of Commerce, Vels University, Pallavaram, Chennai

ABSTRACT

Effective stress management, on the other hand, helps you break the hold stress has on your life, so you can be happier, healthier, and more productive. The main aim of this study is to find out the various factors contributing to stress among IT peoples and the impact of the stress among employees. The researcher used chi-square test and t-test to find the results. It finds that work load is the main factor that causing stress followed by technology and multi task. Team work and management pressure causing less stress compared with other factors. Finally, it concludes that management takes lots of techniques such as, arranging tours, awards, appreciation and monetary motivations to avoid stress among the employees and to achieved the goals.

Keywords: *Stress, IT culture, coping strategies, monetary motivations.*

INTRODUCTION

Stress management is a wide spectrum of techniques and psychotherapies aimed at controlling a person's level of **stress**, especially chronic **stress**, usually for the purpose of improving everyday functioning. Stress management starts with identifying the sources of stress in your life. This isn't as straightforward as it sounds. While it's easy to identify major stressors such as changing jobs, moving, or a going through a divorce, pinpointing the sources of chronic stress can be more complicated. It's all too easy to overlook how your own thoughts, feelings, and behaviours contribute to your everyday stress levels.

Effective stress management, on the other hand, helps you break the hold stress has on your life, so you can be happier, healthier, and more productive. The ultimate goal is a balanced life, with time for work, relationships, relaxation, and fun—and the resilience to hold up under pressure and meet challenges head on. But stress management is not one-size-fits-all. That's why it's important to experiment and find out what works best for you. The following stress management tips can help you do that.

Stress has becoming significantly with the result of dynamic social factors and changing needs of life styles. Stress is man's adaptive reaction to an outward situation which would lead to physical mental and behavioural

changes. Brain cells create ideas, Stress may kills brain cells. The truth is that not all stresses are destructive in nature. Appropriate amount of stress can actually trigger your passion for work, tap your latent abilities and even ignite inspirations.

Stress is a fact in our daily life. When a person needs help, it means the person feels physically and emotionally disabled. Most people believe that their capacity and capabilities are so little to encounter high level of stress. Most people think that they know the stress. The reality is that, stress is complicated and it is not well perceived. To know how the stress works and affects on our lives, first, we describe it and then study its relationship with organisational life.

Challenge will give mental and physical energy to person and stimulate him to learn new skills in his job field. Therefore, a challenge in a workplace is a constructive and an important factor for health and productivity (Norcross & Prochaska, 2007, p. 78).

Organizational strategies to prevent occupational stress are quite simple; they involve the creation of a suitable working environment in terms of employment characteristics, labor relations, organizational structure and achievement of a healthy organizational culture. Companies have realized the usefulness of anti-stress programs by looking at the reduction of medical costs for their employees. The latest programs of this kind

are the so-called “wellness programs” designed to take care of both the physical and psychological aspect of the employee.

The work stress is found in all professions, the very affected are the IT professionals who are highly target driven, highly pressured on results, and are squeezed both physically and mentally to the maximum on their roles and loads. The stress is manifested in various ways and means, and the much prone sector is the IT sector, which has turned upside down only their working hours, but also their biological system, which affects at three different levels viz., individual, interpersonal and organizational level. Devoid of stress, a person becomes sluggish and boring. Positive stress encourages a person to achieve better. However, if this stress exceeds beyond the required level it causes distress.

To cope up this situation the IT Management are taking many steps to reduce the stress of their employees such as arranging outstation, conducting games among the employees, providing facilities, holidays etc.,

REVIEW OF LITERATURE

Jac J.L. van der Klink, Roland W. B. Blonk, Aart H. Schene,(2001), *The Benefits of Interventions for Work-Related Stress*, *American Journal of Public Health*. 2001;91:270–276). This study is to determine the effectiveness of occupational stress–reducing interventions and the populations for which such interventions are most beneficial. Forty-Four intervention types were distinguished: cognitive–behavioral interventions, relaxation techniques, multimodal programs, and organization focused interventions. A moderate effect was found for cognitive–behavioral interventions and multimodal interventions, and a small effect was found for relaxation techniques. It concludes that Stress management interventions are effective Cognitive– behavioral interventions are more effective than the other intervention types¹.

Mihaela STOICA,(2010), *CCUPATIONAL STRESS MANAGEMENT OCCUPATIONAL STRESS*, *Management in health* XIV/2/2010; pp. 7-9, Stress management is an important part of maintaining good physical and emotional health and healthy relationships with others. This article presents some strategies to prevent and reduce stress both at the organizational level as well as individually. With rare exceptions, Romanian stress Management programs

have not known a great success, the reasons behind this being related to mentality. The occupational stress problem in Romania is still an open question, waiting to be solved⁵.

Laiba Dar,Anum Akmal, Muhammad Akram Naseem,Kashif Ud Din Khan(May 2011), *Impact of Stress on Employees Job Performance in Business Sector of Pakistan*. *Global Journal of Management and Business Research* Volume 11 Issue 6 Version 1.0, The main aim of this study to examine the relationship between job stress and job performance. The chi-square test and t-test was used to test the hypothesis. The findings showed that job stress brings about subjective effects such as feeling undervalued and workplace victimization/ bullying, unclear role/errands, work home interface; fear of joblessness, exposure the traumatic incidents at work and economic instability among our target population. Resulting in poor concentration, mental block and poor decision making skills. Based on these findings, it was recommended that organizations should reduce psychological strain, work overload and role ambiguity through adoption of job redesign techniques. Furthermore, the study explores the employees job performance with demographic variables, resulting that male employees are highly stressed vis-à-vis their female counterparts³.

Uma Devi .T(OCT 2011) *A Study on Stress Management and Coping Strategies With Reference to IT Companies*, *Journal of Information Technology and Economic Development* 2(2), 30-48, October 2011 30. The focus of the paper is to study the stress level among IT employees and to suggest the coping strategies. A survey of 200 IT employees in the IT companies situated in and around Hyderabad is done. Some of the stress coping strategies identified by this study includes stress management programs, physical activities planned in job design, life style modification programs, finding triggers and stressors, supportive organization culture, stress counseling programs, and spiritual programs⁹.

Ramezan Jahanian, Seyyed Mohammad Tabatabaei(Nov 2012) *Stress Management in the Workplace*, *International Journal of Academic Research in Economics and Management Sciences*, ISSN: 2226-3624. The nature of working has been changed widely, and still these changes are in progress. Following these changes, number of illnesses has been increased, morality and human aspects are faded and new problems

are occurred every day, so that we are facing job stress which called “illness of the century”⁶.

Soni Kushwaha(2014),Stress Management At Workplace, Global Journal of Finance and Management. ISSN 0975-6477 Volume 6, Number 5 (2014), pp. 469-472, This paper will discuss various techniques of stress management at workplace, measures to reduce workplace stress and interventions when sources of stress cannot be eliminated⁸.

Dr. Latha Krishnan(May 2014), Factors Causing Stress among Working Women and Strategies to Cope Up, IOSR Journal of Business and Management (IOSR-JBM) e-ISSN: 2278-487X, p-ISSN: 2319-7668. Volume 16, Issue 5. The main aim of this study have identified socio-economic stressors, psychological and family and relationship stressors causing stress among working women and strategies to cope up with it. Statistical tools like factor analysis and regression coefficient were used to develop Structural Equation Model. The findings of the study reveal that under socio-economic stressors unexpected guests, followed by absence of domestic help causes major stress among working women. Similarly being perfectionist with unnecessary worries which cause psychological set back among working women. Moreover anxiety about children future and husbands job insecurity play a major role in causing stress under family and relationship⁴.

Sanjeev Kumar, J. P. Bhukar(Jan 2013), Stress level and coping strategies of college students, Journal of Physical Education and Sports Management, Vol. 4(1): pp. 5-11. The aim of this study was to investigate the stress levels and coping strategies of professional students belonging to Physical Education and Engineering professions. A sample of 60 subjects was randomly selected from the Physical Education and Engineering Institute, India. Two way analysis of variance (ANOVA) showed that stress due to all the stimuli was significantly higher among girls in comparison to boys of their profession. Coping strategy was higher in boys than girls of their respective profession, but Physical Education girls had higher coping strategy than boys and girls of Engineering. Therefore, it can be concluded that Physical Education students had better coping strategy than engineering students⁷.

Dr. A. Jayakumar, K. Sumathi(2014), An Empirical Study on Stress Management for Higher Secondary

Students in Salem District-Tamil Nadu. International Journal of Recent Advances in Organizational Behaviour and Decision Sciences (IJRAOB) (ISSN: 2311-3197) 2014 Vol: 1 Issue 1. The study mainly focuses on higher education students. The students suffer from stress on some level. It mainly based on empirical study. The samples include higher education students. The research instruments are questionnaire method. This research focuses on stress perception stressful experiences and stress management in studies of students. The learning strategies required to manage stressful situations in order to improve their performance².

Unnikrishnan.P (Feb 2015),Management Of Stress And Motivation Of Employees, International Journal Of Research – Granthaalayah ISSN- 2350-0530(O) ISSN- 2394-3629(P). The concept of motivation can be effectively used to remove stress from our organization .Different motivational techniques such as financial incentives, appreciation, personal encouragement, training and development programs ,seminar & workshops etc. will helps to throw away stress from organizations, if complete stress had been removed ,and motivation is given, a complete & strategic organizational change will takes place in organization¹⁰.

OBJECTIVES OF THIS STUDY

The specific objectives of the study are:

1. To identify the various factors contributing to stress among IT peoples.
2. To identify the impact of the stress among employees.
3. To find out the management techniques used by IT management.

HYPOTHESES OF THIS STUDY

1. There is no significant difference among the factors causing stress between the IT peoples.
2. There is no significant relationship between stress management techniques and impact of employees.

IMPACT OF STRESS IN THE WORK PLACE

1. Low involvement in their work.
2. Poor performance
3. Lack of interest

4. Memory Loss
5. Unnecessary Arguments
6. Poor co-operation
7. Tension
8. Absenteeism
9. Misbehaviour
10. Resigned attitude
5. Awards
6. Promotions
7. Monetary Motivations
8. Maintain good relationship among employees
9. Developing healthy life styles.

MANAGEMENT TECHNIQUES TO REDUCE STRESS

1. Convenient time
2. Arrange tours
3. Conducting games
4. Appreciations

RESEARCH ANALYSIS

The researcher used chi-square test and t-test to find the results. After analysing national and international journals there are many factors causing stress among the IT peoples. The main factors are job rotation, technology, work load, competition, IT culture, multi task, Management pressure, team work, job loss and various commitments. The following table shows that the relationship between age and income of IT peoples.

Count		Income				Total	
		15,000-35000	35,000-50,000	Above 50,000			
Age	Less than 15,000	25-30	35	15	0	0	50
	Above 31	0	0	62	88	150	
Total			35	15	62	88	200

Source: computed data

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	200.000 ^a	3	.000
Likelihood Ratio	224.934	3	.000
Linear-by-Linear Association	160.607	1	.000
N of Valid Cases	200		

a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 3.75.

Source: computed data

In view of the above, it can be presumed that the Pearson chi-square = 200.000 p=.000 are statistically significant at the 5 % level. This implies that age of the employees is an important criterion for the employees. The income of the employees varies depends upon their age.

FACTORS CAUSING STRESS AMONG THE IT PEOPLES

The researcher framed ten factors that are intimately connected stress among IT peoples. These dimensions are composed of 'n' no. of variables that are needed to be reduced systematically without affecting their representations on the population parameters. Therefore,

the researcher appropriately applied Factor Analysis by principal component method to reduce the variables into predominant factor:

This construct consists of 8 variables in Likert’s five point scale which ranges from “Strongly Agree” to “Strongly Disagree”. The application of Factor Analysis brought the following results:

Table - 3 T-test for stress

	N	Mean	Std. Deviation	Std. Error Mean	t-value lower	Significance Lower	Rank
Job rotation	200	2.67	1.284	.091	2.49	2.49	7
Technology	200	3.36	1.027	.073	3.21	3.21	2
Work load	200	3.37	.952	.067	3.23	3.23	1
competition	200	2.86	1.281	.091	2.68	2.68	4
IT culture	200	2.66	1.391	.098	2.47	2.47	8
Multi task	200	2.90	1.152	.081	2.74	2.74	3
Management pressure	200	2.49	1.051	.074	2.34	2.34	9
Team work	200	2.47	1.056	.075	2.32	2.32	10
Job loss	200	2.86	1.262	.089	2.68	2.68	4
Commitments	200	2.76	1.113	.079	2.60	2.60	6

Source: computed data

From the above table it can be found that the mean values range from 2.47 to 3.47 with the respective standard deviation and standard error. The t values 2.49, 3.21, 3.23, 2.68, 2.47, 2.74, 2.34, 2.32, 2.68, 2.60 are statistically significant at the 5 % level. Therefore, it can be concluded that among the ten factors work load is the main factor for stress among the employees in IT sector.

FINDINGS AND CONCLUSIONS

There are various factors causing stress in the IT sectors. The main factors are job rotation, technology, work load, competition, IT culture, multi task, Management pressure, team work, job loss and various commitments. Apart from these ten factors work load is the main factor that causing stress followed by technology and multi task. Team work and management pressure causing less stress compared with other factors

Competition and job loss gets equal points that create stress among the IT peoples. The management avoids Job rotation of the employees to reduce stress. Finally, it concludes that management takes lots of techniques such

as, arranging tours, awards, appreciation and monetary motivations to avoid stress among the employees and to achieved the goals.

TESTING OF HYPOTHESES

There is no significant difference among the factors causing stress between the IT peoples - Rejected

There is no significant relationship between stress management techniques and impact of employees – Rejected.

Conflict of Interest – Nil

Ethical Clearance – Taken from UGC Committee

Source of Funding- Self

REFERENCES

1. Jac J.L. van der Klink, Roland W. B. Blonk, Aart H. Schene,(2001), The Benefits of Interventions for Work-Related Stress, American Journal of Public Health. 2001;91:270–276).

2. Dr. A. Jayakumar, K. Sumathi(2014), An Empirical Study on Stress Management for Higher Secondary Students in Salem District-Tamil Nadu. *International Journal of Recent Advances in Organizational Behaviour and Decision Sciences (IJRAOB)* (ISSN: 2311-3197) 2014 Vol: 1 Issue 1.
3. Laiba Dar, Anum Akmal, Muhammad Akram Naseem, Kashif Ud Din Khan (May 2011), Impact of Stress on Employees Job Performance in Business Sector of Pakistan. *Global Journal of Management and Business Research* Volume 11 Issue 6 Version 1.0,
4. Dr. Latha Krishnan (May 2014), Factors Causing Stress among Working Women and Strategies to Cope Up, *IOSR Journal of Business and Management (IOSR-JBM)* e-ISSN: 2278-487X, p-ISSN: 2319-7668. Volume 16, Issue 5.
5. Mihaela STOICA, (2010), CCUPATIONAL STRESS MANAGEMENT OCCUPATIONAL STRESS, *Management in health* XIV/2/2010; pp. 7-9.
6. Ramezan Jahanian, Seyyed Mohammad Tabatabaei (Nov 2012) Stress Management in the Workplace, *International Journal of Academic Research in Economics and Management Sciences*, ISSN: 2226-3624.
7. Sanjeev Kumar, J. P. Bhukar (Jan 2013), Stress level and coping strategies of college students, *Journal of Physical Education and Sports Management*, Vol. 4(1): pp. 5-11.
8. Soni Kushwaha (2014), Stress Management At Workplace, *Global Journal of Finance and Management*. ISSN 0975-6477 Volume 6, Number 5 (2014), pp. 469-472,
9. Uma Devi .T (OCT 2011) A Study on Stress Management and Coping Strategies With Reference to IT Companies, *Journal of Information Technology and Economic Development* 2(2), 30-48, October 2011 30
10. Unnikrishnan.P (Feb 2015), Management Of Stress And Motivation Of Employees, *International Journal Of Research – Granthaalayah* ISSN- 2350-0530(O) ISSN- 2394-3629(P).

Factors Affecting Dental Attitudes of the Adults of South India: A Cross Sectional Study

Nishu Singla, Shashidhar Acharya², Prajna Nayak³, Ritesh Singla⁴

¹Reader, ²Prof. & Head, ³Lecturer, Department of Public Health Dentistry, Manipal College of Dental Sciences, Manipal Academy of Higher Education, Manipal, ⁴Associate Professor, Department of Orthodontics, Manipal College of Dental Sciences, Madhava Nagar, Manipal, Karnataka

ABSTRACT

Objective: This study evaluates various factors which can influence the dental attitude of adult patients towards their dental health and care. **Material and Method:** It was a cross-sectional study consisting of self-administered structured questionnaire on patients' dental attitude as well as socio demographic variables completed by 377 patients; mean age 34.3 years recruited from the dental centers of Manipal College of Dental Sciences in Udupi Taluk, Karnataka, India. Frequency distribution analysis and chi-square test was used to compare between categorical variables. **Results:** The good dental attitude were significantly found in subjects those belonged to urban places ($p < 0.001$), had higher SES ($p = 0.003$), had better financial capacity ($p < 0.001$), were able to pay the bills comfortably (< 0.001), were satisfied with their dentists ($p < 0.001$) and those believed in having personal responsibility in taking care of their oral health ($p < 0.001$) than their counterparts ($p < 0.001$). The poor dental attitudes were significantly found in subjects those agreed that cost had influenced their treatment in the past ($p < 0.001$), those believed to get over any dental problem by itself ($p < 0.001$) and eventually losing their teeth regardless of the efforts ($p < 0.001$), those had cynicism towards dentists and dental care ($p < 0.001$) and those dental treatment didn't work out well ($p < 0.001$). **Conclusion:** Health promotion strategies focused on changing the dental attitudes of patients based upon these determinants can achieve better compliance of the patients towards dental health advice and care.

Keywords: Factors, Determinants, Dental, Attitudes, Adults

INTRODUCTION

Dental attitude can be explained as attitudes and beliefs of the people that might affect their oral health behaviors, dental attendance, utilization of dental services and treatment choices¹⁻³. Attitudes are mostly formed from person's past experiences and may affect their readiness to modify present behavior. There are several factors that can influence dental attitudes of the people such as perceived health, importance of oral health, nature of the doctor-patient interaction,

quality of recent dental care and cost of the treatment^{3,4}. These factors can be considered as the psycho-social determinants of health attitudes as they might play major role in the development of health attitudes and behaviors^{5,6}.

Self-care health practices are the most effective measures for preventing oral diseases yet a large proportion of the population fails to sufficiently adopt or maintain adequate oral hygiene behavior. This is because patients' health beliefs and attitudes influence patients' motivation to perform health behaviors, to seek treatment and adhere to dentists' advices. It also explains why several oral health programs fails to bring a change in the oral health behaviors of people, as, they are mostly not centered on the development of dental health attitudes and perceptions^{5,6}. Learning about these determinants can help to understand the issues related to patients' compliance or reluctance to adhere to dental

Corresponding Author:

Ritesh Singla,

Associate Professor, Department of Orthodontics,
Manipal College of Dental Sciences, Madhava Nagar,
Manipal, Karnataka, Phone numbers: 9844807978
E-mail address: riteshsingla83@yahoo.com

health advice.

It is therefore important to study and understand various factors which may play role in influencing dental attitudes of the patients. Also, identification of the difficulties faced by the patients to comply with dental health advice or care can provide solutions to dental health care providers to overcome them. This study evaluates various factors which can influence the dental attitude of adult patients towards their dental health and care. It will also be needful for some outreach programs to focus on these factors to change dental attitudes of people with the ultimate goal of preventing disease and promoting oral health.

MATERIAL AND METHOD

The present study was a cross sectional survey conducted among 15-70 years aged subjects visiting dental outreach centers of Manipal College of Dental Sciences in Udupi district, Karnataka, in the Southern part of India. The ethical clearance to conduct the study was obtained from the Institutional Ethics Committee. The patients were recruited in the waiting area before their appointments. All subjects were briefed about the purpose and process of the study and informed consent was sought for the self-administered questionnaire. A pilot study was done on 20 subjects before the commencement of the study in order to assess the feasibility of the study. The sample size required to carry out the study was taken 384 subjects (maximum) after assuming the prevalence at 50%, confidence level at 95% (Z, standard value of 1.96) and margin of error at 5% (d, standard value of 0.05) considering around 10% refusal or incomplete responses, the sample size was fixed at 430. The questionnaire was distributed to 430 patients, out of which 377 patients returned the completed questionnaire with the acceptable response rate of 88%. Patients below the age of 15 years, illiterate and those not willing to participate were excluded from the study.

The self-administered questionnaire consisted of variables regarding socio-demographics such as age, gender, location, income, marital status, education, religion and occupation with two additional questions on patients' financial capability and ability to pay bills. Age was categorized as ≤ 32 years and ≥ 33 years after considering the median. The location of the respondents was categorized into urban or rural. The Kuppaswamy

scale was used to calculate the socioeconomic status by adding education, occupation and income of the study subjects. It was categorized into upper class, middle class (upper middle + lower middle) and lower class (upper lower + lower)⁷. The dental attitude of the subjects was assessed using a twenty nine item modified attitudinal questionnaire⁴. It consisted of eight factors assessing influence of costs on past dental treatment, eventuality of dental decline, effectiveness of dental care, cynicism towards dentists and dental care, quality of recent dental care, personal influence on oral health, importance of preventing dental problems and frustration about dental care. The individual item were rated on five-point Likert scale ranging from "strongly disagree" to "somewhat disagree", "neutral", "somewhat agree" and to "strongly agree". Few of the items had their scoring reversed to avoid response set bias. The range of the scores derived from attitudinal questionnaire was divided into three equal divisions; based upon which study population was grouped into three categories of subjects with poor attitude, good attitude and very good attitude. Kannada is the regional language of Karnataka; hence, its English version was translated and adapted into Kannada. It involved the forward translation from English to Kannada and then independent backward translation from Kannada to English by two qualified English-to-Kannada translators.

STATISTICAL ANALYSIS

The analysis of the study was carried out using the Statistical Package for Social Sciences (SPSS 11.5 version). Frequency distribution analysis and chi-square test was used to compare between categorical variables. The cut-off level for statistical significance was taken at <0.05 .

RESULTS

Table 1 shows the distribution of study population based on their socio-demographic variables. There was an approximately equal distribution of the study sample with respect to gender, age and location of the subjects. Majority of the study population belonged to middle SES (61.8%) and lower SES (35.3%). Nearly, three fourth of the subjects had low financial capacity and reported to have difficulty in paying the bills. The greater number of study subjects were found to have good dental attitudes (64.2%). The study subjects those belonged to urban places ($p<0.001$), had higher SES

(p=0.003), had better financial capacity (p<0.001) and were able to pay the bills comfortably (<0.001) were found to have significantly better dental attitudes than their counterparts.

The subjects those agreed that cost had influenced their treatment in the past had significantly poorer dental attitudes than those who disagreed to it (p < 0.001). It was found that subjects those believed to get over any dental problem by itself and believed coming to dentist only in pain and eventually losing their teeth regardless of the efforts were found to had significantly poorer dental attitudes as well (p<0.001). Almost all the study subjects (95%) had faith in dentistry and effectiveness of dental care. The subjects those had cynicism towards dentists and dental care had significantly poorer dental attitudes as well (p<0.001). The subjects those received good quality of recent dental care and were satisfied with their dentists had significantly better dental attitudes (p<0.001). The subjects those believed in having personal responsibility in taking care of their oral health (p<0.001) and felt very important to visit dentist had significantly better dental attitudes as well (p<0.001). The subjects those dental treatment didn't work out well were very frustrated with dental care and had poorer dental altitudes (p<0.001).

Table 1: The distribution of study population based on socio-demographic variables

Variables		% (n)
Gender	Male	51.2% (193)
	Female	48.8% (184)
Age	≤32 years	53.3%(201)
	≥33 years	46.7%(176)
Location	Urban	49.3%(186)
	Rural	50.7%(191)
Marital status	Married	65.8% (248)
	Single	34.2%(129)
SES*	Lower	35.3% (133)
	Middle	61.8% (233)
	Upper	2.9% (11)

Cont... Table 1: The distribution of study population based on socio-demographic variables

Financial Capacity	cannot make ends meet	50.1%(189)
	manage to get by	31.3%(118)
	enough plus extra	10.1%(38)
	money is not a problem	8.5%(32)
Ability to pay bill	able to pay comfortably	25.2%(95)
	with difficulty	42.7%(161)
	not able to pay	32.1%(121)
Religion	Hindu	75.3% (284)
	Christian	18.3%(69)
	Muslim	5.3%(20)
	others	1%(4)
Attitude	Poor	29.2 % (110)
	Good	64.2%(242)
	Very Good	6.63%(25)
	Total	100%(377)

n= number of participants

*SES (Education + Occupation +Income) as per Kuppaswamy SES scale

DISCUSSION

Dental attitudes and beliefs of the people about oral disease and the importance of preventive and curative oral care can certainly bring about differences in the quality of oral health among them^{4, 8}. The most important concern noticed with poorer dental attitudes subjects is that they usually ignore their dental health and delay seeking dental care until oral disease becomes more severe which require more invasive, complex and expensive treatment¹⁻³. Hence, it necessitates the need to study various factors which can influence the dental attitudes of people. This study was an attempt to know various factors affecting dental attitude of adult patients towards their dental health and care. A number of factors that positively affected dental attitudes for adult patients in the study were urban location, higher socio economic status, better financial capacity, ability to pay bills comfortably, recent good quality dental care, satisfaction with dentists' behavior and optimism about personal and professional oral care.

A large number of studies have agreed that urban participants have greater awareness, better knowledge and understanding of dental problems and higher oral health-seeking behavior^{9, 10}. Similarly, in the present study, urban participants were found to have better dental attitudes than rural participants. The variation in the dental attitudes of urban and rural population of India can be mainly attributed to their differences in lifestyles, socioeconomic status, affordability and availability of treatment facilities. The affordability of dental care services had always been one of the important negative factors influencing the dental attitudes of people^{11, 12}. In addition to high cost of dental care, lower socioeconomic status adds greater financial constraints for the patients to comfortably attain the treatment and so, brings reluctance in them. The best measure to address these issues is to increase awareness among people to adopt self-care practices as most of the dental diseases are preventable. Additionally, government sectors should take initiatives to address these problems by taking necessary actions.

Beliefs about perceived control over health are considered to be an important motivational factor for understanding an individual's likelihood of adopting health-promoting behaviors^{6, 13}. The locus of control belief is an important determinant of whether or not a patient takes responsibility for their oral healthcare. Individuals with a high internal locus of control believe that events result primarily from their own behavior. Those with a low internal locus of control believe that powerful others, fate, or chance primarily determine events¹⁴. In the present study also, subjects those had believed in having personal control over their oral health had better dental attitudes than subjects those believed to get over any dental problem by itself, believed coming to dentist only in pain and believed in eventually losing their teeth regardless of the efforts. Oral health professionals should enable people to understand the importance of oral health and develop self-efficacy by providing them information on health and by facilitating skills development.

Previous dental health care experiences, whether good or bad, will affect the individual's mind set for further dental treatment¹⁵. It was noticed in the present study as well, that study participants those were cynical about dentists and dental care and were frustrated had poorer dental attitudes than participants those received good quality of recent dental care. Dentist should

enquire about such traumatic or negative experiences of the patients and should educate, counsel and allay their fears. A trustful relationship with patients can be built by two-way communication, expressing concern and empathy, demonstrating competence and ethics.

CONCLUSION

Dental attitudes of a people may be considered as proxy indicator of their oral disease, self-care practices and dental health care services utilization. Peoples' attitudes, perceptions and behaviors are based on their life experiences and events. Oral health professionals should enable people to develop positive dental attitudes by education and provision of good dental care services with concern, empathy, competency and ethics. Moreover, health promotion strategies focused on changing the dental attitudes of patients based upon these determinants can achieve better compliance of the patients towards dental health advice and care.

Financial support and sponsorship: Nil

Conflicts of Interest: Nil

REFERENCES

1. Bommireddy VS et al. Oral health care-seeking behaviors and influencing factors among South Indian rural adults: A cross-sectional study. *J Indian Assoc Public Health Dent* 2017; 15:252-7.
2. Pritma Singh et al. Dental health attitude in Indian society. *J Int Soc Prev Community Dent*. 2013; 3(2):81-84.
3. Nafeesa Tabassum et al. Patient's attitude towards dental treatment: Treatment plan versus patient willingness. *International Journal of Dentistry Research* 2017;2(3):73-75
4. Riley JL III et al. Dental attitudes: proximal basis for oral health disparities in adults. *Community Dentistry Oral Epidemiology* 2006; 34:289-98.
5. Ruth freeman. The determinants of dental health attitudes and behaviors. *British dental journal* 1999;187(1):15-18
6. Scheerman JFM et al. Psychosocial correlates of oral hygiene behavior in people aged 9 to 19: a systematic review with meta-analysis. *Community Dent Oral Epidemiol* 2016; 44: 331-341.
7. Singh T et al. Socio-economic status scales updated

- for 2017. *Int J Res Med Sci* 2017; 5:3264-7.
8. Baker SR et al. What psychosocial factors influence adolescents' oral health? *J Dent Res.* 2010; 89(11):1230-5.
 9. E.O. Ogunbodede et al. Oral Health Inequalities between Rural and Urban Populations of the African and Middle East Region. *Advances in Dental Research* 2015, 27 (1):18–25.
 10. Ritesh Singla et al. Comparative Study of Lifestyle-related Risk Factors of Periodontal Disease among Urban and Rural Population of India *World Journal of Dentistry* 2016; 7(3):129-134.
 11. Brandy Thompson et al. The potential oral health impact of cost barriers to dental care: findings from a Canadian population-based study. *BMC Oral Health.* 2014; 14:78.
 12. Wallace B.B and MacEntee M.I. Access to Dental care for Low-Income Adults: Perceptions of Affordability, Availability and Acceptability. *J Community Health* 2012; 37 (1):32-39.
 13. Dumitrescu AL et al. Instability of self-esteem, self-confidence, self-liking, self-control, self-competence and perfectionism: associations with oral health status and oral health-related behaviors. *Int J Dent Hygiene* 2012; 10(1):22–29.
 14. Rotter, J.B. Generalized expectancies of internal versus external control of reinforcements. *Psychological Monographs* 1966; 80(1):609.
 15. Leena Merdad and Azza A. El-Housseiny. Do children's previous dental experience and fear affect their perceived oral health-related quality of life (OHRQoL)? *BMC Oral Health.* 2017; 17:47.

Regional Dimensions of Health Status of Children in Haryana

Manju Sharma¹, Sandeep Kumar²

¹Assistant Professor, Department of Geography, Dayanand College, Hisar, Haryana, ²Post Graduate Teacher (Geography), AMSSS, Bhiwani Rohilla, Hisar, Haryana

ABSTRACT

Children are the future of tomorrow and potential efficiency and development of the nation depends on their health and it is prime responsibility of every nation to provide essential as well as better facilities and excellent flanking milieu to its nascent future. The present study is based on secondary data collected from District Level Household and Facility Survey –III. Pearson's correlation coefficient has been used to calculate the degree of association between child health and its major determinants. It has been revealed the considerable segment (13.0 per cent) of child population of the state is isolated from good health indicators. The common but avoidable incidences of diarrhea, infectious diseases and vitamin deficiencies are widely prevalent and children are suffering from lack of iron, malnutrition and partial vaccination which cause irretrievable damage in their future life.

Keyword: Health, Nutrition, Efficiency Immunization, Diarrhea, and Vitamin Deficiency.

INTRODUCTION

The children fitness is an important aspect of the development of society at micro and macro level. The health and nutritional needs of children are crucial to the well-being of whole nation since they are prime asset for progression and failure to develop their potential will certainly be the loss of the nation.⁽¹⁾ In fact, meager nutrition during childhood makes a long-term impression in terms of poor physical and mental growth of the children. The kids are naturally innocent, reliant and susceptible and inappropriate care during infancy causes malnutrition which refers to both under and over-nutrition. It may also lead to starvation, reducing the work competence and abridged the intellectual and communal growth.⁽²⁾ WHO itself stated that effective learning practice necessitates good quality health.⁽³⁾ The freedom from starvation and malnutrition is a basic human need for civilization and its mitigation is essential for society's development. In present time,

malnutrition has become leading health dilemma and crucial communal health impasse in developing countries like India. It influences the growth prospect and increases the risk of death and morbidity in later days of life.⁽⁴⁾ It is estimated that one hundred fifty million children (26.6 percent) are underweight while one hundred eighty-two million (32.5 percent) are stunted at global level.⁽⁵⁾ In context to India, children health is not satisfactory as different types of undernourishment and deficiencies of macro and micronutrients are the major concerns and seem like silent crisis. Among 150 million undernourished children of the world, one in every three belongs to India.^(6&7) In Haryana also child population is facing many health plights as infant (21 per 1000 population) and under-5 mortality rate (52 per 1000 population) are high. About 40 percent children suffer from various degree of malnutrition and 72 percent are anemic. More than one-third proportions (40.4 percent) of children are not fully immunized.⁽⁸⁾ So it is a matter of concern that even after having graceful place among economically and agriculturally developed states in the country as well as being famous for its healthy food habits why Haryana is failed to give reputed health standards to its prospects.

Correspondence to:

Manju Sharma

Assistant Professor, Department of Geography,
Dayanand College, Hisar, Haryana,
E-mail: manju.haritash@gmail.com

Study Area

Haryana is a land locked state and one of the economically most developed states of the nation, it is also recognized as a state having lowest sex-ratio (879 females per 1000 males) in the country (Census of India, 2011). It came into existence on 1st of November 1966 with covering an area of 44,212 square kilometers which comprises the 1.34 percent of total area of the country.

OBJECTIVES

The present study aims at realizing the following set of objectives:

- To study the spatial pattern of child health in Haryana at district level.
- To examine the shaping factors of health status of children and identify the existing relationship between child health and its various determinants.

MATERIAL AND METHOD

The present study is based on secondary sources of information collected from District Level Household and Facility Survey –III (DLHS-3) relates to year 2007-2008 and has been published in 2010. The following indicators have been used to measure the health status of the children:

- Suffering and treatment of acute respiratory infections (ARI) with in last two weeks (under 3 years).
- Suffering and treatment of diarrhea within last two weeks (under 3 years).
- Breast feeding practices (under 3 years) within one hour, within 24 hour and after 24 hour of the birth.
- Fully immunization/vaccination (12-23 months).
- Vitamin 'A' intake at least one dose (12-23 months).
- ORS awareness among women.

Pearson's correlation coefficient has been computed to gauge the degree of association between child health and its major formative factors.

RESULTS AND DISCUSSION

Suffering and Treatment of Acute Respiratory Infection (ARI)

Acute Respiratory Infections (ARI) is the most serious sickness among pre-school children at universal level and every child may suffer from five to eight attacks of ARI infections annually.⁽⁹⁾ The study shows that more than 90 per cent children of five districts namely Ambala, Yamunanager, Kurukshetra, Karnal and Fatehabad whereas 80-90 per cent children of districts Panchkula, Kaithal, Jind, Hisar, Sirsa, Panipat, Sonipat, Rohtak, Gurgaon and Mewat suffer from ARI. The low prevalence of these infections is found in Bhiwani, Mahendergarh, Jhajjar and Rewari districts. The high incidences of treatment of ARI have been observed in Panchkula, Ambala, Yamunanager, Karnal, Sonipat, Bhiwani, Rewari and Gurgaon districts. In nine districts (Sirsa, Fatehabad, Hisar, Jind, Rohtak, Panipat, Kurukshetra, Mahendergarh and Faridabad) the ARI infections has been treated with in last two weeks averagely 80-90 per cent and only in two districts Jhajjar and Mewat ARI treatment is found below 80 per cent. The highest proportion of 98.4 per cent in Panchkula followed by 97.1 per cent in Rewari and 96 per cent children in Kaithal get treatment from ARI (Table 1).

Suffering and Treatment of Diarrhea

Diarrhea infection has third rank of childhood death in India, and it is to blame for thirteen percent of all deaths and sickness per year in pre-school children of world.⁽¹⁰⁾ In 2013, nearly five lakhs and seventy thousand children below the age of five years passed away from diarrhea in world whereas one lakh and thirty thousand were related to India.⁽¹¹⁾ The regional variation shows that high occurrence of diarrhea has been traced in two districts i.e. Yamunanager and Karnal. There are moderate diarrhea incidences in Panchkula, Ambala, Kurukshetra, Panipat, Jhajjar, Mewat and Faridabad whereas in eleven districts of western and south-western Haryana has reported low cases. The treatment of diarrhea within last two weeks has been found high only in three districts namely Yamunanager, Kaithal and Jhajjar whereas in Ambala, Kurukshetra, Bhiwani, Rohtak, Mahendergarh, Gurgaon and Mewat districts, diarrhea handling have been found below 15 per cent. The rest of Haryana has shown moderate attention towards curing the problem of dehydration in children.

Breastfeeding Practices

The mother milk is measured as a complete food for the physical and mental growth of child and colostrums (thick, yellow milk of mother just after delivery) increase the anti-biotic capacity of children particularly during early years. ⁽¹²⁾ As recommended by the WHO, breastfeeding should be initiated immediately after birth and should be continued up to a minimum of six months. All over, there is not much awareness about commencement of breast milk in the state. The spatial pattern reflects that in Rewari and Sirsa districts more than 25 per cent women begins breastfeeding within one hour of the birth whereas in six districts namely Panchkula, Ambala, Kurukshetra, Rohtak, Rewari and Gurgaon this practice is adopted within twenty four hours of the birth.

In Yamunanager, Karnal, Panipat, Sonipat districts of eastern Haryana as well as in Jind, Fatehabad, Palwal and Mewat less than 15 per cent newborns receive mother's milk within one hour of the birth whereas in fifteen out of twenty districts (whole northern and eastern districts of study area including Sirsa, Hisar, Rohtak, Mahendergarh, Rewari, Gurgaon and Faridabad districts) of the state, mother's start to feed their children after twenty four hours of the birth.

Immunization Coverage

The full vaccination of child covers BCG, three doses of DPT, three doses of polio vaccine and measles against the six somber but vaccine preventable diseases (VPDs) (diphtheria, whooping cough, tetanus, tuberculosis, polio and measles). The immunization against these ailments has received maximum attention of child health care policy makers in India ^(13&14) however yearly five lakhs deaths are caused by VPDs in India. ⁽¹⁵⁾ These are interrelated as well as cyclic infections of formative years of children which provide a space to one another to be start. The figure demonstrates that in eight districts specifically Yamunanager, Ambala, Kaithal, Karnal, Sonipat, Rohtak and Gurgaon, more than 70 per cent children has been covered under full vaccination target whereas the minimum covering of complete vaccinated children (below 60 per cent) has been traced in six districts i.e. Panipat, Jind, Hisar, Bhiwani, Mewat and Faridabad. In Ambala district, highest 79.1 children have received full vaccination while district Faridabad is on bottom with 46.4 percent (Table 1).

Vitamin 'A' intake

Vitamin 'A' deficiency (VAD) is a concerning health and nutrition predicament in the rising countries like India. ⁽¹⁶⁾ The insufficiency of Vitamin 'A' costs night blindness and morbidity and transience from infections in early days of children. About 5.7 percent children in India endure this problem. ^(17 & 18) The statistics shows that high intake of Vitamin 'A' has been traced only in three districts (Karnal (78.4 per cent), Panchkula (73.9 per cent) and Sonipat (70.2 per cent) while 50-60 per cent children of Ambala, Kurukshetra and Yamunanager districts receive this most necessary quantity. It has been documented that instead of above said six districts, in entire state the intake of at least one dose of Vitamin 'A' is below 50 per cent and it is matter of great concern (Table 1).

ORS Awareness among Women

Oral rehydration solution (ORS) is defined as water solution with specific amount of salt and sugar and is used to control the liquid and solid loose in the body. The effectiveness of this concoction mainly depends on mother's awareness about its cleanliness, quantity and repetition during early phase of diarrhea instigation among infants. The regional variation exposes that in northernmost district Panchkula, westernmost district Sirsa in addition to Rohtak, Rewari and Gurgaon districts, more than 25 per cent women are found aware about ORS. The highest knowledge with 63.5 per cent value has been registered in Rewari district followed by Gurgaon (61.1 per cent) and Rohtak (59.1 per cent) districts (Table 1).

The moderate responsiveness (15-25 per cent) is observed only in Ambala and Kaithal districts while in rest thirteen districts (Yamunanager, Kurukshetra, Karnal, Panipat, Sonipat, Fatehabad, Hisar, Jind, Bhiwani, Jhajjar, Mahendergarh, Mewat and Faridabad) less than 15 per cent women are conscious about ORS. In Mewat and Faridabad districts women are found least aware about ORS drink i.e. 16.6 and 33.5 per cent respectively. Though there is considerable difference between knowledge and application of rehydration mixture yet awareness absolutely affects in positive manner to mitigate any type of disease.

Child Health and its Determinants

The health of the children is directly or indirectly

shaped by a number of socio-economic determinants. Generally, the prevalence of poor child health incidences is intimately correlated with low level of mother’s education and pathetic fiscal position of family.

Table: 1 Selected Indicators of Child Health in Haryana

Sr. No.	Districts	% of Breast feeding within one hour of Birth	% of Breast feeding within 24 hour of Birth	% of Breast feeding after 24 hour of Birth	Vitamin ‘A’ intake at least one dose (12-23 months)	% of children aged 12-23 months Fully Vaccination	Treatment of Acute Respiratory Infections (ARI) with in last two weeks (under 3 years)	% of Children Suffered from ARI	% of Children Suffered from Diarrhea	Treatment of Diarrhea within last two weeks (under 3 years).	% of Women Aware of ORS
1	Ambala	19	69.3	30.7	65.9	79.1	91.2	13.8	15.1	74	50.8
2	Bhiwani	24.1	47.6	52.4	44.5	58.4	95.2	4.1	12.1	81.3	37.8
3	Faridabad	10.9	53.1	46.9	28.7	46.4	84.6	4.1	19.8	80.6	33.5
4	Fatehabad	10.8	40.3	59.7	45	62.8	89.7	10.1	9.3	81.4	29.2
5	Gurgaon	17.6	67.8	32.2	49.5	70.5	94.7	8.5	8.9	77.1	61.1
6	Hisar	23	63.4	36.6	44.6	55.8	82.4	5.6	11.7	79.7	38.7
7	Jhajjar	15.7	49.9	50.1	42.8	64.8	79.3	5	17.1	95	42.7
8	Jind	12.1	37.7	62.3	57.1	55.4	88.1	7	14.7	88.3	40.5
9	Kaithal	18.5	58.1	41.9	56.3	72.5	96	7.6	12.1	98.3	52.8
10	Karnal	7.8	54.6	45.4	78.4	75.2	91.5	14.6	33.4	88.3	39.4
11	Kuruksherta	18.8	67.9	32.1	67.2	67.8	82.7	14.9	22.8	79.5	43.2
12	Mahendragarh	23.3	61	39	52.4	67.7	82.4	2.8	13.9	76.7	42.3
13	Mewat	7.5	29.2	70.8	7.9	11	75.9	9.1	23	74.8	16.6
14	Palwal	DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA	DNA
15	Panchukala	19.7	70.5	29.5	73.9	78.1	98.4	9.8	15.7	97.5	56
16	Panipat	12.3	52.8	47.2	54.9	57	87	9.2	22.1	85.6	37.8
17	Rewari	33.3	74.8	25.2	54.1	67.3	97.1	4.9	9.5	86.5	63.5
18	Rohtak	20.3	70.9	29.1	46.8	75.7	88.4	8.2	11.5	74.5	59.1
19	Sirsa	27.5	57.2	42.8	59.6	61.3	88.5	5.6	7.5	87.8	55.7
20	Sonipat	8	63.3	36.7	70.2	73	94.2	7.3	13.5	83.7	44
21	Yamunanagar	8.5	57.1	42.9	61.5	70	94.8	13.1	26.8	88.1	42.5

Source: District Level Household and Facility Survey- III, 2007-08.

Note: DNA (Data not available)

Correlation matrix demonstrates that breast feeding within one hour of the birth, at least one dose of Vitamin ‘A’ intake, full immunization, treatment of acute respiratory infections within last two weeks, women awareness about ORS and female literacy have positive and significant correlation with child health indicators.

The social standard (caste) of the family is strongly positively associated with Vitamin ‘A’ intake and full vaccination of children. As in deprived social community lack of education and awareness, poor availability and expenditure on nutritious food, improper food allocation at household level are mainly responsible factor for appalling child health.

Table: 2 Correlations Matrix

Health Indicators	X ¹	X ²	X ³	X ⁴	X ⁵	X ⁶	X ⁷	X ⁸	X ⁹	X ¹⁰	X ¹¹	X ¹²	X ¹³	X ¹⁴	X ¹⁵	X ¹⁶
X ¹	1	0.547*	-0.547*	0.097	0.266	0.202	-0.435	-0.630**	-0.006	0.629**	0.179	0.063	0.25	-0.078	0.223	-0.062
X ²	0.547*	1	-1.000**	0.553	0.728**	0.449*	0.105	-0.235	-0.02	0.819**	0.736**	-0.570**	0.179	-0.565**	0.259	0.053
X ³	-0.547*	-1.000**	1	-0.553*	-0.728**	-0.449*	-0.105	0.235	0.02	-0.819**	-0.736**	0.570**	-0.179	0.565**	-0.259	-0.053
X ⁴	0.097	0.553*	-0.553*	1	0.837**	0.591**	0.452*	0.126	0.392	0.531*	0.562**	-0.249	0.545*	-0.751**	0.247	0.267
X ⁵	0.266	0.728**	-0.728**	0.837**	1	0.634**	0.257	-0.154	0.281	0.729**	0.772**	-0.42	0.537*	-0.743**	0.391	0.404
X ⁶	0.202	0.449*	-0.449*	0.591**	0.634**	1	0.142	-0.228	0.374	0.608**	0.477*	-0.182	0.339	-0.506*	0.089	0.14
X ⁷	-0.435	0.105	-0.105	0.452*	0.257	0.142	1	0.585**	-0.043	-0.05	0.119	-0.058	0.271	-0.602**	-0.287	-0.053
X ⁸	-0.630**	-0.235	0.235	0.126	-0.154	-0.228	0.585**	1	0.088	-0.460*	-0.061	-0.136	-0.218	-0.086	-0.424	0.022
X ⁹	-0.006	-0.02	0.02	0.392	0.281	0.374	-0.043	0.088	1	0.229	0.105	0.055	0.205	-0.294	0.307	0.179

Cont... Table: 2 Correlations Matrix

X^{10}	0.629**	0.819**	-0.819**	0.531*	0.729**	0.608**	-0.05	-0.460*	0.229	1	0.644**	-0.313	0.257	-0.472*	0.403	-0.007
X^{11}	0.179	0.736**	-0.736**	0.562**	0.772**	0.477*	0.119	-0.061	0.105	0.644**	1	-0.766**	0.141	-0.598**	0.365	0.275
X^{12}	0.063	-0.570**	0.570**	-0.249	-0.42	-0.182	-0.058	-0.136	0.055	-0.313	-0.766**	1	0.27	0.349	-0.136	-0.196
X^{13}	0.25	0.179	-0.179	0.545*	0.537*	0.339	0.271	-0.218	0.205	0.257	0.141	0.27	1	-0.632**	0.227	0.405
X^{14}	-0.078	-0.565**	0.565**	-0.751**	-0.743**	-0.506*	-0.602**	-0.086	-0.294	-0.472*	-0.598**	0.349	-0.632**	1	-0.131	-0.281
X^{15}	0.223	0.259	-0.259	0.247	0.391	0.089	-0.287	-0.424	0.307	0.403	0.365	-0.136	0.227	-0.131	1	0.404
X^{16}	-0.062	0.053	-0.053	0.267	0.404	0.14	-0.053	0.022	0.179	-0.007	0.275	-0.196	0.405	-0.281	0.404	1

Note: *Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Note: X^1 = Percentages of Breastfeeding within one hour of Birth, X^2 = Percentages of Breastfeeding within 24 hour of Birth, X^3 =Percentages of Breastfeeding after 24 hour of Birth, X^4 =Vitamin 'A' intake at least one dose (12-23 months), X^5 =Percentage of children aged 12-23 months Fully Vaccination, X^6 =Treatment of Acute respiratory infections (ARI) with in last two weeks (under 3 years), X^7 =Percentage of Children suffered from ARI, X^8 =Percentage of Children suffered from Diarrhea, X^9 =Treatment of Diarrhea within last two weeks (under 3 years), X^{10} =Percentage of Women Aware of ORS, X^{11} = Female Literacy (2011), X^{12} =Percentage of BPL Family, X^{13} =Percentage of SC Population, X^{14} = Female marriage below 18 years. X^{15} =Asha Workers, X^{16} =Anganwadi Workers.

The female marriage below 18 years has significant and negative correlation with all most all determinants of infant wellbeing. The weak but positive link has been identified between BPL families, scheduled caste population and female marriage below eighteen years. The convenience of *Asha* and *Anganwadi* workers has documented assenting association with almost all signs of child fitness except some.

CONCLUSION

As today's children are possessions of tomorrow and the way of potential development will certainly led by them. Inherently, child health itself is associated with a number of social and cultural factors. The study demonstrates that poor health status of children is a challenging issue for the state. There is a wide regional heterogeneity in every health indicators of children which are espoused in present study and conceivably this variation may be the consequence of inequity in socio-economic development the state. The information shows

a little exposure towards the initiation of breastfeeding practices, vitamin 'A' intake and necessary vaccination course of children in many advanced districts of the state in addition to backward districts like Mewat where the condition is worse. The female literacy and awareness has been found very closely coupled with nearly all child health determinants whereas customary cataloging of household, fiscal position and integer of trained health workers at local level have also considerable impact in child health seminal. So the first and most requisite obsession is that there should be awareness about utilization of health care facilities in initial stage of childhood morbidity at household level because first of all, infant's good or bad health is an outcome of family's consciousness. Secondly, it is exceedingly necessary to confer the key attention towards the health of children in health plans and policy formulation as well as there is also a need to ensure the effectual implementation, surveillance and harmonization of health programmes in addition to providing qualitative environment to improve the health provision of the children in the state.

Conflict of Interest - Nil

Source of Funding- Self by Authors

Ethical Clearance- Nil

REFERENCES

1. Verma A. Nutritional status of residential and non-residential school going children (10-12 years) of Pilani- an assessment study. M.Sc. Dissertation. Department of Home Science, Smt. Indiramani Mandelia Shiksha Niket; 2008, Pilani, Rajasthan.
2. Awasthi CP, Kumar S, Tiwari PP, Singh AB. Nutritional status of pre-school and school children in rural area of Sultanpur district. J Dairying Foods & Home Sci. 2000; 19: 16-1.
3. World Health Organization. WHO expert committee on school health services. Technical Report Series, No. 30, Geneva: 1950.

4. Sommerfelt AE. Comparative analysis of the determinants of children's nutritional status. Paper Presented at: the Demographic and Health Surveys World Conference; 1991 Aug 5-7; Washington, D.C.
5. Alhaji M, Allen S. Pediatric review: Management of severe malnutrition-time for a change? *Africa Health*. 2002; 24: 21-3.
6. Raman M. Childhood Nutrition. *Health Action*. 2009; 22 (5).
7. Bandikolla V. A study on nutritional assessment of school going children. *Research Desk*. 2016; 5 (1): 539-42.
8. National Family Health Survey- III (NFHS-3). International Institute for Population Sciences (IIPS), (2005-06): Mumbai, India.
9. Nichter M. Social science lessons from diarrhoea and their application to ARI. *Human Organization*. 1993; 52: 53-67.
10. Lakshminarayanan S, Jayalakshmy R. Diarrheal diseases among children in India: current scenario and future perspectives. *J Nat Sc Bio Med*. 2015; 6 (1): 24-8.
11. United Nation Children's Fund (UNICEF) Committing to child survival: a promise renewed progress report 2014, Available from http://files.unicef.org/publications/files/APR_2014_web_15Sept14.pdf on 4 November, 2014.
12. Huffman SL, Barbara BL. Breastfeeding performance and child survival. *Popul. Dev. Rev*. 1984; 10: 93-116.
13. Padhi, S. Infant and child survival in Orissa: an analysis with NFHS data. *Econ. Political Wkly*. 2001; 36 (34): 3316-326.
14. Saha BK, Saha U, Shajy KI. Child care and utilization of health services in some north Indian states. *East Anthropol*. 2003; 56 (1): 75-91.
15. Singh JP, Gupta SB, Kariwal P, Singh AK, Imtiaz D. Immunization status of under two years children in rural Bareilly. *Sch. J. App. Med. Sci*. 2014; 2 (2D): 826-29.
16. Christian P, West KP, Khattry SK, Kimbrough PE, LeClerq SC, Katz J, Shrestha SR, Dali SM and Sommer A. Night blindness during pregnancy and subsequent mortality among women in nepal: effects of vitamin A and B- carotene supplementation. *Am J Epidemiol*. 2000; 152 (6): 542-47.
17. Park, K. Park's textbook of preventive and social medicine.; 23rd Edition. Banarsidas Bhanot Publishers, Jabalpur; 2015.
18. Abedi AJ, Mehnaz S, Ansari MA, Srivastava JP, Srivastava KP. intake of vitamin a & its association with nutritional status of pre-school children. *Int J Community Med Public Health*, 2015; 2: 489-93.

Effectiveness of Structured Exercise Program on Insulin Resistance in Type 2 Diabetes Mellitus – A Pilot Study

A Sampath Kumar¹, Arun G Maiya², B.A. Shastry³, Vaishali K², Animesh Hazari¹, Radhika Jadhav⁴

¹PhD Scholar, Department of Physiotherapy, School of Allied Health Sciences, Manipal Academy of Higher Education, Manipal, ²Professor, Department of Physiotherapy, School of Allied Health Sciences, Manipal Academy of Higher Education, Udupi, Karnataka, India, ³Professor, Department of Medicine, Kasturba Hospital, Manipal, ⁴Physiotherapist, Manipal, Karnataka

ABSTRACT

Complications resulted due to diabetes are known to be a leading cause of morbidity & mortality among people. While this is a serious issue, it can be delayed and prevented by following a healthy diet and physical activity schedule along with prescribed medication. In the study conducted, a total of 12 T2DM male participants in the age group of 30 - 65 years included. The criteria of exclusion for the participants were those with T1DM, Respiratory disease, Neurological disorders, musculoskeletal problems. The average age of participants in the control group was 59.0±8.6 & 47.25±3.20 in the study group. The participants underwent a structured exercise program. The study showed a significant improvement in their fasting blood sugar (P<0.01) when compared to the control group & also there was also statistical difference seen in fasting insulin level (P<0.03) from pre-intervention to post-intervention.

Keywords: *Insulin resistance; Aerobic exercise; Resistance training; Glycosylated HB, Homa-IR; Metabolic syndrome.*

INTRODUCTION

Type 2 diabetes is considered one of the fastest growing noncommunicable diseases worldwide which is characterized by, hyperglycemia resulting from defective insulin secretion, insulin action or both. Diabetes complications are the leading causes of morbidity and mortality which can be prevented by taking prescribed medication accurately along with maintaining a healthy diet and physical activity. With this, the long-term complications can delay.⁽¹⁾

There has been an increase in the cases of type 2 diabetes across the globe. The number of people with diabetes in 2011 was 366 million, which is projected to increase approximately 552 million by 2030.⁽²⁾

Corresponding Author:

Dr. Arun G Maiya,

Professor & Associate Dean, Department of Physiotherapy, School of Allied Health Sciences, Manipal Academy of Higher Education, Manipal, Karnataka, India.

Email Id: arun.maiya.g@gmail.com,

ajmaiya@gmail.com, Contact No: +91 98453 50823

In type 2 diabetes there will be elevated glucose levels in circulating blood, caused by impairment in glucose tolerance which leads to the development of insulin resistance. It impairs the ability of muscle cells which are responsible for storage of glucose and triglycerides. Impaired glucose control and insulin resistance reported being a risk factor for the development of cardiovascular disease.⁽³⁾

Insulin resistance (IR) commonly associated with glucose intolerance, hypertension, dyslipidemia, endothelial dysfunction and visceral adiposity contributes a significant pathophysiological role in type 2 diabetes.⁽⁴⁾

Insulin resistance and β -cell function are the most frequently evaluated by using the measures like Fasting Insulin and Homeostatic Model Assessment-Insulin Resistance (HOMA-IR). The gold standard tool for evaluation of insulin sensitivity is done by glucose clamp test .(5), (6) Hyperglycemia is an early manifestation of development of diabetes which damages muscle and results in strength and mass loss leading to excess

physical disability in older adults especially in the lower extremity mobility tasks .(7)

Exercise and physical activity considered as a cornerstone for the treatment and prevention of diabetes. (8) Exercise training is an important nonpharmacological tool in the treatment of diabetes. (9),(10)

Aerobic and resistance exercise training improves the glycemic control by increasing insulin sensitivity and together shows a positive impact to improve glucose regulation and also helps to provide the synergistic effect. (10) Resistance training has shown more significant benefits in older patients with impaired glucose levels. (11)

Previous studies have reported that exercise intervention with eight weeks program achieved a beneficial impact on type 2 diabetes mellitus with increased cardiovascular fitness and reduced BMI. (8) In an earlier study, the type and duration of exercise had more significant effect on the results. On the other hand, in most of the studies, the impact of use on insulin resistance hasn't been assessed enough. So, the current research is aimed at evaluating the effects of a structured exercise program on insulin resistance in type 2 diabetes mellitus.

MATERIALS AND METHOD

The study approved by the scientific committee and Institutional ethical committee of Manipal University, Karnataka, India. The study included 12 male participants aged between 30 - 65 years who have type 2 diabetes mellitus and are on oral hypoglycemic agents with or without Insulin therapy. Exclusion criteria for the study included participants with type 1 diabetes mellitus, known case of respiratory disease, coronary artery disease, neurological disorders, pregnant, people with thyroid disorders and musculoskeletal problems that would interfere with the exercise training and unwilling subjects. Informed consent had been obtained after proper explanation of study objective to all the participants and divided into two groups; (1) study group (2) control group. Each group contained six participants who were recruited under purposive sampling and allocated by block randomization method.

All participants were screened for insulin resistance and clinically, biochemically evaluated for fasting blood sugar and fasting insulin level. After screening, participants were randomly assigned into two groups

that are study group and control group. The control group consisted of six participants who were not given any structured exercise program, and standard hospital care provided as per physician's advice. The study group included 6 participants who had type 2 diabetes mellitus and were given a set of structured exercise program along with standard care. It mainly consisted of aerobic and resistance exercise like-brisk walking for 45 mins, jogging, weights for upper and lower body major muscle groups. The baseline data collected before the intervention and progression of exercise program done was after six weeks. At the 3rd month, all the participants were reassessed for fasting insulin level and fasting blood sugar in both groups.

DATA ANALYSIS

SPSS version 16.0 software was used for statistical analysis. Repeated measure ANOVA will be used to compare the mean of all the outcome measures. Descriptive statistics are used to analyze the age.

RESULTS & DISCUSSION

Demographic and clinical data of study & control group shown in table 1 & 2. The current study aimed to find out the effectiveness of aerobic and resistance exercise program on insulin resistance, which demonstrated that the exercise program proved to be very effective. The study consisted of 12 participants comparable in age, gender and BMI in between both study and control groups. The average age of the participants in the control group was 59.0 ± 8.6 and 47.25 ± 3.20 in the study group. All the participants had a history of type 2 diabetes mellitus with a mean duration of 6.38 ± 3.24 . Regular exercise is an important nonpharmacological tool. We designed and administered a structured exercise program for 12 weeks to participants with type 2 diabetes mellitus and evaluated its effects. In this study, the structured exercise program consists of aerobic and resistance exercises which are given to the study group participants.

In the current study, the participants who underwent structured exercise program had shown a mean decrease in fasting blood sugar and fasting insulin when compared with the control group from pre-intervention to post-intervention. It is well documented that exercise training decreases insulin resistance. The AHA, ADA, and ACSM recommend combined aerobic and resistance training for people with type 2 diabetes mellitus. (12)

There are several possible reasons proposed for improved glucose control following “prolonged exposure to exercise, includes structural and biochemical adaptations of skeletal muscles. The former includes an upregulation of mitochondrial proteins involved in respiration -citrate synthase, increased glycogen synthase activity and GLUT4 protein content.” The latter comprise resistance training-induced increase in contractile protein content i.e hypertrophy leading to a higher metabolic rate and in turn a potentially higher absolute glucose intake.”

Aerobic exercise increases the distribution of substrates through increased proteins of mitochondria and improved muscle fiber capillary. Finally, visceral and intramuscular fat stores, i.e., regional adiposity, is directly proportional to the insulin insensitivity via a direct influence on insulin receptor function in muscle

tissue by intramyocellular fat storage.. The said decline may be due to increasing in muscle mass as a result of resistance training, which in turn could contribute to blood glucose uptake without causing alterations in the intrinsic capacity of the muscle to respond to insulin. On the other hand, aerobic exercises enhance the insulin absorption through a higher action, independent of the changes in the muscle mass or aerobic capacity. A combination of aerobic and resistance exercise training may, therefore, be more effective in improving blood glucose control.¹²

Earlier studies results had shown that participation in regular exercise by people with type 2 diabetes improve blood glucose control, reduce diabetes complications and have favorable effects on cardiovascular events, mortality, and quality of life.

Table 1: Mean demographic data in study & control group

Groups (n=6)	Weight (kg) (Mean±Sd)		Height (cm) (Mean±Sd)		BMI (Mean±Sd)		Fasting blood sugar (mg/dl) (Mean±Sd)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Study	73.32±10.39	71.97±9.88	172.25±8.34	172.25±8.34	25.06±3.8	24.65±3.65	168.75±8.34	151.5±4.04
Control	7.035±4.16	69.8±3.82	168.9±6.51	168.9±6.51	24.67±0.89	24.5±0.85	100±7.7	96.75±4.1
P value (p≤0.05)	.614	.696	.559	.559	.846	.963	0.00	0.00

Table 2: Pre –post mean change in fasting insulin resistance:

Variable	Pre intervention	Post intervention	P value (p≤0.05)
Fasting Insulin(μU/ml)	20.68±5.83	16.63±8.26	0.03

CONCLUSION

Based on the results found in our study, participants with increased insulin resistance who underwent structured exercise program had significant improvement in values of fasting blood sugar and fasting insulin when compared with the control group, and these structured exercise program can be recommended to reduce insulin resistance in type 2 diabetes mellitus.

Conflict of Interest- NIL

Source of Funding: Self-funding

REFERENCES

1. Motahari-Tabari N, Ahmad Shirvani M, Shirzade-Ahoodashty M, Yousefi-Abdolmaleki E, Teimourzadeh M. The Effect of 8 Weeks Aerobic Exercise on Insulin Resistance in Type 2 Diabetes: A Randomized Clinical Trial. Glob J Health Sci

- [Internet]. 2014;7(1):115–21.
2. Aune D, Norat T, Leitzmann M, Tonstad S, Vatten LJ. Physical activity and the risk of type 2 diabetes: a systematic review and dose–response meta-analysis. *Eur J Epidemiol* [Internet]. Springer Netherlands; 2015;30(7):529–42.
 3. Short KR, Vittone JL, Bigelow ML, Proctor DN, Rizza RA, Coenen-Schimke JM, et al. Effect of supervised progressive resistance-exercise training protocol on insulin sensitivity, glycemia, lipids, and body composition in Asian Indians with type 2 diabetes. *Diabetes* [Internet]. Springer Netherlands; 2008;67(7):179–83.
 4. Gutch M, Kumar S, Razi SM, Gupta KK, Gupta A. Assessment of insulin sensitivity/resistance. *Indian J Endocrinol Metab* [Internet]. 2015;19(1):160–4.
 5. Okita K, Iwahashi H, Kozawa J, Okauchi Y, Funahashi T, Imagawa A, et al. Homeostasis model assessment of insulin resistance for evaluating insulin sensitivity in patients with type 2 diabetes on insulin therapy. *Endocr J* [Internet]. 2013;60(3):283–90.
 6. Singh B, Saxena A. Surrogate markers of insulin resistance: A review. *World J Diabetes*. 2010;1(2):36–47.
 7. Kalyani RR, Metter EJ, Egan J, Golden SH, Ferrucci L. Hyperglycemia predicts persistently lower muscle strength with aging. *Diabetes Care*. 2015;38(1):82–90.
 8. Zou Z, Cai W, Cai M, Xiao M, Wang Z. Influence of the intervention of exercise on obese type II diabetes mellitus: A meta-analysis. *Prim Care Diabetes* [Internet]. Primary Care Diabetes Europe; 2015
 9. Lazarevic G, Antic S, Cvetkovic T, Vlahovic P, Tasic I, Stefanovic V. A physical activity programme and its effects on insulin resistance and oxidative defense in obese male patients with type 2 diabetes mellitus. *Diabetes Metab* [Internet]. 2006;32(6):583–90.
 10. Fedewa M V, Gist NH, Evans EM, Dishman RK. Exercise and Insulin Resistance in Youth: A Meta-Analysis. *Pediatrics*. 2014;133(1):E163–74.
 11. Geirsdottir OG, Arnarson a., Briem K, Ramel a., Jonsson P V., Thorsdottir I. Effect of 12-week resistance exercise program on body composition, muscle strength, physical function, and glucose metabolism in healthy, insulin-resistant, and diabetic elderly icelanders. *Journals Gerontol - Ser A Biol Sci Med Sci*. 2012;67(11):1259–65.
 12. Colberg SR, Sigal RJ, Fernhall B, Regensteiner JG, Blissmer BJ, Rubin RR, et al. Exercise and type 2 diabetes: The American College Of Sports Medicine and The American Diabetes Association: Joint position statement executive summary. *Diabetes Care*. 2010. p. 2692–6.

Postural Pain in Computer Users: Role of Preventive and Curative Physiotherapy

Pooja Sharma¹, Supriti Aggrawal², Sadhana Meena³

¹Research Scholar, ABS, Amity University, Noida, ²Assistant Professor, ABS, Amity University, Noida,

³Physiotherapist at Sports Injury Centre, Safdarjung Hospital, Delhi

ABSTRACT

Statement of the problem : Working on computers is a major part of most of the jobs now a days and is associated with musculoskeletal discomforts. Sitting in front of laptops, desktops has caused not only the weakening of the muscles and decrease in flexibility but also a bad posture. Intensive computer usage has been associated with work related musculoskeletal disorders among the office or company workers worldwide and the symptoms of these disorders are growing day by day effecting the posture of the individual.

Methodology : A convenient sample of 30 academic professionals suffering from idiopathic postural pain and discomfort constituted the study sample. The subjects were in the age range of 20 – 35 years with mean BMI range (19 to 25). The minimum hours spent daily while working on computer was 4 hours. Pre-and post VAS was used to document the decrease in pain and the RAND 36 questionnaire to assess he quality of life.

Result : Data was analyzed using SPSS. Paired t-test was applied for the pre-and post-exercise scores. Patients suffering from postural pain were found to have low scores in all the eight dimensions assessing the quality of life. Following the exercise regime there has been improvement in the parameters assessed

Conclusion: The present study emphasizes the role of exercises in decreasing the discomfort and to plan the management of these musculoskeletal system disorders. Ergonomics is highly advised in these working set ups to decreases the risk factors and to prevent faulty posture.

Keywords: Postural pain, RAND -36, Ergonomics, Exercise regimes for postural pain.

INTRODUCTION

Working on computers is a major part of most of the jobs now a days and is associated with musculoskeletal discomforts. Sitting in front of laptops, desktops has caused not only the weakening of the muscles and decrease in flexibility but also a bad posture.¹ The term ergonomics is derived from Greek word, ‘ergon’ which means work and ‘nomos’ which means natural law is the scientific study which tells or describe about people and their daily work. Intensive computer usage has been associated with work related musculoskeletal disorders

among the office or company workers worldwide and the symptoms of these disorders are growing day by day effecting the posture of the individual.² These musculoskeletal disorders are considered as an important source of occupational morbidity. They are being associated with high costs to employers such as lost productivity and increase health care, disability, worker’s compensation costs. Musculoskeletal disorders cases are more severe than the any illness in the body or nonfatal injury.³

Postural back pain has become a major health and occupational hazard especially in employees using computers for long hours and is causing modern day occupational diseases. This has resulted in decreased ability of the employee to perform at the work station but also effected their day to day activities.⁴The effected posture together with physical burden also has both

Corresponding author:

Pooja Sharma,

Research Scholar, ABS, Amity University Noida

E-mail: psharma1@amity.edu

biological & psychological components associated with it. Approximately 9-12% population of the world suffers from postural low back pain in their life.⁵ It has been recommended that use of well-designed chairs which provide the body alignment for extended periods can help to avoid undue pressure on bony structures and hence avoiding postural discomfort. The poor posture acquired by the people can be attributed to the long sitting hours on computers causing biomechanical changes in spine. Also reduced activity levels together with decreased muscle endurance are among the few factors associated with postural pain.^{6,7} If unnoticed or untreated for long, it can result in disability leading to decrease in productivity and effecting one's career.⁸ The available literature recommend the following of exercise regime to prevent these postural discomforts which include both range of motion exercises together with strengthening exercises.^{9,10} Active treatment protocols has been advocated for the management of nonspecific postural pain in order to improve the strength of the muscles involved by increasing the neural activation of these muscles.^{11,12}

METHODOLOGY

A convenient sample of 30 academic professionals working in different fields suffering from idiopathic postural pain and discomfort constituted the study sample. The subjects were in the age range of 20 – 35

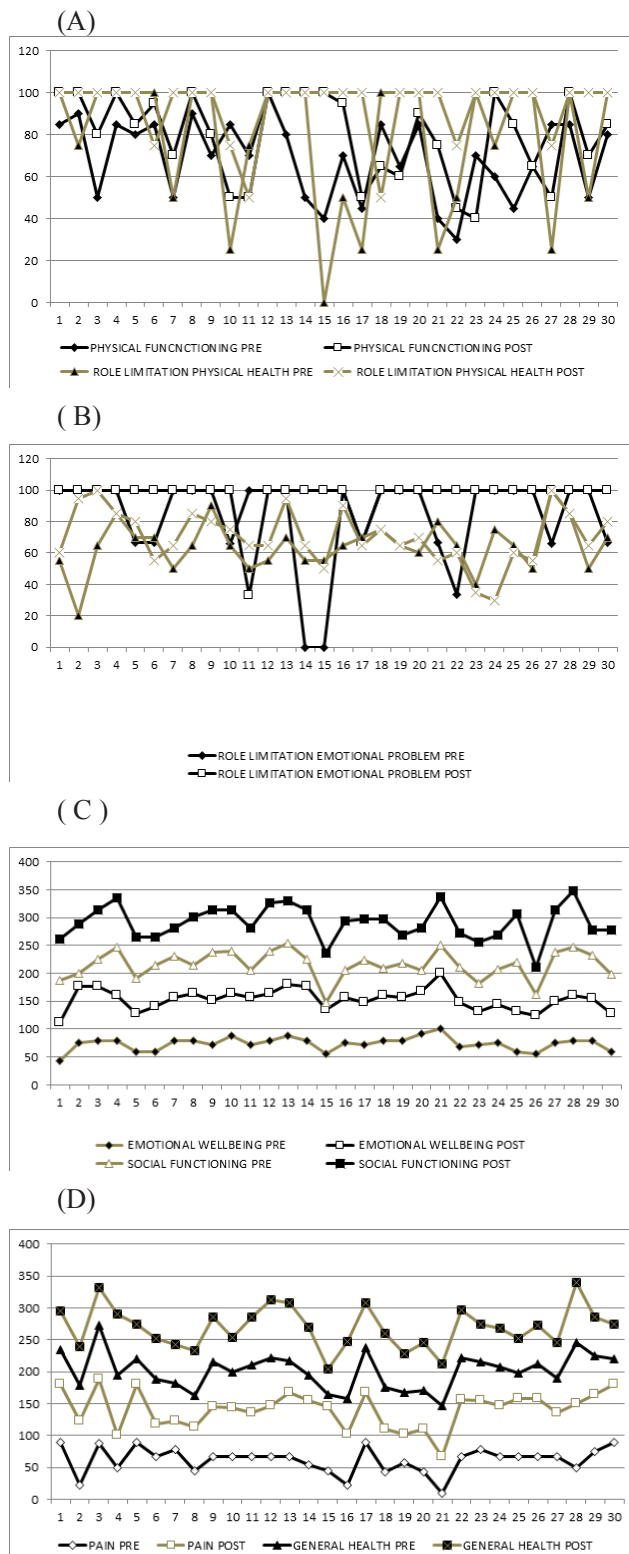
years with mean BMI range (19 to 25). The minimum hours spent daily while working on computer was 4 hours. The patients with nerve root compression, prolapsed or disc herniation, severe scoliosis and with recent history of any spinal surgery were excluded. All the included subjects were well explained about the purpose of the study and an informed consent was obtained. The Standard Nordic questionnaire was then administered to assess the musculoskeletal disorders. The most prevalent areas for pain and discomfort included the neck and the low back for majority of the sample. The subjects were then prescribed an exercise program starting with 10 minutes of warm up which included simple stretching exercises followed by range of motion exercises for the neck and low back. These exercises included neck flexion extension exercise with lateral bending and side rotations together with trunk flexion, extension, lateral bending and rotation exercises. Following this strengthening exercises for the same muscle groups were actively performed by the subjects. The entire exercise session was conducted for the duration of 45 minutes four days in a week for a total of four weeks. After the exercise session postural advice was given to the subjects to avoid unnecessary strain on the muscles while working at home settings. Pre-and post VAS was used to document the decrease in pain and the RAND 36 questionnaire to assess the quality of life.

RESULT

Table 1: Data was analyzed using SPSS. Paired t-test was applied for the pre-and post-exercise scores.

Dimension of RAND	Mean	Standard deviation	P value
Physical functioning	11.5	535.07	p<0.05
Role limitation due to physical activity	15.63	1096.43	p<0.05
Role limitation due to emotional problem	13.37	1046.66	p<0.05
Energy / fatigue	5.84	115.44	p<0.05
Emotional well being	12.96	634.78	p<0.05
Social functioning	12.88	657.86	p<0.05
Pain	16.89	606.87	p<0.05
General health	7.20	200.42	p<0.05

Figure 1: RAND 36



DISCUSSION

The exercise regime prescribed to the clients was found to be effective in decreasing the pain and discomfort of the patient and increasing their physical functioning.

This is in accordance with the current literature which also emphasize the beneficial effects of exercises and postural advice for decreasing the musculoskeletal disorders in computer workers.⁹ Postural advice provided to the subjects on the first day of the therapy helped to prevent faulty postures during work and adaptation of modified postures.¹⁰ Exercises has helped to increase the overall flexibility of the subject. Stretching exercises helped in relieving the tightness in the muscles due to long sitting hours.

The concept of health-related quality of life and its determinants have evolved since the 1980s in order to deal with those aspects of overall quality of life that affect health either physical or mental.^{13,14,15} The RAND-36 is one of the most widely used health-related quality of life survey instrument. The reliability and validity of the RAND 36-Item Health Survey has been well established.¹⁶ It is comprised of 36 items that assess eight health concepts: physical functioning, role limitations caused by physical health problems, role limitations caused by emotional problems, social functioning, emotional well-being, energy/fatigue, pain, and general health perceptions.¹⁷

Patients suffering from postural pain were found to have low scores in all the eight dimensions assessing the quality of life. Following the exercise regime there has been improvement in the parameters assessed.¹⁸ Along with the postural pain the associated pain in other areas like neck and shoulder also aggravate the symptoms. Slumped sitting during long hours of working has been documented to be one of the major cause of postural pain. Providing adequate modifications and adjustment of height of chair used to work, the pain seemed to be relaxed amongst the subjects. Incorrect arm, wrist and back support and position of keyboard increases the chances of pain and discomfort for the worker.¹⁹ Constant bending of neck and forward sitting without taking support from backrest causes increased tension in muscles of back and neck. This is known to further increase the postural abnormalities together with pain and spasms in neck and back muscles.

A multidisciplinary treatment approach is required for the management of musculoskeletal disorders.⁸ A combined exercise protocol which include both strengthening and stretching exercises together with resistance training helps to decrease the pain and discomfort of the patient and increase their quality of

life.²⁰ The present study emphasizes the role of exercises in decreasing the discomfort and to plan the management of these musculoskeletal system disorders. Ergonomics is highly advised in these working set ups to decrease the risk factors and to prevent faulty posture. ²¹ A good ergonomics setup not only maximum capacity of workers but also increase their productivity and job satisfaction.

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

- 1 Sharma P , Golchha V. Awareness among Indian dentist regarding the role of physical activity in prevention of work related musculoskeletal disorders . Indian journal of dental research. May – Jun 2011, Volume 22, Issue 03 pg : 381-4 .
- 2 Vineet Golchha , Pooja Sharma , Jitesh Wadhwa , Deepti Yadav , Rahul Paul. Ergonomic risk factors and their association with musculoskeletal disorders among Indian dentist: A Preliminary study using Rapid upper limb assessment. Indian journal of dental research. November- December ,2014 , 25(6), pg 767 -771 .
- 3 Pooja Sharma, Simran Narang, Vineet Golchha.'Technology Driven Musculoskeletal Disorder in Individuals Using Computer', International Journal of Current Advanced Research, 06(11), pp. 7759-7761.
- 4 Paula T. Hakala, Arja H. Rimpela, Lea A. Saarni, Jouko j. salminen; Frequent computer-related activities increase the risk of neck-shoulder and low back pain in adolescents; Eur J Public Health; 2006;16(5) : 536-541
- 5 CheilaMairaLelis, Maria Raquel Brazil Battaus ,Fabiana Cristina Taubert de Freitas, Fernanda Ldmilla Rossi Rocha , Maria Helena PalucciMarziale , Maria Lucia do Carmo Cruz Robazzi; Work related musculoskeletal disorder in nursing professionals: an integrative literature review; Acta Paul. Enferm, vol25 no 3 sao Paulo 2012.
- 6 Amy J.Haufler, PHD, Michael Feuerstein, PHD, Grant D. Huang,MS, MPH ; Job stress, upper extremity pain and functional limitation in symptomatic computer users; American Journal of Industrial Medicine November 2000 38: 507-515.
- 7 O'Sullivan PB1, Mitchell T, Bulich P, Waller R, Holte J. The relationship between posture and back muscle endurance in industrial workers with flexion-related low backpain. Man Ther. 2006 Nov;11(4):264-71.
- 8 Kiran M. Shete, Prachi Suryawanshi, and Neha Gandhi Management of low back pain in computer users: A multidisciplinary approach J Craniovertebral Junction Spine. 2012 Jan-Jun; 3(1): 7–10.
- 9 Yoo WG : effect of resing in a chair , resting with range of motion exercises, & back strengthening exercises on pain & the flexion relaxation ratio of computer workers with low back pain, 2014 Feb;26(20):321-2.
- 10 Watanabe S1, Kobara K1, Yoshimura Y1, Osaka H1, Ishida H1. Influence of trunk muscle co-contraction on spinal curvature during sitting. J Back Musculoskelet Rehabil. 2014;27(1):55-61.
- 11 Mannion AF , Dvorak J et al : increase in strength after active therapy in chronic low back pain : muscular adaptation & clinical relvance,2001 dec;15(6):468-73
- 12 Pfnngsten M1, Leibing E, Harter W, Kröner-Herwig B, Hempel D, Kronshage U, Hildebrandt J. Fear-avoidance behavior and anticipation of pain in patients with chronic low back pain: a randomized controlled study. Pain Med. 2001 Dec;2(4):259-66
- 13 Gandek B, Sinclair SJ, Kosinski M, Ware JE Jr. Psychometric evaluation of the SF-36 health survey in Medicare managed care. *Health Care Financ Rev*2004;25(4):5-25.
- 14 McHorney CA. Health status assessment methods for adults: past accomplishments and future directions. *Annual Rev Public Health* 1999; 20:309-35.
- 15 Selim AJ, Rogers W, Fleishman JA, Qian SX, Fincke BG, Rothendler JA, Kazis LE. Updated U.S. population standard for the Veterans RAND 12-item Health Survey (VR-12). *Qual Life Res.* 2009;18(1):43-52.
- 16 Vander Zee, K.I., Sanderman, R., Heyink, J.W. et al. Psychometric qualities of the RAND 36-Item Health Survey 1.0: a multidimensional measure of general health status. *Int. J. Behav. Med.* (1996) 3: 104-22.

- 17 Lamé IE1, Peters ML, Vlaeyen JW, Kleef Mv, Patijn J. Quality of life in chronic pain is more associated with beliefs about pain, than with pain intensity. *Eur J Pain*. 2005 Feb;9(1):15-24
- 18 Balthazard P1, de Goumoens P, Rivier G, Demeulenaere P, Ballabeni P, Dériaz O. Manual therapy followed by specific active exercises versus a placebo followed by specific active exercises on the improvement of functional disability in patients with chronic nonspecific low back pain: a randomized controlled trial. *BMC Musculoskelet Disord*. 2012 Aug 28; 13:162.
- 19 Zejda JE1, Bugajska J, Kowalska M, Krzych L, Mieszkowska M, Brozek G, Braczkowska B. Upper extremities, neck and back symptoms in office employees working at computer stations. *Med Pr*. 2009;60(5):359-67.
- 20 Andersen LL1, Christensen KB, Holtermann A, Poulsen OM, Sjøgaard G, Pedersen MT, Hansen EA. Effect of physical exercise interventions on musculoskeletal pain in all body regions among office workers: a one-year randomized controlled trial. *Man Ther*. 2010 Feb;15(1):100-4.
- 21 Van Middelkoop M1, Rubinstein SM, Kuijpers T, Verhagen AP, Ostelo R, Koes BW, van Tulder MW. A systematic review on the effectiveness of physical and rehabilitation interventions for chronic non-specific low back pain. *Eur Spine J*. 2011 Jan;20(1):19-39.

Management of Patient with Pneumonia and Hypothyroidism – A Case Study

Manisha Vikrant Mistry¹, A Seeta Devi¹

¹Asst. Professor, Symbiosis College of Nursing, Symbiosis International University, Pune

ABSTRACT

Infection risk associated with hyperthyroidism although not uncommon, may present with increased mortality if left untreated. The role of hyperthyroidism and its risk for infection is primarily due to the hyper metabolic effect on the body. Modification to the sympathetic nervous system produces a down regulation of the neutrophil response towards the sites of inflammation and/or infection. Consequently, remarkably increasing the risk for complications of infections to occur i.e., bacterial pneumonia¹. The 68 year-old female came with the complaints of orthopnea, mild cough and breathlessness. She was admitted to the ICU and was treated with stat doses of anti-hypertensive, nebulization with bronchodilators, physiotherapy and antibiotics. She was also prescribed with Thyronorm to treat hyperthyroidism. This case was effectively managed for two weeks. The patient showed marked progress in the health status after 4 days of rigorous treatment. During the last week of care orthopnea reduced to a great extent as she could sit in fowler's position comfortably. There was marked decrease in the pallor and her general health improved a lot.

Keywords: (*Hypothyroidism, Pneumonia, Infection,*

INTRODUCTION

Pneumonia is found among people with Hypothyroidism, especially for people who are female, 60+ old, take medication Synthroid and have high blood pressure. Hypothyroidism is reported in

Females – 75.32% and males 24.68%. According to FDA reports, the trend of Pneumonia cases was the least in 2004(8), which drastically increased to 198 in 2012. After an active management strategy, the counts fell from 225 in 2016 to 47 in 2017. People with age 60+ the incidence of Pneumonia is 68.96%. Most of the patients with Pneumonia have top co-existing conditions like High BP – 38.69, high blood cholesterol – 20.22%, Depression – 17.13%. Symptoms commonly seen are: dyspnea, fatigue, weakness and cough. Commonly used drugs are: Synthroid, Levothyroxine sodium².

Hyperthyroidism generally presents as a well-recognized constellation of symptoms, including nervousness, fatigue, and palpitation, weight loss despite good appetite, loose bowels, heat intolerance, tremor and excessive perspiration. Sometimes, however, the involvement of one organ system can so dominate

the clinical picture that initially the diagnosis of hyperthyroidism is missed. Such oligo symptomatic disease occurs especially in older patients who may have only cardiac symptoms. The initial evaluation of these patients yields few clues to the underlying condition. These patients often slip into a fatal thyroid storm that is equally apathetic and hard to detect. We report an unusual case of apathetic hyperthyroidism presenting as recurrent pneumonia³.

CASE PRESENTATION

The 68 year-old female came with the complaints of orthopnea, mild cough and breathlessness since 3-4 days. She also complained of poor appetite. She displayed general fatigability. She is a known case of Hypothyroidism and hypertension. She has a strong past surgical history. She was operated twice, once for Uterine prolapse repair 15 days back in the year 2017 and Laminectomy in the year 2004. The old lady was examined thoroughly. Although signs of ageing were evident, she presented with Crepitation and Rhonchi on auscultation of both Lungs. Her O₂ saturation was 78% and BP was recorded high i.e. 180/90 mmHg.

CHEST X-RAY REPORTS

The reports revealed Tracheal shift and haziness in the Rt. Lung. 2D Echo portrayed LVDD with degenerative Valve changes, LVEF – 60%. ECG recorded Right Bundle Branch Block (RBBB) with sinus rhythm.

Table 1 : Biochemistry tests results

Test	Pt. values	Normal Values	Inference
Hemoglobin	10.9	13-17 g/dL (men), 12-15 g/dL (women)	Decreased
TLC	7980	4,000 to 11,000	Normal
Platelet count	378000	150,000 to 450,000 platelets microliter of blood	Normal
Uric acid	18.28	0.18-0.48 mmol/L	Increased
Creatinine	0.8	0.8-1.3 mg/dL	Normal
Potassium	3.9	3.5-5 mmol/L	Normal
Sodium	118.7	135-145 mmol/L	Decreased
Magnesium	1.47	1.5-2 mEq/L	Decreased
Chlorides	84.7	95-105 mmol/L	Normal
Phosphorus	3.67	1-1.5 mmol/L	Increased
Blood sugar level	144	65-110 mg/dL	Increased
NT Pro-BNP	567.5	⋈ 300 pg/mL	Increased

There is a substantial increase in the Pro-BNP levels of the patient which is suggestive of co-existing hyperthyroidism. Other potential causes of elevated BNP levels include diastolic dysfunction, acute coronary syndromes (very sensitive but not specific), hypertension with LVH, Valvular heart disease, atrial fibrillation, and pulmonary embolism, pulmonary hypertension, sepsis, or COPD⁴.

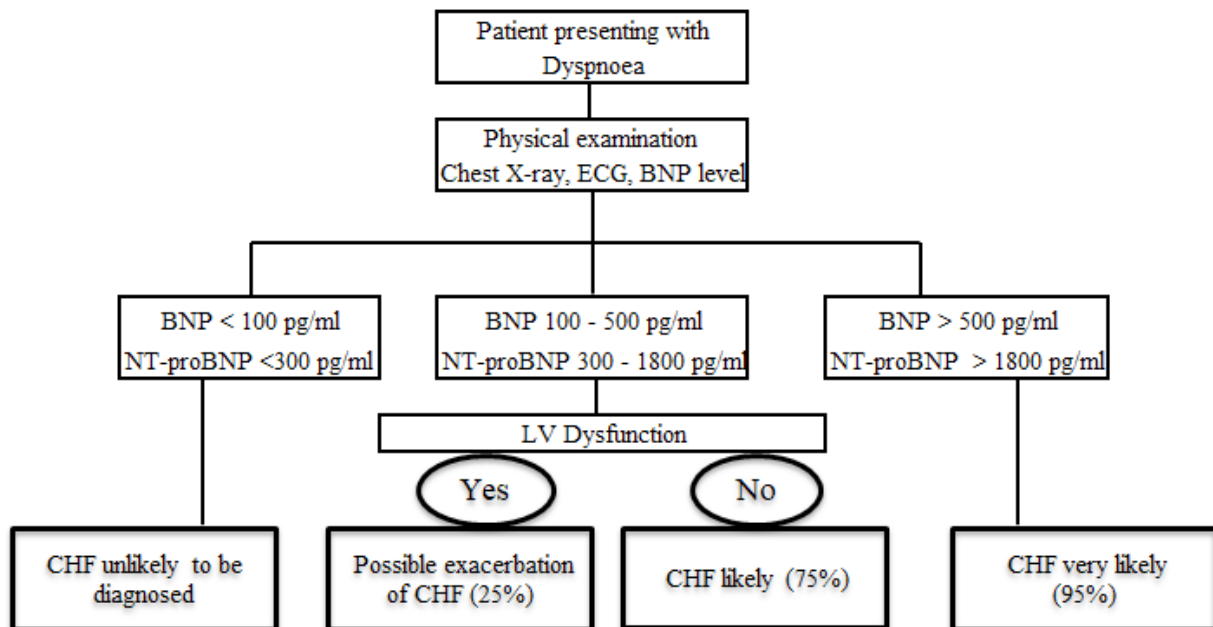


Fig 1: Schematic algorithm of treatment

Clinical presentation of both Lungs

Table 02 – Clinical presentation of Right & Left Lung

Aspects	Rt Lung	Lt Lung
Breath Sounds	-	-
Vocal resonance	-	-
Percussion note	+	-
Creptitation	+	+
Ronchi	+	+

Management and Outcome

Immediately on admission to the ICU, patient was put on Oxygen 2 L/min and was given stat doses of Tab Stamlo 5mg, MgSO₄ – 2gm in 100ml NS and Inj. Effcorlin 100 mg, Inj. Lasix 20mg and nebulization with Duoline and Budacort combined drugs diluted in sterile water. Chest physiotherapy was given in order to clear the secretions. The medications prescribed for her were; Tab Natrise 15mg OD along with salt capsules TID, Inj. Pan 40mg OD, Inj. Magnex Forte 1.5gm BD, Tb Azee 500mg OD, Tab Thyronorm 50mcg OD and Tab Stamlo 5mg OD. Nebulization was continued BD and chest physiotherapy was also given.

The patient showed marked progress in the health status after 4 days of rigorous treatment. During the last week of care orthopnea reduced to a great extent as she could sit in fowler's position comfortably. There was marked decrease in the pallor and her general health improved a lot.

DISCUSSION

Pneumonia is a disease commonly encountered along with hypothyroidism. This condition worsens if proper care is not taken well in advance. Similar case is reported with a 75-year-old male ex-smoker with a Brinkman index (BI), which is defined as numbers of cigarette smoked per day times smoking years, of 150 developed a non-productive cough and dyspnea for one year. He had a clinical history of hypothyroidism and received the hormone replacement therapy. He was diagnosed as Pneumonia and was on prednisolone due to the progression of respiratory symptoms. The patient

started to receive long term oxygen therapy two years after the biopsy due to slow progression of the disease. A chest radiograph showed fine reticular opacities in bilateral lower lung zones. Chest computed tomography (CT) demonstrated reticular and ground-glass opacities with traction bronchiectasis predominantly in lower lung zones. Radiological diagnosis was possible Usual Interstitial Pneumonia (UIP) pattern⁵.

Another 72-year-old male ex-smoker had hypothyroidism and received the hormone replacement therapy developed a cough and was pointed out to have crackles on auscultation. He had cheek erythema and appeared pedal edema for two years. His blood test was positive for anti SS-A antibody, however, there was no symptom suggestive for Sjögren's syndrome. His serum test was also positive for IgG antibodies against bird serum antigens. A chest radiograph depicted faint ground-glass shadow in bilateral lung fields⁵.

Ethical approval: Written informed consent was obtained from the patient and hospital author for publication of this case report and accompanying images.

Conflict of Interest: There is no conflict of interest.

Source of Funding: Self

REFERENCES

1. Dookhan A, Patel H, Patel M, Patel K, Bass J, Sinha A. Hyperthyroidism associated with an increased risk for infection: A case report. J Case Rep Images Med 2016;2:55–58.
2. Hypothyroidism and Pneumonia, Report from Food and Drug Administration. Oct, 21, 2017 (Link : <http://www.ehealthme.com/cs/hypothyroidism/pneumonia/>)
3. Rosenthal MJ, Goodwin JS: A case of hyperthyroidism presenting as recurrent pneumonia. West J Med 1985 Apr; 142:550-552
4. Schultz M et al, N-terminal-pro-B-type natriuretic peptide (NT-pro-BNP) in different thyroid function states. Clin Endocrinol (Oxf). 2004 Jan;60(1):54-9.
5. Case Report on Pathology of Interstitial Pneumonia Associated with Hypothyroidism-Report of Three Cases, Tomohisa Uchida, Aung Myo Hlaing, et al, Journal of Pulmonary & Respiratory Medicine.

Prevalence of Chronic Obstructive Pulmonary Disease (COPD) and Risk Factors in Non-Smokers at a Tertiary Care Teaching Hospital of Eastern India

Banani Jena¹, Rabi Narayan Mania¹, Pritam Chhotray², Syed Umer Ahmed², Mahesh Chandra Sahu³

¹Associate Professor, Department of Pulmonary Medicine, ²Postgraduate student, Department of Pulmonary Medicine, ³Assistant Professor, Directorate of Medical Research, IMS and SUM Hospital, Siksha "O" Anusandhan University, K8, Kalinganagar, Bhubaneswar, Odisha, India

ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) primarily affect the lungs and are major causes of morbidity and mortality worldwide. The most widely recognized risk factor for COPD is smoking, but non-smoking factors include biomass fuel, occupational exposure to dusts and gases were studied.

Method: A prospective study was conducted on patients attending pulmonary medicine OPD and IPD in IMS AND SUM Hospital ,Bhubaneswar .Diagnosis of COPD was made by history, clinical examination, spirometric criteria and other investigations as per GOLD guidelines . Risk factors of COPD among non smoker COPD patients were identified by intensive questioning through preformed questionnaires.

Results: In this study 7 groups, 60 patients individual are participated in each group to know the prevalence of COPD and it was revealed that House wife (History of Biomass exposure) and teachers are most susceptible to COPD. In BMI study, it was revealed that 7 patients were under weight. On chest X-ray PA view revealed that Hyperinflation was 47.17%, Flattening of hemidiaphragm 33.96% and Tubular heart was 18.87%. The prevalence of nonsmoker COPD was more in history of biomass fuel exposures 54.71% (more in female housewife and daily labors).

Conclusions: Biomass fuel exposure in house wife females and teachers exposures to chalk dust are very much prone to COPD.

Keywords: Biomass, Chalk dust, COPD, Prevalence and non-smokers

INTRODUCTION

Worldwide, Chronic Obstructive Pulmonary Disease (COPD) is the third leading cause of death and it is more risk to tuberculosis ¹. COPD is characterized by persistent airflow limitation that is typically progressive and associated with an enhanced chronic inflammatory

response in the airways and lung tissue to harmful particles or gases ². The chronic airflow limitation in COPD is caused by the combination of parenchymal destruction (emphysema) and small airways disease (obstructive bronchiolitis), of which the relative presence varies from person to person ². According to estimates from the Global Burden of Disease Study, COPD was prevalent in more than 300 million people in 2013 ³. The disease burden and its financial impact is predicted to increase, mainly due to population aging ⁴⁻⁶. Several studies reported on the prevalence of COPD. In European adult populations over 40 years, the prevalence of COPD ranges between 15–20 % and is higher in men than in women ⁷⁻⁹. Even though the prevalence of COPD is well known, only few studies examined its incidence rate in

Corresponding author:

Dr. Rabi Narayan Mania,

Professor, Department of Pulmonary Medicine, , IMS and SUM hospital, Siksha "O" Anusandhan University, K8, Kalinganagar, Bhubaneswar-751003

Email: rabinarayanmania@soa.ac.in

a prospective and standardized manner (supplementary Table 1S in the Online Resource provides an overview of studies which investigated the incidence of COPD). While tobacco smoking is a major risk factor for COPD, only approximately 20 % of smokers develop the disease. More evidence is rising to suggest that other risk factors such as air pollution, respiratory infections, poor nutritional status, chronic asthma, impaired lung growth, poor socio-economic status and genetic factors are also important for disease development ¹⁰⁻¹². About 15–20 % of COPD cases are due to occupational exposures to pollutants at the workplace ⁹, and about 50 % of subjects who died from COPD in developing countries have been exposed to biomass smoke during lifetime ¹⁰. These facts emphasize the need for action in order to reduce the impact of those risk factors on disease development. To this end, investigating the incidence of COPD is important, since it might shed light on new trends in the development and course of the disease, which in turn can lead to new insights and guidance for prevention and treatment. Till date our focus has mainly been on smoking as a causative factor for COPD. With the emergence of other factors which can cause COPD, there is need for evaluation of these factors. With this background, we undertook this study to identify different non smoking risk factors of COPD which will help in diagnosis, treatment and prevention of such COPD cases.

MATERIAL AND METHOD

This prospective study was carried out with patients attending pulmonary medicine OPD and IPD in IMS AND SUM Hospital, Bhubaneswar. COPD Diagnosed patients were documented by questionably, such as;

history, clinical examination, spirometric criteria and other investigations as per GOLD guidelines. Risk factors of COPD among non smoker COPD patients were identified by intensive questioning through preformed questionnaires. Inclusion criteria are included, Patients who are diagnosed with COPD in OPD and IPD, Age 30-90 years, Both male and females, Non-smoker COPD. Similarly, Exclusion criteria are Patients who are sputum smear positive for TB, Pregnant women and HIV, HBV and HCV, Age<30 years or>90 years. All the data regarding occupation of the patients, BMI, radiological evident and history of biomass were documented. All the data were analyzed with SPSS 20 softwares.

RESULTS

In this study 7 groups such as; House wife, Teacher, Ciivile engineer, Masonry, Grocery shope, Farmer and others, 60 patients individual are participated in each group to know the prevalence of COPD (Table 1) and it was revealed house wives with history of biomass exposures and teachers are more prone to COPD. In BMI study, it was revealed that 7 patients were under weight. Whereas 25 patients were obese, which are prone to COPD (Table 2). On chest X-ray PA view revealed that Hyperinflation was 47.17%, Flattening of hemidiaphragm 33.96% and Tubular heart was 18.87%. Increased bronchovascular marking were also observed (Fig 1, Table 3).

Among the 53 COPD patients 29 were biomass fuel exposed and 24 were not exposure. The prevalence of nonsmoker COPD was more in history of biomass fuel exposures 54.71% (more in female housewife and daily labors) (Table 4).

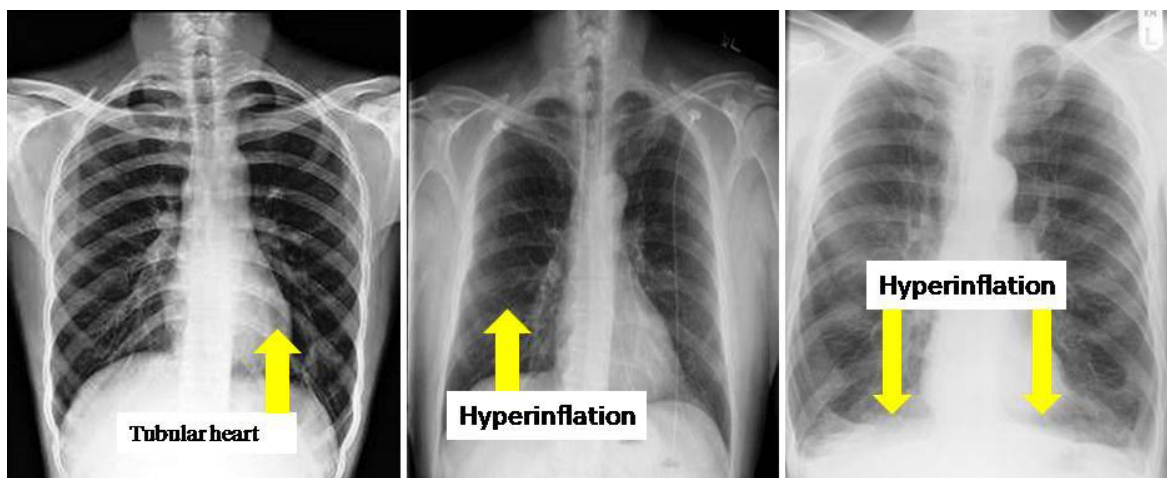


Fig 1 Chest X-ray of Non smoker COPD patients

Table 1: Prevalence of COPD in non smokers

Test population	Total	M	F	%
House wife (N=60)	15	0	15	25.00
Teacher (N=60)	15	11	4	25.00
Ciivile engineer(N=60)	6	6	0	10.00
Masonry (N=60)	5	2	3	8.33
Grocery shope(N=60)	3	3	0	5.00
Farmer (N=60)	8	5	3	13.33
Other(N=60)	1	1	0	1.67
Total (N=420)	53	28	25	12.61

Table 2: Body mass index (BMI) of the study population

BMI		M	F	Total
<18.5	under weight	2	5	7
18.5-24.9	normal	10	2	12
25-29.9	over weight	6	6	12
30-34.9	obesity I	4	4	8
35-39.9	obesity II	2	5	7
>40	Obesity III	4	3	7
Total		28	25	53

Table 3: Prevalence of Chest X-ray of Non smoker COPD patients

Chest X ray	Total	M	F	%
Hyperinflation	25	9	4	47.17
Flatting of hemidiaphragm	18	10	6	33.96
Tubular heart	10	9	15	18.87
Total	53	28	25	100.00

Table 4: Prevalence of Biomass exposure in non-smoker COPD patients

Biomass Exposure	Male	Female	Total	%
Yes	7	22	29	54.71
No	21	03	24	42.28
Total	28	25	53	100

DISCUSSION

Findings from early studies reported that exposure to toxic gases in the workplace ¹¹ grain dust in farms ¹² and dust and fumes in factories ¹³ was strongly associated with COPD. Results from longitudinal studies have associated COPD with occupational exposures in coal miners, hard-rock miners, tunnel workers, and concrete manufacturers. In heavily exposed workers, the effect of dust exposure might be greater than that of smoking ¹⁴. Persistent exposure to silica in construction, brick manufacturing, gold mining, and iron and steel foundries is strongly associated with COPD; average respirable dust concentration is 10000 µg/m³ ¹⁵. The contribution of outdoor air pollution to COPD was investigated in 1958 in UK postmen—the prevalence of COPD was higher in those working in more polluted areas than in those working in areas with less pollution, and the association was independent of smoking ⁸. Results of a later study showed reduced lung function in postmen who worked in more polluted cities than in those who worked in less polluted areas ¹⁶. These findings have been reinforced by studies in the general population in the UK ¹⁷ and USA ¹⁸ and in people living close to roads with heavy motor vehicular traffic. As most autoimmune diseases occur more frequently in women than men, the autoimmune hypothesis is worth considering as a contributor to the predominance of females among non-smokers with COPD. In this study most of the patients were from rural background in both smoker and non smoker group (58.3% in non smoker vs. 64.8% in smoker). There is no significant difference in geographical distribution among both the groups. More than half of the patients in both smoker and non smoker groups were 40-59 years old (56.3% in non smoker vs. 53.1% in smoker).

The proportion of patients in the age group less than 40 years and more than 80 years were found to be more in non smoker COPD as compared to smoker COPD. Proportion of females was found to be more in non smoker COPD and that of male was found to be more in smoker COPD among all age group except age group less than 40 years in which proportion of male were more in non smoker COPD group. In this study we found age is the statistically significant risk factor for COPD, similar results were also found by Behrendt et al. 2005 in USA¹⁹. In our study, sex is also found statistically significant risk factor for COPD, we found that non-smoker COPD were higher in female patients, but it might be due to factors like exposure to biomass smoke, which is itself a major non-smoking risk factor for COPD, was more common in female. Female sex as a risk factor for COPD in non-smoker group was also found by Ten et al. 2003 in 12 countries of Asia pacific²⁰. Exposure to biomass smoke as a risk factor has been found to cause COPD in nonsmoker group in this study and the association of this factor is statistically significant with nonsmoker COPD. Similar association has also been found by Lindstrom et al. 2001 in Finland and Sweden²¹. There is evidence that substantial proportion of COPD, up to 20% can be attributed to occupational exposure²². Occupational exposure as a risk factor among non-smoker COPD were also found by Lampracht et al. 2008 in Austria²³ and Ehrlich et al. 2008 in South Africa²⁴. Genetic susceptibility has attracted general attention^{25,26}. The difference is because our study is hospital based study and most of the patients were of age >40 years, so it is very difficult to take history of respiratory infection in childhood in the absence of patient's parents. There is evidence that exposure to passive smoke is associated with COPD²⁵ and affects women more often than men²⁶.

CONCLUSION

Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality worldwide. Tobacco smoking is established as a major risk factor, but emerging evidence suggests that other risk factors are important, especially in developing countries. An estimated 25–45% of patients with COPD have never smoked; the burden of non-smoking COPD is therefore much higher than previously believed. About 3 billion people, half the worldwide population, are exposed to smoke from biomass fuel compared with 1.01 billion people who smoke tobacco, which suggests that

exposure to biomass smoke might be the biggest risk factor for COPD globally. We review the evidence for the association of COPD with exposure to biomass fuel ,teacher ,civil engineer ,masonry, grocery shop and farmers.

Ethical Clearance: This study is approved from our institutional ethics committee.

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Lozano R, Naghavi M, Foreman K, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012;380:2095–128.
2. Vestbo J, Hurd SS, Agusti AG, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease GOLD executive summary. *Am J Resp Crit Care*. 2013;187:347–65.
3. Tea Vos. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*. 2015;386:743–800.
4. Prince MJ, Wu F, Guo Y, et al. The burden of disease in older people and implications for health policy and practice. *Lancet*. 2014;385:549–62.
5. Muka T, Imo D, Jaspers L, et al. The global impact of noncommunicable diseases on healthcare spending and national income: a systematic review. *Eur J Epidemiol*. 2015;30:251–77.
6. Herse F, Kiljander T, Lehtimaki L. Annual costs of chronic obstructive pulmonary disease in Finland during 1996–2006 and a prediction model for 2007–2030. *NPJ Prim Care Respir Med*. 2015;25:15015.
7. Atsou K, Chouaid C, Hejblum G. Variability of the chronic obstructive pulmonary disease key epidemiological data in Europe: systematic review. *BMC Med*. 2011;9:7.
8. Rycroft CE, Heyes A, Lanza L, Becker K. Epidemiology of chronic obstructive pulmonary disease: a literature review. *Int J Chron Obstruct*

- Pulmon Dis. 2012;7:457–94.
9. Gibson L, Sibille, Lundbaˆck. Fletcher: Lung health in Europe, facts and figures. European lung foundation; 2013.
 10. Salvi SS, Barnes PJ. Chronic obstructive pulmonary disease in non-smokers. *Lancet*. 2009;374:733–43.
 11. Chester EH, Gillespie DG, Krause FD. The prevalence of chronic obstructive pulmonary disease in chlorine gas workers. *Am Rev Respir Dis*. 1969;99: 365-73.
 12. Husman K, Koskenvuo M, Kaprio J, Terho EO, Vohlonen I. Role of environment in the development of chronic bronchitis. *Eur J Respir Dis Suppl*. 1987;152:57–63.
 13. Becklake MR. Occupational exposures: evidence for a causal association with chronic obstructive pulmonary disease. *Am Rev Respir Dis*. 1989;140(pt 2):S85–S91.
 14. Ulvestad B, Bakke B, Eduard W, Kongerud J, Lund MB. Cumulative exposure to dust causes accelerated decline in lung function in tunnel workers. *Occup Environ Med*. 2001;58:663–69.
 15. Bergdahl IA, Toren K, Eriksson K, et al. Increased mortality in COPD among construction workers exposed to inorganic dust. *Eur Respir J*. 2004;23:402–06.
 16. Rushton L. Chronic obstructive pulmonary disease and occupational exposure to silica. *Rev Environ Health*. 2007;22:255– 72.
 17. Holland WW, Reid DD. The urban factor in chronic bronchitis. *Lancet*. 1965;285:445– 48.
 18. Lambert PM, Reid DD. Smoking, air pollution, and bronchitis in Britain. *Lancet*. 1970;295:853–57.
 19. Burrows B, Kellogg AL, Buskey J. Relationship of symptoms of chronic bronchitis and emphysema to weather and air pollution. *Arch Environ Health*. 1968;16: 406–13.
 20. Lindstrom M, Kotaniemi J, Jonsson E, Lundback B. Smoking, respiratory symptoms, and diseases: a comparative study between northern Sweden and northern Finland: report from the Fin EsS study. *Chest*. 2001;119:852–61.
 21. Trupin L, Earnest G, San Pedro M, et al. The occupational burden of chronic obstructive pulmonary disease. *Eur Respir J*. 2003;22:462–69.
 22. Lamprecht B, Schirnhofner L, Kaiser B, Buist S, Studnicka M. Non-reversible airway obstruction in never smokers: results from the Austrian BOLD study. *mRespir Med*. 2008;102:1833-38.
 23. Ehrlich RI, White N, Norman R, et al. Predictors of chronic bronchitis in South African adults. *Int J Tuberc Lung Dis*. 2004;8:369-76.
 24. Wood AM, Stockley RA. The genetics of chronic obstructive pulmonary disease. *Respir Res*. 2006;7:130-143.
 25. Zhou Y, Wang C, Yao W, et al. COPD in Chinese non-smokers. *Eur Respir J*. 2009; 33:509-18.
 26. Yin P, Jiang CQ, Cheng KK, et al. Passive smoking exposure and risk of COPD among adults in China: the Guangzhou Biobank Cohort Study. *Lancet*. 2007;370(9589):751–757.
 27. Larsson ML, Loit HM, Meren M, et al. Passive smoking and respiratory symptoms in the FinEsS Study. *Eur Respir J*. 2003;21(4):672–676.

Assessment of Self-Care Practices among Diabetic Patients, Suraram, Telangana State, India

Suguna Dumpala¹, Padmavathi Vutukuru²

¹Associate Professor, Department of Community Medicine, Mallareddy Medical College for Women, Suraram, Hyderabad, ²Professor, Department of Pharmacology, Mallareddy Medical College for Women, Suraram, Hyderabad

ABSTRACT

Background: India contributes to 69.2 million diabetics (8.7%) as per World Health Organization, 2015. Specific, effective and affordable care reduces morbidity and mortality among them. Although challenging, self care is one of the important practices among diabetic patients which is not well-documented. Therefore, assessment of unique data sets on self care practices among diabetics immensely helps to improve their quality of life, prevent complications and pre-mature deaths.

Objective: To assess the self-care practices among diabetic patients residing at Suraram, Telangana State

Study Design: Cross-sectional study

Setting: Urban Health Training Centre

Material and Method: Data was collected from 155 Diabetic patients during July to December 2016, using a semi-structured questionnaire. Summary of Diabetes Self-Care Activities (SDSCA) instrument was employed to collect the data.

Statistics: Reported as frequencies in numbers and percentages. Chi-square and ANOVA were performed by Statistical Package for Social Sciences (SPSS, Inc., Chicago, IL, version 19). $p < 0.05$ was set to consider as significance level.

Results: Study subjects ranged from 25 to 83 yrs of age, mean age $52y \pm 11.52$, females were slightly more 80 (51.6%); Most were Hindus 123 (79.4%); Maximum Backward class (BC) 73 (47.1%); 84 (54.2%) belonged to Upper and Lower middle class of Kuppuswamy's socio-economic class; 90 (58.1%) smoked and 93 (60%) addicted to alcohol. Overall poor practices were in 82 (53%) of them. There was an association between self-care practices and socio-economic class, smoking, alcohol, co-morbidities and complications ($p < 0.05$). However, age, sex, religion, caste, type of family, marital status, duration of disease did not show any association.

Conclusion: Promoting self-care practices is vital and has to be emphasized by the clinicians who treat them

Keywords: Diabetes, Self-care practices, Co-morbidities

INTRODUCTION

Diabetes Mellitus (DM) a common chronic metabolic disorders of multiple aetiologies, a fourth leading cause of death contributing to 9% mortality in humans across the globe¹. According to International Diabetic Federation (IDF)², approximately 415M adults have diabetes which could reach 642 M by 2040. Of

Author for Correspondence:

Dr. Padmavathi Vutukuru

Professor and Head, Department of Pharmacology
Mallareddy Medical College for Women,
Suraram, Hyderabad

these 80% of them are from developing or less developed countries (middle and low-income countries). India contributes nearly 69.2M diabetics (8.7%) which is an alarming trend³. Over the past two decades, a dramatic increase in the global prevalence of DM was observed. Although both type 1 and type 2 DM are on the rise, a more rapid increase in the prevalence of type 2 DM is observed⁴. It is usually associated with certain complications such as neuropathy, retinopathy and nephropathy. In addition, reduced blood flow and nerve damage in the feet leads to Diabetic Foot. In addition to morbidity, acute infections may lead to amputation and mortality in severe cases which involve huge health care costs⁵. As the incidence of DM increases across the globe² consumes a major chunk of health care resources, WHO called for proactive diabetes management by accelerating prevention and treatment of the disease. Diabetes management regime requires multiple strategies including self-care to regulate hyperglycaemia and treat its associated complications. Self-care practices (SCPs) in diabetes depend on the patient's ability to learn and cope up with the complications associated with the disease as a function of time as emphasized by many professional bodies⁶. The SCPs include but not limited to monitoring of blood glucose level, strict control of diet, optimum physical activity, proper foot care and above all compliance to medication⁷. Earlier studies demonstrated that patients who are knowledgeable in SCPs exhibited good glycemic control and dramatic progress in their diabetic management⁸. On the other hand, there is four times increase complications in patients who were not aware of SCPs⁹. Thus, for achieving effective diabetes management, a set of complex self-care skills are required by the diabetic patients. Research is warranted to assess the SCPs among diabetic patients, which hold the key for reducing their complications and improving the quality of life. A perusal of the available literature indicates that such baseline studies on SCPs in urban populations are scarce in Telangana state. In the light of this, we made an attempt to explore the SCPs among diabetic patients in an urban community of Suraram near Hyderabad city in Telangana state.

MATERIALS AND METHOD

A community based cross-sectional study was conducted to assess SCPs among Diabetic patients in field practice area of Urban Health Training Centre (UHTC), Suraram, Hyderabad city, Telangana state, which is in the southern part of India. This training

centre is attached to Department of Community Medicine, Malla Reddy Medical College for Women (MRMCW), Suraram. UHTC covers 7500 houses with a population of 29956, in 16 Municipal wards. The study subjects are patients suffering with type-2 diabetes. A convenient sample size of 155 (75 men and 80 women) was considered and study subjects were selected by simple random technique. Data was collected from July to December 2015. Inclusion criteria: Diabetic patients 18 years and above diagnosed by physician with or without co-morbidities or complications. Exclusion criteria were: Patients not willing to participate in the study. Ethical clearance was obtained from the Institutional Human Ethics Committee, MRMCW. An informed written and signed consent for participation in the study was taken from all the participants in English/Telugu (local vernacular) language. Data were recorded by using a semi-structured field tested questionnaire. No surrogate responses were permitted. Assessment of Social class of caste was as per Social Welfare Department, Government of Telangana. It was coded as Open category (OC), Backward Class (BC), Scheduled Caste (SC), Scheduled Tribe (ST). Standard Indian classification system was followed to assess occupation and coded as skilled workers, unskilled workers and professionals¹⁰. Education level was classified under illiterate and literate categories. Data were collected on age, gender, type of family, presence of co-morbidities or complications like heart disease, high blood pressure, tuberculosis, chronic bronchitis, cancer; if they had a stroke and receiving regular medication for this condition; tobacco use in any form (smoked or chewed on a daily basis in the past six months), and regular consumption of alcohol (for ≥ 10 days a month in the last six months). Self-Care practices were studied in five domains of Physical activity (PA), Dietary Practices, Blood Sugar monitoring, Drugs and foot care. These domains were adapted from American Association of Diabetes Educators (AADE)¹⁰ to measure the outcome. This ensured the validity of study instrument. PA domain was measured as per Indian diabetes risk score¹¹. A valid scale of Summary of Diabetes Self-Care Activities was used (SDSCA)¹² for other domains. Scores were assigned to each domain based on response of the study subjects. The operational definition of SCPs was defined as "the extent to which patients do physical exercise, follow diet, medication schedules and monitor blood sugar levels as prescribed by their health care providers for the last 15 days. This short period was chosen to minimize recall

bias. For Dietary practices, questions were whether diet chart was followed, red meat, saturated fats like ghee, sweets, tea with sugar were avoided, vegetables and fruits (> 400 gm)¹⁷ consumed daily in the last one week - a maximum score of 15 was given; information on daily physical activity of the participants based on the duration and frequency over the past one month was also collected. Any type of aerobic exercise for minimum of 150 minutes per week was given a maximum score of 9; compliance of Blood sugar monitoring as prescribed by health care provider was given a score of maximum 1; Regularity of taking Medicines was given a maximum of 10; Foot care like examining the feet, washing, drying, cleaning, wearing ordinary/microcellular or no footwear at home was given a maximum score of 15. Scores of each domain were added to get a performance score in that domain. Thus by summing up the scores of all the five domains, a maximum overall score of 50 was possible which was an outcome variable. A score of 25 and above was considered good practices and a score below 25 was considered as poor performance. The primary outcome in this present analysis was self-care practices. A test of independence, chi-squared test was performed to observe the relation between various demographic, socioeconomic categories, comorbidities, complications and self-care practices. ANOVA was applied to analyze the effects of duration of disease (continuous variable) on self-care practices (independent variable). Statistical-Package for Social Sciences (SPSS Inc, Chicago and III) 19th version was used for statistical analysis. $p < 0.05$ was considered for statistical significance.

RESULTS

Table-1 illustrates the association between socio-demographic characteristics and self-care practices among study subjects. A total of 155 subjects (75 men

and 80 women) participated. Their age ranged from 25 to 83 yrs with a mean age of $52 \text{ y} \pm 11.52$. Females were slightly more 80 (51.6%). Most of the participants, 123 (79.4%) belonged to Hindu religion and 110 (70.97%) were from scheduled castes, scheduled tribes and backward class (BC). Majority of the study participants were from nuclear families, 132 (85.16%). Regarding the marital status, 136 (87.74 %) individuals were married and living with spouse. As per the modified Kuppaswamy's socio-economic class, most of the participants 84 (54.2%) belonged to upper-lower class. Furthermore, 52 (33.55%) of them from lower class exhibited poor self care practices. Ninety (58.1%) subjects were smokers while 93 (60%) addicted to alcohol. Overall poor practices were observed in 82 (53%) of them. There was an association between self-care practices and socio-economic class, smoking and alcohol consumption ($p < 0.05$). However, age, sex, religion, caste, type of family, marital status, duration of disease did not show any association.

Table-2 depicts the association between comorbidities, complications and self-care practices among the study participants. Ninety three (60.00%) of them had co-morbidities and 111 (71.60%) of them had complications associated with diabetes. Poor practices were observed in 62 (33.50%) and 60 (38.70) among them. Pearson chi-square tests found the relation between these characteristics and SCPs which was statistically significant ($p < 0.05$)

Table-3 The mean duration of diabetes among the study population was 5.6 yrs. Twenty two (14.1%) of them had diabetes for less than 1yr, 36 (23.3) between 1 to 3 yrs, 43 (27.8%) for 3-5 yrs and 54 (34.8%) for more than 5 yrs. Of these, poor practices were observed in 34 (21.9%) of cases. One way ANOVA test showed no statistically significant difference between groups, $F(24,130) = 0.917, p = 0.579$

Table-1 Association between Socio-Demographic Characteristics and Self-Care Practices

Demographic characteristic		Good Practices		Poor Practices		Total n=155 No. (%)	χ^2 value p-value
		No. 73	(47%)	No. 82	(53%)		
Age(y)	25-34	05	(3.23)	06	(03.87)	11 (07.10)	0.433 p=0.979
	35-44	12	(7.74)	14	(09.03)	26 (16.77)	
	45-54	24	(15.48)	25	(16.13)	49 (31.61)	
	55-64	22	(14.19)	23	(14.84)	45 (29.03)	
	>=65	10	(6.45)	14	(09.03)	24 (15.48)	
Sex	Male	35	(22.58)	40	(25.81)	75 (48.39)	0.181 p=0.917
	Female	38	(24.52)	42	(27.10)	80 (51.61)	

Cont... Table-1 Association between Socio-Demographic Characteristics and Self-Care Practices

Religion	Hindus	61	(39.35)	62	(40.00)	123	(79.35)	1.777 p=0.411
	Muslims	06	(03.87)	12	(07.74)	18	(11.62)	
	Christians	06	(03.87)	08	(05.16)	14	(09.03)	
Caste	Other Caste	23	(14.84)	22	(14.19)	45	(29.03)	0.410
	SC,ST & B.C	50	(32.26)	60	(38.71)	110	(70.97)	p=0.523
Type of Family	Nuclear	62	(40.00)	70	(45.16)	132	(85.16)	0.005 p=0.939
	Extended	11	(07.10)	12	(07.74)	23	(14.84)	
Marital Status	Single, Widow, Divorce, etc.,	07	(04.52)	12	(07.74)	19	(12.26)	0.914 p=0.339
	Married and living with spouse	66	(42.58)	70	(45.16)	136	(87.74)	
Socio-economic status	Upper Middle (II)							21.746 p=0.001*
	Lower Middle (III)	54	(34.84)	30	(19.35)	84	(54.19)	
	Upper Lower (IV)							
	Lower (V)	19	(12.26)	52	(33.55)	71	(45.81)	
Smoking	Yes	13	(08.39)	77	(49.68)	90	(58.06)	91.837 p=0.001*
	No	60	(38.71)	05	(03.23)	65	(41.94)	
Alcohol	Yes	21	(13.55)	72	(46.45)	93	(60.00)	5.809 p=0.016*
	No	52	(33.55)	10	(06.45)	62	(40.00)	

*Significant at p <0.05

Table-2 Association between Co-morbidities, Complications and Self Care Practices

Characteristics		Good Practices No.73 (47.1%)		Poor Practices No. 82 (52.9%)		Total n=155 No. (%)	χ^2 value p-value
Co-morbidities	Yes	31	(26.50)	62	(33.50)	93 (60.00)	17.679 p=0.00003*
	No	42	(20.60)	20	(19.40)	62 (40.00)	
Complications	Yes	51	(32.90)	60	(38.70)	111 (71.60)	16.199 p=0.00006*
	No	22	(14.20)	22	(14.210)	44 (28.40)	

*Significant at p <0.05

Table-3 Comparison between Duration of Disease and Self Care Practices

Characteristic		Good Practices No.73 (47.1%)	Poor Practices No. 82 (52.9%)	Total n=155 No. (%)	F- value p-value
Duration of Disease (yrs)	<1	10 (06.4)	12 (07.7)	22 (14.1)	0.917 p=0.579
	1-<3	15 (09.7)	21 (13.6)	36 (23.3)	
	3-<5	28 (18.1)	15 (09.7)	43 (27.8)	
	>5	20 (12.9)	34 (21.9)	54 (34.8)	

*Significant at $p < 0.05$

DISCUSSION

In this study, the participants ages ranged from 25 to 83yrs, which is similar to the study conducted by Sekhar TVD Sasi in South India¹⁴. These findings may be because of the longevity of life, accessibility and better health services in urban areas. Maximum of them were between 45 to 54yrs (31.61%), which are slightly higher compared to study conducted by Peraje, where in the participants ages ranged from 40 to 49 years (Peraje Vasu Dinesh et al). The mean age is 52 yrs \pm 11.52 almost similar to studies conducted in south India by Sekhar and Kalaiselvi^{14,15}. The mean duration of disease is 5.6yrs which is slightly lower when compared to study by Sekhar¹⁴. On the other hand, age, sex, religion, caste, type of family, marital status, duration of disease did not show any association with SCPs, which was similar to study by Wu et al. However study by Sekhar¹⁴ showed an association age and sex with SCPs, which was statistically significant ($p = < 0.05$). In addition, most of the studies (Bogner et al, few workers. 2007), demonstrated a positive correlation between age and SCPs. It is well known that smoking and alcohol consumption in diabetic patients often leads to various co-morbidities and associated complications. Around 52(33.55%) participants from upper lower and lower middle class have shown poor self-care practices which may lead to DM associated morbidities/complications. This is in agreement with the findings of previous studies (Chio et al 2009, Hosler et al. 2005). Apparently, high income helps in facilitating certain self care practices related to the physical activity, dietary practice, blood sugar monitoring, compliance to medication and proper

foot care. In the current study, significant correlation ($p < 0.05$) was seen between SCPs and socio-economic class, smoking and alcohol consumption. Poor SCPs were noticed in patients belonging to low socio-economic class, those addicted to smoking and alcohol, suggesting lack of awareness on proper diabetic management. Comparison between duration of disease and SCPs showed 22 participants (14.1%) had diabetes for less than 1yr, 36 (23.3%) for 1-3yrs, 43 (27.8%) above 3-5yrs and 54 (34.8%) had diabetes for more than 5yrs. Of these, poor practices were observed in 34 (21.9%) of them. However, there was no association between SCPs and duration of diabetes statistically ($P > 0.05$). This could be attributed to the fact that current interventions only focus on patient and use of health services. In contrast, research indicates that long duration of diabetes had a positive correlation with good adherence to self-care practices (Chio et al. 2009; Xu et al. 2010)

LIMITATIONS

As this is a pilot study involving a small sample population, the results cannot be generally applicable to the entire community.

CONCLUSION

Management of DM can be improved in the long run by supporting SCPs among the diabetic patients. Health education on SCPs by health care providers will improve clinical outcomes and aid them to lead quality life. Hence role of clinicians in promoting self-care practices among these patients is vital and has to be emphasized.

Conflicts of Interest: No conflicts of interest

Source of Funding: Nil

REFERENCES

1. Rodrigues, Beverly T, Venkat N. Vangaveti, and Usman H. Malabu. 2016. "Prevalence and Risk Factors for Diabetic Lower Limb Amputation: A Clinic-Based Case Control Study", *Journal of Diabetes Research*. Article ID 5941957, <http://dx.doi.org/10.1155/2016/5941957>.
2. International Diabetes Federation, IDF Atlas, International Diabetes Federation, Brussels, Belgium, 6th Edition, 2011, <http://www.idf.org/diabetesatlas>
3. World Health Organization (WHO), factsheet report 2015
4. International Diabetes Federation, IDF Diabetes Atlas, 2015
5. Hingorani A, Glenn M. La Muraglia, Peter Henke, Mark H. Meissner, Lorraine Loretz, Kathya M. Zinszer, Vickie R. Driver, Robert Frykberg, Teresa L. Carman, William Marston, Joseph L. Mills Sr, and Mohammad Hassan Murad. 2016. "The Management of Diabetic Foot: A Clinical Practice Guideline by the Society for Vascular Surgery in Collaboration with the American Podiatric Medical Association and the Society for Vascular Medicine", *Journal of Vascular Surgery*. 63(2): 3S–21S.
6. American College of Endocrinology: The American association of clinical endocrinologist guidelines for the management of diabetes mellitus: the AACE system of diabetes self-management. *Endocr Pract* 2002, 8:S41-S84
7. American Association of Diabetes Educators: AADE7 Self-Care Behaviours. *Diabetes Educ* 2008, 34:445-449
8. UKPDS: Intensive blood glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). *Lancet* 1998, 352 (9131):837-853
9. Mensing C, Boucher J, Cypress M, Weinger K, Mulcahy K, Barta P: National standards for diabetes self-management education. *Diabetes Care* 2006, 29 (Suppl 1):S78-S85
10. Etzwiler DD: Diabetes translation: a blueprint for the future. *Diabetes Care* 1994,17(Suppl. 1):1–4
11. American Association of Diabetes Educators: AADE7 Self-Care Behaviors. *Diabetes Educ* 2008, 34: 445–449
12. V. Mohan, R. Deepa, M. Deepa, S. Somannavar, and M. Datta, "A simplified Indian diabetes risk score for screening for undiagnosed diabetic subjects," *Journal of Association of Physicians of India*, vol. 53, pp. 759–763, 2005
13. D. Toobert, S. Hampson, and R. Glasgow, "The summary of diabetes self-care activities measure: results from 7 studies and a revised scale," *Diabetes Care*, 2000;23(7):943–950
14. Sekhar TVD Sasi, Madhavi Kodali, Kalyan Chakravathy Burra, Baby Shalini Muppala, Parvathi Gutta, and Murali Krishna Bethanbhatla "Self Care Activities, Diabetic Distress and other Factors which Affected the Glycaemic Control in a Tertiary Care Teaching Hospital in South India", *Journal of Clinical and Diagnostic Research*, 2013;7(5):857-60
15. Kalaiselvi Selvaraj, Gomathi Ramaswamy, Shrivarthan Radhakrishnan, Pruthu Thekkur, Palanivel chinnakali, Gautam Roy, "Self-care practices among diabetes patients registered in a chronic disease clinic in Puducherry, South India", *Journal of Social health and Diabetes*. 2016;4 (1):25-29

Comparison of Stress Patterns in the Edentulous Mandibular Bone around Four Implant Retained Over Denture and All-On-Four Concept – A Three Dimensional Finite Element Analysis

Puneeth Hegde¹, Dhanasekar B², Satish Shenoy³, Aparna I.N⁴, Lokendra Gupta⁵,
Shobha J Rodrigues⁶, Thilak Shetty⁶

¹Reader, Department of Prosthodontics and Crown & Bridge, Manipal College of Dental Sciences, Manipal Academy of Higher Education, Manipal, Mangalore, ²Professor & Head, Department of Prosthodontics and Crown & Bridge, Manipal College of Dental Sciences, Manipal Academy of Higher Education, Manipal, Manipal, ³Professor & Head, Department of Aeronautical and Automobile Engineering, Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal, Manipal, ⁴Professor, Department of Prosthodontics and Crown & Bridge, Manipal College of Dental Sciences, Manipal Academy of Higher Education, Manipal, Manipal, ⁵Associate Professor, Department of Prosthodontics and Crown & Bridge, Manipal College of Dental Sciences, Manipal Academy of Higher Education, Manipal, Manipal, ⁶Associate Professor, Department of Prosthodontics and Crown & Bridge, Manipal College of Dental Sciences, Manipal Academy of Higher Education, Manipal, Mangalore

ABSTRACT

Purpose: The purpose of this study was to compare the stress patterns on a four implant supported over denture with that of All-On-Four Concept.

Method: The computed tomographic image of the human edentulous mandible was simplified into an arc shaped bone block of 7.5mm thick and 15 mm high with 1mm cortical bone layer. With the help of projector the implant design and dimensions were carefully recorded and same measurements were transferred to the FEA software. Three dimensional finite element analysis models of four implant supported over denture and the model with ALL-On-Four concept were prepared and were exposed to five different loading simulations.

Results: From the study it was found that the stress levels during full mouth loading was the highest for the four implant supported over denture compared to the prosthesis with All-On-Four concept. The stress levels for the cantilever and non-cantilever were nearly the same for all the simulated designs.

Keywords: Resorbed ridges, implant, All-On-Four, overdenture, finite element analysis.

INTRODUCTION

In recent years replacement of missing teeth with the implant supported prosthesis has been considered as

Corresponding Author:

Dr. Puneeth Hegde

Reader, Department of Prosthodontics and Crown & Bridge, Manipal College of Dental Sciences, (A Constituent College of Manipal Academy of Higher Education, Manipal) Light House Hill Road Hampankatta, Mangalore – 575001

one of the most sought after and predictable treatment options for the patients. Though more than 95% implant success has been reported, failure of an implant can lead to disappointment for both the clinician as well as the patient.^{1,2,3} Hence an attempt to understand the biomechanics and structural properties associated with implant load due to external forces needs to be analysed^{3,4}. The force factors during loading, the dynamic nature of loading, mechanical and structural properties of the prosthesis are the factors involved in design of an implant prosthesis^{2,6}. However accurate data on such

parameters are incomplete.

Often the available bone height in the posterior region is less than in the anterior region. Hence the proposed methods in the treatment of posterior edentulous ridge would include bone grafting, sinus floor elevation or zygomatic implants.^{5,7,11} These procedures might result in post-surgical complications like donor site morbidity, loss of bone graft and implant, sinusitis and fistula etc.

The All-On-Four concept was introduced to treat completely edentulous ridges without any advanced surgical procedures.^{1,2,6} The concept aims to maximise the use of existing bone thereby permitting longer and stronger implant placement. In All-On-Four concept, four implants are placed in the edentulous jaw. Two vertical anterior fixtures in the lateral incisor region and two posterior long fixtures with distal angulations at the premolar regions.^{3,4}

Placing the tilted implants is an effective and safe alternative in treatment for patients with atrophic ridges. The main advantage of this method is the possibility of omitting or reducing the length of the cantilever in the prosthesis. The concept permits placement of longer implants thereby increasing the implant- bone interface. Since the implants are placed in the patient's existing bone, complicated surgical procedures can be avoided.^{4,7} The present study aimed at comparing the amount and distribution of stress in the mandibular bone surrounding the implants in four implant supported prosthesis with the All-On-Four concept.

Aim

To compare the stress patterns in the edentulous mandibular bone around four implant retained over denture and the prosthesis restored with All-On-Four concept.

Objectives

To compare the biomechanical behaviour of the prosthesis restored with All-On-Four concept with that of four implant retained over denture using finite element analysis.

To compare the Von Misses stresses induced on the implants under different loading simulations.

MATERIAL & METHOD

After obtaining approval from the institutional

ethical and research committee, the study was carried out at

Department of Prosthodontics and Crown & Bridge, Manipal College of Dental Sciences, Manipal Academy of Higher Education, Manipal, Manipal.

Department of Aeronautical Engineering, Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal, Manipal.

Armamentarium used for the study

CT Scan of edentulous mandible

- Replace Select Tapered TiU NP 3.5 x 13mm (Nobel Biocare)
- The Profile Projector (METZ- 801)
- Cylindrical Retainer of 4mm diameter.
- ANSYS - 11 Workbench Software.

Preparation of FEM model of the Edentulous Mandible.^{1,9}

A Computerized tomography image of the human edentulous mandible was obtained and introduced into the Computer Aided Design Software. Using the ANSYS software, the CT image of the mandible was later simplified into an arc shaped bone block with dimensions of 7.5 mm thick and 15mm high. A 1mm cortical bone layer was established overlying the entire mandible whereas trabecular bone was used in the internal structure, simulating the type III bone. Once the computerized 3-Dimensional model was obtained, incorporation of the implant design into the model was planned.

Preparation of the FEM implant model

The study was done to compare the stress patterns in the edentulous mandible under various implant supported overdenture designs, so the accuracy and contour of the threaded implant was a major concern. But the contour, shape and depth of the threads in the implant could not be evaluated and reproduced in the 3-dimensional model with the help of the computerized tomography, hence an instrument called 'Profile Projector Optical System' was used in this study. The values that were obtained from the profile projector were then used to prepare an accurate 3-D model of the threaded implant along with

the retainer.

All profile projectors display magnified images on an appropriate viewing screen, as an aid to more precise determination of dimension, form and occasionally physical characteristics of sample parts. These optical projectors are able to display a two dimensional projection of a part rather than a simple linear dimension as with most other gauging devices.

This instrument creates work piece image on the projection screen at desired magnifications (10x, 20x, 50x) to provide accurate dimensional measurement as well as inspection of the contour and surface condition of the work piece.

The METZ- 801 features a large Projection Screen 300mm diameter and the combination of high performance projection lens and an optical system minimizing the magnification error, which may occur due to insufficient or improper focussing and ensures accurate measurements over the entire projection screen. The accuracy of this instrument is known to be 0.001mm.

Preparation of the working model^{1,9}

Three dimensional working models were constructed using 3D computer aided design software (ANSYS). The models represented the mandible restored with 4 implant supported prosthetic design and the design restored with the All On Four Concept. A rigid type III gold prosthetic bar, 6mm thick and 4mm high and in the shape of an arc was then designed and joined to the abutments.¹

For the 3- Dimensional four implant supported prosthesis model, in addition to the mesial implants placed bilaterally, distal implants were vertically placed bilaterally in the premolar region.

For the 3- dimensional 'All-On-Four' model, two anterior implants were placed vertically in the position of the lateral incisors and two implants were placed bilaterally in the position of second premolars and tilted distally to 30° angle.

To evaluate and compare the distribution of stresses on the implant on the three models, four loading situations were simulated in each model using load values similar to those of functional bite movements from patients with implant supported prostheses.

- Loading 1: Full mouth biting – bilateral and

simultaneous vertical static loads of

- 200 N was applied on the occlusal surface of the first molars (Cantilevers)

- 150 N on the occlusal surface of second premolars

- 150 N on the occlusal surface of first premolars

- 100 N on the distal of canines

- Loading 2: Lateral Load – Unilateral static load of 50 N applied in the region of left canine.

- Loading 3: Cantilever Load – Unilateral vertical static load of 200 N was applied on the left cantilever.

- Loading 4: Load without the cantilever - Unilateral vertical static load of 200 N was applied in the region adjacent to the left second premolar, simulating absence of cantilever.

The results of the mathematical solutions were later converted into visual results and expressed in colour gradients, ranging from shades of red, orange, yellow, green and blue, with red representing highest stress values. The stress values in the three models were collected and compared, with the points of greatest magnitude identified by the Von Mises equivalent stress levels.

This study was carried out on FEM models simulating four implant retained prosthesis and the prosthesis restored with the All-On-Four Concept under a) Full mouth load, b) Lateral load, c) Cantilever load, d) Load without cantilever.

RESULTS

The results of the numerical analysis are shown in Table - 2 for Von Mises stresses occurring for the FEM models.

The graph 1 represents the biomechanical behaviour of the four implant supported overdenture FEM models under different loading simulations. The maximum stress level in this model was found during the full mouth loading simulation which was 303.51 Mpa followed by load simulating cantilever loading which was 187.34 Mpa and load simulating load without cantilever which was 125.09 Mpa. The least stress was found during lateral loading shown as 57.35 Mpa.

Graph 2 illustrates the graphical representation

of the biomechanical behaviour of the FEM model simulating the prosthesis restored with the All-On-Four Concept. The maximum stress in this simulation was found during full mouth loading which was 253.37 Mpa followed by load simulating lateral load which was 88.01 Mpa and load simulating the cantilever load which was 85.22 Mpa. The least stress was found when load without cantilever was simulated which was 60.21 MPa.. The stress levels in the model simulating the All-On-Four concept were comparatively much less than the four implant supported overdenture model.

From the graphs it can be inferred that among the two models, the stress levels for full mouth loading simulation was more for four implant supported overdenture design and the least for All-On-Four overdenture design. For both the designs, the least stress was when the implants were loaded in a lateral direction. The stress levels for cantilever and non-cantilevered designs were nearly the same for all the simulated designs. From the study we also found out that maximum stress concentration was near the neck of the implant.

Table – 1: Representing Young’s modulus and Poisson’s ratio.

Material	Young’s Modulus	Poisson’s ratio
Cortical Bone	13.7	0.30
Trabecular bone	1.37	0.30
Titanium	115	0.35
Type III gold	100	0.30

Table – 2 : Representing peak stress values under different loading conditions.

	FOUR IMPLANT	ALL-ON-FOUR
A	303.51	253.37
B	57.35	88.01
C	187.34	85.22
D	125.09	60.21

DISCUSSION

Various clinical studies claim a rate of more than 90% success with implants for many implant systems.^{5,7} One of the most important deciding factors in success or failure of dental implant is the manner in which the stresses are transferred to the surrounding bone. However the vertical and transverse loads from mastication induce axial forces and bending moments and result in stress

gradients in implant as well as the bone. Various factors like type of loading, bone-implant interface, length and diameter of implants, shape and characteristics of the implant surface, the prosthesis type and also the quality and quantity of the surrounding bone decide the load transfer from the implants to the surrounding bone.

Despite medical and technological advancements, resorption of the ridges is one of the most common problems in edentulous ridges. In addition to this various anatomical landmarks and associated surgeries prevent us from placing implants in favourable sites. Hence All-On-Four concept is an excellent alternative to rehabilitation of patients with resorbed ridges.

The finite element analysis is a technique for obtaining a solution to a complex mechanical problems by dividing the problem domain into smaller and simpler domains. Since the components in the dental implant-bone system are extremely complex geometrically, finite element analysis has been considered as the most suitable tool for analysis.

Keeping in mind the consequences of unwanted stresses, this study was an attempt to compare the Von Mises Stresses around the implant by different loading conditions, on two different finite element models. The models were simulated on the basis of implant number, position, angulation and the type of prosthesis which is a Type III gold bar.

The results of the study imply that there is substantial physiological advantage in use of the All-On-Four concept compared to the conventional four implant supported prosthesis for rehabilitation of edentulous patients with implant supported prosthesis. The angled abutments permits placement of the implants in the most favourable quantity and quality of available bone in patients with compromised osseous anatomy, while enhancing the engineering and mechanics of the prosthesis by correcting the spatial relationships.

CONCLUSION

The results of this preliminary investigation suggests that endosseous implants placed following the All-On-Four concept for rehabilitation of completely edentulous patients has overall mechanical advantage when compared to the four implant supported prosthesis. And the All-On-Four concept can be routinely used in patients with compromised ridges and close proximity

to important anatomical structures thereby avoiding the requirement for additional surgical procedures.^{2,3,7}

Conflict of Interest : Nil

External Funding : Nil

REFERENCES

1. Guilherme Carvalho Silva, Jose Alfredo Mendonca, Luiza Randazzo Lopes, Janes Landre Jr: Stress patterns on implants in prostheses supported by four or six implants: A three dimensional finite element analysis. *Int J Oral Maxillofac Implants* 2010;25:239-246.
2. Martin Kregzde: A Method of Selecting the Best Implant Prosthesis Design Option Using Three-Dimensional Finite Element Analysis. *Int J Oral Maxillofac Implants* 1993;8:662-673.
3. Nancy L Cleland et al: Use of axisymmetric finite element method to compare maxillary bone variables for a loaded implant. *J Prosthodont* 1993;2:183-189.
4. Nancy L Clelland et al: A three dimensional finite element analysis of angled abutments for an implant placed in anterior maxilla. *J Prosthodont* 1995;4: 95-100.
5. Atilla Sertgoz, Sungur Guvener: Finite element analysis of the effect of cantilever and implant length on stress distribution in an implant-supported fixed prosthesis. *J Prosthet Dent* 1996;76:165-169.
6. Robert Kenny, Mark. W. Richard: Photoelastic stress patterns produced by implant retained overdentures. *J Prosthet Dent* 1998;80:559- 64.
7. Tamar Brosh, Raphael Pillo , David Sudai: The influence of abutment angulation on strains and stresses along the implant/bone interface: Comparison between two experimental techniques. *Journal of Prosthetic Dentistry* 1998;79:328-34.
8. Tom W.P. Koriioth , Andrew R. Johann: Influence of mandibular superstructure shape on implant stresses during simulated posterior biting. *J Prosthet Dent* 1999;82:67-72.
9. Dorothy E Eger, John C. Gunsolley, Sylvan Feldman: Comparison of angled and standard abutments and their effect on clinical outcomes: A preliminary Report. *Int J Oral Maxillofac Implants* 2000;15:819-823.
10. Jian-Ping, Keson B.C.Tan, Gui-Rong: Application of finite element analysis in implant dentistry: A review of literature. *J Prosthet Dent* 2001;85:585-98.
11. Haldun Iplikcioglu, Kivanc Akca, Murat C.Chreli, Saime Sahin: Comparison of non- linear finite element stress analysis with invitro strain guage measurements on morse taper implant. *Int J Oral Maxillofac Implants* 2003;18:258-265.
12. Chun-Li Lin, Jen-Chyan Wang: Non linear finite element analysis of a splinted implant with various connectors and occlusal forces. *Int J Oral Maxillofac Implants* 2003;18:331-340.
13. Shinichiro Tada, Roxana Stegaroiu, eriko Kitamura, Osamu Miyakawa: Influence of Implant bone quality on stress/strain distribution in bone around implants: A three dimensional finite element analysis. *Int J Oral Maxillofac Implants* 2003;18:357-368.
14. Mauro Cruz, Thomaz Wassall, Eison Magalhaes Toledo, Luis Paulo da Silva Barra, Afonso Celso de Castro Lemonge: Three dimensional finite element analysis of a cuneiform-geometry implant. *Int J Oral Maxillofac Implants* 2003;18:675-684.
15. Lisa A. Lang, Byungisk Kang BS, Rui-Feng Wang, Brien R.Lang: Finite element analysis to determine implant preload. *J Prosthet Dent* 2003;90:539-546.
16. Beata Dejak, Andrzej Mlotkowski, Maciej Romanowicz: Finite element analysis of stresses in molar during clenching and mastication. *J Prosthet Dent* 2003;90:591-597.
17. Allahyar Geramy, Steven M.Morgano: Finite element analysis of three designs of an implant supported molar crown. *J Prosthet Dent* 2004;92:434-440.
18. Lucie Himmlova, Tatjana Dostalova, Alois Kacovsky, Svatava Konvickova: Influence of implant length and diameter on stress distribution: A finite element analysis. *J Prosthet Dent* 2004;91:20-25.
19. Dincer Bozkaya, Sinan Muftu, Ali Muftu: Evaluation of load characteristics of five different implants in compact bone at different load levels by finite element analysis. *J Prosthet Dent* 2004;92:523- 530.
20. Murat Sutpideler, Steven E.Eckert, Mark Zobitz, Kai-Nan An: Finite element analysis of effect of prosthesis height, angle of force application, and implant offset on supporting bone. *Int J Oral Maxillofac Implants* 2004;19:819-825.

Enablers of Telemedicine Technology Adoption: A Case-Based Conceptualization in Indian Context

Samyadip Chakraborty¹, Vaidik Bhatt²

¹Associate Professor, ²Research Scholar, Department of Operations & IT, ICFAI Business School (IBS), Hyderabad, The ICFAI Foundation for Higher Education (IFHE) (Deemed to be university u/s 3 of the UGC Act 1956) Hyderabad-India

ABSTRACT

The paper investigates the information processing theory for telemedicine reach and ends up with the proposed model with the constructs which may leads towards the adoption behavior and reach. The systematic literature review followed by one to one interaction with the physicians, patients and telemedicine experts, the anecdotal propositions are made based on case studies which are likely to affect the implementation and adoption of telemedicine technology. The fit between the telemedicine information processing needs and telemedicine capabilities required for the adoption and reach of telemedicine. The fit is required between need and capabilities, so managers have to invest in partnership specific assets, training programs should be there to adoption and reach.

Keywords- Telemedicine, Healthcare, Rural India, Information Processing needs, Information Processing Capabilities

INTRODUCTION

Technology has always played an integral role in human social life. While use of some technology has increased standard of living, some other technology has improved the quality and assurance of life. Telemedicine is use of electronic information and communication technology by healthcare professionals with an aim to deliver a better health care services for patients with the different geographic locations. With the development of IT infrastructure, innovative technology applications in the field of healthcare had revolutionized healthcare delivery to patients across the globe.

But in a country like India where large chunk of population lives in rural areas and often remote areas as well, though the promise of telemedicine carries

lots of ideology and prospect, but how effective it is actual scenario in reaching to the needs of the poverty-stricken village people in often infrastructure-starved villages, looms large as a big question. This study aims to explore the way how the fit between the telemedicine information processing needs and telemedicine information processing capabilities can generate the adoption of telemedicine and ultimately leads towards the reach of telemedicine technology.

LITERATURE REVIEW

Telemedicine is a use of telecommunication technologies to provide medical information and healthcare services¹. It provides a digital platform on which patients' and medical experts or physicians can interact and physician can diagnose as well as prescribe the treatment and/or medicines as per the disease condition of patient⁴. By using the bandwidth, fog computing and the internet-based technologies telemedicine enables a treatment and diagnosis from the remote location as expert can treat the patient who lives in interior rural India and may not have an access to the superior healthcare¹⁵.

Corresponding author:

Vaidik Bhatt

Research Scholar, Department of Operations & ICFAI Business School (IBS), Hyderabad, The ICFAI Foundation for Higher Education (IFHE) (Deemed to be university u/s 3 of the UGC Act 1956) Hyderabad-India. E-mail: vaidik.bhatt@ibsindia.org

Recently Indian healthcare sector is having three major issues to deal with. Quality of care, access to care and affordability to care. Available WHO statistics also supports our argument as WHO (2016) data states that there is only 0.797 physician per 1000 population in India. Hence, providing healthcare to the last mile is a challenge.

Telemedicine is proven to fasten the speed of healthcare delivery because of its capabilities of remote sensing and remote treatment traveling can be avoided for the healthcare service^{2,3}. With the use of telemedicine network physician can use the collaborative network and can provide the services to more patients in a stipulated time¹. Moreover, India is divided into metro, semi metro, town and villages. Where, metro and semi metro cities have good service providers for healthcare in compare to town. But, villages are still untouched area for giant healthcare service providers who can provide extremely good services to open up a facility. Which creates a need for providing healthcare services to the last mile which cannot be fulfilled without the information sharing and information processing as one wrong decision can lead to the fatigue for the patient. Which clearly states that there is an *Information Processing Need*. By exploitation of telemedicine capabilities like Information communication technology for health (ICT4H)⁵ the gaps between the service quality can be narrowed.¹²

With the proper fit between the information processing needs which is providing the healthcare services via integrated information systems enabled through information technology and information processing capabilities which is telemedicine capabilities a proper healthcare system can be governed¹². Hence, it is possible to provide the affordable and quality healthcare services to the last mile as well as a people living below the poverty line¹⁰. with the industry 4.0 era healthcare services can also be provided from the mobile and wearable devices enabled IoT technology which can lead to the higher patient satisfaction with the better relations with the healthcare service providers also.

RESEARCH METHODOLOGY

The study follows a two-stage methodology for initial model formation and conceptualization. For the conceptualization part, systematic review of relevant academic and practitioner literature has been done followed by in-depth scenario understanding through

one-to-one discussions with few key stakeholders like physicians, patients, and technology experts. Systematic literature review has been followed by focused group discussion aiming at understanding the underlying practical linkages and subsequently followed by in depth interviews with semi structured questionnaires. Certain key aspects emerged out of as dominant enablers which hints towards providing key insight about the factors which can predominantly dominate the adoption and use of technology.

In the second phase due to dearth of enough empirical evidences, this study used a mix of two parallel techniques namely case-based modelling and q-sorting with industry experts as an alternative to pre-pilot and pilot studies. Through Q-sort technique¹¹ the study tried to incorporate an alternate investigative viewpoint using telemedicine implementation experts and physicians involved in similar fields. Through Q-sorting three aspects were closely monitored: Inter-rater reliability, Cohen's kappa and raw agreement scores and the study continued for three rounds with distinct sets of experts till all the three values above 0.9 were achieved. However, since in q-sorting the subjective perspectives of the experts were only taken into consideration, we have substantiated our claim through development of two fact-based realistic cases in the context of already running telemedicine projects in Indian context to add to the clarity and get a more nuanced understanding about the factors affecting telemedicine implementation and adoption. From the systematic literature review, semi structured focused group interview followed by Q-sort, and small case-based propositions this study goes forward to put forth five key propositions which carry immense managerial and practitioner implications.

Case Study

While we were in the process of focused group discussion with the telemedicine technology experts, physicians and patients, we have made two distinct case studies which portrays in lucid manner how telemedicine facility can work, what are the facilities that are needed for a telemedicine center, and how well it can impact the adoption and implementation of telemedicine technology; thereby aiming at providing better healthcare services.

Case Study – I

A prominent Pan-India private healthcare service

provider, with key multi-specialty chain hospital network spread across India, has developed telemedicine network and has been providing telemedicine services in almost all states of India, and nine overseas countries from their seven tertiary care facilities across the country. Patients have been evaluated from the distances ranging from 120 to 4500 miles as there is a need the hospital has developed capability to fulfill the need. Facilities are available for tele-auscultation and for transmitting and viewing an echocardiogram live from a few centers. facility has Web-based software platform, to transmit electrocardiograms, images, ultrasound pictures, MRI and other reports.

In India where there is dearth of electricity and power outages are common, if due to some network or technical error web based live tele-consultancy process gets stuck up, this telemedicine service provider has designed process backups like transcript emailing and diagnosis mailing to avoid ambiguity and synchronize incomplete consultations. Even storage, retrieval and re-evaluation facilities are also provided to distant patients. All the teleconsultations are recorded and stored. The facility uses broadband, ISDN line or VSAT (Very Small Aperture Terminal) for transmitting data, images, video, audio and provides a superior healthcare. All process level cross-checks prevent variability and enhances standardized care service delivery.

Case Study – II

The second case is in the context of rural telemedicine, service their rural outposts from metropolitan centers. This leading telemedicine service provider have been serving in rural India, from its metropolitan centers, using hub and spoke model for delivering better healthcare. For achieving the success, they have done the partnership with the rural practitioners as they do not possess advanced skills but they have basic skills and follows the guideline. The facility provides the training and motivates physician by lucrative incentives for telemedicine, The facility has a technology for video conferencing and transmitting, image, audio, video text towards both the ends. These are aimed at enhancing the pervasiveness and standardized care delivery practice by prescription mailing to the patient with all the necessary reports generated by experts at telemedicine facility to increase trust building between technology, doctors and patients and trying to mimic the existing care delivery practices in brick and mortar setups.

PROPOSITION DEVELOPMENT

As per the Information processing theory¹², a good fit between the information processing needs and information processing capabilities will lead towards a better outcome which may be an antecedent for the adoption. Adoption describes the behavior of user when user is using the technology for the first time.

We have used Venkatraman's strategy framework for defining a 'fit as matching'¹³ which leads to conclusion that proper matching of information processing needs and information processing capabilities required for adoption of a technology if anyone of the above mentioned constructs lacks either need or technology will not lead towards the fit¹⁴ as matching which will not lead to the adoption and thereby reach of telemedicine.

INFORMATION PROCESSING NEEDS

For providing a healthcare services information should be processed in a proper way as asymmetries between information or wrong information will mislead the physician's decision and approach towards the treatment and can be resulted into the dire consequences like fatigue. So, here the need is information must be produced and passed through the integrated systems which can give real time insights of the patient's condition to the physician.

Another issue over here is uncertainty. There is always an uncertainty observed with the patient's health condition. For dealing with the uncertainty telemedicine providers have to invest in a partnership specific asset or develop their own assets at the villages. As described in a case study I telemedicine service provider has developed their own asset and some other providers as in case study II has done the partnership with rural physician and their clinic. In both the cases tasks are clearly divided to challenge the status quo.

Proposition 1 – only information processing needs without a capability to process the information will not lead towards the adoption of technology.

INFORMATION PROCESSING CAPABILITIES

With the needs, the capabilities required to match. Telemedicine has a capability like, remote testing and diagnosis^{7,10}, treatment time optimization, information pervasiveness⁶. Telemedicine technology uses the web-based technology and thus remote diagnosis and

testing can be enabled. With the web-based credentials, the security of data can also be achieved as medical records cannot be handover to the unauthorized person, but the transparency so reports can be created between the physician and patient which will leads towards the patient’s satisfaction for the healthcare services¹⁶. With the treatment time optimization physician can take care of a more patient within a stipulated time and thus the issue of access to care can be resolved as travelling time for doctor as well as patient will significantly decreased.

Proposition 2 – Only capability to process the information is useless if there is no need to use the information and will not leads to the fruitful outcome of adopting the same.

FIT AS MATCHING

There are six dimensions for fit on a strategic point of view¹³, and we have used ‘fit as matching’ in the operational perspective rather than the strategic perspective to observe the adoption behavior. The information processing theory¹² suggests that, proper matching should be there between data processing needs and telemedicine capabilities to enhance the adoption of telemedicine technology. In the era of industry 4.0 telemedicine can be combined with the other technologies and concepts like, IoT, healthcare analytics, artificial intelligence for healthcare, which provides a better capability to process the data need in near real time.

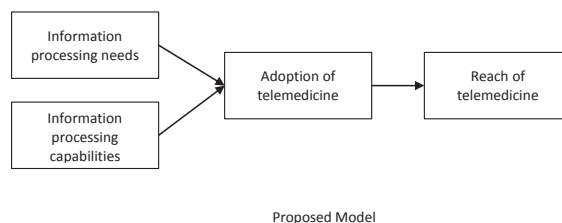
This suggests that with the minimal efforts the fit can be achieved, which will lead to the adoption of technology, because as per TAM perspective⁸ person will use the technology for the first time if user perceives the usefulness of the technology.

Proposition 3 – When a fit is created between the need and capabilities for processing the information, then only the technology can be adopted.

ADOPTION

As per TAM perspective⁸, if user has used the technology once and found it useful, then the probability of using it for second time and so on is higher. With the promotion of technology to others, user also start adopting a technology with cognitive thinking ability and the reach can be created.

Proposition 4 – Adoption of technology will create the reach for telemedicine technology as more users starts to adopting the telemedicine.



IMPLICATIONS

MANAGERIAL IMPLICATIONS

Forim plementation of telemedicine hospital management must invest on it specifically in the partnership related assets which we have discussed, as telemedicine is able to provide high returns on investment as only one-time technology cost is there, but after implementation more patients can be handled swiftly which increases the patient’s satisfaction. For the constraints related to technology Indian Space Research Organization (ISRO) has already launched a satellite, for an exclusive use of telemedicine and healthcare technology, which can have a wide reach and range of connectivity which increases the capability. Hospital management also supports the training program for the telemedicine operations for doctors and telemedicine operators, as training can motivates the usefulness, adoption and reach of technology.

SOCIETY AT LARGE

Government should also take the initiatives and make a telemedicine center at government hospitals in a metropolitan city, on the other end, primary healthcare center or “Aanganwadi” in the villages should be made as a teleconsultation program – which is connected with one or other hospitals with government as well as private telemedicine set up to decrease the uncertainty of partnership and provide an access of healthcare services to the last mile. These types of initiatives will satisfy the need of processing the information with the merged capability and can achieve a good fit, which can helpful to increase the reach of telemedicine at the end, as telemedicine is able to provide the superior healthcare services to the last mile at affordable cost.

ACADEMIC IMPLICATIONS

Researchers and scholars can remove the

technological as well as managerial constraints which are hurdle in the implementation and adoption of technology by achieving the good fit. moreover, how to enhance the reach and adoption for telemedicine especially in India, as India is a country with wide variety of geography, psychology and interior villages where reach is an issue. Moreover, in which disease condition and for which disease how telemedicine technology can be used effectively and efficiently is an area for research.

FUTURE SCOPE

Scope of converting the proposition into testable hypotheses to be tested empirically.

Ethical Clearance: As it is management study and no experimentation done in the laboratory no ethical clearance needed

Source of Funding:- Self

Conflict of Interest:- Nil

REFERENCES

1. Sims JM. Communities of practice: Telemedicine and online medical communities. *Technological Forecasting and Social Change*. 2018 Jan 1;126:53-63.
2. Parajuli R, Doneys P. Exploring the role of telemedicine in improving access to healthcare services by women and girls in rural Nepal. *Telematics and Informatics*. 2017 Nov 1;34(7):1166-76.
3. Dullet NW, Geraghty EM, Kaufman T, Kisse JL, King J, Dharmar M, Smith AC, Marcin JP. Impact of a university-based outpatient telemedicine program on time savings, travel costs, and environmental pollutants. *Value in Health*. 2017 Apr 1;20(4):542-6.
4. Sasikala S, Indhira K, Chandrasekaran VM. Performance prediction of interactive telemedicine. *Informatics in Medicine Unlocked*. 2018 Mar 24.
5. Chandwani R, De R, Dwivedi YK. Telemedicine for low resource settings: Exploring the generative mechanisms. *Technological Forecasting and Social Change*. 2018 Feb 1;127:177-87.
6. Bos L, Marsh A, Carroll D, Gupta S, Rees M. Patient 2.0 Empowerment. *InSWWS 2008 Jul 14 (Vol. 97, No. 4, pp. 164-168)*.
7. Tachakra S, Wang XH, Istepanian RS, Song YH. Mobile e-health: the unwired evolution of telemedicine. *Telemedicine Journal and E-health*. 2003 Sep 1;9(3):247-57.
8. Venkatesh V, Davis FD. A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science*. 2000 Feb;46(2):186-204.
9. Surana S, Patra R, Nedeveschi S, Brewer E. Deploying a rural wireless telemedicine system: Experiences in sustainability. *Computer*. 2008 Jun 1(6):48-56.
10. Ganapathy K, Ravindra A. Telemedicine in India: the Apollo story. *Telemedicine and e-Health*. 2009 Jul 1;15(6):576-85.
11. Moore GC, Benbasat I. Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information systems research*. 1991 Sep;2(3):192-222.
12. Galbraith, J.R. *Designing Complex Organizations*. Reading, MA: Addison-Wesley, 1973.
13. Venkatraman, N., The concept of fit in strategy research: Towards verbal and statistical correspondence. *Academy of Management Review*, 14, 3 (1989), 423-444.
14. Premkumar G, Ramamurthy K, Saunders CS. Information processing view of organizations: An exploratory examination of fit in the context of interorganizational relationships. *Journal of Management Information Systems*. 2005 Apr 1;22(1):257-94.
15. Rahmani AM, Gia TN, Negash B, Anzanpour A, Azimi I, Jiang M, Liljeberg P. Exploiting smart e-Health gateways at the edge of healthcare Internet-of-Things: A fog computing approach. *Future Generation Computer Systems*. 2018 Jan 1;78:641-58.
16. Ghani A. Healthcare electronics—A step closer to future smart cities. *ICT Express*. 2018 Feb 15.

An Empirical Relationship between Organisational Culture and Performance Management

M Jayanthi¹, G.S. Maheswari²

¹Research Scholar, ²Professor & Research Supervisor, Department of Commerce, Vistas, Pallavaram, Chennai

ABSTRACT

The main aim of this study is to identify the factors determining organisational culture and to find the relationship between organisational culture and Performance Management. Organisational culture affects the performance management directly. The researcher used regression analysis to find the results. It finds that there is a positive relationship between the organisational culture and performance management and the good organisational culture achieved the firm's goal and improve the employee's performance.

Keywords: *Organisational culture, Organisational Performance*

INTRODUCTION

Organizational culture is defined as the underlying beliefs, assumptions, values and ways of interacting that contribute to the unique social and psychological environment of an *organization*. Also, *organizational culture* may influence how much employees identify with their *organization* (Schrodt, 2002).

Organizational culture and performance relation has been examined by many researchers (Ogbonna & Harris, 2000; Rousseau, 1990; Kotter & Heskett, 1992; Marcoulides & Heck, 1993), not much research has been done on organizational culture as a contextual factor of performance management (Magee, 2002).

Organizational culture works a lot like this. Every company has its own unique personality, just like people do. The unique personality of an organization is referred to as its culture. In groups of people who work together, organizational culture is an invisible but powerful force that influences the behavior of the members of that group.

Organizational culture is a system of shared assumptions, values, and beliefs, which governs how people behave in organizations. These shared values have a strong influence on the people in the organization and dictate how they dress, act, and perform their jobs. Every organization develops and maintains a unique culture, which provides guidelines and boundaries for the behavior of the members of the organization.

IMPORTANCE OF ORGANISATIONAL CULTURE

The culture decides the way employees interact at their workplace. A healthy culture encourages the employees to stay motivated and loyal towards the management.

The culture of the workplace also goes a long way in promoting healthy competition at the workplace. Employees try their level best to perform better than their fellow workers and earn recognition and appreciation of the superiors. It is the culture of the workplace which actually motivates the employees to perform.

Every organization must have set guidelines for the employees to work accordingly. The culture of an organization represents certain predefined policies which guide the employees and give them a sense of direction at the workplace. Every individual is clear about his roles and responsibilities in the organization and know how to accomplish the tasks ahead of the deadlines.

Corresponding Author:

Dr. G.S. Maheswari

M.Com., M.Phil., B.Ed., Ph.D.,

Professor & Research Supervisor, Department of Commerce, Vistas, Pallavaram, Chennai

E mail id – roshanmaheswari@gmail.com

No two organizations can have the same work culture. It is the culture of an organization which makes it distinct from others. The work culture goes a long way in creating the brand image of the organization. The work culture gives an identity to the organization. In other words, an organization is known by its culture.

The organization culture brings all the employees on a common platform. The employees must be treated equally and no one should feel neglected or left out at the workplace. It is essential for the employees to adjust well in the organization culture for them to deliver their level best.

Organizational culture and performance relation has been examined by many researchers (Ogbonna & Harris, 2000; Rousseau, 1990; Kotter & Heskett, 1992; Marcoulides & Heck, 1993), not much research has been done on organizational culture as a contextual factor of performance management (Magee, 2002).

In this article the researcher discuss the relationship between the organisational culture and Performance management ,the factors determining organisational culture.

REVIEW OF LITERATURE

Angelo S. et al(2006) Performance Appraisal, Performance Management and Improving Individual Performance: A Motivational Framework. Journal compilation USA. Performance appraisal has been the focus of considerable research for almost a century. This research has resulted in very few specific recommendations about designing and implementing appraisal and performance management systems whose goal is performance improvement. We review these trends and their genesis, and propose a motivational framework as a means of integrating what we have learned and generating proposals for future research that focus on employee's performance improvement¹.

UIMujeeb et al(2011). Relationship between Organizational Culture and Performance Management Practices: A Case of University in Pakistan. The aim of this study is to expand the base of knowledge and empirically test the relationship between the components of organizational culture and performance management practices. The regression and correlation statistical analysis were used. The results from the statistical analysis show that, involvement is highly

correlated with consistency and adaptability. Similarly, the other dimensions of organizational culture have a positive significant relationship with the performance management practices⁶.

Maastricht (2011)The impact of performance management on the results of a non-profit organization Andre ´ de Waal Centrefor Organizational Performance. International Journal of Productivity and Performance Management Vol. 60 No. 8, 2011 pp. 778-796. This article aims to describe the results of a study that explored the quantitative impact of performance management on the results of a non-profit organization. The research shows that several key activities related to the introduction of performance management have an impact on the results of an organization although not always in an expected positive way³.

Pamela F. Resurrection,(2012) Performance Management and Compensation as Drivers of Organization Competitiveness: The Philippine Perspective. International Journal of Business and Social Science. Vol. 3 No. 21; November 2012. The study was conducted to determine the extent of implementation of select performance management and compensation practices in Filipino-owned SMEs and its underlying relationships with organizational competitiveness. This study found that human resource management practices in performance management and compensation, particularly employee benefits were all found to be significant predictors of organizational competitiveness. This finding signify that Filipino – owned companies are giving more emphasis on employee benefits to support its thrust of achieving competitiveness, further suggesting that employees are more motivated to perform if employee benefits that allows flexibility and convenience are provided⁴.

Hsi-Ying Hsieh(2015)The Influence of Leadership Style and Corporate Culture on Organizational Commitment and Job Performance - A Comparison between a Local 5-star Hotel and an International Chain Hotel in Taiwan. Proceedings of the Third Asia-Pacific Conference on Global Business, Economics, Finance and Banking (AP15Singapore Conference) ISBN: 978-1-63415-751-3 17-19 July 2015 Paper ID: S539. This study examined the influence of corporate culture and leadership styles on organizational commitment and job performance in a local 5-star hotel and an international chain hotel in Taiwan. The combined samples show

innovative and supportive cultures, and a consideration leadership style, had positive effects on employee organizational commitment and job performance, with the influence of an innovative culture on employee organizational commitment and job performance, and the influence of a consideration leadership style on employee organizational commitment, being stronger in the sample of International Chain Hotel².

Parvee Ahmed Alam Performance Management System: A Conceptual Framework. In this paper an attempt has been made to provide a conceptual framework through reviewing the relevant literature with reference to Performance Management System (PMS)-its genesis and process; its linkage with Human Resource Systems, the impact it has in the business arena as well as the modern trends in PMS. An attempt has also been made to touch upon the, how-so-ever limited, literature in this field focusing on the Indian scenario⁵.

Table – 1 One-Sample statistics

	N	Mean	Std. Deviation	Std. Error Mean
External parties	100	3.60	1.279	.128
Goals of the firm	100	3.17	1.457	.146
Management style	100	3.17	1.303	.130
Employees involvement	100	2.61	1.675	.168
Goodwill of the firm	100	3.07	1.328	.133

Table – 2 One-Sample Test

	Test Value = 0						Rank
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference		
					Lower	Upper	
External parties	28.142	99	.000	3.600	3.35	3.85	1
Goals of the firm	21.760	99	.000	3.170	2.88	3.46	2
Management style	24.327	99	.000	3.170	2.91	3.43	3
Employees involvement	15.581	99	.000	2.610	2.28	2.94	5
Goodwill of the firm	23.123	99	.000	3.070	2.81	3.33	4

OBJECTIVES OF THE STUDY

To identify the factors determining organisational culture.

To find the relationship between organisational culture and Performance Management.

HYPOTHESES OF THE STUDY

There is no significant influence among the variables of organisational culture.

There is no significant relationship between the organisational culture and Performance Management.

ANALYSIS OF T-TEST

In the case of Organisational culture the researcher identifies that the following order is perceived very important for the reliability measure

From the above table it can be found that the mean values range from 2.610 to 3.600 with the respective standard deviation and standard error. The t values 28.142, 21.327, 24.327, 15.581, 23.123, are statistically significant at the 5 % level. The t values are statistically insignificant at 5% level. Therefore, it can be concluded, among the 5 factors external parties which is involved in the firm’s transactions are affected more than the other factors.

INFLUENCE OF ORGANISATIONAL CULTURE ON PERFORMANCE MANAGEMENT

The cultural factor covers five variables and its subsequent influence over Performance management is measured through linear multiple regression analysis. The results are shown below

Table – 3 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.983 ^a	.967	.965	.273

a. Predictors: (Constant), Factor5, Factor4, Factor1, Factor2, Factor3

In the above table persist that R=.983 R square = .967 and adjusted R square .965. It indicates that the cultural variable creates 97.7% variance over the Performance management. The cumulative influence of five variables of cultural over Performance management is formulated through the following one way analysis of variance.

Table – 4 ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	204.021	5	40.804	546.441	.000 ^b
	Residual	7.019	94	.075		
	Total	211.040	99			

a. Dependent Variable: performance management
 b. Predictors: (Constant), Factor5, Factor4, Factor1, Factor2, Factor3

It was inferred in the above table that f=546.441 p=.000 are statistically significant at 5% level. This indicates to all the five variables cumulatively responsible for Performance management. The individual influence of all this five variables is clearly given in the following co-efficient table.

Table – 5 Coefficients^a

Model	B	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		Std. Error	Beta			
1	(Constant)	-.259	.088		-2.937	.004
	External parties	.479	.059	.419	8.111	.000
	Goals of the firm	.488	.064	.487	7.599	.000
	Management style	.003	.102	.002	.026	.979
	Employees involvement	-.004	.031	-.004	-.120	.904
	Goodwill of the firm	.114	.107	.104	1.061	.291

a. Dependent Variable: performance management

It was presented in the above table External parties (Beta=.419, t=-8.111, p=.000), Goals of the firm (Beta=.487, t=7.599, p=.000), Management style (Beta=.002, t=.026, p=.979), employee's involvement (Beta=-.004, t=-.120, p=.904), Goodwill of the firm (Beta=.104, t=1.061, p=.291) are statistically significant at 5% level. This indicates that the goals of the firm achieved because of organisational culture and it influenced in the performance management.

FINDINGS AND CONCLUSIONS

Organisational culture affects the performance management directly. There is a positive relationship between the organisational culture and performance management.

Good organisational culture achieved the firm's goal and improve the employee's performance.

Good will of the firm also determined by organisational culture.

External parties such as suppliers, creditors etc., also affected because of organisational culture.

Thus, Organisational culture influenced the performance management and the firm should have to develop good cultural traits to achieve the mission.

Conflict of Interest – Nil

Ethical Clearance – Taken from UGC Committee

Source of Funding- Self

REFERENCES

1. Angelo S. DeNisiet al. Performance Appraisal Performance Management and Improving Individual Performance: A Motivational Framework. Journal compilation USA .2006.
2. Hsi-Ying Hsieh. The Influence of Leadership Style and Corporate Culture on Organizational Commitment and Job Performance - A Comparison between a Local 5-star Hotel and an International Chain Hotel in Taiwan. Proceedings of the Third Asia-Pacific Conference on Global Business, Economics, Finance and Banking (AP15 Singapore Conference) 19 July 2015 ISBN: 978-1-63415-751-3 17- Paper ID: S539.
3. Maastricht. The impact of performance management on the results of a non-profit organization Andre ' de Waal Centre for Organizational Performance. International Journal of Productivity and Performance Management 2011. Vol. 60 No. 8, pp. 778-796.
4. Pamela F. Resurrection. Performance Management and Compensation as Drivers of Organization Competitiveness: The Philippine Perspective. International Journal of Business and Social Science. November 2012. Vol. 3 No. 21;
5. Parvee11 Ahmed Alam Performance Management System: A Conceptual Framework.
6. UlMujeebEhtesham, et al. Relationship between Organizational Culture and Performance Management Practices. 2011.

Three Dimensional Finite Element Stress Analysis of Two and Four Implant Supported Prosthesis

Puneeth Hegde¹, Dhanasekar B², Satish Shenoy³, Aparna LN⁴, Lokendra Gupta⁵, Umesh Y⁶, Mahesh M⁶

¹Reader, ²Professor & Head, Department of Prosthodontics and Crown & Bridge, ³Professor & Head, Department of Aeronautical and Automobile Engineering, ⁴Professor, ⁵Associate Professor, ⁶Associate Professor, Department of Prosthodontics and Crown & Bridge, Manipal College of Dental Sciences, Manipal Academy of Higher Education, Manipal, Mangalore

ABSTRACT

Purpose: The biomechanical behavior of the two-implant-supported overdenture was compared with that of four-implant supported mandibular overdenture using the three dimensional finite element method (FEM). Thereby evaluating the von Misses stresses induced on the implants under different loading simulations.

Materials & Method: Three dimensional models representing mandible restored with two-implant-supported and four-implant-supported prosthesis were developed in the three dimensional design software and then transferred into FEM software. The models were then subjected to four different loading simulations (full mouth biting, canine disclusion, load on cantilever, load in the absence of cantilever). The maximum von Mises stresses were localized and quantified for comparison.¹

Results: Among the three models, under all loading simulations, the maximum stress concentrations were along the neck of the implant. The stress levels for full mouth loading simulation was highest for two implant supported overdenture design when compared with the four implant retained overdenture design. In both the designs, the least stress was when the implants were loaded in a lateral direction. The stress levels for cantilever and non-cantilevered designs were nearly the same for all the simulated designs.

Conclusion: When tested under different loading simulations, both models showed similar location and distribution of stress patterns. Thus from the study it can be concluded that the four implant retained overdenture design is a better treatment option for the atrophic edentulous ridges and induces comparatively less amount of stresses on the edentulous ridges. Therefore the overall longevity of the prosthesis is greatly enhanced.

Keywords: atrophic mandible, biomechanics, finite element analysis, implants supported prosthesis, overdenture

INTRODUCTION

The high success rate and patient satisfaction has made it possible for implants to be used extensively for

rehabilitation of partially and completely edentulous jaws with fixed or removable prosthesis². However marginal bone loss is a common occurrence in implant supported prosthesis which can be attributed to compromised oral hygiene and unfavorable biomechanical factors^{1,2}.

Corresponding Author:

Dr. Puneeth Hegde

Reader, Department of Prosthodontics and Crown & Bridge, Manipal College of Dental Sciences, (A Constituent College of Manipal Academy of Higher Education, Manipal) Light House Hill Road Hampankatta, Mangalore – 575001, India

Compromised oral hygiene needs to be dealt with by motivating the patient to strictly follow good oral hygiene and also by periodic recall and checkup. However precise analysis and sound treatment plan is necessary for controlling the biomechanical factors.

Various factors like size of implant, its location in the edentulous ridge, implant design, quality & quantity of bone and the host overall health & maintenance play a substantial role in load transfer and stress concentration. Specific factors like force factors during loading, the dynamic nature of loading, mechanical and structural properties of the prosthesis are the factors involved in design of an implant prosthesis^{2,6}. However accurate data on such parameters are incomplete.

Hence the present study evaluates and compares the stress patterns in the edentulous mandibular bone around two implant retained with that of four implant retained over denture under different loading conditions using finite element analysis.

Aim

To compare the stress patterns in edentulous mandibular bone around two implant retained over denture and the prosthesis restored with four implant retained over denture.

Objective

To compare the biomechanical behavior of the two implant retained over denture with that of four implant retained over denture using finite element analysis.

To compare the Von Misses stresses induced on the implants under different loading simulations.

MATERIAL & METHOD

After obtaining approval from the institutional ethical and research committee, the study was carried out at

Department of Prosthodontics and Crown & Bridge, Manipal College of Dental Sciences, Manipal Academy of Higher Education, Manipal, Manipal.

Department of Aeronautical Engineering, Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal, Manipal.

Armamentarium used for the study

CT Scan of edentulous mandible

- Replace Select Tapered TiU NP 3.5 x 13mm (Nobel Biocare)

- The Profile Projector (METZ- 801)
- Cylindrical Retainer of 4mm diameter.
- ANSYS - 11 Workbench Software.

Preparation of FEM model of the Edentulous Mandible.^{1,3}

A Computerized tomography image of the human edentulous mandible was obtained and introduced into the Computer Aided Design Software. Using the ANSYS software, the CT image of the mandible was later simplified into an arc shaped bone block with dimensions of 7.5 mm thick and 15mm high. A 1mm cortical bone layer was established overlying the entire mandible whereas trabecular bone was used in the internal structure, simulating the type III bone. Once the computerized 3-Dimensional model was obtained, incorporation of the implant design into the model was planned. The Young's Modulus and Poisson's ration used for the study is given in table 1.

Preparation of the FEM implant model^{1,3}

The study was done to compare the stress patterns in the edentulous mandible under various implant supported overdenture designs, so the accuracy and contour of the threaded implant was a major concern. But the contour, shape and depth of the threads in the implant could not be evaluated and reproduced in the 3-dimensional model with the help of the computerized tomography, hence an instrument called 'Profile Projector Optical System' was used in this study. The values that were obtained from the profile projector were then used to prepare an accurate 3-D model of the threaded implant along with the retainer.

All profile projectors display magnified images on an appropriate viewing screen, as an aid to more precise determination of dimension, form and occasionally physical characteristics of sample parts. These optical projectors are able to display a two dimensional projection of a part rather than a simple linear dimension as with most other gauging devices.

This instrument creates work piece image on the projection screen at desired magnifications (10x, 20x, 50x) to provide accurate dimensional measurement as well as inspection of the contour and surface condition of the work piece.

The METZ- 801 features a large Projection Screen 300mm diameter and the combination of high performance projection lens and an optical system minimizing the magnification error, which may occur due to insufficient or improper focussing and ensures accurate measurements over the entire projection screen. The accuracy of this instrument is known to be 0.001mm.

Preparation of the working model^{1,3}

Three dimensional working models were constructed using 3D computer aided design software (ANSYS). The models represented the mandible restored with 4 implant supported prosthetic design and the design restored with the All On Four Concept. A rigid type III gold prosthetic bar, 6mm thick and 4mm high and in the shape of an arc was then designed and joined to the abutments.¹

For the 3-Dimensional two implant supported prosthesis model, the threaded implants were strategically placed vertically in the region of lateral incisors bilaterally.

For the 3- Dimensional four implant supported prosthesis model, in addition to the mesial implants placed bilaterally, distal implants were vertically placed bilaterally in the premolar region.

To evaluate and compare the distribution of stresses on the implant on the three models, four loading situations were simulated in each model using load values similar to those of functional bite movements from patients with implant supported prostheses.

- Loading 1: Full mouth biting – bilateral and simultaneous vertical static loads of

- 200 N was applied on the occlusal surface of the first molars (Cantilevers)

- 150 N on the occlusal surface of second premolars

- 150 N on the occlusal surface of first premolars

- 100 N on the distal of canines

- Loading 2: Lateral Load – Unilateral static load of 50 N applied in the region of left canine.

- Loading 3: Cantilever Load – Unilateral vertical static load of 200 N was applied on the left cantilever.

- Loading 4: Load without the cantilever - Unilateral vertical static load of 200 N was applied in the region

adjacent to the left second premolar, simulating absence of cantilever.

The results of the mathematical solutions were later converted into visual results and expressed in colour gradients, ranging from shades of red, orange, yellow, green and blue, with red representing highest stress values. The stress values in the three models were collected and compared, with the points of greatest magnitude identified by the Von Mises equivalent stress levels.

This study was carried out on FEM models simulating two implant retained prosthesis and four implant retained prosthesis under a) Full mouth load, b) Lateral load, c) Cantilever load, d) Load without cantilever.

RESULTS

The results of the numerical analysis are shown in Table - 2 for Von Mises stresses occurring for the FEM models.

The Table 2 represents the biomechanical behavior of the two implant supported over denture FEM modes when subjected to different loading simulations. The graph depicts maximum stress levels during full mouth loading simulation which was 2226.7 Mpa followed by cantilever loading simulation which was 813.09 Mpa and load without cantilever shown as 531.39 Mpa. The least stress for this model was found during the lateral loading simulation which was 64.76 Mpa.

The table 2 also represents the biomechanical behavior of the four implant supported over denture FEM models under different loading simulations. The maximum stress level in this model was found during the full mouth loading simulation which was 303.51 Mpa followed by load simulating cantilever loading which was 187.34 Mpa and load simulating load without cantilever which was 125.09 Mpa. The least stress was found during lateral loading shown as 57.35 Mpa. The stress levels in the four implant simulation were comparatively much less than the two implant supported overdenture model.

From the analysis it can be inferred that among the two models, the stress levels for full mouth loading simulation was more for two implant supported overdenture design and the least for four implant supported overdenture design. For both the designs,

the least stress was when the implants were loaded in a lateral direction. The stress levels for cantilever and non-cantilevered designs were nearly the same for all the simulated designs. From the study we also found out that maximum stress concentration was near the neck of the implant.

Table – 1 Young’s Modulus & Poisson’s Ratio used in the study¹.

<i>MATERIAL</i>	<i>YOUNG’S MODULUS</i>	<i>POISSON’S RATION</i>
CORTICAL BONE	13.7	0.30
TRABECULAR BONE	1.37	0.30
TITANIUM	115	0.35
TYPE III GOLD	100	0.30

Table – 2 Maximum stress values recorded during different simulations.

	<i>TWO IMPLANT (Mpa)</i>	<i>FOUR IMPLANT (Mpa)</i>
Full Mouth biting	2226.7	303.51
Lateral Load	64.76	57.35
Cantilever Load	813.09	187.34
Load without Cantilever	531.39	125.09

DISCUSSION

In the patient’s mouth, the dental implants are frequently subjected to multidirectional loads originating from the stomatognathic system ^{2,3}. The osseointegrated implant interface is rigid and transmits the occlusal loads directly into the underlying bone. These loads lead to stress on the residual bone leading to accelerated bone resorption. Proper analysis of the stress distribution and subsequent implant treatment planning is necessary when implant supported over dentures are planned for the completely edentulous patients ^{3,4}.

The finite element method is a numerical technique for structural analysis. This technique involves dividing the structure into simpler parts called finite elements. These finite elements are collectively called the mesh. Their assembly at the corner are called the nodes. When the nodes are subjected to certain loads, it results in

change in the mechanical model. Compilation of all these results are done by the ANSYS software in the computer to obtain accurate results. The finite element analysis has been used to study stress distribution in implants ^{4,5,6}.

Keeping in mind the consequences of unwanted stresses, this study was an attempt to compare the Von Mises Stresses around the implant by different loading conditions, on two different finite element models. The models were simulated on the basis of implant number, position, angulation and the type of prosthesis which is a Type III gold bar.

Thereby attempting to analyze the best treatment option between the two.

From the study it was found that the four implant retained over denture substantially reduced stress concentration and was better able to distribute the stresses when compared to the two implant retained over denture design. Hence for the long term success and patient comfort the four implant over denture design should always be preferred over the two implant design.

Further analysis in this regard by comparing the four implant design with that of All-On-Four and six implant over denture designs are the need of the hour. Thus enhancing rehabilitation options for completely edentulous patients with atrophic ridges and close proximity to important anatomical landmarks.

CONCLUSION

The results of the preliminary investigation suggests that the four implant supported over denture design for rehabilitation of the completely edentulous patients is better option when compared to the two implant supported over denture design. The load transferred by the two implant over denture design leads stress concentration and can lead to severe resorption and eventually may lead to implant failure. Hence the four implant design should be used routinely for the long term success of the prosthesis.

Conflict of Interest : Nil

External Funding : Nil

Ethical Clearance & Research Committee Clearance : Manipal College of Dental Sciences, Manipal (A constituent of Manipal Academy of Higher Education, Manipal)

REFERENCES

1. Guilherme Silva, Jose Mendonca, Luiza Lopes, Janes Landre: Stress Patterns on Implants in Prostheses supported by Four or Six Implants: A Three Dimensional Finite Element Analysis. *Int J Oral Maxillofac Implants* 2010;25:239-246
2. Shinichiro Tada, Roxana Stegaroiu, Eriko Kitamura, Osamu Miyakawa, Haruka Kusakari: Influence of Implant Design and Bone Quality on Stress/Strain Distribution in Bone Around Implants: A 3- dimensional Finite Element Analysis. *Int J Oral Maxillofac Implants* 2003;18(3):357-368
3. Sawako Yokoyama, Noriyuki Wakabayashi, Makoto Shiota, Takashi Ohyama: Stress analysis in Edentulous Mandibular Bone Supporting Implant – Retained 1-piece or Multiple superstructures. *Int J Oral Maxillofac Implants* 2005;20:578-583
4. Atilla sertgoz, Sungur Guvener: Finite element analysis of the effect of cantilever and implant length on stress distribution in an imlant supported fixed prosthesis. *J Prosthet Dent* 1996;76:165-169.
5. Mauro Cruz, Thomas Wassall, Elson Magalhaes Toledo, Luis Paulo da Silva, Afonso Celso: Three dimensional Finite Element Stress Analysis of a Cuneiform Geometry Implant. *Int J Oral Maxillofac Implants* 2003;18(5):675-684
6. Nancy L Clelland et al: A three dimensional finite element analysis of angled abutments for an implant placed in anterior maxilla, *Journal of Prosthodontics* 1995; 4:95-100.
7. Nancy L Clelland et al: Use of axisymmetric finite element method to compare maxillary bone variables for a loaded implant. *Journal of Prosthodontics* 1993;2: 183- 189
8. Dorothy E Eger et al: Comparison of angled and standard abutments and their effect on clinical outcome, *Int J Oral Maxillofac Implants* 2000;15(6):819-823
9. Martin Kregzde: A Method of Selecting the Best Implant Prosthesis Design Option Using Three-Dimensional Finite Element Analysis. *Int J Oral Maxillofac Implants* 1993;8:662–673.
10. Robert Kenny, Mark. W. Richard: Photoelastic stress patterns produced by implant retained overdentures. *J Prosthet Dent* 1998;80:559- 64.
11. Tamar Brosh, Raphael Pilo , David Sudai: The influence of abutment angulation on strains and stresses along the implant/bone interface: Comparison between two experimental techniques *J Prosthet Dent* 1998;79:328-34.
12. Tom W.P. Koriioth , Andrew R. Johann: Influence of mandibular superstructure shape on implant stresses during simulated posterior biting. *J Prosthet Dent* 1999;82:67-72.
13. Jian-Ping, Keson B.C.Tan, Gui-Rong: Application of finite element analysis in implant dentistry: A review of literature. *J Prosthet Dent* 2001;85:585-98.
14. Haldun Iplikcioglu, Kivanc Akca, Murat C.Chreli, Saime Sahin: Comparison of non- linear finite element stress analysis with invitro strain guage measurements on morse taper implant. *Int J Oral Maxillofac Implants* 2003;18:258-265.
15. Chun-Li Lin, Jen-Chyan Wang: Non linear finite element analysis of a splinted implant with various connectors and occlusal forces. *Int J Oral Maxillofac Implants* 2003;18:331-340.
16. Shinichiro Tada, Roxana Stegaroiu, eriko Kitamura, Osamu Miyakawa: Influence of Implant bone quality on stress/strain distribution in bone around implants: A three dimensional finite element analysis. *Int J Oral Maxillofac Implants* 2003;18:357-368.
17. Mauro Cruz, Thomaz Wassall, Eison Magalhaes Toledo, Luis Paulo da Silva Barra, Afonso Celso de Castro Lemonge: Three dimensional finite element analysis of a cuneiform-geometry implant. *Int J Oral Maxillofac Implants* 2003;18:675-684.
18. Lisa A. Lang, Byungisk Kang BS, Rui-Feng Wang, Brien R.Lang: Finite element analysis to determine implant preload. *J Prosthet Dent* 2003;90:539-546.
19. Beata Dejak, Andrzej Mlotkowski, Maciej Romanowicz: Finite element analysis of stresses in molar during clenching and mastication. *J Prosthet Dent* 2003;90:591-597.
20. Allahyar Geramy, Steven M.Morgano: Finite element analysis of three designs of an implant supported molar crown. *J Prosthet Dent* 2004;92:434-440.
21. Lucie Himmlova, Tatjana Dostalova, Alois Kacovsky, Svatava Konvickova: Influence of implant length and diameter on stress distribution: A finite element analysis. *J Prosthet Dent* 2004;91:20-25.

22. Dincer Bozkaya, Sinan Muftu, Ali Muftu: Evaluation of load characteristics of five different implants in compact bone at different load levels by finite element analysis. *J Prosthet Dent* 2004;92:523- 530.
23. Murat Sutpideler, Steven E.Eckert, Mark Zobitz, Kai-Nan An: Finite element analysis of effect of prosthesis height, angle of force application, and implant offset on supporting bone. *Int J Oral Maxillofac Implants* 2004;19:819-825.

Awareness of Smoke-free Legislation (Section 4 of COTPA) among Owners or Person in-Charge of the Public Places in Ramanagara City

Usha S¹, Sindhu R²

¹Associate Professor, Department of Community Medicine, Rajarajeswari Medical College and Hospital, Bengaluru, ²Medical Officer - BBMP

ABSTRACT

Background: Strong smoke-free legislation continues to be the most widely adopted measure for protecting people from tobacco smoke and to maintain smoke-free environment the owners or persons in charge of public places must be aware of Smoke-free legislation: The objective of the study was to assess the awareness of Smoke-free legislation (section 4 of COTPA) among the owners/person in-charge of public places in Ramanagara city, Karnataka State.

Method: A Cross sectional study was conducted among owners or person in-charge of all the registered public places of Ramanagara city, using a protocol developed by the Bloomberg Initiative to Reduce Tobacco Use and its partners. The data was collected and compiled in MS excel and was analyzed using SPSS software version 20.0

Results: Out of 184 public places, majority were educational institutions(35.3%), followed by restaurants(25%), government offices(21.7%), bars(9.2%), hospital buildings(6%), cinema halls(1.6%), railway station and City bus stand(1%). 115 owners/person in-charge participated in the study, only 42(36.5%) were aware of smoke-free legislation in public places and when asked about the rules under the law, majority (95.2%) of them said 'No person should smoke tobacco in public places and majority (63.4%) of them said lack of awareness about the law was the reason for non-compliance.

Conclusion: Sustained awareness campaign among owners/person in-charge of public places about smoke-free legislation is the need of the hour and they should be educated about the harmful effects of smoking and the importance of smoke-free places.

Keywords: Public places, COTPA Act, Smoke free legislation, Awareness.

INTRODUCTION

Tobacco is the foremost preventable cause of premature adult death in the world today, killing half of its users.¹ Tobacco kills nearly 6million people each year of which more than 5 million are the result of direct tobacco use and the annual death toll in the world could rise to 8 million by 2030.²

Globally, there are 1.1 billion smokers.³ Smoking is the most important cause of lung cancer to the extent that over 80% of lung cancers are caused by smoking.⁴ Smoking causes many other diseases, including cancers, heart disease --globally, about 11% of cardiovascular deaths are caused by smoking: ⁵ stroke, chronic bronchitis, peptic ulcer and several other fatal diseases.⁶

India is the second largest producer and consumer of tobacco in the world. There are almost 275 million tobacco users in India⁷ Each year tobacco use kills about 1 million Indians.⁸

Correspondence:

Dr Usha S

Associate Professor, Department of Community Medicine, Rajarajeswari Medical College and Hospital, Bengaluru, E-mail: drushapradeep@gmail.com

Government of India also enacted the Cigarettes and Other Tobacco Products (Prohibition of Advertisement and Regulation of Trade and Commerce, Production, Supply and Distribution) Act (COTPA) in 2003. Later in 2008 provisions were reviewed and a comprehensive revised Smoke Free legislation 'Prohibition of Smoking in Public Places Rules, 2008 (section 4 of COTPA) came into effect from 2nd October 2008, redefining 'public places' so as to include all workplaces and authorizing personnel responsible for enforcement of law for maintaining smoke-free public places across the country.^{9, 10}

Strong smoke-free legislation continues to be the most widely adopted measure for protecting people from tobacco smoke. Smoke-free environments not only protect non-smokers, they reduce tobacco use in continuing smokers and help smokers who want to quit.¹¹ To maintain smoke-free environment the owners or persons in charge of public places must be aware of Smoke-free legislation and relatively few studies have been conducted in South India particularly in Karnataka State regarding the same, hence an effort has been made to assess the awareness of Smoke-free legislation (section 4 of COTPA) among the owners/person in-charge of public places in Ramanagara city, Karnataka.

METHODOLOGY

Materials and Method

Source of data: Data was obtained by interviewing owners or person in-charge of the following public places of Ramanagara city, Ramanagara district, Karnataka

Based on the accessibility and feasibility the following public places were considered for the study Educational Institutions (private and government schools and colleges), Government offices, Hospital Buildings (private and government), Cinema Halls, Bars and Restaurants (eateries, canteens and fast foods), transit stations (city bus stand and railway station)

Study design: A Cross-sectional study

Study period: June 2015- January 2016 (6 months)

Study area: Public places of Ramanagara city, Ramanagara district, Karnataka.

Inclusion criteria:

In the current study public place was defined as any

Educational Institutions, Government offices, Hospitals Buildings, Cinema Halls, Restaurants and Bars, City bus stand and Railway station in Ramanagara city and the Owners or the person in-charge of the same were included in our study.

Exclusion criteria:

Owners or the person in-charge of public places who were not available on three repeated visits and those who did not give consent to participate in the interview.

Unauthorized, unregistered, closed public places were excluded.

Sample size: All the public places registered in the respective departments of Ramanagara city were included in the study.

Study tool: Pre-tested, semi-structured questionnaire developed by the Bloomberg Initiative to Reduce Tobacco Use and its partners was used with appropriate modifications.

Method of data collection:

The study was conducted in public Ramanagara city with a population of around 95000 and area of 14.53sqkms with 31 wards¹² using a protocol developed by the Bloomberg Initiative to Reduce Tobacco Use and its partners (which include Campaign for Tobacco-Free Kids, Johns Hopkins Bloomberg School of Public Health and International Union Against Tuberculosis and Lung Disease).¹³ The list of public places was obtained from the city municipal council office, block education office and District Statistical Office and was categorized into Educational Institutions, Hospital buildings, Government offices, restaurants, bars and cinema halls and transit stations (City bus stand and Railway station). According to the list 184 public places were present in Ramanagara City. Ethical clearance was obtained from the Institutional Ethical Committee.

A written consent was taken from owners or person in-charge willing to participate in the interview. A pre tested semi-structured questionnaire developed by the Bloomberg Initiative to Reduce Tobacco Use and its partners¹³ with appropriate modifications was used to interview the owners/person in-charge.

DATA ANALYSIS

The data was collected and compiled in MS excel

and was analyzed using SPSS software version 20.0 and tabulated accordingly. Descriptive statistics was used as necessary; all qualitative variables were presented as frequencies and percentages. Chi square test of significance and Fischer exact test of significance was applied and p value less than 0.05 were considered as statistically significant.

RESULTS

In the current study a total of 184 public places were visited, which includes 84 government and 100 private public places. For the study purpose, all the selected public places in Ramanagara city were divided into 7 broad categories.

Out of 184 public places, majority were educational institutions 65(35.3%), followed by restaurants 46(25%), government offices 40(21.7%), bars 17(9.2%), hospital buildings 11(6%), cinema halls 03(1.6%), railway station and City bus stand 02(1%).

In the present study out of 184 public places visited, Owners/Person in-charge of 115(62.5%) public places participated in the Interview, 37(20.1%) did not give consent and 32(17.4%) were not available even after repeated (3) visits.

Table 1: Demographic details of Owner/Person in-charge of public places who participated in the Interview

Demographic details		Frequency (%)
Age (years)	20-39	44 (38.3)
	40-59	65 (56.5)
	>60	6 (5.2)
	Total	115 (100.0)
Sex	Male	88 (76.5)
	Female	27 (23.5)
	Total	115 (100.0)
Religion	Hindu	66 (57.3)
	Muslim	45 (39.2)
	Christian	4 (3.5)
	Total	115 (100.0)

Cont... Table 1:

Education	Illiterate	----
	High School	9 (7.9)
	Pre-University	12 (10.4)
	Graduation	23 (20.0)
	Post-graduation	71 (61.7)
	Total	115 (100.0)

Out of 115 Owners/Person in-charge of public places, 65 (56.5%) belonged to the age group of 40-59 years whereas 6 (5.2%) belonged to the age group >60 years and the mean age of the participants was 31 years, 88(76.5%) were males and 27(23.5%) were females. Most of them 66(57.3) were Hindus and 4(3.5%) were Muslims. Most of them were Post-graduates 71(61.7%) and none of them were illiterates. (Table 1)

It is observed that 65(56.5%) of 115 were Owners or Principal, 40(34.8%) were Managers and 10(8.7%) were Person in-charge of public places.

Table 2: Awareness of Smoke-free legislation among the Owners/person in-charge of different categories of public places

Public places	Awareness of Smoke-free law in public places		Total
	Yes	No	
Educational Institutions	10 (18.5)	44 (81.5)	54 (100.0)
Hospital Buildings	3 (50.0)	3(50.0)	6 (100.0)
Government Offices	11 (55.0)	9 (45.0)	20 (100.0)
Restaurants	11(52.4)	10 (47.6)	21 (100.0)
Bars	3 (30.0)	7 (70.0)	10 (100.0)
Cinema Halls	2 (100.0)	0 (0.0)	2 (100.0)
Railway Station and city Bus Stand	2 (100.0)	0 (0.0)	2 (100.0)
Total	42 (36.5)	73 (63.5)	115 (100.0)

Among the owners/person in-charge, 42(36.5%) were aware of smoke-free legislation in public places. It was also observed that manager/ person in-charge in all Cinema halls, railway station and city bus stand were aware of the smoke-free law. Most 11(55%) of the managers at government officers were aware of the Smoke-free legislation in public places, followed by hospital buildings where the awareness among owner/ person in-charge was 3(50%) and least awareness of 18.5%(10) was found among Principals of educational institutions. (Table 2)

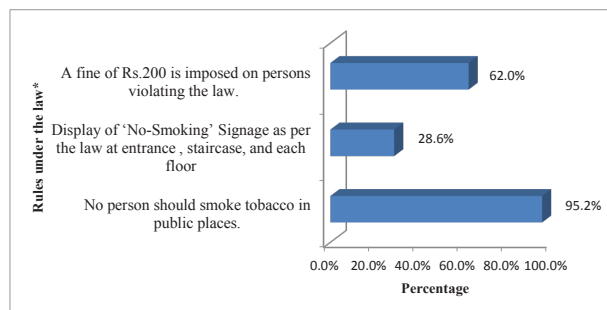


Figure 1: Bar diagram showing the Owners/person in-charge's awareness of rules under the Smoke-free law: (n=42)

*Multiple Responses

Owner/person in-charge who were aware of smoke free legislation when asked about the rules under the law, majority (95.2%) of them said 'No person should smoke tobacco in public places', 62.0% of them said 'A

fine of Rs.200 is imposed on persons violating the law' and only 28.6% of them were aware that 'No-Smoking' signage should be displayed as per the law at entrance, staircase, and each floor'. (Figure 1)

Table 3: Source of Awareness of Smoke-free legislation among Owners/manager/person in-charge of public places

Source of awareness of Smoke-free Law*	Number	Percent (%)
Radio	18	42.8
News channel	23	54.8
Internet	20	47.6
Newspaper	32	76.2
Ads in Cinema theatres	38	90.5
Enforcement officers	40	95.2

*Multiple responses

The highest source of awareness of smoke-free legislation among owners/person in-charge of public places were enforcement officers (95.2%) next highest was ads in cinema theatres (90.5%) and least source of awareness was radio (42.8%). (Table 3)

Table 4: Association between awareness of Smoke-free legislation among owners/person in-charge of public places and compliance to Smoke-free Indicators

Parameters		Smoke free legislation		Chi square test	p- value
		Aware (n=42)	Not aware (n=73)		
'No smoking' signage displayed	Yes	26(61.9)	17(23.3)	16.98	<0.001
	No	16(38.1)	56(76.7)		
Signage Comply with Smoke-free law	Yes	07(16.7)	01(1.3)	0.0035*	<0.001
	No	35(83.3)	72(98.7)		
No active Smoking found Indoors	Yes	38(90.5)	68(93.1)	0.264	0.607
	No	04(9.5)	05(6.9)		

Cont... Table 4: Association between awareness of Smoke-free legislation among owners/person in-charge of public places and compliance to Smoke-free Indicators

No active Smoking found at the entrance/exit	Yes	30(71.4)	56(76.7)	0.394	0.529
	No	12(28.6)	17(23.3)		
Smoking Aids not found	Yes	41(97.6)	65(89.3)	0.151*	0.151
	No	01(2.7)	08(10.7)		
Cigarette butts/ bidi stubs not found	Yes	23(54.8)	50(68.5)	2.168	0.140
	No	19(45.2)	23(31.5)		
Absence of Odor emanating from cigarettes or bidi	Yes	35(83.3)	55(75.3)	1.006	0.317
	No	07(16.7)	18(34.7)		

*Fischer exact test

Awareness of Smoke-free legislation among owners/person in-charge and Display of ‘No smoking’ Signage , signage as per the law

Out of 42 owners/person in-charge of public places who aware of Smoke-free legislation 26(61.9%) of them had displayed one or more ‘No smoking’ signage and 7(16.7%) of them complied with specifications of ‘No smoking’ signage as given under COTPA act.

The association between display of ‘No-smoking’ signage, compliance to specifications of ‘No smoking’ signage as given under COTPA act in public places and awareness of Smoke-free legislation among owners/person in-charge of respective public places was found to be statistically significant. **(Table 4)**

Awareness of Smoke-free legislation among owners/person in-charge and active smoking not found indoors/ entrance/exit , absence of smoking aids and odor

Among 42 public places whose owners/person in-charge of public places were aware of Smoke-free legislation, active smoking was not found indoors and at the entrance/exit in 38(90.5%) and 30(71.4%) public places respectively, smoking aids and cigarette butts or bidi stubs were not found in 41(97.6%) and 23(54.8%) public places respectively. There was absence of odor

emanating from cigarette or bidi in 35(83.3%) public places.

There was no statistically significant association between absence of Cigarette butts/bidi ends, absence of odor and non-availability of smoking-aids in public places and awareness of Smoke-free legislation among owners/person in-charge of respective public places. **(Table 4)**

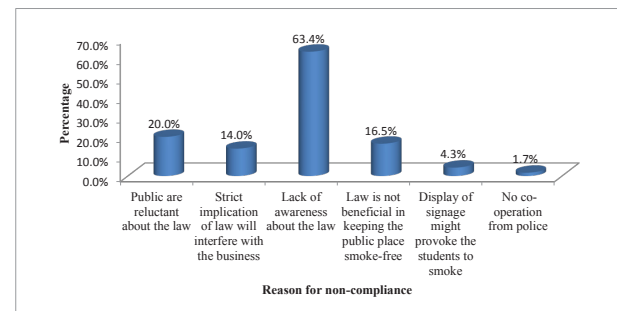


Figure 2: Cylinder diagram showing the Owners/ person in charge’s reason for non-compliance to Smoke-free laws in different Public places

*Multiple response

Owners/person in-charge of public places when asked about the reason for non-compliance to Smoke-free laws in respective public places, majority (63.4%) of them said lack of awareness about the law, few

(4.3%) of the principals felt display of signage might provoke the students to smoke and 1.7% expressed non-co-operation from police as the reason mainly in transit stations. (**Figure 2**)

DISCUSSION

In the current study, 36.5% of Owners/Person in-charge of public places was aware of Smoke-free law in public places (section 4 of COTPA) and among them majority (95.2%) said that ‘No person should smoke tobacco in public places’, 62.0% of them said ‘A fine of Rs.200 is imposed on persons violating the law’.

According to a Tobacco Control Law Enforcement and Compliance study conducted in Odisha, India awareness about COTPA findings revealed that 80.8% of the respondents knew about the provision of the law prohibiting smoking in public places, only 6.7% had awareness about ‘penalty’ on smoking in public places.¹⁴ In a study conducted in a district of North India by Goel et al, where most (84%) of the study participants were aware that smoking was banned in public places and half of them knew about the fine for violation of COTPA act¹⁵.

In the present study, it was observed that, majority (80-100%) of the Owners/person in-charge of public thought that Smoke-free legislation is useful in keeping the respective public places smoke free and supported smoke-free law. In a study conducted in North India, nearly 90% of respondents supported smoke-free law COTPA.¹⁶

Around the world; countries which successfully introduced smoke-free laws have witnessed widespread public support for it. A survey carried out in Latin America showed that more than three fourth respondents supported smoke free public places.¹⁷

In the current study owners/person in-charge of Bar and restaurants expressed Strict implication of law would interfere with the business as the main reason for non-compliance to smoke-free legislation. However, in every country where comprehensive smoke-free legislation has been enacted, smoke-free environments are popular and result in either a neutral or positive impact on business.¹¹

CONCLUSION

Only 36.5% of the owners/person in-charge was

aware of Smoke-free law in public places. Sustained awareness campaign among owners/person in-charge of public places about smoke-free legislation is the need of the hour. Owners/person in-charge of public places should be educated about the harmful effects of smoking and the importance of smoke-free places.

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. World Health Organization. WHO report on the global tobacco epidemic: The MPOWER package [Internet]. Geneva 2008 [cited 2016 August]. Available from: <http://www.who.int/tobacco/mpower/2008/en/>
2. World Health Organization. Fact sheet Tobacco [Media Centre: Internet]. 2016 June [Updated June 2016: cited 2016 August]. Available from URL: <http://www.who.int/mediacentre/factsheets/fs339/en/#>
3. World Health Organization. WHO report on the global tobacco epidemic: Raising taxes on tobacco [Internet]. Geneva 2015 [cited 2016 August]. Available from URL: http://www.who.int/tobacco/global_report/2015/report/en/
4. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global Cancer Statistics. *CA Cancer J Clin*. 2011 Mar-Apr [cited 2016 July];61(2):69-90. Available from: <http://onlinelibrary.wiley.com/doi/10.3322/caac.20107/pdf>
5. Ezzati M, Henley SJ, Thun MJ, Lopez AD. Role of Smoking in Global and Regional Cardiovascular Mortality. *Circulation*. 2005 [cited 2016 Aug] 112: 489-497. Available from: <http://circ.ahajournals.org/content/112/4/489.full>
6. International Agency for Research on Cancer (IARC). Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, Vol. 83. Tobacco Smoke and involuntary Smoking. Lyon: IARC; 2004. Available from URL: Available from: <http://monographs.iarc.fr/ENG/Monographs/vol83/volume83.pdf>.
7. Karnataka. State Anti-Tobacco Cell [Resource Material: Internet] 2012 [cited 2014 Sept]. Available from <http://satckarnataka.in/facts>

8. Campaign for Tobacco-Free Kids. Global Epidemic: India [Home page on the Internet]. 2014 [cited 2014 Sept] Available from: http://www.global.tobaccofreekids.org/en/global_epidemic/india/
9. Government of India, Ministry of Health and Family Welfare. Global adult tobacco survey (GATS) India report: 2009-2010.[Internet] New Delhi: MOH and FW; 2010. [accessed on 2015 July] Available from URL: <http://mohfw.nic.in/WriteReadData/1892s/1455618937GATS%20India.pdf>
10. India. Guidelines for Law Enforcers for effective implementation of Tobacco Control Laws. Ministry of Health and Family welfare. World Health Organization [Internet]. 2013 [cited 2014 Sept]:15-19. Available from URL:<http://www.mohfw.gov.in/WriteReadData/1892s/Law%20Enforcers%20Manual.pdf>
11. World Health Organization. WHO report on the global tobacco epidemic: Implementing smoke-free environments [Internet]. Geneva 2009 [cited 2016 August]. Available from URL: <http://www.who.int/tobacco/mpower/2009/en/>
12. Ramanagara City Municipal Council [Home Page: Internet]. Government of Karnataka. [cited 2014 Sept]. Available from: <http://www.ramanagaracity.gov.in>
13. Campaign for Tobacco Free Kids, John Hopkins Bloomberg School of Public Health and International Union against Tuberculosis and Lung Disease. Assessing compliance with smoke free laws: A “how to” guide for conducting compliance studies .2nd ed. Washington DC [Internet]. 2014 [cited 2014 Aug]. Available from: <http://www.theunion.org/what-we-do/publications/technical/assessing-compliance-with-smoke-free-laws>.
14. Panda B, Rout A, Pati S, et al. Tobacco Control Law Enforcement and Compliance in Odisha, India - Implications for Tobacco Control Policy and Practice. *Asian Pacific J Cancer Prev*, 2012;13 (9), 4631-4637.
15. Goel S, Ravindra K, Singh RJ, Sharma D. Effective smoke-free policies in achieving a high level of compliance with smoke-free law: experiences from a district of North India. *Tob Control*. 2014; 23:291-294. Available from: <http://tobaccocontrol.bmj.com/>
16. Goel S, Singh RJ1, Sharma D, Singh A. Public opinion about smoking and smoke free legislation in a district of North India. *Indian J Cancer* 2014;51:330-4. [cited 2016 July] . Available from: <http://www.indianjcancer.com>
17. A cross country comparison of exposure to second-hand smoke among youth. GTSS Collaborative Group. Centers for Disease Control and Prevention. *Tob Control*. 2006; 15:ii4-19.

Dens Evaginatus on a Permanent Mandibular Molar-Report of a First Case

Karuna Y M¹, Shailaja Datta², Arathi Rao³

¹Assistant Professor, ²Post Graduate Student, ³Professor, Department of Paedodontics and Preventive Dentistry, Manipal College of Dental Sciences, Mangalore, Manipal Academy of Higher Education, Karnataka, India

ABSTRACT

Dens evaginatus is a developmental anomaly in form of an accessory cusp. It arises during morpho-differentiation stage due to abnormal proliferation of the inner enamel epithelium into the stellate reticulum of the enamel organ. Though mandibular premolars are most commonly affected teeth, there are case reports of dens evaginatus of maxillary molars. However, dens evaginatus of a mandibular molar has not been reported till date to best of our knowledge. Thus, this case report adds a rare form of presentation of dens evaginatus to the existing literature.

Keywords: *Dens evaginatus, Mandibular, Molar*

INTRODUCTION

Dens evaginatus (DE) is a developmental anomaly that arises during morpho-differentiation stage due to abnormal proliferation of the inner enamel epithelium into the stellate reticulum of the enamel organ. It is clinically seen in the form of an accessory cusp.^{1,2}

The morphology of the accessory cusp has been described in the literature in multiple ways like abnormal tubercle, elevation, protuberance, excrescence, extrusion, or bulge. Accordingly DE is also referred as tuberculated cusp, occlusal tubercle, tuberculum anomalum, accessory cusp, supernumerary cusp, interstitial cusp, accessory tubercle, occlusal tuberculated premolar, Leong's premolar, odontome, odontoma (odontome) of the axial core type, evaginatus odontoma (evaginated odontome), and occlusal pearl.^{2,3}

Macroscopically, DE consists of a narrow extension of the pulp tissue within the dentinal core and an enamel cap. The condition can be either unilateral or bilateral.⁴ Prevalence ranges from 0.5 to 4.3%, depending upon the population group studied. The condition is predominantly seen in people of Asian descent including North Indians and North American Indians.^{4,5}

Though it's primarily seen in mandibular premolars on the occlusal surface between the buccal and lingual cusps, it has also been very rarely reported on molars, canines, and incisors.⁶ However to best of our literature search, till date there is no report of involvement of a mandibular molar. This article presents a unique case of DE on the occlusal surface of a mandibular second molar.

CASE REPORT

A twelve years old female patient reported to the Department of Paedodontics and Preventive Dentistry with the complaint of malaligned upper and lower teeth. The medical history of the patient was non-significant. On intra oral examination, the patient was having complete set of permanent dentition, with crowded maxillary and mandibular anteriors and dental caries involving multiple teeth (16, 26, 17, 27 and 37). The interesting finding on intra oral examination was presence of a tubercle on the occlusal surface of mandibular right

Corresponding Author:

Dr Arathi Rao,

Professor, Department of Paedodontics and Preventive Dentistry, Manipal College of Dental Sciences, Light House Hill, Mangalore, Manipal Academy of Higher Education, Manipal, 575001.

Phone number: 9845242079

Email. Id: arathi.rao@manipal.edu

second molar (47) (Fig 1a). The occlusion of the patient was undisturbed (Fig 1b), but the occlusal fissures of 47 were deep and discolored (Fig 1a). No catch or softness was present upon probing. The developmental anomaly on 47 was provisionally diagnosed as DE. Intra oral periapical radiograph (IOPAR) of 47 (Fig 2) revealed the presence of an extra cusp which contained pulpal extension within dentinal and enamel covering, thus confirming the provisional diagnosis. A treatment plan was formulated to seal the fissures and pits of 47 using pit and fissure sealant (Fig 3) along with attending other treatment needs of the patient.

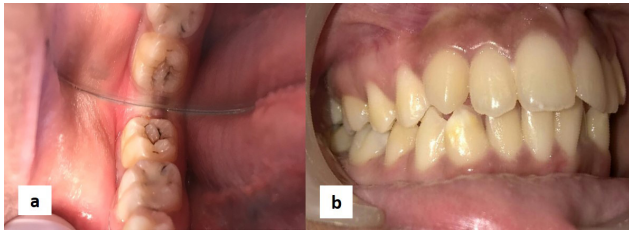


Fig 1, a: Dens Evaginatus involving 47, b: Right lateral occlusion



Fig 2: IOPAR of 47



Fig 3: Post sealant application wrt 47.

DISCUSSION

DE is the variation of tooth morphology that is occasionally seen clinically.⁷ The prevalence rate varies

depending on the affected population, dental arch and tooth type. It is usually a bilateral presentation with female predilection.^{2,7} Though DE occurs in both primary and permanent dentition, more frequently it's seen in the later. It can affect both anterior (referred as Talon cusps of the incisors) and posterior teeth.² Most common association of DE is with the premolars.^{8,9} Literature also reports cases of DE on maxillary molars.^{7,10} However, till date no reports are present describing DE on a mandibular molar and thus this case is unique and first of its kind.

Schulge (1987) has mentioned five types of DE for posterior teeth based on the location of the tubercle.¹¹ The present case is 5th type which is described as a tubercle arising from the occlusal surface obliterating the central groove. Also, based on Lau's classification on the basis of anatomical shapes of the tubercle, the present case can be categorized as of grooved/ ridged DE.⁶

The differential diagnosis for DE includes cusp of Carabelli. The cusp of Carabelli has been reported commonly in white population and is seen on the palatal aspect of the mesiolingual cusp of maxillary first molars. The presence of pulp within the cusp like tubercle of the former also has great diagnostic value, as the later doesn't contain pulp. Larger than the normal mesiodistal diameter is another additional distinguishing characteristic of cusp of Carabelli, whereas except for the tubercle crown of the tooth with DE has a normal anatomy. However, abnormal root patterns are very often linked with DE involved teeth.² The radiographic findings of our case revealed the presence of pulpal tissue within the tubercle and the presence of single root while the usual tendency for the mandibular second molars is to have two roots.¹²

Caries has historically not been a factor for consideration regarding pulpal involvement for this entity. Due to the extension of the DE tubercle above the occlusal surface resultant malocclusion is a clinical concern. The abnormal wear or fracture of the tubercle due to occlusal trauma may even lead to pulpal exposure.² However, in the present case, no malocclusion was seen, but the fissures surrounding the tubercle were discolored. Thus no occlusal adjustments were done, only preventive treatment was offered by sealing the discolored fissures using pit and fissure sealant.

As it would be appropriate to observe the eruption of the affected teeth regularly to closely monitor the likely complications in terms of traumatic occlusion and pulp exposure,⁵ the present case is also kept under regular follow up.

CONCLUSION

DE is a congenital developmental anomaly of the tooth. The structural anomaly itself does no harm to the patient. But because of its occurrence on the occlusal surface, it can be easily fractured due to occlusal forces, leading to pulpitis or pulpal necrosis. Thus with an eye to the future, the patient with this anomaly needs to be followed up and best treatment modalities available should be implemented when indicated.

Ethical Clearance- Taken from Institutional ethical committee

Source of Funding- Self

Conflict of Interest – NIL

REFERENCES

1. Tratman EK. An unrecorded form of the simplest type of the dilated composite odontome. *Br Dent J* 1949;86:271-5.
2. Levitan ME, Himel VT. Dens evaginatus: literature review, pathophysiology, and comprehensive treatment regimen. *J Endod.* 2006;32(1):1-9.
3. Shafer WG, Hine MK, Levy BM, Tomish CE: Dens evaginatus. In *A Textbook of Oral Pathology*, WB Saunders Co, 1983:42.
4. Echeverri EA, Wang MM, Chavaria C, Taylor DL. Multiple dens evaginatus: diagnosis, management, and complications: case report. *Pediatr Dent* 1994;16(4):314-7.
5. Kocsis G, Marcsik A, Kokai E, Kocsis K. Supernumerary occlusal cusps on permanent human teeth. *Acta Biol Szeged* 2002;46:71– 82.
6. Lau TC. Odontomes of the axial core type. *Br Dent J* 1955;99:219-25.
7. Thakur NS, Thakur S. Double dens evaginatus on permanent maxillary first molar: A case report of this rare occurrence. *Indian J Dent Sci* 2017;9:114-6.
8. Oehlers F, Lee K, Lee E. Dens evaginatus (evaginated odontome): its structure and responses to external stimuli. *Dent Pract Dent Rec* 1967;17:239 – 44.
9. Hill FJ, Bellis WJ. Dens evaginatus and its management. *Br Dent J* 1984;156(11):400-2.
10. Morinaga K, Aida N, Asai T, Tezen C, Ide Y, Nakagawa K. Dens evaginatus on occlusal surface of maxillary second molar: a case report. *Bull Tokyo Dent Coll* 2010;51(3):165-8.
11. Schulze CH. Anomalien und Missbildungen der menschlichen Zähne. Quintessenz Verlags GmbH, Berlin 1987:94-101.
12. Manning SA. Root canal anatomy of mandibular second molars. Part I. *Int Endod J* 1990;23(1):34-9.

Knowledge and Perception of Patients in a Tertiary Hospital about Radiation and its Effects –A Survey

Suveen¹, Fatema M Satchoo¹, Sachin Davis¹, Suresh Sukumar²

¹Student, BSc. MIT, ²Associate Professor, Department of Medical Imaging Technology, SOAHS, MAHE, Manipal

ABSTRACT

Aim: To assess the knowledge and perception of patients about the relative ionizing radiation exposure and its effects in a tertiary hospital.

Material and method: A total of 171 subjects were selected from patients who have undergone Computed Tomography and X ray. The self-administered survey comprised of fifteen questions that were divided in two sets with a five point scoring scale. The first set of questions was based on patients' knowledge and perception on physician practices and the second set of questions was based on the knowledge and perception of patients on radiological examinations. The data were statistically analyzed using descriptive statistics where mean, standard deviation, and range was used to report the data.

Results: Among 171 study participants 61.99 % had an X-ray done and 38.01% had a CT-scan done The respondents who attended university/college show that they have greater awareness than respondents from the latter (35.6%) as compared to the participant who pursued their education in college but didn't enter university. The patients who finished primary and secondary school showed to have lesser awareness comparatively. The result indicates that those patients who had passed university/college had better awareness (39.1%) than the rest.

Conclusion: The overall knowledge and perception of radiation and its effect happens to be moderate based on the results. However, it is best if the patients are highly aware about radiation, dose, its risks, protection and justification, considering its hazard as a carcinogenic entity.

Keywords: Radiation, awareness, patients, radiological examination.

INTRODUCTION

Radiation has always been existent around us and our surroundings. However, mankind was not directly conscious of its existence until the end of the 19th century. Since the beginning of medical imaging with the first medical use of x-rays in 1896, the field of diagnostic imaging has come a long way and is one of the fastest growing areas of medical technology.^[1] Ionizing radiation in medical imaging is a vital and powerful

diagnostic tool that is constantly being used in medicine. Several studies have revealed that many doctors have reported in order to complete their diagnosis they always sent their patients for a radiologic examination. Even though all medical interventions have potential benefits, its potential risks cannot be ignored. ^[2] It is estimated that 2.0% of all the cancers may now be attributed to radiation from examinations due to CT scanning. Therefore, before undertaking any type of radiological examination, it is vital that the patients should recognize and apprehend the potential risks of radiation and its benefits towards them.

Furthermore, studies also show that health care practitioners are not familiar with the hazards related to radiation use. The doctors who prescribe various scans are unaware of the doses involved in various scans and

Corresponding author:

Dr. Suresh Sukumar

Department of Medical Imaging Technology, SOAHS,
MAHE, Manipal. Manipal-576104,

Mobile: 9886118811

Email ID: suresh.sugumar@manipal.edu

often do not educate the patients on the possible risks that could arise out of these scans. However, many of the health care practitioners who may be aware of risks caused by radiation and its dose, struggle to acknowledge the concerns and questions of the patients as they may not be able to grasp any of the dose terminologies.^[3]The study among patients in South India is imperative owing to the fact that not many studies have been reported among the South Indian population in specific and that many patients are deemed ignorant when it comes to the after-effects of radiation.

Radiation, considering its importance as a carcinogenic entity should therefore, be taken seriously and knowledge about it considered a top requisite for not only the patients but the general public too. The purpose of this study was to assess the knowledge and perception of patients about the relative ionizing radiation exposure and its effects in a tertiary hospital.

METHODOLOGY

We performed a cross sectional study on patients who were 18 – 55 years of age by administering a close-ended survey questionnaire. The Institutional Ethics Committee at Kasturba Hospital approved the study protocol.

The study was conducted from April 2018 to July 2018 in a tertiary hospital. We excluded patients who were unconscious or cognitive and those who weren't willing to sign informed consent thereby not willing to participate. The questionnaire was in English and Kannada, and those patients who spoke other languages were encouraged to take part if they understood the latter two and could answer the questions at ease.

The questionnaires were administered to the patients individually and were recommended to answer the questions to the best of their abilities. The patient's age, gender, educational status and whether they lived in rural or urban areas was also collected so as to analyze the demographic data using descriptive statistical analysis.

All the significant data was obtained and collected by interviewing the patients with self-prepared, structured questionnaires. One hundred seventy one samples were selected by convenience sampling technique. The survey comprised of fifteen questions that were divided in two sets with a five point scoring scale. The first set

of questions was based on patients' knowledge and perception on physician practices and the second set of questions was based on the knowledge and perception of patients on radiological examinations.

Once all the data was collected, the results were then ascertained based on evaluation of the received questionnaire sheets and the scores obtained per individual. The scoring was assessed as follows:

The tool consists of fifteen items divided into two sets, six items in first set and nine items in the second set.

For the first set of questions:

6 x 5 = 30 - Have greater knowledge and perception on radiology and its effects on physician practices.

6 x 1 = 6 - Have lesser knowledge and perception on radiology and its effects on physician practices.

For the second set of questions:

9 x 5 = 40 - Have greater knowledge and perception on radiology and its effects on radiological examinations.

9 x 1 = 9 - Have lesser knowledge and perception on radiology and its effects on radiological examinations.

The scores for any individual would come down between 6 and 30 for the first set of questions. If the score happens to be between 6 and 12 it would mean poor awareness, a score of anywhere between 13 and 23 would mean moderate awareness and a score between 24 and 30 would be suggestive of high awareness.

The scores for any individual would come down between 9 and 40 for the second set of questions. If the score happens to be between 9 and 22 it would mean poor awareness, a score of anywhere between 23 and 35 would mean moderate awareness and a score between 36 and 45 would be suggestive of high awareness.

RESULTS

A study of 171 questionnaires was distributed among patients. The statistical analysis was carried out using SPSS version 16.0. Among 171 study participants 61.99 % had an X-ray done and 38.01% had a CT-scan done (Figure 1). The education status of the participants is given in figure 2.

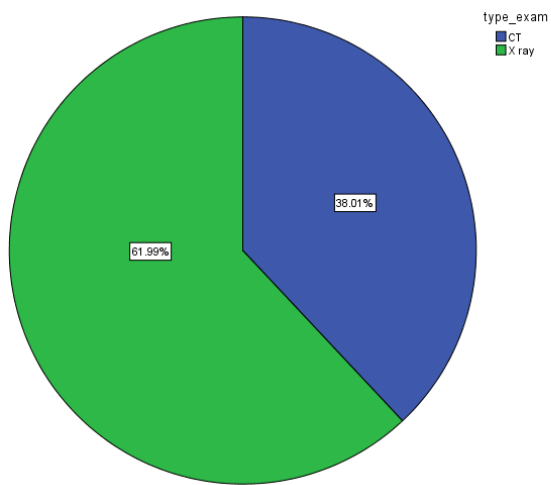


Figure 1: Pie chart showing distribution of participants based on the type of examination.

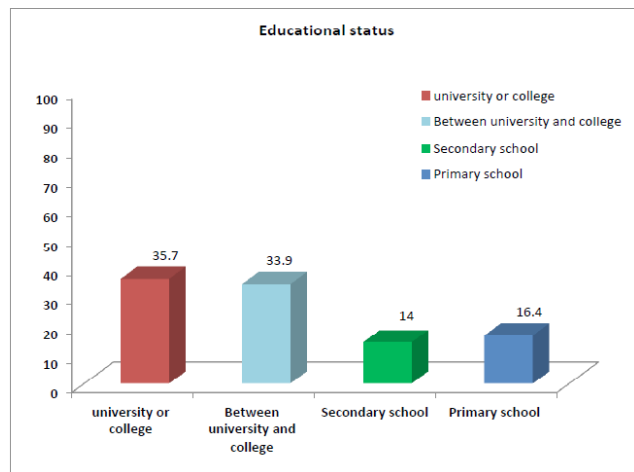


Figure 2: Educational status of the participants.

The awareness of radiological examinations of patients and their educational status in table 1. The respondents who attended university/college show that they have greater awareness than respondents from the

latter (35.6%) as compared to the participant who pursued their education in college but didn't enter university. The patients who finished primary and secondary school showed to have lesser awareness comparatively.

Table 1: Awareness on radiological examinations based on educational status

Education	Awareness		
	Moderate awareness	High awareness	Total
University / college	12.9%	22.8%	35.6%
Intermediate between university and college	23.4%	10.5%	33.9%
Secondary school	7.6%	6.4%	14.0%
primary school	8.8%	7.6%	16.4%
Total	52.6%	47.4%	100.0%

The awareness of patients on physician practices based on their educational status is shown in table 2. The result indicates that those patients who had passed university/college had better awareness (39.1%) than the rest. This in turn was followed by patients who had passed college but didn't attend university (33.9%). It is important to note that respondents who attended primary school had poor awareness (4.1%) compared to the rest.

Table 2: Awareness on physician practices based on educational status

Education	Awareness			
	Moderate	High	Total	
Low				
University	3.5%	22.8%	9.4%	39.1%
Intermediate between university and college	2.3%	19.9%	11.7%	33.9%
Secondary school	2.3%	7.0%	4.7%	14.0%
primary school	4.1%	7.0%	5.3%	16.4%
Total	12.3%	56.7%	31.0%	100.0%

DISCUSSION

The overall awareness level of the patients was found to be moderate based on both the domains which had a percentage of 56.7 that was acquired from physician practices and 52.6 from radiological examinations respectively. High awareness on both the domains were comparatively lesser in both the sets of questions with a percentage of 31 on physician practices and 47.3 which was obtained from radiological examinations.

Most of the literatures depict that patients from other parts of the world have low or very poor awareness about radiation and its effects. A study done by Brigitte M. Baumann et al^[4] to determine the perception and understanding on radiation and its exposure in CT revealed that the patients had an insufficient understanding of the associated radiation exposure and underestimated the risks of cancer that could be caused by radiation.

Another study done by Michelle L. Ricketts^[5] brought to light the poor state of awareness where not only patients, but a number of physicians were uncertain about the radiation that was associated with a number of interventional procedures. The medical students had very basic knowledge on the pertinent amount of radiation used for radiographic studies. Thus, consequential gaps in knowledge on risks and hazards of radiation amidst patients who were ascribed for any radiological examination were inevitable. This highlighted the need for better teaching programs to be incorporated in addition to the existing curriculum. Our study however shows that patients in India are more knowledgeable in this aspect.

A study conducted by Christopher Lee et al^[6] to ascertain the understanding levels on radiation dose from CT among patients, emergency department physicians and radiologists also determined a drastic drop in patient awareness. The study determined that patients were not informed enough about the dose of radiation, its hazards and the advantages when asked to get a CT scan. Doctors could not give accurate estimations of doses in CT despite their level of experience. This study contradicted to the results obtained within our study where most of the patients accepted the fact that referring doctors did explain about the importance of radiological examination with a percentage of 59. Moreover, most of the patients also admitted that the doctors did explain to them about

the benefits (59%) and risks (50.3%) associated with the radiological examination that was referred to them.

A significant relationship can also be observed between demographic data that includes level of education with radiation awareness. A greater education level indirectly implies a substantial amount of familiarity and understanding of radiation. Ali Dehghani et al^[7] study insinuated that higher educational level peoples' awareness was significantly higher than lower educational level. The results attained in our study were analogous where education level of the patients ranging from patients who have passed university or college having a moderate awareness of 22.81% on physician practices and 22.81% of moderate awareness on radiological examinations. Whereas those patients who just passed the primary level had a moderate awareness of 7.02% on physician practices and 7.60% on radiological examinations. This indicated that patients with a higher education level had a greater awareness compared to those with a lower educational level.

However, considering that patients in the higher education groups have a good knowledge and perception on the amount of radiation associated with the particular radiological procedure, Doctors and medical professionals should not make assumptions that patients will be aware about their medical examinations due to their educational or social status. As it was formerly proposed by Freudenberg and Beyer et al^[8], it is vital that any medical professional should make an effort and approach to educate every patient they consult each time.

Justification happens to be an integral part of educating patients, as any practice involving radiation exposure should be justifiable in order that it yields more benefit to the society than harm. This however happens to be in question as responses pertaining to this aspect happens to be mixed. Ho Kwan Sin et al^[9] mentions that there is gross discrepancy between the actual practice and the expectations of patients. This was because most of the respondents expected to be told the reason for the associated risks of the radiological procedure they would be undergoing and the amount of radiation associated. In contrast to the present study conducted, from the frequency of responses of 1-5, 1 having the least responses and 5 having the most, most of patients (25.1%) admitted that their doctors did explain to them the relevance of radiological examinations prescribed to diagnosis of patient specific condition. When it came

to patients being explained about amount of radiation associated, from a frequency of responses of 1-5, most of the patients (25.1%) admitted that their doctors always, and a fair number of patients (24.6%) accepted that they have been informed about the radiation dose associated with the radiological procedure they have been prescribed. Few patients (26.3%) responded that their physicians never gave them information about the relative radiation dose associated. Anxiety of the patient is normally the driving force behind such coercion of their physician. Proper instruction and education of the patient will help in removing anxiety and apprehension within the patient (10).

A significant relationship was observed between 2 questions in the separate sets. Under the set of questions regarding patients' knowledge and perception of physician practices, when asked whether the doctors explained about the importance of the radiological examinations, most of the patients agreed that their physicians had explained about the procedure importance. Whereas, in the second set of questions where the patient was asked whether they understood their doctors explanation about radiation most of the patients agreed that they did in turn understand whatever their doctors explained to them.

Our study does not agree with most of the studies done worldwide in terms of the awareness of radiation, its effects and other related aspects. Our findings were much higher than those obtained in retrospective cohorts. Patients in the South Indian population are well aware of the associated risks of radiation and its effects and its benefits. Majority of them exhibited a moderate awareness from both the sets of questions that were given to them. A percentage of 56.7% was obtained from awareness on physician practices and 52.6% was acquired from awareness of patients on radiological examinations. From patients that were studied, poor awareness was noted only among 12.3% of them. This is contradicting to studies reported worldwide where patients had poor knowledge and perception on radiation and its effects. However, high awareness is desired considering the importance of radiation as a carcinogen rather than just moderate awareness. It is noteworthy that a low awareness should not be mistaken as indicating a complete lack of information regarding any aspect of radiation.

LIMITATIONS OF THE STUDY

The sample size was limited and the study was time bound. The sample population also represented highly educated patients and may not have been representative of the target population therefore having high baseline awareness on radiation.

RECOMMENDATIONS

There is very sporadic study reported among the patients in South India and therefore there is scope for a much elaborate study, throughout the country as a whole.

CONCLUSION

The overall knowledge and perception of radiation and its effect happens to be moderate based on the results. More frequent courses and updates on these topics are recommended in order to keep up with the latest advancements in dose reduction and other protective measures, thereby paving the way for better patient care ultimately.

Conflict of Interest : There is no conflict of interest

Source of Funding : Self

REFERENCES

1. Bushberg JT, Seibert JA, Leidholdt EM, Boone JM, Goldschmidt EJ. The Essential Physics of Medical Imaging. Vol 30.; 2003. doi:10.1118/1.1585033
2. Mojiri M, Moghimbeigi A. Awareness and attitude of radiographers towards radiation protection. *J Paramed Sci Autumn*. 2011;2(4):2008-4978. doi:10.22037/jps.v2i4.2714
3. Ludwig RL, Turner LW. Effective patient education in medical imaging: public perceptions of radiation exposure risk. *J Allied Heal*. 2002;31(3):159-164. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=12227267.
4. Baumann BM, Chen EH, Mills AM, et al. Patient perceptions of computed tomographic imaging and their understanding of radiation risk and exposure. *Ann Emerg Med*. 2011;58(1):1-7. doi:10.1016/j.annemergmed.2010.10.018
5. Ricketts ML, Baerlocher MO, Asch MR, Myers A. Perception of Radiation Exposure and Risk Among Patients, Medical Students, and Referring

- Physicians at a Tertiary Care Community Hospital. *Can Assoc Radiol J.* 2013;64(3):208-212. doi:10.1016/j.carj.2012.05.002
6. Lee CI, Haims AH, Monico EP, Brink JA, Forman HP. Diagnostic CT Scans: Assessment of Patient, Physician, and Radiologist Awareness of Radiation Dose and Possible Risks. *Radiology.* 2004;231(2):393-398. doi:10.1148/radiol.2312030767
 7. Dehghani A, Ranjbarian M, Mohammadi A, Soleiman-Zade M, Dadashpour-Ahangar A. International Journal of Occupational Hygiene : IJOH. *Int J Occup Hyg.* 2009;6(3):114-119.
 8. Freudenberg LS, Beyer T. Subjective Perception of Radiation Risk. 2015:29-36. doi:10.2967/jnumed.110.085720
 9. Sin H, Wong C, Huang B, et al. Assessing local patients ' knowledge and awareness of radiation dose and risks associated with medical imaging : A questionnaire study. 2013;57:38-44. doi:10.1111/j.1754-9485.2012.02471.x
 10. Priyanka, Rahul P Kotian, Nitika C P. Comparison Of Surface Radiation Dose To The Gonads By Radiographic Examination Of The Lumbar Spine Using Computed Radiography And Direct Digital Radiography. *Asian Journal of Pharmaceutical and Clinical Research* 2017; 10(12): 52-55.

Uncovering the Burden of Healthcare Associated Infections (HAIs) in Indian Hospitals: A Review

Soumya Christabel¹, Christopher Sudhaker², Muralidhar Varma³, Anice George⁴, Elsa Santatombi⁵

¹Asst. Professor, ²Professor, ⁴Dean, Manipal College of Nursing, Manipal Academy of Higher Education, Manipal, Karnataka, India, ³Associate Professor, Dept. of Medicine, Kasturba Medical College, Manipal Academy of Higher Education, Manipal, Karnataka, India, ⁵Professor, Manipal College of Nursing, Manipal Academy of Higher Education, Manipal, Karnataka, India

ABSTRACT

Healthcare Associated Infection (HAI) prevention and control continues to be a point of concern in terms of safety for both patients and healthcare professionals in the health care field. The true burden of HAI remains unknown, particularly in developing countries. The objective of the review is to provide an overview of HAI burden in Indian hospitals based on the evidences available in the published scientific literature. It also recognizes the inconsistency in the method of surveillance of HAI. A comprehensive search was made on PubMed - Medline, CINAHL, Proquest and Ind Med databases between 2010 and 2017 reporting the prevalence of HAI in India. A total of 47 studies are included in the literature review. Compared to the developed countries the HAI rates in Indian hospitals appears to be high. This could be adding to significantly increased burden on the health system by augmented morbidity and mortality. However, considering the diverse Indian population, further data would be required to assess meticulously the occurrence of various HAIs within different types of hospital settings throughout India.

Keywords: *Healthcare Associated Infections (HAIs); Indian Hospitals; Surveillance.*

INTRODUCTION

Healthcare Associated Infections (HAIs) is a major burden and safety issue for patients inflowing in hospitals of the developing countries. It is considered as one among the leading complication of modern medical therapy supplemented with the advancing age of population, complexity of patients disease conditions, increased use of invasive devices and inappropriate usage of antimicrobials in treatment regimen¹.

On any given day, about one in 25 hospitalized patients has at least one HAI². In the healthcare the

most essential HAIs are those related to use of invasive devices: catheter associated urinary tract infection (CAUTI), catheter related blood stream infection (CRBSI), ventilator associated pneumonia (VAP) and surgical site infection (SSI).

The HAIs burden is huge in developed countries, where it affects, 5 -15% of patients in regular wards and 50% or more of patients in ICUs. World Health Organization estimates the Global HAI prevalence between 7 to 12%. The magnitude of the problem in developing countries like India, remains undervalued or even unidentified largely because of complex surveillance activities.

Some developed countries have established surveillance systems. But, in majority of the developing countries it is not the reality because of poor health-care system which are further aggravated by already prevalent economic problems, inadequate resources/ supply of equipment's, understaffing with inadequate infection control practices/policies/guidelines, overcrowding, underreporting and lack of trained professionals. From

Corresponding author:

Soumya Christabel

Asst. Professor- Senior Scale, Manipal College of Nursing, Manipal Academy of Higher Education Manipal, Karnataka, India- 576104

Ph: 09739319382, Office: 08202922443

Fax: 08202922572,

Email: soumya.christabel@manipal.edu, soumyasoans@gmail.com

the past many years, it has been acknowledged that HAIs are partially preventable and healthcare can be much safer¹.

Despite HAIs being widely conveyed as the most commonly found complication, there are not adequate evidences of accurate estimate of HAIs in India. The purpose of this review is to explore the burden of HAIs in Indian hospitals by defining the incidence/prevalence of HAIs, as presented in the peer-reviewed scientific literature.

OBJECTIVE

To provide an overview of the burden of HAI in Indian hospitals based on the evidences available in the peer-reviewed scientific literature.

METHOD

Search Strategy and Selection Criteria:

The systematic literature search was made in electronic databases like, MED LINE (Pub Med), CINHALL (Cumulative Index to Nursing and Allied Health Literature), Proquest, Ind Med for published original research articles published between 1st January 2010 and 31st December 2017.

The search terms used to identify articles from MEDLINE and CINAHL, are “epidemiology” OR “prevalence” OR “Surveillance” OR “incidence” OR “Frequency” OR “Rate” OR “Percentage” OR “Proportion” OR “Extent” OR “Statistics” OR “Number” in combination with “cross infection” OR “Healthcare associated infection” OR “infection” OR “Nosocomial infection” OR “HAI”.

To limit the publications from Indian hospitals, the search term used are “hospitals” OR Hospital OR “delivery of health care” OR “Health care” was used with South Asia OR “India” OR “North India” OR “South India” OR “West India” OR “East India”. These Mesh terms were applied using an all text search.

Eligibility criteria:

Inclusion criteria

Cross sectional, cohort, case control, observational, randomised controlled trial, case reports published in peer-reviewed English-language journals

Only studies undertaken in Indian hospital(s)

If a study is international and multi-centred, then data from the Indian hospitals are included.

Exclusion criteria:

Grey literatures

Non-peer reviewed literatures

Conference abstracts or policy statements

RESULTS

Selection of literatures:

On preliminary search total 1950 articles were identified. After duplicate articles were removed and title screening was done for 1938 articles. Total 264 abstracts were reviewed and among which 54 articles were considered appropriate for the full text review. Among them, 47 articles are included in the review as they met the eligibility criteria.

General study characteristics:

Overall, all the studies were hospital based and were primarily prevalence/ incidence surveys, which were carried out in specific areas like medical / surgical wards or ICUs or to particular population as well as for particular procedures.

There were 3 multicenter study, giving the cumulative infection rate. Majority of the studies were done at single tertiary care hospitals. Six of the study were retrospective study. Data collection period of the studies varied from 6 months to 6 years. Majority of the studies used US CDC/ NHSN surveillance definition of HAI and 4 studies have used, Clinical pulmonary infection score (CPIS) for diagnosing VAP.

Uniformity in reporting of infection rates were not maintained. Majority of studies have reported HAIs mainly as infections per 100 patients. Some studies reported specific infection per 100 patients, whereas device associated infection have reported rate of infection per 1000 device days.

HAI prevalence/ Crude infection rates:

There are considerable variation in infection rates in studies done at different centers across the country. The prevalence of HAI varied based on the study setting, the

type of hospital, location of surveillance (ICU or general ward), the type of patient/ population and the definition of HAI and its surveillance techniques. Hospital-wide HAI prevalence in the present review varied between 3.76% and 50.2%^{3,4}. Overall HAI rates were not described in many studies. However the prevalence or incidence based on the type of HAI is explained. The reason for the greater infection rate may be the higher number of visitors, length of ICU stay, improper antimicrobial therapy, device usage, lack of knowledge, improper monitoring and structure of the hospital⁵.

Nevertheless crude infection rate may not be demonstrative of the overall burden of the HAIs because they don't consider the risk factors in patients to develop infection or risks associated with exposure to medical therapy. At the same time the differences in literature findings are not certainly related to superior quality care, as there are many other factors may be responsible including differences in criteria's used for patient selection, mixing of the patients, type of ICUs, length of stay in hospital, extent of device utilization, resources available and criteria for discharge⁶.

Catheter Associated Urinary Tract Infections (CAUTI):

Prevalence of CAUTI was reported by 21 studies. Prevalence of CAUTI ranged from 0.6 per 1000 device days to 42 (53.43%)^{9,13}.

CAUTI is a serious cause of morbidity and mortality in ICU patients. Duration of indwelling catheters in place is strongly associated with the risk of acquiring infection i.e., the longer the duration of catheter is in place, higher is the incidence of CAUTI. The daily rate of acquiring bacteriuria is approximately 3 to 10%¹⁴. There was a co-relation between duration of catheterization and increased incidence of CAUTI. The incidence of CAUTI was found 6.54% with more than 8 catheter days, 75% incidence with 15-21 catheter days almost 100% with >22 catheter days¹⁵.

Catheter related blood stream infection (CRBSI):

Central line insertion, is a prevailing invasive procedure performed in critical care areas and are linked with local colonization of infectious organisms ultimately leading to bacteremia and sepsis. The more frequently reported reason for CLABSI is the use of central venous catheters among critically ill patients. In the present review CRBSI and BSI related data were reported in 22 studies. The infection rate ranged from 0.45% in Primary BSI - 47.6%, Secondary BSI - 52.3%. A number of reasons for CRBSI include type of patient setting, insertion technique, catheter lumens, cannulation site, duration of catheterization, frequency of manipulation, type of antiseptic solution used, experience and skill of the person handling, antibiotic use and immune status of the patient¹⁸. CLABSI rates in ICUs of developing countries like India are 3-5 times greater than the developed world¹⁹.

Table 1: Rate of CAUTI & CRBSI

Author	Location	Infection Rate
CAUTI		
Sarita Yadav et al ¹⁶	Haryana	8.73/1000 device days
Devendra K. et al ¹⁵	Gwalior	13.14/ 1000 catheter days
Indranil Bagchi et al ¹⁴	Nagpur, Maharashtra	29.09%
Namita Jaggi et al ¹⁷	NR	7.93 %
CRBSI		
Purva Mathur et al ⁹	New Delhi.	Primary BSI - 47.6% Secondary BSI - 52.3%
Namita Jaggi et al ¹⁷	Multi center	6.4/1000 CL-days (baseline) & 3.9/1000 CL-days (second year)

Cont... Table 1: Rate of CAUTI & CRBSI

Deepti et al ⁷	New Delhi	/ 1000 CVC days
Ramanathan et al ¹⁸	NR	8.75 /1000 catheter days
K Chopdekar et al ¹¹	Mumbai	9.26/1000 catheter days
S.B.Misra et al ¹⁹	Northern India	17.04/1000 catheter-days

Surgical-site infections (SSIs):

The rate of SSI also varies more widely based on the types of surgical procedures, circumstances at which procedure was performed, suggesting it to be an important determinant. In the present review SSI rate varied from 1.6% to 17.8%^{2,10}.

SSIs were identified as the most common HAI (23.94%), followed by hospital-acquired pneumonia (18.31%), UTI (16.9%), CRBSI (16.9%), VAP (9.85%), septicemia (8.45%). These infections were reported highest in surgical ICU (25%), followed by medical ICU (20%) and burns ward (20%)³. Wound infections (44.44%) were the most frequent HAI found, followed by urinary tract infections (31.31%) and respiratory tract infections (9%) with the more bacterial load in burn ward (51.51%). There is a need for antimicrobial stewardship in preventing in HAI⁸.

Ventilator Associated Infection (VAP):

Literature review, revealed VAP, ranged from 4.12 per 1000 ventilator-days to 72.56% per 1000 device days^{19,4}. Among the common infections reported VAP (81%) is the most common infection, followed by CAUTI (17.2%) and CR-BSI (1.7%)⁴. This was comparable with a study where VAP (50%) followed by CRBSI (27.77%), and CAUTI (22.22%) was seen. The chance of acquiring VAP is reported as 3% per day during the first week, 2% per day during the second week and 1% per day in the ensuing weeks of mechanical ventilation⁴.

Mortality and morbidity analysis:

Often HAIs are related with substantial mortality and morbidities. The likelihoods of acquiring an HAI were 3.11, 3.85 and 5.24 times more when the duration of hospital stay exceeded 15, 22-30 or more than 30 days respectively³. The maximum number of deaths was due to BSI contributing to case fatality rate (27.22%) and proportional mortality rate (60.12 %) ¹¹.

HAI contributed to death in 42 (24.1%) patients as compared to 28 patients (16.2%), without acquiring HAIs⁴. The crude mortality rate was 34.5% in trauma patients having BSI. Among these, 40 (36%) episodes were primary BSIs and 72 (64%) were secondary BSIs. Among them 75% patients, died because of septicemia⁹. Mortality among VAP patients was found to be 50%⁴⁰. The attributable mortality of CRBSI are at the range of 10% - 25%. It mandates for regular surveillance being done at the critical care areas¹¹.

Unfortunately, very limited mortality and morbidity related data of HAI are existing from Indian hospitals. Sustained surveillance of HAI is essential to guide appropriate therapy to overcome the threat of infections. It is imperative that all health care professionals must take key role in controlling and preventing HAI.

DISCUSSION

HAIs are seen worldwide but are less studied and are given less emphasis in developing countries. Patients in hospitals especially, critically ill patients in ICUs, are at greater risk of developing HAI. It is difficult to ignore the burden posed by HAIs on patients' safety in terms of sufferings, pain, antibiotic resistance, delayed recovery, prolonged hospital stay, increased number of re-admission, mortality, morbidity and excess healthcare costs.

This review has highlighted a myriad of different HAIs in Indian healthcare. In many instances, the data shown in the literature was limited. Hence, making comparisons or extrapolation of data was not possible.

The review revealed an extremely fragmented information on the burden of HAI in India. With less number of studies, varying way of presenting infection rates and lack of existing national surveillance systems, makes it difficult to estimate the burden of HAI in the country. Furthermore majority of these studies were

done at single hospital which cannot be considered representative of HAI in the country. In particular majority of these studies were conducted in private or corporate hospitals, which represent a specific type of setting and not the broad range of healthcare settings in India. Hence it is difficult to reflect the actual scenario.

The threat posed by HAI and its associated complications within healthcare settings and to the community is alarming. If, the reporting of HAIs from hospitals in India are made mandatory, it would help to tackle the problem and take any corrective action. Ultimately this brings the quality and enable patient empowerment in Indian health care.

Quite a lot of studies have shown that routine surveillance of HAI can reduce the burden of HAI. However, in developing countries, due to lack of formal surveillance the rate of HAI is high. Surveillance of HAI is an imperative prerequisite for quality care and prevention of infections.

CONCLUSION

Healthcare today is becoming more and more complex with emerging challenges and the changing healthcare environment. The change in trend of bacterial infection and their antimicrobial susceptibility patterns strongly indicate toward a need for implementing robust infection control policies and active surveillance. Health professional must focus on practices known to reduce the HAI. Researches must be invested towards finding innovative solutions to combat challenges, such as antimicrobial resistance, the increasing burden of HAIs, and the refinement of existing intervention bundles to be the safest and most cost-effective way.

Conflicts of Interest: None known

Ethical Clearance: Obtained from KMC Ethics committee

Source of Funding: Self

REFERENCES

1. Al-tawfiq JA, Tambyah PA. Healthcare associated infections (HAI) perspectives. *J Infect Public Health*. 2014;7(4):339–44.
2. Negi V, Pal S, Juyal D, Sharma MK, Sharma N. Bacteriological profile of surgical site infections and their antibiogram: A study from resource constrained rural setting of Uttarakhand state, India. *J Clin Diagnostic Res*. 2015;9(10):DC17-DC20.
3. Velu Nair, A.K. Sahni, Dinesh Sharma, et al. Point prevalence & risk factor assessment for hospital-acquired infections in a tertiary care hospital in Pune, India. *Indian J Med Res*. 2017;145:824–32.
4. Chanaveerappa Bammigatti, Saikumar Doradla, et al. Healthcare Associated Infections in a Resource Limited Setting. *J Clin Diagnostic Res*. 2017;11(1):OC01-OC04.
5. I Ginawi, Mohd Saleem, Mastan Sigh, A K Vaish, et al. Hospital Acquired Infections Among Patients Admitted in the Medical and Surgical Wards of a Non-Teaching Secondary Care Hospital in Northern India. *J Clin Diagnostic Res*. 2014;8(2):81–3.
6. Sugata Dasgupta, Soumi Das, Neeraj S. Chawan AH. Nosocomial infections in the intensive care unit: Incidence, risk factors, outcome and associated pathogens in a public tertiary teaching hospital of Eastern India. *Indian J Crit Care Med*. 2015;19(1):14–20.
7. Deepti, Sinha S, Sharma S, Aggrawal P, Biswas A. Central Venous Catheter Related Bloodstream Infections in Medical Intensive Care Unit Patients in a Tertiary Referral Centre. *Indian J Chest Dis Allied Sci*. 2014;56:85–91.
8. Chavan AR, Kelkar V. Study of healthcare-associated infections in surgical unit in a newly established tertiary care hospital of Nanded, Maharashtra, India. *Int J Surg Open*. 2017;9:30–5.
9. Purva Mathur, Varghese P, Vibhor Tak, et al. Epidemiology of Blood Stream Infections at a Level-1 Trauma Care Center of India. *J Lab Physicians*. 2014;6(1):22–17.
10. Shah S, Singhal T, Gnm RN. A 4-year prospective study to determine the incidence and microbial etiology of surgical site infections at a private tertiary care hospital in Mumbai, India. *Am J Infect Control*. 2015;43(1):59–62.
11. K Chopedkar, C Chande, S Chavan, V Wabale, K Vishwakarma AJ. Central venous catheter-related blood stream infection rate in critical care units in a tertiary care, teaching hospital in Mumbai. *Indian J Med Microbiol*. 2018;29(2):169–71.
12. Kumar A, Biswal M, Dhaliwal N, Mahesh R,

- Appannanavar SB, et al. Point prevalence surveys of healthcare-associated infections and use of indwelling devices and antimicrobials over three years in a tertiary care hospital in India. *J Hosp Infect.* 2014;86(4):272–4.
13. Chakraborty P, Mukherjee S. A Study on the Prevalence and Microbiological Profile of Nosocomial Infections in the ICU of a Tertiary Care Hospital in Eastern India. *Int J Curr Microbiol Appl Sci.* 2016;5(55):920–5.
 14. Bagchi I, Jaitly NK, Thombare VR. Microbiological Evaluation of Catheter Associated Urinary Tract Infection in a Tertiary Care Hospital. *People's J Sci Res.* 2015;8(2):23–9.
 15. Prajapati DK, Gupta A, Prajapati R. Epidemiological study of catheter associated urinary tract infection (CAUTI) in surgical patients in Gajra Raja Medical. *IOSR J Dent Med Sci.* 2015;14(9):77–81.
 16. Yadav S, Goel S, Yadav AK, Yadav S. Increase in catheter associated urinary tract infections in intensive care units at a tertiary care centre : A cause of concern. *Int J Biomed Res.* 2015;6(10):815–8.
 17. Jaggi N, Sissodia P. Multimodal Supervision Programme to Reduce Catheter Associated Urinary Tract Infections and Its Analysis to Enable Focus on Labour and Cost Effective Infection Control Measures in a Tertiary Care Hospital in India. *J Clin Diagnostic Res.* 2012;6(8):1372–6.
 18. Parameswaran R, Sherchan JB, Vidyasagar S. Intravascular catheter-related infections in an Indian tertiary care hospital. *J Infect Dev Ctries.* 2011;5(6):452–8.
 19. S.B. Misra R. Misra AA, Poddar. Epidemiology of central line-associated bloodstream infections at a tertiary care centre in northern India. *J Hosp Infect.* 2016; 92:295–302.

Women Empowerment through Step Programme of Government with Special Reference to Kanpur (Uttar Pradesh)

Monica Tiwari¹, P Shalini²

¹Research Scholar, School of Management Studies, Vels Institute of Science, Technology and Advance Studies,

²Professor, School of Management Studies, Vels Institute of Science, Technology and Advance Studies (VISTAS), Chennai, India

ABSTRACT

Purpose-The aim of this paper is to identify the factors of women empowerment and to know how STEP policy contributes in women empowerment.

Methodology/Statistical Analysis - Regression analysis is used for this research paper

and the research use four independent variable(**economic participation, economic opportunity, cultural and social issue, future status quo**) and one dependent variable (**Women empowerment**) is to analyze whether the STEP policy is beneficial for women empowerment or not.

Findings-The findings of the study shows that there is a positive and significant relationship among the independent variable(economic participation, economic opportunity, cultural and social issue, future status quo) and dependent variable (Women empowerment).

Practical implication- To aware the government regarding proper implementation of STEP policy and aware to people regarding STEP policy.

Research limitations- Respondents level was not up to the mark they find it hard to respond to the questionnaire. The busy schedule of the respondents was a major limitation for the study.

Keywords- Women Empowerment, Government Policies, STEP scheme, Economic Participation, Economic Opportunity, Cultural and Social issue, Future Status Quo.

INTRODUCTION

“There is no chance for welfare of the world unless the condition of women is enhanced .it is not possible for a bird to fly on only one wing”

Swami Vivekanand

International Women’s Day was celebrated on 8th March. This year the UN COMMISSION theme was

Corresponding author:

Monica Tiwari

Research Scholar, School of Management Studies, Vels Institute of Science, Technology and Advance Studies (VISTAS), Chennai, India

Email- monijune11@gmail.com

“ Time is now: rural and urban activists transforming women’s lives” Women empowerment as a approach was discussed at the UNITED NATION’S third world war meeting on female in Nairobi in 1985 which defined it as “ **A reallocation of social and economic freedom and control of resources in favor of women**”. Women empowerment has now become an international issue and gender inequality is the problem against women .The Government of India announced 2001 as the year of Women’s Empowerment “swashakti”. Narendra Modi had mentioned the importance of Women Empowerment as “**Economic power is very important for women empowerment they must participate in economic development and I have seen that women are very good at adapting latest technology, we should link**

women and technology up gradation” As this study is based on women empowerment through government policy and its effectiveness this research paper considering one central government policy that is STEP .

Support to Training and Employment Program for women (STEP) Ministry of Women and Child Development of India: The Program is a 100% Central Sector program is under implementation since 1986-87. Government of India has set an enthusiastic target of training 500 million individuals by 2022 which translates to training 42 million a year for this objective. India’s vocational training infrastructure needs to be widened to meet the diverse and many skill requirements of the Industry. There has been recent concern about the decrease in women’s workforce participation in India. Concurrently, women have become more inspirational and are ready to participate equally to the economy .It is a program designed for skill training of women which has been remake during Eleventh plan based on evaluation results and integrated with Swayamsiddha to ensure adequate expenditure for countrywide implementation. The Rashtriya MahilaKosh has been integrated with STEP and Swayamsiddha for credit linkages. STEP Program has been introduced to address occupational inspiration of poor women who do not have the opportunity of formal proficiency training. This program concentrate on proficiency Development for self or wage employment because proficiency and knowledge are the active force of economic growth and social development of a country².

The objectives of this scheme are as below:

- To develop skills that provide Employment to women.
- To develop expertise and proficiency that capacitate women to become entrepreneurs.
- To upgrade the proficiency of poor and marginalized women.
- To provide employment to them on a continuous basis.

Beneficiaries : All women candidates who are in the age group of 16 and above are eligible.

Benefits: Under this program assistance is given to the following sector i.e Farming,Horticulture, Food Processing, Handloom,

Tailoring,Stitching,Embroidery,Zari,etc Handicraft, Computer &IT Implemented Services along with soft skill English, Gemsand Jewelry, Travel, Tourism and Hospitality¹. For Conveying Skill related to employability and entrepreneurship, Provision for Support Services (Health, Childcare, Education, and Sanitationetc.), access to Credit and Imparting Nutrition Education. According to WOMEN AND CHILD DEVELOPMENT UTTAR PRADESH annual report (2017-18) department has released fund for STEP programRs.156.31 lakhs and beneficiaries covered are 2850 in UP till March 2017³.

OBJECTIVE OF STUDY

1. To evaluate the significant relationship between STEP program and economic status of women.
2. To examine the relative effect of each independent variables on STEP program

Hypothesis of the study:

1. There is no significance relation between STEP policy and economic status of women.
2. There is no significance between empowerment program and social status of women.

THEORITICAL FRAMEWORK MODEL

Research methodology: This study is conducted in NGOs which are located in Kanpur area of UP. The data was collected in month of March. Women needs to be empowered by which country will be developed.

Sampling: The sampling techniques used for this study is purposive sampling.

Nature of variable: variables have direct impact on women empowerment. Respondents have given their response in five point Likert scale ranging from strongly disagree to strongly agree.

Collection of Data: 210 questionnaire was distributed and we got back only 200 filled questionnaire from the respondents.

REVIEW OF LITERATURE

Women empowerment :

The women empowerment is defined as “the method , and the result of the method, by which women acquired larger control over material and psychological

resources, and challenge the culture of society and the gender-based differences against women in all the institutions and structures of society⁴. The circumstances and consequences of preferences are reflections on the appraisal of women's empowerment. It reveals that the most probable indicators for empowerment of women are: family size and structure, married benefits, financial independency, freedom of mobility and lifelong expertise of employment participation in the modern.⁵ she sees empowerment as relative to one's own previous competencies. She identifies empowerment of women in 3 spheres the individual empowerment, collective or group empowerment and empowerment in close relationship⁶ It is concluded that women empowerment is process oriented, holistic in nature and it deals with strategic rather than practical gender interest⁷.

Economic opportunity:

Women empowerment has positive relationship to women's career choice and having a bank account which provides monetary security to women as they feel a lot authoritative and can contribute economically to their families⁸ The researcher identifies that the economic opportunity and economic participation has directly related to the increase in women income and promote her status in the society (women empowerment)⁹ The poverty and lack of opportunity increases the difference between men and women. So economic opportunity is positively related to the women empowerment and women status in society.¹⁰

3. Economic Participation

The labor force participation of the women is the strongest factor than education and household decision making. These have a positive impact on Women Empowerment in South East Asian countries¹¹. The women contribution in economic activities is inversely related with marriage status, primary education, number of kids and female head of households in Pakistan¹². The Women's wage rate and education are positively related with labor force participation rate. The labor force participation rate is inversely related with marriage status, the number of kids and age in Kuwait¹³

4. Cultural and Social issues

The culture of the respondent is measured through respondent's education and level of exposure of women to media are two important positive granting indicators

in every region in India increasing women empowerment level with respect to independent decision making role¹⁴. The research has been found that Women's ages and education level have raised the two highly important indicators for crushing domestic Violence¹⁵. The research shows that women are not getting permission to participate in politics and decision making that can positively affect their life and family in Nigeria¹⁶.

5. Future status quo

India's national income would increase by 27 % if the participation of women is equal to the level of men¹⁷. The country economic growth is positively effected by women working age in formal employment¹⁸. The research says that there is a positive correlation between women empowerment and GDP¹⁹.

RESULTS

Multiple regression analysis is used for this research and this method will explain the relationship between dependent (women empowerment) and independent variable (economic participation, economic opportunity) R Square value used to regulate the variation on dependent variable towards the independent variable.

Table No. 1: Reliability Statistics

(Common attributes of women empowerment)

INDICATORS	CRONBACH'SALPHA
Economic participation	0.761
Economic opportunity	0.620
Cultural and social issue	0.710
Future status quo	0.763
Women empowerment	0.739

INTERPRETATION: The cronbach's alpha was executed here for statistical evaluation of reliability of the responses. Table (NO 1.) is showing the information

TABLE NO.2: MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.867 ^a	.751	.746	.55792	.751	147.221	4	195	.000

a. Predictors: (Constant), FSQ, EO, EP, CS

b. Dependent Variable: WE

TABLE NO 3: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	183.302	4	45.826	147.221	.000 ^a
	Residual	60.698	195	.311		
	Total	244.000	199			

This model summary shows the value of R for the model that has been derived for the data, R has the value of 0.867 % indicators have been added are (Economic participation ,Economic opportunity Cultural and social issue Future status quo) between outcome (Women empowerment) therefore R value = 0.867% is good model fit. As per next column a value of R²(0.751) is achieved and the value is a measure of how much of the variability in the outcome is accounted by the indicators . The adjusted R ² (0.746 %) gives us some pictures of how well our model generalizes and ideally, we would like its value to be the same as ,or very close to the value of R² in fact the difference between the value is (0.751 -0.746 = .005 %).

DISCUSSION

The findings of the study shows that there is a positive and significant relationship among the independent variables and dependent variable .The null Hypothesis is rejected because analysis shows that all the independent indicators has(Economic participation, Economic opportunity Cultural and social issue Future status quo) positively related to the women empowerment.

CONCLUSION

This research concludes that UP government has implemented STEP policy in Kanpur area. By the above analysis this research reveals that economic opportunity is positively related to women empowerment that means if opportunity for women is increased, women will get employed and become empowered. Economic participation is positively related to women empowerment and if women are doing job or entrepreneur so that they participate in economic activity directly or indirectly which may help in empowering women. Social and Cultural issues positively impact the women empowerment if society and cultural norm support to women so women status will also be improve in society and women become empowered and future quo is also positively related to women empowerment that means if women are self-employed and participate in economy so they directly or indirectly participate in the development of country economy. The government STEP scheme is implemented in Kanpur area and it had helped to improve economic and social status of women and when the economic and social status of women improves women are empowered automatically.

Ethical Clearance: Nil

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Golder S at al ; Oxfem india organization, Report on Gender development and women empowerment in Uttar Pradesh 2017(Available from www.oxfemindia.org)
2. Ministry Of Women And Child Development Government Of India, Report on women empowerment and protection 2016-17(Available from <http://www.wcd.nic.in/>)
3. Women And Child Development Uttar Pradesh, New women empowerment policies 2016-17 (available at <http://mahilakalyan.up.nic.in/>)
4. Batliwala S, at al ; The meaning of women's empowerment new concepts from action, Boston Harvard University press :(1994) 127-138
5. Kabeer N , Resources, agency, and achievements: Reflections on the measurement of women's empowerment Development and Change, Institute of social studies : (1999) 435-464.
6. Rowlands J, at al ; A Word Of Times, But What Does It Mean? Empowerment In The Discourse And Practice Of Development,The Third World : New York :(1998)
7. Tandon T ,Women Empowerment: Perspectives and Views, International Journal of Indian Psychology: (2016).
8. Bushra A, wajiha N Assessing the Determinants of Women Empowerment in Pakistan a case of two colleges of Lahor ,Pakistan journal of applied economics: (2013) 115-139.
9. Zahidi S at al ; Report on Women's Empowerment: Measuring The Global Gender Gap-2017, (Available from <https://www.weforum.org>)
10. Dufflo E ,Women Empowerment And Economic Development, Journal Of Economic Literature: (2012), 1051-1079
11. Ly Phan. Measuring Women's Empowerment at Household Level Using DHS Data of Four Southeast Asian Countries. Soc Indic Res 2016; 126: doi 10.1007/s11205-015-0876
12. Naqvi Zareen F, at al ; How Do Women Decide To Work In Pakistan?, The Pakistan Development Review: (2002) 495-513.
13. Aly at al ; Determinants Of Women Labour Force Participation In Kuwait: A Logit Analysis, The Middle East Business And Economic Review: (1996) .
14. Chakrabarti S at al ; An Exploratory Analysis Of Women Empowerment In India: A Structural Equation Modelling Approach" Journal Of Development Studies : (2012) 164–180 .
15. Gupta K, at al ; Evidence of Women's Empowerment In India: A Study Of Socio-Spatial Disparities. Geo journal : (2006) 63–84.
16. Abdussalam , at al ; The determinants of women empowerment and its impact on poverty alleviation: a case of kwara state, Nigeria, Asian journal of social sciences & humanities : (2013) 342-347
17. International monetary fund, Report on women empowerment survey 2016(available from <https://www.imf.org>)
18. Klasen S, World bank organization, Report on gender and development survey 1999 (Available from <http://documents.worldbank.org>)
19. Haan A , The Win-Win Case for Women's Economic Empowerment and Growth, international development research centre : (2017).

A Mixed Method Study on Utilization of Maternal Health Services and Barriers among Women of Reproductive Age in Gujarat State- Pilot Study

Sapnaben Bhavin Patel¹, Anil Sharma², Jogindra Vati³

¹Assistant Professor, Department of Obstetrics and Gynaecology, ²Principal, Associate Professor, Manikaka Topawala Institute of Nursing, CHARUSAT, Changa (Gujarat), India, ³Principal, Professor, SGHS College of Nursing, Chandigarh, India

ABSTRACT

Background: It is necessary for the policy makers to understand factors influencing utilization of services provided to mothers. This will help them to formulate interventions which can improve utilization. So present study was conducted to determine utilization and barriers of utilization of services provided to mothers in rural areas of Anand district in Gujarat state.

Method: A sequential explanatory study was conducted in eight villages of Anand district from March 2018 to May 2018. Total 48 women of reproductive age were recruited through multistage sampling to assess utilization of services provided for maternal health through structured questionnaire. Reproductive age women (18-45 years), medical officers, female health worker and ASHAs were selected through purposive sampling for indepth interviews and focus group discussion to explore barriers of utilization of maternal health services.

Results: 100% participants utilized antenatal visits at least once, 97.91% participants utilized intranatal services and 97.91% participants received visit by health care professionals. However mother's health literacy, economical issues, influence of socio cultural believes and practices, response of health care provider, access and resource availability, physical response, gender bias, negligence and ignorance were perceived barriers of not utilization of various aspects of maternal health services.

Conclusion: The study revealed that women had positive response towards utilization of services but it is a need of awareness programme for women on content and utilization of services.

Keywords: maternal health services, women of reproductive age, ASHA

INTRODUCTION

Child bearing period believed to be very blessed period since past in India. But it also conceal implicit threats to women's health.^(1,2)

World Bank, UNICEF and WHO estimated more than 3.5 lakh maternal death per year across the world. 99% estimated maternal mortality present in developing countries and death is more common in women belongs to rural parts and underprivileged families.^(3,4)

Improvement of maternal health was one of the goals for development in the Millennium Declaration (MDG 5) and Health for All by 2000 AD.^(5,6) Further, one of objectives of global strategy for Women's, Children's and Adolescents' Health, 2016-2030 was to decrease maternal mortality lesser than 70 per 100000 live births across the world.⁷

Corresponding author:

Sapnaben Bhavin Patel, Assistant Professor,
Department of Obstetrics and Gynaecology, Manikaka
Topawala Institute of Nursing, CHARUSAT,
Changa-388421 (Gujarat), India
Email-sapanamanger@gmail.com

Though India is very first country to start maternal health program, it has high maternal mortality (167 per 100000 live births in 2011-2013) with low utilization of maternal health services. India accounts for an approximate 44000 maternal death.^(6,8) Pregnancy associated mortality and morbidity have major impression on Indian women's life, their families and newly born child.⁸ In spite of international progress in decreasing maternal mortality, prompt measures are required to fulfill the SDG 2030 target to abolish preventable maternal mortality.⁹

Gujarat is one of the prosperous, urbanized, industrialized and fastest growing states of India but MMR of Gujarat was 112 during the year 2011-13.¹⁰ So the present study was conducted to determine the utilization and barriers of utilization of maternal health services in Anand district with assumption that the result of the study will improve policy maker's understanding and serves as important tool for any possible interventions aimed to improve the low usage of services related to maternal care in Gujarat.

Objectives:

1. To determine the utilization of maternal health services among women of reproductive age in selected rural areas of Anand district.
2. To explore the perception of rural women about barriers of utilization of maternal health services.
3. To explore perception regarding barriers of utilization of maternal health services from health care providers like doctors, nurses, ASHA, family members.

MATERIAL AND METHOD

Study design and setting:

The research adopted a mixed method approach with sequential explanatory design. The design consisted of three phases. In phase-1 quantitative data were collected from women of reproductive age and analyzed. In phase-2, the result of quantitative data was used to build qualitative data collection tool and to select participants. Also the qualitative data were collected and analyzed in phase-2. In phase-3 finding obtained from all methods were drawn together and overall results identified.

Setting and sampling:

For phase-1 multi stage sampling was used to select participants.

1st stage: Anand district was selected (with convenience) from central region of Gujarat state.

2nd stage: Anand district is consists of 8 taluka. The rural area of that taluka was listed and with simple random sampling one village was selected from each taluka.

3rd stage: From each village prior list of women who met the inclusion and exclusion criteria was prepared with the help of Medical Officer, Female health worker and ASHA. 6 women from each village and total 48 women of reproductive age were selected with simple random sampling to determine utilization of services provided for maternal health.

For phase-2, total 8 women who had poor utilization of services were selected for in depth interview with purposive sampling to explore barriers of utilization of maternal health services. CHC, PHC or sub centre present in the selected women's areas were included to interview of its health care professionals like 5 Medical officer, and 7 female health workers to explore barriers of utilization of services related to maternal health. Total 12 ASHAs were selected for focus group discussion.

Data collection:

Data were collected from March 2018 to May 2018. In phase-1 data was collected through structured questionnaire during a personal interview conducted in Gujarati language. The questionnaire made up of socio-demographical features, obstetric profile and utilization of maternal health services. Utilization of services covered antenatal services, intranatal services and postnatal services.

In phase-2 in depth interviews were conducted with women who had poor utilization with semi structured interview guide to explore barriers. Total 8 interviews with women of reproductive age, 5 with medical officer, 7 with FHW and 2 focus group interviews with ASHAs were conducted which was lasted for 30-45 minutes. All discussions were audio recorded and field notes were also taken. Then responses were transcribed verbatim into English and reviewed to ensure accuracy. The

transcripts were analyzed using the inductive content analysis approach and the responses were triangulated.

FINDINGS

Phase-1:

Demographic and obstetrical data of participants:

39.58% participants were belonged 18-22 years, 31.25% from 23-27 years, 22.91% from 28-32 years and 6.25% had more than 33 years age. 25% participants did not receive formal education, 47.91% received primary, 16.66% received secondary and 10.41% received higher secondary education. 87.5% participants were unemployed, 10.41% were unskilled and 2.08% were semiskilled employee. 68.75% participants had monthly family income ≤5000, 29.16% had 5001-10000 and 2.08% had 10001-15000. 39.58% participants had 1 child, 25%, 22.91% and 12.5% had 2,3 and more than 3 children respectively.

Table-1: Utilization of services related to maternal health:

Sr. No.	Utilization of services related to maternal health	Frequency N=48	Percentage
I	Antenatal services		
	Utilization of antenatal visit	48	100%
	First visit: till 16 weeks of pregnancy	40	83.33%
	Second visit period: 20-24 weeks of pregnancy	41	85.41%
	Third visit period: 28-32 weeks of pregnancy	35	72.91%
	Forth visit period: 36 to 40 weeks of pregnancy	31	64.58%
	Measurement of height and weight during each visit.	47	97.91%
	Measurement of blood pressure during each visit.	45	93.75%
	Utilization of blood test services.	48	100%
	Utilization of urine test services.	47	97.91%
	Abdominal examination.	26	54.16%
	Received two doses of tetanus toxoid vaccination	46	95.83%
	Used minimum 100 tablets of iron folic acid or syrup	37	77%
	Counselling for personal hygiene.	47	97.91%
	Counselling for nutrition.	47	97.91%
	Counselling for rest during pregnancy.	45	93.75%
	Counselling for danger signs of pregnancy.	46	95.83%
II	Intranatal services		
	Institutional delivery	47	97.91%
	If yes	47	97.91%
	Safe delivery assisted by skilled birth attender.	47	97.91%
	Free diet during hospital stay.	47	97.91%
	Exemption from all kinds of user charges.	46	95.83%
	Free transportation facility provided by health care institute.	47	97.91%
III	Postnatal services		
	Postnatal visit by health care provider	47	97.91%
	Detail		
	2 nd visit: On 3 rd postnatal day	47	97.91%
	3 rd visit: On 7 th postnatal day	47	97.91%
	4 th visit: After 6 weeks of delivery	35	72.91%

Cont... Table-1: Utilization of services related to maternal health:

	If yes		
	Counselling for danger signs in postnatal.	37	77.08%
	Counselling for breast feeding.	40	83.33%
	Counselling for immunization of baby.	37	77%
	Counselling for family planning methods.	35	72.91%

Phase-2:

Analysis revealed following themes of barriers to utilize maternal health care services in rural areas.

Mother's health literacy:

Illiteracy, lack of knowledge about pregnancy and postnatal visit, unawareness about body changes were perceived barriers of utilization of services related to maternal health. As one of the participant said that "I am illiterate and I don't know date, my menstruation was missed and I thought I had 3 months but when we went for sonography in first visit I came to know that I had 5 month." (Women of reproductive age-5, 30 years old).

"Many women did not remember the date of their last menstrual period, we need to give them clues about any festivals or important days." (ASHA-2, 9)

Economical issues:

Though all maternal health services are not charged under JSSK scheme, extra payments like journey cost during antenatal visits, leaving work for the antenatal visits, paying for investigation, and giving money to hospital staff after delivery were reported as barriers for utilization of services related to maternal health. Even APL holders did not receive financial assistance from government.

"The delivery was free of cost but Traditional birth attender asked Rs. 200 and class IV worker asked Rs. 100 and we paid to them. We had to pay." (Women of reproductive age-6, 28 years old)

Influence of socio cultural believes and practices:

Social responsibilities of women like taking care of child, taking care of house, preparing food for family and working in the farms were responsible for not arrive at health facilities during the regular time of service delivery.

"Many women were so busy with home responsibilities that they could not come for regular antenatal visits and vaccination and they did not have time for themselves." (ASHA-4)

Cultural believes and practices:

Some women and their family members did not visit hospital during antenatal period because of religious believes. Women also followed food taboos.

"I had vegetable and my daughter got sick so I stopped eating that vegetables." (Women of reproductive age-3, 28 years old)

Traditional believes:

Tradition to delivered babies at home was also a barrier.

"Madam, the Dayan was very trustable and all old female of my family delivered at home. And both mother and babies were healthy." (Female decision maker of family-2, 50 years old)

Social power:

Cultural believes and practices passed by parents in laws and relatives acted as barriers of not utilizing counselling services.

"I did not know the reason but I ate whatever was given to me in postnatal period." (Women of reproductive age-6, 28 years old)

Response of health care provider:

Absences of medical officer, bed smell in hospital, long waiting time, were reported as perceived barriers of not utilization or living of the maternal health services.

"I have charge of two PHC so I am not available in either of PHC for few days." (Medical officer-2)

Access and resource availability

Far distance of PHC, not availability of emergency services at night time, longer waiting time in hospital to get institutional transportation were perceived barriers of not accessing the maternal health services.

“ASHA said that no emergency transportation available at night so we took private auto and went to hospital.” (Women of reproductive age-5, 30 years old)

Physical response of body:

Constipation, nausea, vomiting, and diarrhoea and bad taste of iron folic acid tablets were reported as perceived barriers of not consuming iron folic tables.

“I had constipation so I did not take medicine” (Women of reproductive age-6, 28 years old)

Gender bias:

Wish to have male child was perceived barrier of utilization of services.

“Even for male child they go for 6-7 para sometimes.” (Medical officer-1)

Negligence and ignorance:

Negligence and ignorance identified as perceived barrier for utilization of postnatal services.

Phase-3:

Interpretation and integration of results of phase-1 and phase-2:

Utilization of antenatal services:

The study revealed that 100% participants had visited health care facilities at least once in throughout pregnancy and majority of them utilized services of blood test, urine test, height and weight measurement and blood pressure monitoring. But illiteracy, lack of knowledge about pregnancy, travel cost, wages lost during antenatal visits, social responsibilities, trust on religious leaders, absence of medical officers at health care institute and long waiting time were perceived barriers of late registration and irregular utilization of services.

Only 26 participants utilized service of abdominal examination although fees for sonography and not provided this service by female health worker were

reported as barrier to abdominal examination service.

Total 37 participants consumed more than 100 iron folic acid tablets while rest of the participants did not consumed due to nausea, vomiting, constipation, black colour stool and ignorance.

Average 45 participants utilized services of counselling and it is not utilized by other participants due to food taboos and restrictions from parents in-laws and relatives.

Utilization of intranatal services:

97.91% participants utilized services of institutional delivery assisted by skilled birth attendant but tradition to deliver baby at home and trust on traditional Dai were perceived barriers of not to go for institutional delivery.

47 participants utilized free transportation provided by hospital and rest of participants did not utilize because of long waiting time to get it.

Utilization of postnatal services:

Total 47 participants were visited by ASHA and Female health worker during 2nd and 3rd postnatal day. But only 35 participants were visited by ASHA after 6th week of delivery. However lack of knowledge about postnatal visit, negligence and busy schedule of female health workers identified as barriers of utilization of postnatal visits.

Average 38 participants utilized services of counselling during postnatal period while food taboos, and restrictions from parents in-laws were identical barriers of utilization counselling services. Further gender bias was barrier of not utilization of family planning counselling.

CONCLUSION

Women of reproductive age had very positive response towards utilization of services related to maternal health. However perceived barriers of utilization of services were included mother's health literacy, economical issues, influence of socio cultural beliefs and practices, response of health care provider, access and resource availability, physical response, gender bias, negligence and ignorance

Limitations: This study relied on self reported quantitative data so there is a chance of recall bias.

Further, the findings cannot be concluded for entire district or state and may not be relevant for urban areas. In addition, questions on the utilization of services were attentive to most recent pregnancy in one year before data collection, so it was difficult to investigate behavioral pattern to use these services for subsequent births from women and therefore establishment of causal relationship is difficult.

Conflict of Interest: No conflict of interest

Source of Funding: None

Ethical Clearance: Ethical clearance was obtained by Institutional Ethics Committee for Human Research, CHARUSAT. Informed written consent was obtained from participants and if participants unable to read or write, the consent was explained and thumb impression was taken in the presence of one witness.

REFERENCES

1. Dabade K J, Dabade S K, Khadilkar H A. A study on utilization of maternal health care services in rural area of Aurangabad district, Maharashtra. *National journal of community medicine* [Internet]. 2013 Oct-Dec 31[cited 2016 Apr 10]; 4(4): 579-583. Available from: file:///C:/Users/sapna%20patel/Downloads/4-4_579-5831%20(2).pdf
2. Bhattacharjee S, Datta S, Saha J K, Chakraborty M. Maternal health care services utilization in tea gardens of Darjeeling, India. *J Basic Clin Reprod Sci* [Internet]. 2013 [cited 2016 Apr 12]; 2(2):77-84. Available from: <https://www.jbcrs.org/articles/maternal-health-care-services-utilization-in-tea-gardens-of-darjeeling-india.pdf>
3. Danasekaran R, Raja P, Ranganathan K. Utilization of antenatal care services among Fishermen population in Kanchipuram district, Tamil Nadu: A cross sectional study. *Indian J Community Med.* 2017 July-Sep; 42(3):159-162
4. WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in Maternal Mortality: 1990 to 2015 Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. World health organization; 2015. 100p.
5. Government of India. Millennium development goals India country reports 2015. New Delhi: Social statistics division; 2015. 245 p.
6. Park K. Park's textbook of prevention and social medicine. 23rd edition. Jabalpur: M/s Banarsidas Bhanot; 2015.
7. UN Secretary General. The global strategy for Women's, Children's and Adolescents' Health, 2016-2030. Sustainable development goals; 2015. 106 p.
8. Ministry of health and family welfare, Government of India. Maternal death and surveillance report. 2017 March. 127 p.
9. Alkema L., Chou D., Hogan D., Zhang S., Moller A.B., Gemmill A., Ma Fat D., Boerma T., Temmerman M., Mathers M, Say L. Global, regional, and national levels and trends in maternal mortality between 1990 and 2015, with scenario-based projections to 2030: a systematic analysis by the UN Maternal Mortality Estimation Inter-Agency Group. *The Lancet* [Internet]. 2015 Nov 13; 387: 462-74. doi: 10.1016/S0140-6736(15)00838-7
10. Vora, K.S., Annerstedt K.S., Mavalankar D.V., Dholakia N.B., Yasobant S., Saiyed S., Upadhyay A. and De Costa A. (2016) Community Based Survey Methodology for Maternal Healthcare Utilization: Gujarat, India. *Health* [Internet]. 2016 Nov 17; 8: 1542-1553. doi: <http://dx.doi.org/10.4236/health.2016.814152>

A Study on Stress and its Effect on Private School Teachers

S Kosalai¹, G S Maheswari²

¹Research Scholar, Department of Commerce, ²Professor & Research Supervisor,
Department of Commerce, Vistas, Pallavaram, Chennai

ABSTRACT

The main aim of this study is to find the factors causing stress to the Private school teachers and the effects on coping strategies to reduce stress. The researcher used regression analysis to find the result. The findings shows that the main factors of stress are low pay and work load. It concludes that the coping strategies followed by the Management reduce stress to the school teachers.

Keywords: Stress Management, Coping Strategies.

INTRODUCTION

Stress management can be defined as a set of techniques to help people deal more effectively with stress in their life by observing the specific stressors and taking positive actions to minimize their effects (Raitano & Klener, 2004). Stress basically involves the relationships between individuals and their environment that are considered as challenging or exceeding their resources. Stress is acknowledged to be one of the main causes of absence from work. Anxiety, frustration, anger and feelings of inadequacy, helplessness or powerlessness are emotions often associated with stress. If these challenges are presented by a teachers, then this will be effected on their teaching and this would be difficult to cope with that profession.

One of the most important sources of stress in each person's life is employment. Occupational stress has become a common and main problem in workplaces. It is one of the main reasons for reduced the performance of employees. To achieve quality, efficiency, effectiveness, and equity in their work place, certain conditions must be appropriate and accompanied by the reduction of stress in employees. There are many stressful things in

the work environment of Private school teachers, the most important of which are the shortage of teachers, many substitute classes and low salary.

Stress management is a wide spectrum of techniques and psychotherapies aimed at controlling a person's level of stress, especially chronic stress, usually for the purpose of improving everyday functioning.

The importance given to stress management skills in workplace can be guessed from the fact that employers, in many countries, have been burdened with a legal responsibility of recognizing as well as coping with the workplace stress in order to ensure good mental and physical health of employees in organization.

Most cure professions including nursing, medicine and other human services ones are considered stressful. Teaching is also particular in view of the responsibility to health, bliss and activities of the students. Teachers are responsible for promotion of knowledge, pedagogy of students and creating discipline so, teachers, stress is of different type.

Reducing stress in your everyday life is vital for maintaining your overall health, as it can improve your mood, boost immune function, promote longevity and allow you to be more productive. Stress has such a powerful impact on your well being because it is a natural response that is activated in the brain.

In this study, the researcher finds the factors causing of stress to school teachers, the coping strategies which

Corresponding author:

Dr. G.S. Maheswari

M.Com., M.Phil., B.Ed., Ph.D.,

Professor & Research Supervisor, Department Of
Commerce, Vistas, Pallavaram, Chennai

E mail id – roshanmaheswari@gmail.com

is followed by the Management to reduce stress and the strategies which are needed to reduce stress more.

REVIEW OF LITERATURE

Nor Diyana Mohammed Shobri et al(2013) The Influence of Stress Management Techniques on Employees' Retention: A Study on Call Center Agents in Malaysia. DOI: 10.7763/IPEDR. 2013. V64. 5. Stress management techniques can help employees to deal effectively with stress in their work life by identifying the specific stressors and taking positive actions to minimize their effects. The techniques that are suitable to prevent stress at the workplace include time management, relaxation and physical exercise. Thus, this study identifies the best stress management technique and its influence on employees' retention among Malaysian call center agents. The finding indicated that relaxation is the best technique in maintaining employees' retention. This article ends with the suggestion for the organization to implement various programs to maintain the well-being of employees³.

Prerana.R.Huli.(2014) Stress Management in Adolescence. Quest Journals Journal of Research in Humanities and Social Science Volume 2 ~ Issue 7 (2014) pp: 50-57. - This is an extensive Review of Literature Study on Stress Management in Adolescents. One of the important trends which are being observed is getting instant gratification from the electronic media and gadgets. The involvement of adolescents in getting instant gratification of needs has led to lot of stress in them and in their relationships with family and peers. Stress leads to maladaptive behavior as mentioned above⁴.

Ioanna V. Papathanasiou et al. (2015) Stress: Concepts, theoretical models and nursing interventions. American Journal of Nursing Science 2015; 4(2-1): 45-50. : Stress is a fact of everyday life and it can be defined either as a reaction or as a stimulus. Propose of this study is to present the basic concepts and the main theoretical models of stress, its effects on the individual, the coping strategies and the nursing methods of addressing it. The main theoretical approaches for stress are interpreting it differently, either as a stimulus, as a response or as a transaction. Nurses, after the recognition of patients' needs and reactions, should choose those interventions that will be the most effective for each particular patient. Most important interventions for alleviating stress

are: anxiety reduction, anger management, relaxation and sleep, proper diet, physical exercise, relaxation techniques and effective time management².

Godwin et al.(2016)Occupational Stress and its Management among Nurses. Health Science Journal ISSN 1791-809X Vol.10 No.6:467. A purposive sampling technique and a self-administered questionnaire were used to select 73 nurses from the nursing and midwifery department in the Hospital. Descriptive and inferential statistics were used to analyze the data. The study found out that the major causes of stress identified by the nurses were inadequate motivation (98.6%), inadequate staffing levels (91.8%), handling a large number of patients alone (83.6%), lack of break during shift (82.2%) and nursing difficult patients (71.3%)¹.

Veena. S. Rai(2016) Stress Management Among Students And Its Impact On Their Effective Learning. International Journal of Engineering Research and Modern Education (IJERME) ISSN (Online): 2455 - 4200 (www.rdmodernresearch.com) Volume I, Issue I, 2016. . Mismatch between the student and the teacher which can raise tension and cause stress, is one of the biggest reason why it attack to all the students. Lack of much family attention has also been a reason why it attacks to all students. Children generally stress. In addition to that the other reason of stress is insufficient sleep is a common cause and students all across the world are getting affected by stress because of it. Stress management among students in universities and college is a hit-or-miss matter. In order to tackle the ugly matter most of the college and universities schedule optional stress management classes, but students often lack the time to attend. An attempt is done through this paper to know the impact of stress among students and the necessity of managing it in order to make the learning effective⁶

Shafaghat et al. (2018), Occupational Stress and How to Confront It: A Case Study of a Hospital in Shiraz Tahereh, : This research evaluated factors affecting occupational stress and strategies for coping with it. This cross-sectional descriptive-analytic study was conducted in 2015. Occupational stress was rated as moderate among the studied nurses. Significant positive correlations were found between occupational stress level and less effective coping method, occupational stress level and work experience level, and ineffective coping methods and age. Moreover, a significant difference was seen

between men and women in terms of emotion-focused coping. Conclusion: According to the research findings, occupational stress was at a moderate level among the studied hospital nurses, indicating that the authorities need to focus on efforts to reduce occupational stress for nurses⁵.

OBJECTIVES OF THE STUDY

To know the factors causing stress to the Private school Teachers.

To find the coping strategies to reduce stress.

HYPOTHESES OF THE STUDY

There is no significant difference among the factors causing stress.

There is no significant relationship between the coping strategies and reduce stress.

ANALYSIS OF FACTORS CAUSING STRESS

There are many factors which is causing stress to

the Private school teachers. The main factors are work load, low pay, Work culture, Exam Result, Pedagogy of Students and Temporary job. The following regression analysis shows that influence on stress to the school teachers and the effects on coping strategies which is followed by the school management.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.980 ^a	.960	.959	.87389

a. Predictors: (Constant), F6, F3, F5, F1, F2, F4

The above table shows that R = .980, R square .980 and Adjusted R Square = .959. It indicates Factors of stress creates 98% over their job. The cumulative variables of these variables is formulated through following one way analysis.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3517.763	6	586.294	767.713	.000 ^b
	Residual	147.392	193	.764		
	Total	3665.155	199			

a. Dependent Variable: Copingstrategies

b. Predictors: (Constant), F6, F3, F5, F1, F2, F4

It was presented in the above table F = 767.713 P = .000 statistically significant at 5% level.

This reflected all the variables cumulatively responsible for coping strategies followed by the Management. The individual influence of all these variables is clearly mentioned in the following co-efficient table.

Model B		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		Std. Error	Beta			
1	(Constant)	-.240	.273		-.879	.380
	Exam Results	.539	.196	.161	2.755	.006
	Work culture	.639	.269	.153	2.375	.019
	Temporary job	.397	.263	.088	1.509	.133
	Low pay	.851	.237	.254	3.583	.000
	Student's Pedagogy	.497	.168	.161	2.968	.003
	Work load	.736	.228	.198	3.234	.001

a. Dependent Variable: Copingstrategies

It was showed in the above table Exam Results (Beta = .161, t = 2.755, P = .006), Work culture (Beta = .161, t = 2.755, P = .006), Temporary Job (Beta = .161, t = 2.755, P = .006), Low pay (Beta = .161, t = 2.755, P = .006), Student Pedagogy (Beta = .161, t = 2.755, P = .006), Work Load (Beta = .161, t = 2.755, P = .006) are statistically significant at 5% level. This indicates that factors of stress affected by the teachers and coping strategies helpful to the teachers to overcome from these factors and to achieve what the management expected.

FINDINGS AND CONCLUSIONS

There are many factors which is causes stress to the school teachers such as Work load, Low pay, Exam results, student's pedagogy and temporary job.

The most affected factors are Low pay and work load. The teachers are getting stress because of low pay and more work load. This will affect the job performance and their family.

The coping strategies which is followed by the Management such as arranging tour, Yoga to the teachers, Sanction of leave, Promotion and career development programmes reduce stress.

It concludes that the teachers are concentrates their achievement what the management expected because of coping strategies. The Management should have to follow the coping strategies to satisfy the teachers in their Job.

TESTING OF HYPOTHESES

There is no significant difference among the factors causing stress - Rejected

There is no significant relationship between the coping strategies and reduce stress – Rejected.

Conflict of Interest – Nil

Ethical Clearance – Taken From Ugc Committee

Source of Funding- Self

REFERENCES

Godwin et al..Occupational Stress and its Management among Nurses. Health Science Journal ISSN 1791-809X (2016) Vol.10 No.6:467.

Ioanna V. Papatheanasiou et al. Stress: Concepts, theoretical models and nursing interventions. American Journal of Nursing Science 2015; 4(2-1): 45-50.

Nor Diyana Mohammed Shobri et al. The Influence of Stress Management Techniques on Employees' Retention: A Study on Call Center Agents in Malaysia. DOI: 10.7763/IPEDR. 2013. V64. 5.

Prerana.R.Huli. Stress Management in Adolescence. Quest Journals Journal of Research in Humanities and Social Science (2014) Volume 2 ~ Issue 7 pp: 50-57.

Shafaghat et al. Occupational Stress and How to Confront It: A Case Study of a Hospital in Shiraz Tahereh, 2018.

Veena. S. Rai. Stress Management Among Students And Its Impact On Their Effective Learning. International Journal of Engineering Research and Modern Education (IJERME) ISSN (Online): 2455 - 4200 (www.rdmodernresearch.com) 2016.Volume I, Issue I..

Evaluation of the Influence of Surface Treatment of Artificial Tooth on the Adhesive Bond Strength to a Commercially Available Denture Base Resin-In Vitro

Gurkaran Singh¹, Veena Hegde²

¹Former Post graduate Student, ²Professor, Department of Prosthodontics, Manipal College of Dental Sciences, Manipal

ABSTRACT

Purpose: Purpose of the study is to evaluate the effect of pre-processing treatment of ridge-lap surfaces of acrylic teeth, air abrasion, chemical modification or combination of both on the strength of the bond between the teeth and the denture base resin..

Materials and method: Total of 32 tooth-acrylic resin samples were equally divided into four groups consisting of eight samples each.. The ridge-lap surfaces of each tooth was flattened to the designated level with a tungsten carbide acrylic bur and finished and polished. Ridge lap area of each group was subjected to pre-processing surface treatment like No treatment, air abrasion, chemical application and combination of both respectively. Wax cylindrical specimen of 20 mm X 17 mm dimensions were obtained using PVC pipes. Acrylic teeth were placed on the wax cylindrical specimens and acrylized. All samples were subjected to bond strength evaluation. Shear load testing was carried out in the Universal testing machine. The failure surfaces were subsequently examined under a stereomicroscope.

Results: Obtained data was subjected to statistical analysis. The ultimate shear strength value obtained amongst all the test groups was the highest (89.18 Kgf) for Group IV, thereby indicating the effect of combination of air-abrasion and MMA conditioning. Although the highest shear bond strength value seen in Group II (69.56 Kgf) was similar to Group III (69.29 Kgf), yet it was higher than highest value seen in Group I (54.65 Kgf).,

Conclusion: There was a significant effect produced on the shear bond strength of the interface when both MMA application and air-abrasion of the ridge-lap surfaces was carried out. When done singly, these modalities showed numerically higher bond strength values but these values were not statistically significant in comparison to the control group in which no treatment was carried out.

Keywords: Bond strength, artificial teeth, Surface treatment

INTRODUCTION

Majority of commercially available, pre-formed artificial teeth are essentially made of acrylic or vinyl-acrylic resin; which is chemically very similar to acrylic

resin used in denture construction¹. Consequently, this inherent ability to chemically bond to the denture base along with higher shock absorbability and ease of adjustment, has led to widespread use of acrylic teeth in removable prosthodontics². Therefore, adhesive bond strength between denture base resin and artificial teeth constitutes one of the most important considerations in the technical procedure related to the fabrication of removable dentures^{2, 3, 4} However, there are only few studies on sandblasting of the denture base and limited

Corresponding author:

Professor, Department of prosthodontics
Manipal College of Dental Sciences, MANIPAL
Email: veena.hegde@manipal.edu

information is available on the use of sandblasting to increase the bond strength of a denture tooth to denture base⁵.

Against this backdrop of scarcity of information, this prospective interventional in-vitro study was aimed at evaluating the effect of pre-processing treatment of ridge-lap surfaces of acrylic teeth, on the strength of the bond between the teeth and the denture base resin. Thus the objective of the study is to evaluate the effect of MMA application, air abrasion and combination of MMA application and air abrasion on the shear bond strength of denture tooth-base interface.

Materials and Methods


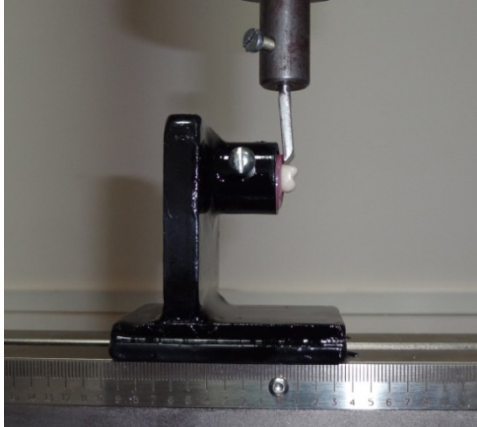
Specimen Preparation

For purpose of the study, a total of 32 tooth-acrylic resin samples were equally divided into four groups as Group I- No surface treatment, Group II - Mechanical modification of ridge-lap surface by air-abrasion with 110-µm aluminum oxide particles at 4.9 Kg/cm² air pressure at 1 cm distance for 10 seconds, Group III-Chemical

modification by application of methyl-methacrylate monomer 10 minutes before acrylic resin packing and once just before packing of denture base and Group IV- Combination of aforementioned modalities with air-abrasion done at the initial stage and MMA conditioning done prior to acrylic resin packing. Specimens of 20 mm X 17 mm dimensions wax cylinders were obtained using PVC pipes (Fig 1). 32 cross-linked acrylic first maxillary molars were taken of a single manufacturer (Lactodont, Pyrax polymers, Roorkee, India) for the study.

A line 1mm occlusal to the ridge-lap surface of the tooth was marked on the palatal aspect using a digital vernier caliper (Mitutoyo Inc. Japan) and continued all around the tooth. The ridge-lap surfaces of each of the 32 teeth were flattened to the designated level with a tungsten carbide acrylic bur and finished and polished

Acrylic teeth were placed on the wax cylindrical specimens after respective surface treatment with their long axis perpendicular to the bottom of the cylindrical wax forms (Figure 1). Prepared specimens were then invested and acrylized using heat cure denture base material.

	
<p>Figure 1: Acrylic resin tooth-wax pattern showing sharply defined junction</p>	<p>Figure 2: Shear load testing carried out in INSTRON 3366 with the specimen attached to the fixture</p>

Upon successful retrieval of cured specimens, conventional finishing and polishing procedures, careful inspection of the tooth-acrylic junction was carried out to make sure that there was no overlap at the interface so as to accurately subject it to shear loading forces.

All the specimens were stored in distilled water for 24 hours before subjecting them to bond strength

evaluation.

Shear load testing was carried out in the Universal testing machine (Instron 3366, UK) equipped with computer control, data acquisition and data analysis software (Bluehill software version 2.18.713). Prepared acrylic specimens were mounted on a specially designed fixates on the universal testing machine mounting

table (figure 2) and shear load was applied at a cross-head speed of 0.5 mm /minute. During the testing, the fixture holding the acrylic resin-tooth sample was so aligned that the shearing blade was located exactly at the interface between the acrylic teeth and the denture base material on the buccal surface of the resin tooth. While performing the test, care was taken that shearing tool had low friction, sharp and hard edges and induced failure with no significant bending/rotation of the sample.

OBSERVATIONS AND RESULTS

Data was analyzed using statistical package SPSS. Mean values and standard deviations were calculated for the ultimate shear bond strength values for different test groups. One-way ANOVA test to determine any significant differences between the test groups was carried out. Subsequently, a Tukey’s post-hoc analysis was conducted and results were expressed as maximum compressive load in Kgf and ‘p’ value at or less than 0.05 was considered statistically significant.

TABLE 1: Shows individual shear bond strength values (Kgf) of various specimens after respective surface treatment.

SAMPLE	GROUP I NO TREATMENT	GROUP II MMA LIQUIDAPPLICATION	GROUP III AIR- ABRASION	GROUP IV MMA APPLICATION + AIR-ABRASION
SAMPLE 1	54.65	60.34	31.17	88.04
SAMPLE 2	48.53	52.07	59.42	38.61
SAMPLE 3	45.81	57.29	39.81	62.71
SAMPLE 4	36.77	60.43	42.53	66.70
SAMPLE 5	49.27	42.41	58.11	67.30
SAMPLE 6	39.38	58.21	39.46	46.67
SAMPLE 7	40.53	69.56	69.29	89.18
SAMPLE 8	35.23	57.61	44.10	53.24

The samples were subjected to shear forces in Universal testing machine and the maximum compressive load values of each of the four test groups was determined (Table 1). The ultimate shear strength value obtained amongst all the test groups was the highest (89.18 Kgf) for Group IV, thereby indicating the effect of combination of air-abrasion and MMA conditioning. Although the highest shear bond strength

value seen in Group II (69.56 Kgf) was similar to Group III (69.29 Kgf), yet it was higher than highest value seen in Group I (54.65 Kgf).

Subsequently, the mean shear strength values were computed. This value for Groups II, III and IV was numerically found to be higher than the mean bond strength value of the control group (Table 2).

TABLE 2: Shows descriptive analysis for each of the test groups showing mean shear bond strength values for each test group and also the 95% confidence limits for each.

TEST GROUPS	N	Mean (Kgf)	Std. Deviation	Std. Error	95% Confidence Interval for mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Group 1	8	43.7713	6.83630	2.41700	38.0560	49.4865	35.23	54.65
Group 2	8	57.2400	7.73957	2.73635	50.7696	63.7104	42.41	69.56
Group 3	8	47.9863	12.84122	4.54006	37.2507	58.7218	31.17	69.29
Group 4	8	64.0562	18.09708	6.39829	48.9267	79.1858	38.61	89.18
Total	32	53.2634	14.13671	2.49904	48.1666	58.3603	31.17	89.18

Thus, all three pre-processing surface treatment modalities had a positive effect on mean shear strength of the denture tooth-base joint in comparison to the case in which no treatment was done.

The mean shear strength values obtained after measurement were subjected to one-way Analysis of Variance or one-way ANOVA test. From this analysis, it is evident that there was a significant difference in mean maximum compressive load among the 4 study groups depending upon the tooth surface conditioning carried out (p value-0.011).

Subsequently, Tukey's post hoc analysis was performed to evaluate the significant differences in between any of the 2 groups.

TABLE 3: Shows Tukey's post-hoc analysis between various test groups to significant pair differences.

Group 1	Group 2	Mean Difference	Std. Error	Significance	95% Confidence Interval	
					Lower Bound	Upper Bound
Group I	Group II	-13.46875	6.11881	.148	-30.1750	3.2375
	Group III	-4.21500	6.11881	.900	-20.9213	12.4913
	Group IV	-20.28500*	6.11881	.013	-36.9913	-3.5787
Group II	Group I	13.46875	6.11881	.148	-3.2375	30.1750
	Group III	9.25375	6.11881	.444	-7.4525	25.9600
	Group IV	-6.81625	6.11881	.684	-23.5225	9.8900
Group III	Group I	4.21500	6.11881	.900	-12.4913	20.9213
	Group II	-9.25375	6.11881	.444	-25.9600	7.4525
	Group IV	-16.07000	6.11881	.063	-32.7763	.6363
Group IV	Group I	20.28500*	6.11881	.013	3.5787	36.9913
	Group II	6.81625	6.11881	.684	-9.8900	23.5225
	Group III	16.07000	6.11881	.063	-.6363	32.7763
*. The mean difference is significant at the 0.05 level.						

Post hoc analysis revealed that Group IV had significantly higher mean compressive strength than Group I (Table 3). No significant differences were present in any of the group comparisons.

DISCUSSION

Bonding failures between artificial teeth and heat-polymerized denture base resins are a result of multitude of factors such as excessive stress, fatigue, insufficient tooth cleaning during denture base resin placement, wax and tinfoil substitute contamination, defective properties of materials^{3,6} and inappropriate heat-polymerizing technique^{3,7}.

The strength of bond between the denture tooth and the denture base has been ascribed to a combination of factors⁸. Such factors have been investigated with different testing methods such as ridge lap grinding diatoric placement, chemical modification, differing mode of polymerization etc. and the resulting data have been used to suggest technical procedures to enhance this bond.

The present study examined changes in the shear bond strength of a single brand of acrylic tooth with a denture base resin, after subjecting it to three differing modes of tooth-surface conditioning prior to conventional heat-processing procedures.

The ridge-lap surface of these cross-linked teeth was flattened to the designated level of 1 mm above the actual ridge-lap base to achieve a flat, uniform surface area of contact with the acrylic resin. Caswell et al.⁹ in 1986 showed that reduction of the base of the tooth increased the depth of bond and overall tensile strength of the tooth. Chemical modification of the ridge-lap area by application of methyl-methacrylate monomer is an accepted surface-treatment modality^{2,5,10}.

As stated by Nishigawa et al.⁴ and other authors¹⁰, free MMA in the dough-state resin causes the plastic tooth resin surface to swell up and dissolve, which promotes its adherence to the heat-cured acrylic resin. A factor of concern for such surface treatment is the MMA wetting time, which has been shown to be of much importance in adhesion between acrylic resins by Vallitu et al.¹¹ Varying MMA wetting-time protocols have been followed by investigators leading to differing results.^{2,5,11} Bragaglia et al.³ etched tooth bases twice with a methylmethacrylate monomer 10 min before acrylic resin packing and just before packing as a surface treatment regimen for their study. The same protocol was followed for the current study.

However, the results of studies in which this modality of surface treatment was carried out, as a method to improve bonding, have largely been contradictory; thus

warranting the present investigation^{3,4,12}

Also, the mode of polymerisation followed for the current study was a thermal mode. Old and recent studies^{5,13} have shown numerically lower denture tooth-base bond strengths with microwave-polymerised specimens owing to uncontrolled temperature rise which results in formation of pores, especially in thicker areas. This is of clinical relevance as thickness of the denture base material in the tooth-bearing areas might promote pore formation. Unlike microwave polymerisation, thermal mode of polymerisation results in better mechanical properties of the denture and thus, is the most widely used method¹⁴.

Bond strengths of various interfaces related to dental materials may be measured in terms of the ultimate shear strength, ultimate tensile strength, ultimate flexural strength or through photo-elastic analysis.

Although considered a reliable modality to test the desired mechanical variable, photo-elastic analysis is however, much dependent upon the homogeneity of the specimen²³. Evaluation of bond strength through 3-point and 4-point flexural loading also, does not provide actual material property data. On the contrary, it provides accurate structural data dependent on inherent material and specimen geometry¹⁵. The tensile loads used in many artificial tooth bond strength studies are not representative of real conditions either. The anatomic shape of posterior teeth and the direction of occlusal forces make the occurrence of significant tensile forces over these teeth unlikely¹⁶. On the other hand, shear and compressive loads are much more plausible clinically, as carried out in a majority of studies³ including the current one. Ideally, the shear bond strength is calculated by measuring the bond surface area but in this study as in other recent studies, the same was not done due to complexity of the curves obtained.

Furthermore, all modalities of surface treatment demonstrated numerically stronger bonds between tooth and denture base than non-treated samples; although not all were significantly strong (Table 3). Conditioning of tooth surfaces with 2 coats of MMA liquid resulted in better shear bond strength than air abrading the ridge-laps with 110 μm alumina particles. These results were similar to the observations of Saavendra et al.¹⁷ but in contrast to the conclusions of Consani et al.¹⁸ This difference could be attributed to the fact that they conducted their study using microwave-polymerised denture base resin and varied MMA wetting time.

CONCLUSION

From the results obtained it can be concluded that, there was a significant effect produced on the shear bond strength of the interface only when both MMA application and air-abrasion of the ridge-lap surfaces was carried out. When done singly, these modalities showed numerically higher bond strength values but these values were not statistically significant in comparison to the control group in which no treatment was carried out. Also, application of MMA over the ridge-lap area yielded better results than air-abrasion with 110 µm alumina particles.

Ethical Clearance- Permission taken from institutional research committee. Animal or human subjects are not involved in the study.

Source of Funding- Self

Conflict of Interest - Nil

REFERENCES

- Anusavice KJ. Philips, Science of Dental Materials, 11th edition, Elsevier, New Delhi, India, 754-758.
- Chaves CL, Regis RR, Machado AL, Souza RF: Effect of Ridge Lap Surface Treatment and Thermocycling on Microtensile Bond Strength of Acrylic Teeth to Denture Base Resins. *Braz Dent J* 2009; 20(2): 127-131
- Bragaglia LE, Prates LHM, Calvo MCM: The Role of Surface Treatments on the Bond between Acrylic Denture Base and Teeth. *Braz Dent J* 2009; 20(2): 156-161
- Nishigawa G, Maruo Y, Okamoto M, Oki K, KInuta Y, Minagi S, et al: Effect of Adhesive Primer Developed Exclusively for Heat-curing Resin on Adhesive Strength between Plastic Artificial Tooth and Acrylic Denture Base Resin. *Dental Materials Journal* 2006; 25(1): 75 - 80.
- Chung KH, Chung CY, Chung CY, Chan DC. Effect of pre-processing surface treatments of acrylic teeth on bonding to the denture base. *J Oral Rehab* 2008; 35: 268-275
- Clancy JM, Boyer DB. Comparative bond strengths of light-cured, heat-cured, and autopolymerizing denture resins to denture teeth. *J Prosthet Dent* 1989; 61: 457-462
- Schneider RL, Curtis ER, Clancy JM. Tensile bond strength of acrylic resin denture teeth to a microwave - or heat – processed denture base. *J Prosthet Dent* 2002; 88: 145-150.
- Albarghouty H, Juszczak AH, Radford DR, Clark RKF: Tensile Bond Strength of Heat and Self-Cured Acrylic Denture Base Resins to the Inner and Outer Layers of Two-Layered Acrylic Resin Denture Teeth. *Eur. J. Prosthodont. Rest. Dent.*, 2007; Vol.15, No. 2, pp 81-83
- Caswell CW, Norling BK. Comparative study of the bond strength of the abrasion-resistant plastic denture teeth bonded to a cross-linked and a grafted, cross-linked denture base material. *J Prosthet Dent* 1986; 55: 701–708.
- American Dental Association. Revised ANSI/ADA specification 15 for synthetic resin teeth. *Am Dent Assoc* 1985;119-131.
- Vallittu PK. Bonding of resin teeth to the polymethyl methacrylate denture base material. *Acta Odontol Scand*, 1995; 53: 99-104
- Minami H, Suzuki S, Minesaki Y, Kurashige H, Tanaka T. In vitro evaluation of the influence of repairing condition of denture base resin on the bonding of autopolymerizing resins. *J Prosthet Dent*. 2004; 91: 164–170.
- Polyzois GL and Dahl JE. Bonding of synthetic resin teeth to microwave or heat activated denture base resin. *Eur J Prosthodont Rest Dent*,1993;2:41-44
- Hayden WJ: Flexural strength of microwave-cured denture baseplate. *Gen Dent* 1986; 34: 367-371
- Bhat VS, Nandish BT. General properties of matter. p 37-39. In, *Science of dental materials*, 1st edition. CBS publishers and distributors. New Delhi, INDIA
- Darbar UR, Huggett R, Harrison A and Williams K. The tooth-denture base bond: stress analysis using the finite element method. *Eur J Prosthodont Rest Dent*, 1993; 1: 117-120.
- Saavedra G, Valandro LF, Leite FPP, Amaral R, Ozcan M, Bottino MA, et al. Bond strength of acrylic teeth to denture base resin after various surface conditioning methods before and after thermocycling. *Int J Prosthodont* 2007; 20: 199-201
- Consani RL, Naoe HT, Mesquita MF. Effect of ridge-lap surface treatment on the bond of resin teeth to denture base. *J Adhesive Dent* 2011; 13; 287-293

Prevalence of Depression among the Post-Menopausal Women in the Field Practice Area of Saveetha Medical College and Hospital, Thirumazhisai, Tamil Nadu

Ruma Dutta¹, Prashanth Rajendran², S.Ramya³, Navukkarasu Sabapathy⁴, S.Kesava³, S.Senthilraja³

¹Associate Professor, ²Postgraduate, Department of Community Medicine, Saveetha Medical College, ³Final Year Undergraduate Student, Saveetha Medical College, ⁴Junior Resident, Saveetha Medical College and Hospital

ABSTRACT

Background: Currently in India, no national health program serves and promotes the specific health needs of postmenopausal women.

Objectives: To determine the prevalence of depression and to assess the level of depression among the postmenopausal women in the field practice area of Saveetha Medical College Hospital- Thirumazhisai, Tamil Nadu.

Method: A community based cross-sectional study was conducted from May 2017 to July 2017. The sample size was calculated as 171. Data was collected using a structured interview schedule among postmenopausal women. Data was entered and analyzed by using IBM SPSS software version 19.

Results: The mean age of the study participants was 54.8 years and their average age of attaining menopause was 49.7 years. It was found that 75% of the women were found to be normal with no symptoms of depression and 22% of the postmenopausal women have mild grade of depression and 4% were found to have moderate grade of depression.

Conclusion: The health care services should pay more attention towards women's health in post-menopausal period.

Keywords: Postmenopausal women, Depression, South India

INTRODUCTION

Menopause is defined as the time of cessation of ovarian function resulting in permanent amenorrhea^[1,2]. It represents the end of menstruation after the last menstrual period. Menopause occurs gradually and it indicates the transition from the reproductive to post-reproductive era of a women's life. According to the World Health Organization, it takes 12 months of amenorrhea to confirm that menopause has set in.

In 1990, about 25 million women worldwide reached menopause; this number is expected to double by the late 2020s.^[3] It was estimated that more than 130 million Indian women are expected to live beyond menopause by 2015. The average age of menopause in India is 47.5 years.^[4] According to Indian Menopausal Society, there were about 65 million Indian women over the age of 45 years in 2006 in the menopausal group^[5]. Although most women transition to menopause without experiencing psychiatric problems, an estimated 20% have depression at some point during menopause.^[6-8]

Corresponding Author:

Dr. Prashanth Rajendran

Department of Community Medicine
Saveetha Medical College

Email: drprashanthrajendran@gmail.com

Menopausal transition, or 'perimenopause', is a defined period of time beginning with the onset of irregular menstrual cycles until the last menstrual period, and is marked by fluctuations in reproductive hormones.

^[7]This period is characterized by menstrual irregularities; prolonged and heavy menstruation intermixed with episodes of amenorrhea, decreased fertility, vasomotor symptoms; and insomnia. Some of these symptoms may emerge 4 years before menses ceases.^[8] Depression during perimenopause is likely due to fluctuating and declining estrogen levels^[9].

A study conducted in Mangalore city, Karnataka, South India on problems associated with menopause found that the significant signs included hot flushes, headache, urinary tract infection, back pain, muscle pain, insomnia, depression & mood disturbances. Experts believe that women are more prone to develop depression secondary to hormonal changes that take place through their life time as well as monthly variations of the menstrual cycle.^[10]

Investigations from the Harvard study of Moods and cycles recruited premenopausal women aged 36-44 years with no history of major depression and followed up these women for 9 years to detect new onsets of major depression. Women who entered peri-menopause were twice as likely as women who had not yet made the menopausal transition to have clinically significant depressive symptoms.^[11]

Psychological problems and particularly depression is one of the problems menopausal women face in the modern societies. Depression is one of the most common psychiatric disorders, which is not limited to specific time, place or person and includes all groups and society^[12]. There are several causes underlying depression associated with menopause. Some of these factors include previous history of depression, personal and cultural issues. The attitude of women about menopause has an important role in the creation or elimination of the problems.^[13]

In Indian scenario, menopausal health demands higher priority.^[14] Currently in India, no national health program serves and promotes the specific health needs of postmenopausal women. Moreover, health programmes provides focused attention to women in the reproductive age group, ignoring those who have passed their reproductive stage.^[15] Hence there is an urgent need to determine the prevalence of depression and to assess the level of depression among the post-menopausal women in the field practice area of Saveetha Medical college Hospital- Thirumazhisai, Tamil Nadu.

MATERIAL AND METHOD

A community based cross-sectional study was conducted from May 2017 to July 2017. The study area was Thirumazhisai which is the field practice area of Saveetha Medical College & Hospital, Chennai, Tamil Nadu. Ethical clearance was obtained from Saveetha Medical College Institutional Ethics Committee (SMC/IEC/2017/132). The study population consisted of all post-menopausal women in the area. Taking the prevalence of depression among postmenopausal women as 24.7%, with an alpha error of 0.05, limit of accuracy of 10%, the minimum sample size required for the study was calculated as 171.

All the women who had attained natural menopause were included in the study. Women who were in the transition period of attaining menopause, women who had undergone surgical menopause and women who did not give consent for the study were excluded. The participants were selected by multi-stage sampling method. Out of the 15 wards in Thirumazhisai town, 3 wards was selected by simple random sampling. The sample size required was equally distributed in the selected 3 wards. The investigator went to the center of the ward and selected the first house on the left hand side and thereby covering the required sample.

Data was collected by interview method using pretested, structured questionnaire translated in local language (Tamil). The study tool contained two parts, part I – Background Characteristics and part II - Hamilton Rating Scale for Depression (HRSD). The level of depression was assessed with the Hamilton Depression Rating Scale wherein a score of 0-7 was considered normal, 8-13 as mild depression, 14-18 as moderate depression, 19-22 as severe depression and individual with a score more than 23 was considered to suffer from very severe depression. Data was collected and entered in MS Excel. Analysis was done using IBM SPSS version 19 and proportions were calculated.

RESULTS AND DISCUSSION

The study was conducted among a total of 171 post-menopausal women in Thirumazhisai. The mean age of the study participants was 54.8 years and their average age of attaining menopause was 49.7 year. Table 1 shows the background characteristics. It was found that 75% of the women were found to be normal with no symptoms of depression and 22% of the postmenopausal women

have mild grade of depression and 4% were found to have moderate grade of depression (Table 3).

TABLE 1: BACKGROUND CHARACTERISTICS OF THE STUDY POPULATION.

VARIABLES	NUMBER OF WOMEN (N = 171)	PERCENTAGE (%)
AGE		
41-50 years	32	18.7
51-60 years	139	81.2
OCUPATIONAL STATUS		
EMPLOYED	10	5.84
UNEMPLOYED	161	94.1
AGE AT MENARCHE		
10-11 years	40	23.39
12-13 years	110	64.32
14-15 years	21	12.2
AGE AT MENOPAUSE		
40-44 years	5	2.92
45-50 years	111	65.49
51-55 years	43	25.1
56-60 years	11	6.43

TABLE 2: DETAILS ABOUT THE SYMPTOMS OF DEPRESSION AMONG THE POSTMENOPAUSAL WOMEN.

SYMPTOMS	SCORE	RESPONSE (N = 171)	PERCENTAGE (%)
DEPRESSED MOOD	0	133	77.70
	1	32	18.70
	2	6	3.50
FEELINGS OF GUILT	0	152	88.80
	1	14	8.18
SUICIDAL THOUGHTS	0	162	94.70
	1	9	5.26
ANXIETY (PSYCHOLOGICAL)	0	116	67.80
	1	22	12.80
	2	32	18.71
SOMATIC SYMPTOMS (GENERAL)	0	98	57.30
	1	65	38
	2	8	4.60
INSOMNIA	0	110	64.30
	1	49	28.60
	2	12	7

TABLE 3: DETAILS ON THE GRADING OF DEPRESSION AMONG THE POSTMENOPAUSAL WOMEN.

GRADE OF DEPRESSION	SCORE RANGE	N	PERCENTAGE (%)
Normal	0 - 7	129	75%
Mild Depression	8 - 13	36	21%
Moderate Depression	14 - 18	6	4%
Severe Depression	19 - 22	0	0
Very Severe Depression	>23	0	0

The mean age of attaining menopause in the study was 49.7 years, which is similar to other studies done across India in various study settings.^[14-17] In this study, it was observed that overall prevalence of depression among the postmenopausal women was 25% which is lower in comparison with previous studies done by Akankshasingh et al^[3], prevalence of depression was about 32.1% and another study done by Lawrence Dcruze, Ruma Dutta et al^[4] showed prevalence of about 24.7% among the postmenopausal women.

The depressive symptoms have been graded into mild, moderate and severe by the Hamilton depression rating scale. Nearly 42.6% of women experienced somatic symptoms (Headache, backache, fatigability) and 32.16% of women had symptoms of Anxiety (Sweating, flushing, stomach cramps, urinary frequency) and 35.6% women had symptoms of insomnia, 5.2% of women had suicidal thoughts, 8% of women had symptoms of feeling guilt for even minor matters. All of these corresponds to symptoms of depression.

In the modern era, mental illness and discomfort can happen to all individuals' depression is a disease that is more common in women.^[18-19] This study showed a significant percentage of women experiencing depression in postmenopausal period. Depression can be associated with certain other personal characteristics which include lifestyle situations, socioeconomic status and other associated factors. Depression in women can cause disability, impair their interpersonal, social functions and career. Thus, the diagnosis of depression and its relevant individual, social, and economic factors in women and providing training and advice from the experts to the family and society will be helpful.

The presence of post menopausal symptoms may decrease the health related quality of life in women changes occurring in women during 40-60 years of age which requires proper attention, working women preferably may require more care due to dual responsibility. Working women due to more stress may have feeling of guilt, irritability, depression etc. The health care services should pay more attention towards women's health in post-menopausal period and appropriate therapy like HRT (Hormone Replacement Therapy) should be encouraged. Certain modifications in life style and some programmed interventions can provide the enhancement of positive healthy habits, reduce stress and can add quality to their life.

CONCLUSION

From the study conducted among 171 postmenopausal women 24.5% of postmenopausal women have symptoms of depression. About 21% has symptoms of mild depression and 3.5% of them have moderate depression

Among women who have symptoms of depression none of them sought medical care to reduce their symptoms. There is a rising prevalence of depression among the post-menopausal women. The most common menopausal complaints reported by the postmenopausal women were sleep disturbances, generalized fatigue, and mild depression.

Source of Funding: Nil

Conflict of Interest: None declared

REFERENCES

- Dalal PK, Agarwal M. Postmenopausal syndrome. *Indian Journal of Psychiatry*. 2015;57(Suppl 2):S222-S232. doi:10.4103/0019-5545.161483.
- Howkins J, Bourne G. Perimenopause, menopause, premature menopause and postmenopausal bleeding. In: Paduvidri VG, Daftary SN, editors. *Shaw's Textbook of Gynaecology*. 14th ed. India: Elsevier; 2008. p. 37.
- Jahanfar SH, Abdul Rahim BA, Shah Reza BK. Age at menopause and menopausal symptoms among Malaysian women who were referred to a health clinic in Malaysia. *Shiraz E-Medical Journal* 2006 July; 7: 3.
- Health Press International; 1997. p. 9-28. . Schiff I, Regestein Q, Tulchinsky D, Ryan KJ. Effects of estrogens on sleep and psychological state of hypogonadal women. *JAMA* 1979;242:2405-4.
- Indian menopause society, 2006.
- Indian menopause society. Making Menopause Easier. New Delhi: Indian Menopause Society. Available from: <http://www.indiatogether.org/2006/Oct/were-menopause.html>. Accessed on 26/08/2018.
- Soares CN, Taylor V. Effects and management of the menopausal transition in women with depression and bipolar disorder. *J Clin Psychiatry* 2007;68Suppl 9:16-21.
- Baram D. Physiology and symptoms of menopause. *A Clinician's Guide to Menopause*. Washington, DC: In: Steward DE, Robinson GE, editors.
- Soares CN. Perimenopause-related Mood Disturbance: An Update on Risk Factors and Novel Treatment Strategies Available. In: Meeting Program. Abstracts. Psychopharmacology and Reproductive Transitions Symposium. American Psychiatric Association 157 th Annual Meeting; May 1-6, 2004; New York, Arlington, VA: American Psychiatric Publishing; 2004. p. 51-61.
- Steiner M, Dunn E, Born L. Hormones and mood: From menarche to menopause and beyond. *J Affect Disord* 2003;74:67-83.
- Lina Alexandra Rosin, Relationship Between Depression And Coronary Artery Disease In Postmenopausal Women, The University Of Arizona 2005 Depression/C. Myths, Magic and Mystery, Supporting women's health and fertility, www.menstruation.com.au cited on april 2012. . Available from: URL: <http://www.menstruation.com.au/contributors/moonflow.html>. Accessed on 26/08/2018.
- Cohen LS, Soares CN, Vitonis AF, Otto MW, Harlow BL. Risk for new onset of depression during the menopausal transition: The Harvard study of moods and cycles. *Arch Gen Psychiatry* 2006;63:385-90.
- Bromberger JT, Harlow S, Avis N, Kravitz HM, Cordal A. Racial/ethnic differences in the prevalence of depressive symptoms among middle-aged women: The Study of Women's Health Across the Nation (SWAN). *Am J Public Health*. 2004;94(8):1378-85.
- Sarrel PM. Women, work, and menopause. *Menopause*. 2012;19(3):250-2. [DOI] [PubMed]
- Reed SD, Ludman EJ, Newton KM, Grothaus LC, LaCroix AZ, Nekhlyudov L, et al. Depressive symptoms and menopausal burden in the midlife. *Maturitas*. 2009;62(3):306-10.
- Ruma Dutta, Anuradha R et al. A population study on the symptoms menopausal symptoms in a rural area of Tamil Nadu, India *journal of clinical and diagnostic Research*. 2012(suppl-2), vol-6(4):597-601.
- Khan HG, Hallad SJ. Age at menopause and menopausal transition: Perspectives of Indian rural women. Available from: <http://www.epc2006.princeton.edu/download>.
- Dasgupta D, Ray S. Menopausal problems among rural and urban. Women from Eastern India. *J Soc Health Sci* 2009;20-33.
- Sharma S, Tandon V, Mahajan A. Menopausal symptoms in urban women. *J K Sci* 2007;9:13-7.
- Ayranci U, Orsal O, Orsal O, Arslan G, Emeksiz DF. Menopause status and attitudes in a Turkish midlife female population: An epidemiological study. *BMC Womens Health* 2010;10:1.
- Rizk DE, Bener A, Ezimokhai M, Hassan MY, Micallef R. The age and symptomatology of natural menopause among United Arab Emirates women. *Maturitas* 1998;29:197-202.

Is India Ready for Telerehabilitation?

Sona Ayanikalath¹, Mershen Pillay², M. Jayaram³

¹University of KwaZulu Natal, South Africa, ²Associate Professor, University of KwaZulu Natal, South Africa, ³Professor, NIMHANS, India

ABSTRACT

Introduction: As telerehabilitation is a novel method of service delivery with most research having been conducted in economically developed countries, the various factors that may affect its effectiveness should be identified when importing this idea to resource constrained countries.

Method: In depth semi-structured interviews of TR personnel in India were used to investigate the factors that influence the effectiveness of TR.

Result: The factors were determined as reduced access to TR in the government sector, better access to TR in private sector, government policies and procedures and funding for TR, cost effectiveness, technology used for TR, power and internet connectivity, device and accessories used for TR, storage of the TR videos, training required for TR, other professionals required for TR, acceptance of TR by professionals in India, acceptance of TR by patients or caregivers in India, computer literacy, severity of disorder being treated and follow up.

Conclusion: The current study suggests that strategies to overcome the factors must be directed at creating and supporting opportunities in resource constrained country to meet patients' needs, irrespective of location.

Keywords: *Effectiveness, resource constrained country, India, TR*

INTRODUCTION

Telerehabilitation (TR) constitutes a small part of the literature on telemedicine,¹ with very few studies being reported in India.² The literature indicates that while telemedicine, which started in 2001 in India, offers great opportunities to health care in general and for rehabilitation services,³ it could be particularly beneficial for resource constrained countries, where access to basic health care is compromised by lack of services and skilled professional care,⁴ by providing access to medical services in any part of the country or the world. Providing population in underserved countries with the means to access rehabilitation services has the potential to help meet previously unmet needs⁵ and positively impact health services.⁶ With an increase in the various

disorders such as cerebro-vascular accidents, traumatic brain injury, global developmental delays in paediatrics, etc. that require rehabilitation interventions like physiotherapy, occupational therapy, speech language pathology and the like in India, and considering their dearth, a new method such as TR need to be considered for their intervention.

As reported by Mars,⁴ to successfully implement TR in a resource constrained country, there needs to be awareness of TR and its scope of practice. As in many such countries, the academic teaching departments are largely unaware of TR. Mars⁴ noted that clinicians who have used videoconferencing, Skype®, email and telephony for work have been driven by local need and the availability of infrastructure. Only a small percentage of rehabilitation professionals in the USA use TR for regular interventions due to issues such as limited access to the internet at work and poor technical support,⁷ which is likely to be even less favourable in India. Poor electricity connection is a disadvantage

Corresponding author:

Dr. Sona Ayanikalath

email: sonanarayanan4@gmail.com

in India, where nearly 45 million households are still waiting to get connected or gain access to some source of reliable and affordable electricity.⁸ While TR appears to be a possible solution to overcoming the short comings, it has not been widely used in India, making it necessary for it to be either developed or imported. This raises the issues as to whether the TR systems used in developed countries,^{7,9} can be imported to a country such as India, while ignoring the factors that could influence its effectiveness.

An exploration of the current status of TR in India was deemed necessary considering it being a new intervention system, where the challenges to its use may not only be technology related. The present study aimed at exploring the various factors that influence the effectiveness of TR when implemented in a resource constrained country.

METHOD AND MATERIALS

A formulative exploratory research design was used.¹⁰ Purposive sampling of two psychiatrists and six speech language pathologists were recruited. Purposeful sampling was used to identify personnel who are especially knowledgeable about or experienced with TR in India.¹⁰⁻¹¹ Personnel who had been providing TR for less than one year were excluded owing to their lack of experience. Informed consent was obtained, after which each interview lasted an hour using Skype®. Interviews were done in English and were audio recorded.

The main questions covered the main content of the study subject and within them participants were encouraged to speak freely about their knowledge, attitudes and practices of TR.¹²⁻¹³ Thematic analysis

resulted in several categories and general findings emerging using coding, categorizing, delineating and connecting them.¹⁴ Code-decoding of the transcripts were done, analyzed and compared by two independent researchers.

FINDINGS AND DISCUSSION

Political and financial factors

Reduced access to TR in the government sector.

Having started in 2001, TR is more than a decade old in India. In the initial years, though, TR was not accessible to the public due to constraints such as lack of funding and changing political agendas. It was mainly accessed by the physicians for consultations amongst themselves. Patients accessing health services in the public sector do not have access to TR, unlike the private sector, where hospitals make use of information technology (IT). It has become accessible to the general population for direct interventions during the last 10 years in India.

Better access to TR in private sector. Participants stated that the technology has been well supported in private sector hospitals due to adequate funding, which contributes to generating a good income due to physician-patient TR consultations. TR for speech language therapy is mainly being provided by SLPs working in private facilities.

Government policies and procedures and funding for TR. There are no state or central government level rules or regulations to guide tele services in India,¹⁵ which results in each organization having its own. This could lead to confusion or misunderstanding regarding the ethical obligations associated with the technology (figure 1).

“We had the symposium of digital mental health, where many people asked regarding the rules and regulations of teleconsultation, which we don’t have at present in India”

[Participant B].

“an international conference on telerehabilitation by the TR society of the USA and the TR society of India. Even I think they are at loggerheads regarding the policies, they are also not very clear about the terms and conditions.” [Participant D].

Figure 1: Direct quotations of participants

The participants noted that TR has considerable potential in India to address the treatment gaps, but that while this is theoretically feasible, attempts to implement it in public sector facilities have not been successful.¹⁵ Participant C stated that India has come up with supportive research regarding TR services, but unfortunately are unable to implement in real life situations (figure

2). This is associated with the appropriate funding available for research projects and not so for its real-life implementation. TR is mainly used for physician to physician consultations, and is being used in only one academic institute done speech language pathology services, as stated by participant D.

In India, there is a lot of scope for telemedicine, theoretically. But practically it's not happening. That is what the government of India is working on. [Participant B]

Figure 2: Direct quotation of participant

As stated by participant B, the Prime Minister of India is now working towards a 'digital India'. This is done by improved online infrastructure and increasing internet connectivity or by making the country digitally empowered in the field of technology, with three core components of digital infrastructure, delivery of services digitally and digital literacy.¹⁶ It includes plans to connect rural areas with high-speed internet networks, which will make TR possible for people throughout the country.

Cost effectiveness. TR reduces the need for patients to travel to the hospitals to meet a physician or to a centre for speech language therapy, physiotherapy or occupational therapy services (figure 3). TR is convenient for patients who experience constraints that affect their ability to travel. Tindall et. al and Burns et. al identified TR to be cost effective for speech language pathology services.¹⁷⁻¹⁸

"Parents find it hard to make it to the therapy appointments because they have to go for speech, they have to go for occupational therapy, they have to go physiotherapy, they have to so many other allied services and they are all in different place. So, reaching them and following up at home gets very overwhelming for certain parents. For them telepractice is helpful." [Participant A]

Figure 3: Direct quotation of participant

Infrastructural factors

Technology used for TR. Skype® was the most commonly used internet application used by most participants for their tele-services. Participant A reported that she also used other applications such as Hangout® and face time on iPhone®. All participants used the inbuilt camera in the laptop, personal computer or the mobile phone.

Power and internet connectivity. The most common issues faced during TR sessions in India are power failures, low bandwidth and poor internet

connectivity, with power outages occurring at least once a day. While remote TR personnel may have good internet connectivity and no power failures, this may not be the case for the patient. Weather conditions such as heavy rains, which are very common in many parts of India, can cause disconnections.

Device and accessories used for TR. Old devices, such as the laptop or a personal computer, can hinder the audio-visual clarity at both ends (figure 4). The TR personnel preferred the use of notebook or personal computers over mobile phones, as they provide clearer video and audio output. While the use of mobile phones

or tablets during TR can hinder effective communication, most of India's population cannot afford personal computers or laptops, with many having old computers that cannot accommodate modern communication

software and takes long time to boot and start. Most household in India use computers or laptops for an average of 5.94 years.¹⁹

“it should not happen that you have to log onto your desktop computer which is God's number of years old and it will take 5-20 minutes to act.” [Participant C]

Figure 4: Direct quotation of participant

Storage of the TR videos. As stated by participants B, C and D, that these videos should be stored safely to ensure confidentiality of the patients. These videos are also required for future consultations and if possible for future research purposes. However, due to the large number of these videos, storage space becomes a problem, which needs to be addressed at both a policy and organizational level.

Personnel factors

Training required for TR. All the participants

reported that no specific training in TR was obtained before starting these services in their respective organizations having been self-taught skills and learnt through trial, error and improvisation (figure 5). As stated by participant D, all TR service providers in India may not have received any formal training before starting to use it, suggesting that it is not too complicated to exclude untrained persons. Holla et. al¹⁵ reported in their study that 52% technicians reported they have never undergone training and the rest had undergone training once.

“We shared and learned. I would say often it was a trial and error.” [Participant F]

Figure 5: Direct quotation of participant

Other professionals required for TR. IT personnel are required for a tele-session, to solve problems that happen with the system during the session and for later storage of the videos. As stated by participant E, while they can also help to retrieve these videos for later use, their lack of availability made it difficult to assist with the system during a tele-session, which results in the end users having to solve the problems by themselves.

Acceptance of TR by professionals in India.The participants thought that service provision through TR was not widely accepted by health professionals in India. As stated by Math, Moirangthem and Kumar²⁰, one main reason was that a physician would not want to liaise with another, which may be due to professional rivalry (figure 6).

“For example, a physician in a district hospital wants to talk to a neurologist here or a paediatrician wanting to talk to a paediatric neurologist. A specialist would not like to take that kind of an advice.” [Participant C]

Figure 6: Direct quotation of participant

The physicians in the government sector are already burdened with their own large number of patients, and therefore facing time constraints. India has one government physician for every 11528 people and one nurse for every 483 people.²⁰ This is associated with the dearth of physicians working in the government sector hospitals, which is also due to their low remuneration. But TR is well accepted by the physicians in the private sector, since the mentioned reasons may not be affecting

their services. Most physicians in the government sector hospitals would welcome the use of TR as it would reduce their travel time to the various district hospitals or primary health care centres.

Most medical professionals were unaware of the use of TR for health purposes in India, which is a barrier to its growing use (figure 7).

“In fact, last week I had been to an international conference and the person was so amazed and said that they were totally unaware that such a service is available. So, it’s our fault and their poor knowledge. We have failed to publicize or their poor knowledge!” [Participant D]

Figure 7: Direct quotation of participant

Patient factors

Acceptance of TR by patients or caregivers in India. TR is welcomed by patient and their caregivers in India as it gives them access to health care services

that are not locally available, and which they might not otherwise have benefited from. TR provides easy access to the professionals from any corner of the country. Parents feel empowered, wanting to learn and interact more during the sessions (figure 8).

“So majorly it’s the mothers who want to learn and they want to be in-charge of doing therapy for their children. We have many parents who call us and ask about us. But who sign up for real therapy are those who want to do and have that time and efforts to give that dedication.” [Participant A]

“Because it is convenient for them. It reduces expenses. They don’t have to wait for long to see a doctor. So, its acceptance is definitely much better.” [Participant B]

Figure 8: Direct quotations of participants

Computer literacy of patients and caregivers can also pose as a challenge to initiating the communication as well as during the TR session.^{16,22}

Severity of disorder being treated. A commonly raised obstacle by the participants A, G and H, who were speech language pathologists, was the challenge of providing language therapy to children who have

severe autism or attention deficit hyperactive disorders in addition to poor eye contact (figure 9). Thus, as the severity of the disorder increased, therapy through TR mode proved to be more challenging than a face to face session. Similar findings were reported in studies conducted in developed countries.²³⁻²⁵ Sessions need to be made creative for any paediatric cases to keep their interest going during the sessions.

“So I think a lot of this depended on how much or what severity of the problem of the child. We started with a child who had ADHD or very severe autism and moved into their issues with their activities and place and things like that. Those were the parents who did not find it very successful.” [Participant A]

“in certain conditions like where the clinician should manipulate the oral structures of the child or the adult for treating conditions like motor speech disorders, TR is posing a limitation” [Participant H]

Figure 9: Direct quotations of participants

Participant D suggested the use of a trained aide at the site of the patient to assist in such situations. Participant C suggested inclusion of an onsite junior to be trained to aid the TR personnel, which could be a novel thought to be considered for future research and implementation.²⁶

Follow up. The professional can access the patient from where he/she is and vice versa, if they are moving places within or outside the country. Participant A reported that paediatric patients improved through TR. She reported other modes of follow up, such as sending emails with the home therapy activities to the parents.

CONCLUSION

This study detailed that TR is an effective method of service delivery in a resource constrained country, where specialised services may not be available in remote areas of the country. However, a dearth of personnel was stated as a major challenge in the government sector hospitals, suggesting the need for public/private partnerships to address the country’s growing health needs. The lack of government infrastructural support appears to be the main element influencing all the other factors, which would lead to its streamlining and obstacles to access financing or funding. Hence, this amounts to the medical and non-medical infrastructural restraints, scarcity of healthcare workers in the government sector and increased burden on the existing professionals, electricity and internet disconnection.

The current study recommends the need to address the factors when implementing TR in India and suggests that strategies to overcome them must be directed at creating and supporting opportunities in resource constrained country to meet patients’ needs, irrespective of location.

Funding Acknowledgements: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of Interest: The authors declare that there is no conflict of interest.

REFERENCES

1. Russell TG. Physical rehabilitation using telemedicine. *Journal of telemedicine and telecare*. 2007 Jul 1;13(5):217-20.
2. Rao K, Iyer C, Anap D. Can Telerehabilitation Add a New Dimension in the Treatment of Osteoarthritis Knee. *J Pain Relief*. 2012;1(113):2167-0846.
3. World Health Organization. Telemedicine: opportunities and developments in member states. Report on the second global survey on eHealth. World Health Organization; 2010.
4. Mars M. Telerehabilitation In South Africa–Is There A Way Forward?. *International journal of telerehabilitation*. 2011;3(1):11.
5. Patnaik S, Patnaik AN. E-Health for all Is India ready?. *National Journal for Community Medicine*. 2015 Oct;6(4).

6. Ganapathy K. Telemedicine in the Indian context: an overview. *Studies in health technology and informatics*. 2004;104:178-81.
7. Ward EC, Burns CL. Dysphagia management via telerehabilitation: A review of the current evidence. *Journal of Gastroenterology and Hepatology Research*. 2014 May 21;3(5).
8. Gill B, Saluja S, Palit D. Electricity Pricing and the Willingness to Pay for Electricity in India Current Understanding and the Way Forward.
9. Sharma S. Telerehabilitation application for the clinical assessment of dysphagia.
10. Creswell JW, Clark VL. *Designing and conducting mixed methods research*. Sage publications; 2017 Aug 31.
11. Patton MQ. *Qualitative research and evaluation methods*. Book Qualitative Research and Evaluation Methods. 1980.
12. Åstedt-Kurki P, Heikkinen RL. Two approaches to the study of experiences of health and old age: the thematic interview and the narrative method. *Journal of Advanced Nursing*. 1994 Sep;20(3):418-21.
13. Turner III DW. *Qualitative interview design: A practical guide for novice investigators*. The qualitative report. 2010;15(3):754-60.
14. Boeije H. A purposeful approach to the constant comparative method in the analysis of qualitative interviews. *Quality and quantity*. 2002 Nov 1;36(4):391-409.
15. Tindall LR, Huebner RA, Stemple JC, Kleinert HL. Videophone-delivered voice therapy: A comparative analysis of outcomes to traditional delivery for adults with Parkinson's disease. *Telemedicine and e-Health*. 2008 Dec 1;14(10):1070-7.
16. Prakash A. Digital India needs to go local. *The Hindu*. Retrieved from <http://www.thehindu.com/opinion/op-ed/digital-india-needs-to-go-local/article7723292.ece>. 2015.
17. Tindall LR, Huebner RA, Stemple JC, Kleinert HL. Videophone-delivered voice therapy: A comparative analysis of outcomes to traditional delivery for adults with Parkinson's disease. *Telemedicine and e-Health*. 2008 Dec 1;14(10):1070-7.
18. Burns CL, Kularatna S, Ward EC, Hill AJ, Byrnes J, Kenny LM. Cost analysis of a speech pathology synchronous telepractice service for patients with head and neck cancer. *Head & neck*. 2017 Dec;39(12):2470-80.
19. Joseph K. Electronic waste management in India—issues and strategies. In *Eleventh International Waste Management and Landfill Symposium, Sardinia 2007 Oct 1*.
20. Math SB, Moirangthem S, Kumar NC. Telepsychiatry: After mars, can we reach the unreachable?. *Indian journal of psychological medicine*. 2015 Apr;37(2):120.
21. Bagcchi S. India has low doctor to patient ratio, study finds.
22. Srivastava N. E-Governance in Rural India. Nidhi Srivastava/(IJCSIT) *International Journal of Computer Science and Information Technologies*. 2015;6(1):741-4.
23. Hill AJ, Theodoros DG, Russell TG, Ward EC, Wootton R. The effects of aphasia severity on the ability to assess language disorders via telerehabilitation. *Aphasiology*. 2009 May 1;23(5):627-42.
24. Hill AJ, Theodoros D, Russell T, Ward E. Using telerehabilitation to assess apraxia of speech in adults. *International Journal of Language & Communication Disorders*. 2009 Jan 1;44(5):731-47.
25. Ward EC, Burns CL, Theodoros DG, Russell TG. Impact of dysphagia severity on clinical decision making via telerehabilitation. *Telemedicine and e-Health*. 2014 Apr 1;20(4):296-303.
26. Sharma S, Ward EC, Burns C, Theodoros D, Russell T. Training the allied health assistant for the telerehabilitation assessment of dysphagia.

Impact of Government Policies on Job Insecurity in Alcoholic Beverages & Its Allied Industries in Tamil Nadu

A Shanmugam¹, N Kalyanaraman²

¹Ph.D (P.T.) School of Management, ²Research Supervisor, [Vels Institute of Science Technology and Advanced, Studies (VISTAS)], Pallavaram, Chennai

ABSTRACT

The main aim of this to study the awareness of employees of alcoholic beverages & its allied industries on the policies of the Government and to measure the influence of Government policies on job security of the employees . The researcher used factor analysis and regression analysis to find the result. The findings are the employees in the Alcoholic and Beverage industries are highly aware of the Government policies of subsequent changing Governments. They felt that the Government focuses mainly on public attraction for political mileage. It is also concluded that alcoholic and beverage industry is one of the income generating industry for the state government and support them to accomplish their election promises to the dynamic voters of Tamilnadu.

Keywords: Job Insecurity, Alcoholic Beverages.

INTRODUCTION

Alcoholic beverages & its allied industries in Tamil Nadu are considered as fragile in nature due to changes in the policies of subsequent governments. The political parties always make strategies for wiping of liquor selling as poll promise to gain a political mileage. Any government which bans the liquor in Tamilnadu creates more impulse on the job security of employees in alcoholic beverages & its allied industries. At the time of ban, the employee's job is not secured anymore and the companies also do not show any interest for their security and welfare. The scenario compels them to self-motivate themselves to face the challenges of job insecurity during liquor bans. The employees plan various strategies to acquire skills and knowledge to switch over to some other companies or venture into the self-employment business.

When employees of Alcoholic industries lose their employment, the companies do not take any moral responsibility to protect their security and not make any arrangements for their income. They show their helpless empty hands to the employees to demotivate them. At the same time the subsequent Governments also do not worry about the employment problems of employees in alcoholic industries. Most of the public hate this

industry as it harms the health of the consumers of liquor and their family, Government cannot directly supports the growth of alcoholic industry. In this situation the present research work throws light upon how the government policies directly create individual impact on employee's livelihood and security.

BRIEF LITERATURE REVIEW

Banu S. Unsal- Akbiyik, K. Ovgu Cakmak-Otluoglu, Hans De Witte (2012), In this study the researcher found out that seasonal workers perceive higher job insecurity compared to permanent workers. They are also affectively less committed to their organizations than permanent workers. Furthermore, job insecurity does not mediate the relationship between contract type and affective commitment¹

Beatriz Sora, Amparo Caballer and José María Perio (2010), In an innovative study the researchers attempted to measure the consequences of job insecurity for employees in the midst of liberation and globalization of the respective economies they argued that the job insecurity has tremendous impact over employees work attitude and intention. The results also revealed job insecurity adversely affects job satisfaction and organizational commitment. It perceived that work

stressor and negatively creative over employees attitude².

Bert Klandermans & Tinka van Vuuren (2010), In this study the researcher finds that job insecurity has adverse affects on psychological well being and it also self esteem. It also reveals that job insecurity even leads to job loss³.

Bert Klandermans, John Klein Hesselink, Tinka van Vuuren (2010), In this study the researcher states that the impact of one's job loss depends upon the individual employment status. The job insecurity reflects health problems and the objective conditions, severity of job loss and depending upon employment status⁴.

J.H. Buitendach, H. De Witte (2005), In this study the results revealed that there is small but significant relationships between job insecurity, extrinsic job satisfaction, job insecurity and affective organizational commitment. Job satisfaction was found to mediate the relationship between job insecurity and affective organizational commitment⁵.

Claudia Bernhard-Oettel, Nele De Cuyper, Bert Schreurs and Hans De Witte (2011), the researcher in this study investigates job insecurity affects the individual well being. Job insecurity is negatively related to organizational outcomes and it is associated with lower affective organizational commitment and higher turnover intentions⁶.

David Campbell et al (2007), In this study examined that the workers fear of insecure jobs with lower levels of wage growth. Workers fears of unemployment are increased by their previous unemployment experience. They also fear about the future unemployment in the organizations⁷.

GAPS IN LITERATURE

After reviewing the national and international literature pertaining to HR practices and job security of the employees, the researcher identified two important questions still remain unanswered.

1. What are the Government policies affects the employees
2. How the employees measure their unemployment problem due to Government policies?

So, this present research work attempts in this direction to answer the research questions.

OBJECTIVE OF THE STUDY

1. To study the awareness of employees of alcoholic beverages & its allied industries on the policies of the Government
2. To measure the influence of Government policies on job security of the employees in study domain.

HYPOTHESIS

1. There is no significant influence of employees' awareness regarding Government policies on their job insecurity.

METHODOLOGY

This research is based on the primary data obtained through a structured questionnaire. It consists of three parts namely a) Demographic profile, b) Awareness on government policies and c) Perception on job security. The first section is completely optional type in nature, whereas the second and third part are in terms of Likert's five point scale which ranges from strongly agree to strongly disagree.

Data collection

In Tamilnadu there are six thousand employees working in different alcoholic and beverages companies. The researcher intended to collect at least 5% of the total population. Researcher circulated 400 questionnaires and able to obtain 309 usable responses through convenience sampling method. Hence the sample size of the research is 309.

Data Analysis

The researcher used KMO (Kaiser-Meyer-Olkin Measure of Sampling Adequacy) Bartlett's test, factor analysis, one-way analysis of variance and linear multiple regression to analyses both independent and dependent variables. This analysis is useful to test the hypothesis and to verify the objectives.

ANALYSIS AND DISCUSSION

In the analytical part, the researcher applied KMO and Bartlett's test to test the normal distribution of the variables pertaining to awareness and job security. The table is presented below:

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.801
Bartlett's Test of Sphericity	Approx. Chi-Square	1974.940
	df	66
	Sig.	.000

From the above table it is found that all the variables are normally distributed and suitable for factor extraction. This would enable the researcher to identify the proper awareness on government policies and job security. The following table gives the factor segmentation and the variances belong to all the variables.

Component	Initial Eigen values			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.195	26.623	26.623	3.195	26.623	26.623
2	3.037	25.306	51.929	3.037	25.306	51.929
3	1.045	8.705	60.634	1.045	8.705	60.634
4	.935	7.792	68.426	.935	7.792	68.426
5	.646	5.379	73.805			
6	.585	4.873	78.679			
7	.549	4.578	83.257			
8	.488	4.066	87.323			
9	.438	3.647	90.970			
10	.400	3.336	94.306			
11	.353	2.939	97.245			
12	.331	2.755	100.000			

Extraction Method: Principal Component Analysis.

From the above table, it is found that the 12 variables of awareness are reduced into four factors namely attractive policies, disciplined approach, income generation, and temporary arrangement. The employees are well aware of these policies of the Government. In fact they are aware that these factors are only temporary arrangement for any Government. At the same time, they employ various strategies to manage the stop gap arrangements.

The total average scores of job security is considered as the dependent variable and the total average score of the four factors are considered as independent variables. A linear multiple regression analysis is applied on four independent variables and one dependent variable and the results are presented below:

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.422 ^a	.178	.171	.71094

a. Predictors: (Constant), work duration, work environ, work overload, Relationship

From the above table, it is found that the four independent variables are statistically significant to prove the impact of employee awareness on the dependent factors job security. The following table gives the designation for the fit of regression.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	55.001	4	13.750	27.205	.000 ^b
	Residual	254.233	503	.505		
	Total	309.234	507			
a. Dependent Variable: job satisfaction						
b. Predictors: (Constant), work duration, work environ, work overload, Relationship						

The F-value and p-values are statistically significant at 5 percent level. This implies there is a valid and well defined relationship that exists between independent variables awareness and the dependent factors job security. The following table gives the nature of relationship among the independent and dependent variables individually

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
B		Std. Error	Beta			
1	(Constant)	1.919	.249		7.701	.000
	work overload	.008	.046	.008	.180	.858
	work environ	.487	.048	.415	10.239	.000
	Relationship	-.079	.044	-.086	-1.813	.070
	work duration	.036	.039	.044	.905	.366
a. Dependent Variable: job satisfaction						

From the above table, it is found that all the four factors are significant with F-values, t-values and p-values. This shows that there is a deep association between awareness of employees on Government policies of alcoholic and beverage industries and their own job security.

FINDINGS AND CONCLUSIONS

The employees in the Alcoholic and Beverage industries are highly aware of the Government policies of subsequent changing Governments. They felt that the Government focuses mainly on public attraction for political mileage. The political parties promote the ban on liquor as a temporary arrangement but they depend upon this industry to implement the development policies of their government. They also strongly agreed that all the Government in Tamilnadu do not worry about their job security, livelihood, employment and

development. During every election their employment become very fragile and they become victims of their political mileage. It is also concluded that alcoholic and beverage industry is one of the income generating industry for the state government and support them to accomplish their election promises to the dynamic voters of Tamilnadu.

Conflict of Interest – Nil

Ethical Clearance – Taken From Ugc Committee

Source of Funding- Self

REFERENCES

- 1) Banu S. Unsal-Akbiyik, K. Ovgu Cakmak-Otluoglu, Hans De Witte, Job Insecurity and Affective Commitment in Seasonal Versus Permanent Workers, International Journal of

- Humanities and Social Science (2012) Vol.2 No.24, pg.no: 14-20
- 2) Beatriz Sora, Amparo Caballer and José María Perio, The consequences of job insecurity for employees: The moderator role of job dependence, *International Labour Organization*, (2010) Vol.149pg.no: 60-72
 - 3) Bert Klandermans & Tinka van Vuuren, Job Insecurity, *European journal of work and organizational psychology*, (2010), Vol.8(2), pg.no: 145–153
 - 4) Bert Klandermans, John Klein Hesselink, Tinka van Vuuren, Employment status and job insecurity: On the subjective appraisal of an objective status, *Economic and Industrial Democracy*, (2010) Vol.31 (4) pg.no: 557–577
 - 5) J.H. Buitendach, H. De Witte, Job insecurity, extrinsic and intrinsic job satisfaction and affective organizational commitment of maintenance workers in a parastatal, *South Africa Journal Business Management*, (2005) Vol.36 (2) pg. no: 27-37
 - 6) Claudia Bernhard-Oettel, Nele De Cuyper, Bert Schreurs and Hans De Witte, Linking job insecurity to well-being and organizational attitudes in Belgian workers: the role of security expectations and fairness, *The International Journal of Human Resource Management*, (2011) Vol.22, No.9, pg.no: 1866–1886
 - 7) David Campbell et al, Job insecurity and wages, *The Economic Journal*, (2007) Vol.11, pg.no: 544–566.

Effectiveness of Social Media Marketing

R Sharmila¹, M.Kavitha²

¹Ph.D Research Scholar, ²Associate Professor & Research Supervisor, Department of Commerce(CA), Vels University, Pallavaram, Chennai

ABSTRACT

The main aim of this study is to know about the demographic profile of the customers of social media marketing and to analyse the effects of various forms of social media marketing on the firm's sales and other activities. The researcher used regression analysis, percentage analysis to find the result. It finds that the firms are achieved their target because of social media marketing. The firm's products are reached in all levels of customers through social media. Finally, it concludes that, Companies should create innovative customer experiences and specific strategies for media to identify the best path for driving up social media marketing performance.

Keywords: Social media, Social relationships.

INTRODUCTION

People are exposing themselves to more and more digital and social media. This is for many purposes, including in their roles as consumers as they search for information about products,¹ purchase and consume them, and communicate with others about their experiences. Marketers have responded to this fundamental shift by increasing their use of digital marketing channels. In fact, by 2017 approximately one-third of global advertising spending is forecast to be in digital channels^[6]. Thus, future consumer marketing will largely be carried out in digital settings, particularly social media and mobile. It is therefore necessary for consumer research to examine and understand consumer behavior in digital environments. This has been happening over the last decade, with increasing amounts of research focusing on digital consumer behavior issues.

Social media marketing is marketing using online communities, social networks, blog marketing and more.

Corresponding author:

Dr. M. Kavitha

M.Com.,M.Phil.,MBA,PGDCA.,Ph.D.,SET,
Associate Professor & Research Supervisor.,
Department of Commerce(CA), Vels University
Pallavaram, Chennai,
E-mail id – kavitha.sms@velsuniv.ac.in

It's the latest "buzz" in marketing. India is probably among the first proponents of social media marketing. These days, the organizational cause has replaced the social cause as companies seek to engage with their audience via the online platforms.

Social media is engaging with consumers online. According to Wikipedia, social media is internet-based tools for sharing and discussing information among human beings. Social media is all about networking and networking in a way that espouses trust among parties and communities involved. Any website which allows user to share their content, opinions, views and encourages interaction and community building can be classified as a social media. Some popular social media sites are: Facebook, YouTube, Twitter, Digg, MySpace, StumbleUpon, Delicious, Scribd, Flickr etc.

Social media is the medium to socialize. They use web-based technology to quickly disseminate knowledge and information to a huge number of users. They allow creation and exchange of user-generated content. Facebook, Twitter, Hi5, Orkut and other social networking sites are collectively referred social media.

Lazer and Kelly's (1973) define social marketing as "concerned with the application of marketing knowledge, concepts, and techniques to enhance social as well as economic ends. It is also concerned with the analysis of the social consequences of marketing policies, decisions

and activities.

The interconnectivity of consumers through social media such as communities, reviews or recommendations is likely to establish trust in e-commerce. In SNSs, the social interaction of consumers helps their peers to develop or reject trust in a provider. Consumer socialisation occurs through social media directly by social interactions among consumers, and indirectly by supporting product involvement (Wang et al. 2012). The social relationship of consumers generated through social media significantly affects the perceived trust of consumers (Pan & Chiou 2011).

The role of social media in marketing is to use it as a communication tool that makes the companies accessible to those interested in their product and makes them visible to those that don't know their product. It should be used as a tool that creates a personality behind their brand and creates relationships that they otherwise may never gain. This creates not only repeat-buyers, but customer loyalty. Fact is social media is so diversified that it can be used in whatever way best suits the interest and the needs of the business.

REVIEW OF LITERATURE

P. Sri Jothi, et al (July 2011) Analysis of social networking sites: A study on effective communication strategy in developing brand communication. *Journal of Media and Communication Studies* Vol. 3(7), pp. 234-242, July 2011 It is necessary to study the effectiveness of brand communication strategy followed in social networking sites which are mainly accessed by Indian users. This research attempts to find the effectiveness of brand communication strategy in promoting and advertising their brand in social networking sites. The effectiveness is determined with the help of survey from people who use these sites, and the content of three social networking sites is analyzed⁹.

Georgios Tsimonis and Sergios Dimitriadis (Sep 2013). Brand strategies in social media. – The purpose of this paper is to: first, examine why companies create brand pages in social media, how they use them, what policies and strategies they follow, and what outcomes do they expect; and second – from firms' point of view – how users are benefited from such pages. The main actions of the firm are making prize competitions, announcing new products/ services, interacting with fans, providing advice and useful information, and

handling customer service issues³.

Afrina Yasmin, et al (April 2015) Effectiveness of Digital Marketing in the Challenging Age: An Empirical Study. *International Journal of Management Science and Business Administration* Volume 1, Issue 5, April 2015, Pages 69-80 The main objective of digital marketing is attracting customers and allowing them to interact with the brand through digital media. This article focuses on the importance of digital marketing for both marketers and consumers. We examine the effect of digital marketing on the firms' sales. Additionally the differences between traditional marketing and digital marketing in this paper are presented. This study has described various forms of digital marketing, effectiveness of it and the impact it has on firm's sales. The examined sample consists of one hundred fifty firms and fifty executives which have been randomly selected to prove the effectiveness of digital marketing. Collected data has been analysed with the help of various statistical tools and techniques¹.

Sita Mishra (May 2015) understanding social media mindset of consumers: an Indian perspective. *JISTEM - Journal Of Information Systems And Technology Management* Vol. 12, No. 2, May/Aug., 2015 pp. 203-218. In the present paper the emphasis is upon the analyses of the social media mindset of consumers in India, and examining the impact of various variables of extended TAM in order to explain the variables that influence level of acceptance of SNS by Indian consumers. Results indicated positive and significant effects of perceived usefulness while perceived risk influenced negatively. Further, perceived ease of use and personal fit with brands both found to have a positive effect on marketing through SNS but were not significant. The results of present study in India pointed out that establishing personal fit with consumers and providing userfriendly web sites, and reducing the perceived risk has impact on developing positive attitudes⁸.

Karla Barajas-Portas (Sep 2015) The Impact of Consumer Interactions in Social Networking Sites on Brand Perception *Journal of Internet and e-Business Studies* Vol. 2015 (2015), Article ID 197131, The aim of the present research is to explore the impact of the interaction on the brand perception using as base the Social Networking sites. We propose an extended model which provides relevant information of the evolution of brand perception, considering one of the most relevant processes for the human being: socialization as interaction

through Social Media. The study was conducted in order to obtain the data with users of at least one Social Networking Site. We present a Brand perception scale measured as a combination of 5 dimensions: Affective perception, Functional perception, Reputation, Brand Experience and interaction through Social Media. The relevance of the research is based on the importance of the generation of innovative ways of being close to the consumer⁵.

F. Safwa Farook, NalinAbeysekara(Dec 2016) Influence of Social Media Marketing on Customer Engagement .International Journal of Business and Management Invention ISSN (Online): 2319 – 8028, ISSN Volume 5 Issue 12.The study examined the influence social media marketing has on customer engagement. The study was decided to be investigated as we can see that organizations spending on social media continue to soar, but measuring its impact remains a challenge for most businesses. All in all, social networking sites facilitate active communication between companies and users and spur interactions among users. Here he need arrived to find out the factors influencing customer engagement; to explore what content they enjoy most on a Facebook brand page. The findings of this study revealed the five factors that have a significant impact on customer engagement⁷.

Haslinda Musa, et al(2016) Analysing the Effectiveness of Social Media Marketing. The purpose of the paper is to report on the process and findings of factors that influence the effectiveness of customer engagement, brand reputation & image, and customer brand attitudes towards online performances of Small and Medium Enterprises (SMEs) in Melaka. The paper contains sufficient details to support that objective and suitable to be presented at the conference. Besides, this paper examines the relationship between factors influencing effectiveness and SMEs performance and also examined the key determinants of those factors towards SMEs performances. A literature review is presented to explain the effectiveness of social media marketing towards SMEs performances. In additional, a survey was carried out through questionnaire in the area of Melaka. The effectiveness of social media marketing contributes to SMEs success and contribute to their growth in the future, although some problems are acknowledged⁴.

Pavel Ciprian (2017).The Growing Importance

Of Social Media In Business Marketing.The growing importance of social media marketing among businesses is very clear. So the question is no longer if you must use the social media tool in your marketing activities, but how to do it better. Business owners should pay attention to which social platforms help them reach their goals with relevant audiences, whether that's generating sales or greater visibility⁶.

Fawad Khan et al(2017),The Importance Of Digital Marketing. An Exploratory Study To Find The Perception And Effectiveness Of Digital Marketing Amongst The Marketing Professionals In Pakistan .The purpose of this exploratory research is to present the perceptions towards Digital Marketing in Pakistan. This issue has rarely been addressed by the academicians and researchers in Pakistan and elsewhere. This study used digital marketing parameters to measure the awareness and effectiveness of digital marketing among marketing professionals in Pakistan. The result suggests that professionals in Pakistan are more sceptical towards digital marketing tools and concepts. They do not fully understand the benefits of digital marketing in terms of growth and cost effectiveness. Finally, the limitations of the studies and findings are presented in study².

OBJECTIVES OF THE STUDY

To know about the demographic profile of the customers of social media marketing.

To analyse the effects of various forms of social media marketing on the firm's sales and other activities.

HYPOTHESES OF THE STUDY

There is no significant influence of demographic variables of social media marketing dimensions.

There is no significant influence of various forms of social media marketing.

METHODOLOGY AND ANALYSIS OF THE STUDY

This study is based on both primary and secondary data which is collected from various journals and books. Primary source is a source from where we collect first-hand information or original data on a topic. Interview technique was used with structured questionnaire for the collection of primary data.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	25-35	54	54.0	54.0	54.0
	35-45	46	46.0	46.0	100.0
	Total	100	100.0	100.0	

In the above table shows that 54% of the customers are the age group of 25-35 followed by the age group of 35-45 are 46%. The age group of 25-35 are dominated in this study.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	students	35	35.0	35.0	35.0
	Bachelors	38	38.0	38.0	73.0
	House wives	3	3.0	3.0	76.0
	Others	24	24.0	24.0	100.0
	Total	100	100.0	100.0	

The various categories of customers are presented in the above table . 35% of students followed by 38% of Bachelors and housewives of 3% are purchased through social media marketing. The Bachelors are purchased more than the others.

EFFECTIVENESS OF SOCIAL MEDIA MARKETING

	N	Mean	Std. Deviation	Std. Error Mean
Brand awareness	100	3.17	1.457	.146
Goodwill	100	3.17	1.303	.130
Profit	100	2.61	1.675	.168
Loyal Customers	100	3.07	1.328	.133
Target achievement	100	3.27	1.462	.146
Increased sales	100	3.71	1.217	.122

Table – 4 One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Brand awareness	21.760	99	.000	3.170	2.88	3.46

Cont... Table – 4 One-Sample Test

Goodwill	24.327	99	.000	3.170	2.91	3.43
Profit	15.581	99	.000	2.610	2.28	2.94
Loyal Customers	23.123	99	.000	3.070	2.81	3.33
Target achievement	22.361	99	.000	3.270	2.98	3.56
Increased sales	30.489	99	.000	3.710	3.47	3.95

The table inferred that the effectiveness of social media marketing in the firms. The mean values of various dimensions are increased sales 3.271, Target achievement 3.270, Brand awareness and Goodwill are 3.170, Profit 2.610. It shows that the firms sales are increased through the social media marketing but the profit is decreased because of reduced cost.

FINDINGS AND CONCLUSIONS

The brand awareness for customers increased due to social media marketing.

The sales are increased by the social media marketing. Hence the customers feel the cost of the products is less compared with other marketing.

The firms are achieved their target because of social media marketing. The forms products are reached in all levels of customers through social media.

Finally, it concludes that, Companies should create innovative customer experiences and specific strategies for media to identify the best path for driving up social media marketing performance.

Conflict of Interest – Nil

Ethical Clearance – Taken from UGC Committee

Source of Funding- Self

REFERENCES

1. Afrina Yasmin et al. Effectiveness of Digital Marketing in the Challenging Age: An Empirical Study. *International Journal of Management Science and Business Administration*. April 2015, Volume 1, Issue 5, Pages 69-80.
2. Fawad Khan et al. The Importance of Digital Marketing. An Exploratory Study To Find The Perception And Effectiveness Of Digital Marketing Amongst The Marketing Professionals In Pakistan. 2017 .
3. Georgios Tsimonis and Sergios Dimitriadis. Brand strategies in social media (Sep 2013)
4. Haslinda Musa, et al. Analyzing the Effectiveness of Social Media Marketing 2016.
5. Karla Barajas-Portas. The Impact of Consumer Interactions in Social Networking Sites on Brand Perception *Journal of Internet and e-Business Studies* 2015, Article ID 197131,
6. Pavel Ciprian .The Growing Importance Of Social Media In Business Marketing 2015.
7. F. Safwa Farook, Nalin Abeysekera. Influence of Social Media Marketing on Customer Engagement. *International Journal of Business and Management Invention*. (Dec 2016) ISSN (Online): 2319 – 8028, ISSN Volume 5 Issue 12.
8. Sita Mishra Understanding Social Media Mindset Of Consumers: An Indian Perspective. *Jistem - Journal of Information Systems and Technology Management Revista de Gestão da Tecnologia e Sistemas de Informação* May/Aug., 2015 Vol. 12, No. 2, pp. 203-218 .
9. P. Sri Jothi, et al. Analysis of social networking sites: A study on effective communication strategy in developing brand communication. *Journal of Media and Communication Studies* July 2011. Vol. 3(7), pp. 234-242.

Clinical Profile and Antibiotic Sensitivity Pattern in Pediatric Urinary Tract Infection of a Tertiary Care Hospital in Bhubaneswar, Odisha

Chinmay Kumar Behera¹, Manas Kumar Nayak², Seba Ranjan Biswal¹, Natabar Swain³,
Sibabrata Pattnaik⁴

¹Associate Professor, Pediatrics, ²Assistant Professor, Pediatrics, ³Professor, Pediatrics, ⁴Assistant Professor,
Pediatrics, Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha

ABSTRACT

Background: Urinary Tract Infection (UTI) is the most common infection encountered in children and fever is the presenting symptom in most of the cases. It is very difficult to diagnose UTI in pediatric age group especially in young infants because of vague, minimal and non-specific, symptomatology. But its early diagnosis is important in children as it may be the marker of urinary tract abnormalities and secondly it can lead to pathological changes in kidneys and urinary tract if not promptly and adequately treated.

Objective: The aim of this study was to determine demographic pattern, clinical profile, common uropathogens involved and their antibiotic sensitivity/resistance pattern in all culture positive UTI cases in children admitted to a tertiary care hospital in Odisha, so that it will be very helpful to the paediatricians in this region in better management of UTI cases in children.

Methods: This retrospective analytical study was carried out at Kalinga Institute of Medical Sciences, Bhubaneswar during the period from January 16 to December 16. A total of 150 pediatric patients aged ≤ 15 yrs having culture positive UTI were included in the study. Newborns, acute kidney injury at the time of admission, chronic kidney disease cases were excluded.

Result: Fever was the common presenting symptom found in 76% children, vomiting was present in 20% and loose motion in 11.3%. Associated co-morbidity was detected in significant number (28.6%) of cases, that includes anemia, pneumonia, nephrotic syndrome, scrub typhus and sickle cell disease. Majority of our cases (70%) didn't have significant leucocyturia. Major organisms isolated in decreasing order were *Escherichia Coli* (45.3%), *Enterococcus fecalis* (34.6%) and *Klebsiella* spp (10%). *Proteus mirabilis* was isolated only in one case. Majority of *E. Coli*, *Klebsiella*, *Acinetobacter* and *Staphylococcus aureus* were sensitive to Amikacin but *Enterococcus* expressed high sensitivity to Linezolid and Vancomycin.

Discussion: UTI should be considered as a potential cause of fever in children even after confirming other disease in a febrile case; urine analysis should be done as UTI may be an associated disease. Further absence of fever is not a criterion to exclude the possibility of UTI. Urine culture should be done as a diagnostic evaluation even if routine analysis does not reveal leucocyturia or bacteruria.

Conclusion: UTI is one of the common bacterial infections in infants and children next only to respiratory infection. Delay in diagnosis and/or definitive treatment may lead to long term sequel like hypertension, renal failure and CKD.

Corresponding author

Dr Manas Kumar Nayak,

Assistant Professor, Pediatrics. Kalinga Institute of
Medical Sciences, Bhubaneswar, Odisha-751024.

Email-id: drmanas_76@yahoo.co.in

Thus it warrants a high level of clinical acumen from the treating paediatrician in diagnosing and initiating prompt and proper treatment.

Keywords: Pediatric urinary tract infection, antibiotic sensitivity pattern.

INTRODUCTION

Urinary tract infection(UTI) is a common bacterial infection in infants and children, with overall prevalence ranging from 2% to 8% throughout childhood.^{1,2} The diagnosis of UTI is often missed in infants and small children due to minimal and non-specific symptoms. Young children are more vulnerable for renal scarring due to immature kidney, which may later on cause hypertension, proteinuria and progressive renal failure¹. The risk of recurrent UTI in children has been found to be around 12-30% in the first 6-12 months following initial UTI.³ Beyond infancy female outnumber male[10:1]⁴. Due to certain anatomic and physiologic factors children are at increased risk of developing UTI compared to adult, out of which vesicoureteric reflux(VUR) is most common⁵. A clinically suspected case of UTI always should be defined and confirmed with urine culture & sensitivity pattern in guiding clinician about treatment and appropriate radionuclear imaging evaluation.⁶

Even a single confirmed UTI should be taken seriously especially in children due to risk of renal parenchymal damage.⁷ E.coli is the causative agent In majority (60-90%) of cases of UTI in children followed by Klebsiella, Enterococcus, Proteus, Pseudomonas, Citrobacter and Staphylococcal species^{8,9}. The changing pattern of organisms and antimicrobial susceptibility in both community and hospital based pediatric UTI & its drug resistance has become a major challenge for its treatment and outcome^{9,10}. With this background the present study was carried out to determine clinical profile and sensitivity pattern of uropathogens to commonly used antibiotics in all children with confirmed UTI cases admitted to a tertiary care hospital in Odisha.

MATERIALS AND METHODS

A retrospective study was conducted to find out the demographic pattern and antibiotic sensitivity pattern of uropathogens among all children aged ≤ 15 years with culture positive UTI admitted to the pediatric ward of a tertiary hospital in Bhubaneswar, Odisha from January 2016 to December 2016. Patients age, sex, presenting symptoms, results of urine microscopy, culture and sensitivity were noted. A total of 150 cases were included in study. Neonates, patients with acute kidney injury(AKI) at the time of admission and chronic kidney disease were excluded. Urine sample of 10 mL were routinely collected in sterile speciman by mid-stream clean catch

or trans urethral catheterization method depending on the patient's age and transported to hospital laboratory properly. The specimens were processed immediately. 5 μ L loopful of the sample was inoculated on a blood agar and Cysteine Lactose Electrolyte Deficient agar[CLED media(Hi-media, Mumbai, India) (semiquantitative method)] and colony count was done after overnight incubation at 37°C. Isolates were identified by Gram Stain and biochemical reactions. Number of colonies obtained were multiplied by 1000 to get the Colony Forming Unit(CFU/mL). Samples showing at least 10^5 CFU per mL of a single species were considered to indicate significant bacteriuric UTI. Guidelines by Hellerstein et al¹¹ was strictly adhered to for diagnosis of pediatric UTI. Antibiotic sensitivity was performed using Kirby-Bauer disk diffusion method following the Clinical Laboratory Standards Institute guideline¹².

Data management and statistical analysis were performed using spss software version 23 (SPSS Inc, Chicago, IL, USA). The variables were analysed using descriptive statistics.

RESULT

150(4.8%) cases out of total 3070 patients admitted to pediatric department during the study period had culture positive UTI. Table 1 shows the age and sex distribution of the children with UTI. There is a overall male preponderance with M:F ratio of 1.1:1, but the prevalence of UTI was more in female compared to male in above 2 years of age (M:F=1:1.4). The mean age of female was (7.5+/- 4.42)yrs, higher than that of male with (4.2+/-4.08)yrs. Table 2 highlights common presenting symptom among these children. Fever was the most common(76%) presenting symptoms followed by vomiting(20%), diarrhea(11.3%), dysuria(10%), hematuria (18%), seizure(6%) and abdominal pain(3.3%). Most of them had more than one symptoms. 110 (73.3%) children received some antibiotics before hospitalization. About 28.6% of UTI cases had comorbidity like anemia(10%) followed by pneumonia (6%) and Scrub typhus, nephritic syndrome, sickle cell disease in 5 cases (3.3%) each(Table-3). The no. of episodes of UTI were maximum in above 2 years age(Table-1). Leucocytosis was seen in 37.3% patients and 15.3% of patients had raised CRP(>10 mg/L). Urine analysis revealed bacteriuria in 9.3% cases and pyuria(> 5 leucocytes in HPF of centrifuged urine) in 30.6% cases(Table-4).

All patients had undergone ultrasonography of abdomen, out of which 14.6% had some form of abnormalities. Hydronephrosis was more common(7.3%) followed by renal calculi(2.6%) and thickened bladder(2.6%). Two patients had evidence of medical renal disease. Out of ten patients who had done their DMSA(dimercaptosuccinic acid) scan on follow up after 3 months, one had renal scar. Table -5 shows the organisms cultured from the urine of study patients. The predominant isolates were E. coli(68, 45.3%) followed by Enterococcus faecalis(51,34%), Klebsiella pneumonia(15, 10%) and Staphylococcus aureus(7, 4.6%). Acinetobacter, Pseudomonas aeruginosa and Proteus were the other organisms isolated. E. coli was more commonly seen in female patients(40/68, 58.8%) in contrast to Klebsiella which was isolated mainly from male patients(14/15, 93.3%). A panel of selected drugs on commonly found organisms confirmed antibiotic sensitivity pattern(Table-6). Majority of E. coli, Klebsiella spp, Acinetobacter and Staph. aureus were sensitive to amikacin where as Pseudomonas showed 100% sensitivity to cefoperazone followed by amikacin, ceftazidime, ciprofloxacin and gentamicin each showing 66.6% sensitivity. Among Gram positive organisms Enterococcus faecalis was the most frequently isolated organism having sensitivity to vancomycin(98%), linezolid(100%) and nitrofurantoin(78.4%). One case of VRE(vancomycin resistant Enterococcus) was isolated from patient with posterior urethral valve who was later on admitted to PICU with uneventful recovery. E. coli was highly sensitive to nitrofurantoin(100%) which also showed good coverage against Staph. aureus(71.4%) and Enterococcus(78.4%). Cefoperazone was least sensitive to all organisms except Pseudomonas(100%) and Acinetobacter(80%). Extended Spectrum β -lactamase(ESBL) producing E.coli was isolated in eight(5.3%) patients and was sensitive to amikacin(100%) and nitrofurantoin(100%) but was resistant to other non- β lactam antibiotics like ciprofloxacin(75%), cotrimoxazole(100%) and gentamicin(100%). There was no difference between the community acquired ESBL E. coli UTI and non-ESBL E.coil UTI in regard to their presentation, age, renal abnormality, previous UTI and recent hospitalization.

Table-1 Age and sex distribution of children

with Urinary tract infection

Age (in yrs)	Male (%)	Female (%)	P value
0-2(n=49)	38(77.55)	11(22.45)	<0.001
2 or more (n=101)	42(41.58)	59(58.42)	Pearson Chi-Square= 17.15

Table-2. Common presenting symptoms and signs in the patients with Urinary tract infection.

SN	Symptoms/Signs	Frequency	Percent (%)
1	Fever	114	76
2	Vomiting	30	20
3	Diarrhea	17	11.3
4	Abdominal pain	5	3.3
5	Body/ leg swelling	9	6
6	Hematuria	12	8
7	Dysuria	15	10
8	Frequent urination	4	2.6
9	Under weight	3	2
10	Seizure	9	6
11	Chill and rigor	6	4
12	Suprapubic tenderness	5	3.3
13	Toxic	4	2.6
14	Phimosis	4	2.6
15	Others	36	24
	Total	150	100

(N:B Total no of patients are 150, however, most of the patients presented with multiple symptoms).

Table 3. Types of co-morbidities associated with

Urinary tract infection

Diseases	Frequency	(%)
Anemia	15	10
Pneumonia	9	6
Scrub typhus	5	3.3
Nephrotic syndrome	5	3.3
Sickle cell disease	5	3.3
Acute glomerulonephritis	4	2.6
Total	43	28.6

Table 4. Urinary findings of patient with Urinary tract infection

Urine	Findings	Number(%)
Appearance	Normal and clear	120 (80)
	Cloudy	10 (6.6)
	Straw	12 (8)
Microscopy	WBC cast	16(10.6)
	Epithelial cast	38 (25.3)
	Microscopic Hematuria	12 (8)
	Pyuria (<5 cells/HPF)	104 (69.3)
	Pyuria (>5 cells / HPF)	34 (22.6)
	Bacteria on Gram's stain	14 (9.3)

Table 5: Correlation between organisms and gender and age of patient with UTI

Sex	Male (%)		Female (%)		Total
	Age (in yrs)		Age (in yrs)		
Organisim Isolated	<=5 yrs	>=5Yrs	>5Year	>5 yrs	
Escherichia coli	18 (26.4)	10(14.7)	17 (25)	23(33.8)	68
Klebsiella Pneumoniae	9 (60)	5(33.3)	1 (6.6)	-	15
Enterococcus	24 (47)	7(13.7)	6(11.7)	14(27.4)	51
Staph.Aures	-	2(28.5)	-	5(71.4)	7
Acinetobacter	2(40)	-	-	3(60)	5
Pseudomonas	2(66.6)	-	1(33.3)	-	3
Proteus	-	1(100)	-	-	1
Total	55	25	25	45	150

Table-6: Antibiotics sensitivity pattern of isolated uropathogens (% sensitive)

Organisms	E coli	ESBL E.Coli	Klebsiella Spp.	Pseudo monas	Acineto bacter	Proteus	Enterococcus	Staph. aureus
Number	60	8	15	0	5	1	51	7
Amikacin	52(86.6)	8(100)	11(73.3)	2(66.6)	4(80)	1(100)	13(25.4)	6(85.7)
Gentamicin	23(38.3)	0	8(53.3)	2(66.6)	2(40)	1(100)	10(19.6)	5(71.4)
Ceftazidime	10(16.6)	1(12.5)	4(26.6)	2(66.6)	3(60)	1(100)	2(3.9)	2(28.5)
Ceftriaxone	13(21.6)	0	4(26.6)	0	1(20)	1(100)	4(7.8)	3(42.8)
Mox-clav	9(15)	0	4(26.6)	0	0	1(100)	18(25/2)	4(57.1)
Cefoperazone	9(15)	0	1(6.6)	3(100)	4(80)	0	0	0
NFT	54(90)	8(100)	7(46.6)	0	2(40)	0	40(78.4)	5(71.4)
Ciprofloxacin	54(90)	2(25)	6(40)	6(66.6)	2(40)	1(100)	3(5.8)	3(42.8)
Piperacilin	10(16.6)	0	3(20)	1(33.3)	3(60)	1(100)	4(7.8)	1(14.2)
Cotrimoxazole	6(10)	0	4(26.6)	0	3(60)	0	7(13.7)	2(3.9)
Cefuroxime	18(30)	3(37.5)	10(66.6)	2(66.6)	2(40)	1(100)	2(3.9)	3(42.8)
Pen.G	0	0	0	0	0	0	21(41.1)	1(14.2)
Vancomycin	0	0	0	0	0	0	50(98)	2(28.5)
Linezolid	0	0	0	0	0	0	51(100)	6(85.7)

NFT- Nitrofurantoin, Pen. G- Penicilin G

DISCUSSION

UTI is a common problem in children, whose prevalence varies with age and sex of children.^{1,2,13} The prevalence rate of 4.8% in present study is comparable to other study in this country with a rate of 4%¹⁴. But this study contrasts with the study by Srivaths et al¹⁵, who reported the rate as 2.48%, the lowest from a developing country. Rabassa and Shattima¹⁶ in Maiduguri reported a rate of 11.3% in children with severe protein energy malnutrition after screening for UTI. Though overall ratio of male and female in our study is 1.1:1, the incidence was slightly higher in female(1:1.4) in above 2 yrs which is quite different from other studies^{1,2}. However our finding is similar to the study by Kalanter et al in which they found UTI more common in female(1.07:1)¹⁷. Akram et al in their study found all organisms were more common in female⁸.

Similar to other studies^{13,18,19} fever was the predominant presenting symptoms reported in 76% of patients. But more specific symptoms like loin pain, increased frequency of urination & dysuria in this

study were less, reiterating the need for screening all febrile children without a definite focus for UTI. About 28.6% of our patients had associated co-morbidities like anemia, nephrotic syndrome, scrub typhus, pneumonia and sickle cell disease among which anemia was most common(10%). Majority(70%) of patients did not have significant pyuria which contrasts with previous studies, where Islam et al¹⁹ detected in 92% of their cases in Bangladesh and Taneja et al¹⁰ found in 53.6% of their cases. As per AAP Clinical practice guidelines updated in 2011 the sensitivity of pyuria varies from 32-100%⁶. More likely explanation for significant bacteriuria in culture without pyuria include delayed urine examination, contamination, insensitive criteria and asymptomatic bacteriuria⁶. Hence urine culture should be done as a diagnostic evaluation even if routine urine analysis does not reveal significant pyuria or bacteriuria. E. coli was the leading (45.3%) cause of UTI in our study, consistent with studies reported by Mashouf et al.(57.4%) in Iran, Brad et al.(47.1%) in Romania and Taneja et al.(47.1%) in India.^{10,20,21} But Mounke et al. in their study in Nigeria found E. coli in 13.6% of cases,¹³ quite less than the other studies.^{10,20,21} Data from above

studies are suggestive of *E. coli* as major uropathogens irrespective of country, community or hospital settings. *Klebsiella* species were found in 10% of patients similar to study from North India by Taneja et al.¹⁰ who detected in 14.5% of cases. Similar to study by Esmaeili et al,²² we had *Klebsiella* more isolated in male patients(14/15), the relevance of association needs further prospective study.

Pseudomonas aeruginosa and *acinetobacter* spp were found in 2% and 3.3% cases respectively which was not reported by Akram et al.⁸ from North India. But in contrast our study did not show *enterobacter* spp. and *streptococci* spp. which was reported by earlier study¹¹ from other centre in India. Gram positive organisms have received more attention recently as a cause of UTI. *Staph. aureus* and *Enterococci* have been reported as important causes of UTI in children.^{17,20} *Enterococci* was isolated in 34% of cases in our study. Majority of *E.coli* and *Klebsiella* isolates were sensitive to amikacin followed by nitrofurantoin. Similar susceptibility patterns have been found in other studies.^{9,19} Though ciprofloxacin was effective against the *Pseudomonas*(66.6%), *Acinetobacter*(40%) and *Proteus*(100%), Kalantar et al.¹⁷ and Mashouf et al.²⁰ demonstrated extremely low susceptibility of Gram negative organisms to fluoroquinolones and co-trimoxazole that are frequently used antibiotics for UTI in our populations. All cases of community acquired ESBL producing *E. coli*(CA-ESBL) were resistant to cephalosporins, penicillin, co-trimoxazole and gentamicin which was similar to the study by Kim Yun et al.²³ where they found 61% of their patients showed antibiotic resistance to at least two non-beta lactam antibiotics. Majority(70%) of Gram positive organisms in our study had shown sensitivity to nitrofurantoin, vancomycin and linezolid which is same as the study from North India by Taneja et al.¹⁰

We observed a significant degree of antibiotic resistance among uropathogens with a tendency towards multi- drug resistance in Gram negative organisms. The possible reason for this among organisms isolated could be due to the high level unnecessary antibiotics use in our county. The worldwide trend of treating community acquired UTI empirically may not apply for specific geographic regions where decreased susceptibility rates are documented for common urinary pathogens. International guidelines are no longer applicable for

treating UTI in a region, which have the tendency of changing antimicrobial sensitivity over a period of time regularly. Hence development of local guidelines based on susceptibility pattern is necessary for guiding empirical treatment before or in absence of urine culture when proper diagnostic modalities are limited in resource poor areas.

CONCLUSION

UTI is one of the common bacterial infections in infants and children next only to respiratory infection; fever being the most common presenting symptom. *E. coli* is the most common isolate in pediatric patients with UTI. Gram negative organisms are sensitive to amikacin, nitrofurantoin where as Gram positive organisms are mostly susceptible to nitrofurantoin, vancomycin and linezolid. Multidrug resistant bacteria are now seen more commonly than before. Hence prospective regional studies should be carried out periodically to identify bacteriological profile and antibiotic sensitivity pattern for appropriate treatment of children with UTI in that locality. Further early diagnosis and institution of definitive treatment is of paramount importance as delay may lead to long term sequelae like hypertension and chronic kidney disease.

Conflict of Interest: The authors declare that there is no conflict of interests regarding the publication of this paper.

Funding Source: None

Ethical Clearance: Since it is a retrospective observational study from analysis of hospital records only, without any interventional work and without any disclosure of patients' identity, thus having no ethical issue; ethical clearance was not considered.

REFERENCES

1. Saadeh SA, Mattok TK. Managing urinary tract infections. *Pediatr Nephrol*(2011) 26:1967-1976.
2. Chang SL, Shortliffe LD. Pediatric urinary tract infections. *Pediatr Clin North Am* 2006;53:379-400.
3. Conway PH, Cnaan A, Zaoutis T, Henry BV, Grundmeir RW, Keren R. Recurrent urinary tract infections in children: risk factors and association with prophylactic antimicrobials. *JAMA*.2007;298:179-186[PubMed][Cross Ref].

4. Elder JS. Urinary tract infection. In: Kliegman, et.al. Nelson textbook of pediatrics. 1st South Asia Edition. Reed Elsevier India Private Limited. 2016 pp 2556-2562.
5. Aggarwal VK, Verrier Jones K. Vesicoureteric reflux: screening of first degree relatives. Arch Dis Child. 1989;64:1538-41[PMC free article][PubMed].
6. Urinary tract infection: Clinical practice guideline for the diagnosis and management of the initial UTI in febrile infants and children 2 to 24 months. Pediatrics. 2011 sep;128(3):595-610.
7. Prajapati BS, Prajapati RB, Patel PS. Advances in management of urinary tract infection. India J Pediatr 2008;75:809-14.
8. Akram M, Sahid M, Khan AU. Etiology and antibiotic resistance patterns of community-acquired urinary tract infection in J N M C Hospital Aligarh, India. Ann Clin Microbiol Antimicrob. 2007;6:4. [PMC free article][PubMed][Cross Ref].
9. Dash M, Padhi S, Mohanty I, Panda P, Parida B. Antimicrobial resistance in pathogens causing urinary tract infections in a rural community of Odisha, India. J Family Community Med. 2013 Jan-April; 20(1):20-26.
10. Taneja N, Chatterjee SS, Singh M, Singh S, Sharma M. Pediatric urinary tract infections in a tertiary care centre from North India. Indian J Med Res 2010;131:101-5. [PubMed][Full text].
11. Hellerstein S. Recurrent urinary tract infections in children. Pediatr Infect Dis 1982;1:271-81
12. Clinical and Laboratory Standards Institute. Performance Standards for antimicrobial susceptibility testing; 17th informational supplements, CLSI M100-S17, vol 27, no.1. Wayne PA: Clinical and Laboratory Standards Institute; 2007.
13. Muoneke VU, Ibekwe MU, Ibekwe RC. Childhood urinary tract infection in Abakalkaliki: Etiological organisms and antibiotic sensitivity pattern. Ann Med Health Sci Res 2012; 2 :29-32.
14. Sumta V, SS Murty YV, S S Kishore M, T Rao P, M Rao K, Pundarikaksha V. Prevalence of urinary tract infection in febrile children. International Journal of Health Research in Modern Integrated Medical Sciences, ISSN 2394-8612(p), ISSN 2394-8620(O), VOL-2, Issue-2, April-Jun 2015, pp 33-38.
15. Srivaths PR, Rath B, Prakash SK, Talakdar B. Usefulness of screening febrile infants for urinary tract infection. Indian Pediatr 1996;66:159-65.
16. Rabassa AI, Shattima D. Urinary tract infection in severely malnourished children at the university of Maiduguri teaching hospital. J Trop Pediatr 2002; 48:359-61.
17. Kalantar E, Motkagh ME, Lornejad H, Reshadmanesh N. Prevalence of urinary tract pathogens and antimicrobial susceptibility patterns in children at hospital in Iran. Iran J Clin Infect Dis 2008;3:149-53.
18. Sharma A, Shrestha S, Upadhyaya S, Rijal P. Clinical and bacteriological profile of urinary tract infections in children at Nepal medical college teaching hospital. Nepal Med Coll J 2011;13:24-6.
19. Islam MN, Khaleque MA, Siddika M, Hossain MA. Urinary tract infection in children in a tertiary care hospital in Bangladesh. Mymensingh Med J 2010, 19(4): 482-486.
20. Mashouf RY, Babalhavaeji H, Yousef J. Urinary tract infection: Bacteriology and antibiotic resistance patterns. Indian Pediatr 2009;46:617-20.
21. Brad GF, Sabau I, Marcovici T, Maris I, Daescu C, Belei O, Vetesi T, Nilima K, Hoduf A, Popoiu CM. Antibiotic resistance in urinary tract infections in children. Jurnalul Pediatruului 2010;13(51-52)73-77.
22. Esmaili M. Antibiotics for causative microorganisms of urinary tract infection. Iran J Pediatr 2005;15(2) 165-173.
23. Kim YH, Yang EM, Kim CJ. Urinary tract infection caused by community-acquired extended-spectrum beta-lactamase-bacteria in infants. J Pediatr (Rio J). 2017;93:260-66.

Effectiveness of Nutritional Ball among Adolescent Girls with Anemia in Selected Government Schools, Greater Noida

Renu Gurung¹, Pauline Sharmila²

¹PG Outgoing Student, ²Principal, SNSR, Sharda University, Greater Noida, UP

ABSTRACT

Anemia continues to be a major public health problem among children in many parts of the world and Nutritional ball helps to increase the Hemoglobin level among the adolescent girls. **Objectives:** To assess the effectiveness of nutritional ball on hemoglobin level among the adolescent girls in experimental group and to find out the association between the post-intervention hemoglobin level among adolescent girls with the selected variables in experimental group. **Design:** Quasi Experimental (Non-Randomized control group design). In Post- intervention time in Experimental group 23.333% of them were not having anemia, 50% of them were having mild anemia, 26.667% were having moderate anemia and none of them were having severe anemia. **Clinical application:** Nutritional ball can be administered to the adolescent girls having less Hemoglobin level than normal to prevent anemia. Nutritional ball is considered as the most essential home remedy for anemia, because of its high iron content, cost effectiveness and easiness to prepare. **Conclusion:** Nutritional ball administration is effective to improve the Hemoglobin level among the adolescent girls.

Keywords: Anemia, adolescent girls, nutrition ball, hemoglobin.

INTRODUCTION

Adolescence is the period that starts from puberty till the completion of sexual maturation¹ According to UNICEF, 2012, adolescent population (10-19), is, 238562.5 i.e. 19% of total population in India among which 60 to 70 percent of the adolescent girls are anemic²

Adolescents gain 30% of their adult weight and more than 20% of their adult height between 10-19 years, which we call as the growth spurt. The prevalence of anemia is disproportionately high in the developing countries, due to poverty, inadequate diet, worm infestations, pregnancy/lactation and poor access to the health services³. In teenagers, anemia is more than just being pale and tired. It can affect their development and school performance. Iron deficiency can cause less attention, alertness and decrease in learning among adolescents. Adolescent girls with chronic illness, heavy menstrual blood loss (>80 ml / month) or who

are underweight or malnourished are at increased risk for iron deficiency and should be screened during health supervision or clinic visits. Overweight and obese children also appear to be at increased risk for iron deficiency and should undergo screening⁴.

WHO estimates that 27 percent of adolescents in developing countries are anemic; the Inter National Centre of Research for Women (ICRW) studies documented high rates in India (55 percent), Nepal (42 percent), Cameroon (32 percent) and Guatemala (48 %) respectively.

WHO lists iron deficiency (ID) as one of “Top Ten Risk Factors contributing to death. Iron deficiency anemia (IDA) is more common in South Asian countries including, India, Bangladesh and Pakistan than anywhere else in the world⁵.

Adolescent girls are particularly prone to iron deficiency anemia because of the increased demands of iron by the body. This anemia not only affects the present status of health of the adolescent girls, but also shows a deleterious effect when these girls become the future mother. A satisfactory hemoglobin status at the

Corresponding author:

Prof. Pauline Sharmila

Principal, Snsr, Sharda University, Greater Noida, UP,

time of conception results in safe pregnancy and healthy child birth. This could be attained only when the status of hemoglobin is monitored and improved in adolescent stage itself. According to 2014 census report of India, Uttarakhand is leading on having 91.1% prevalence of anemia whereas Uttar Pradesh is on second by having 90.9%.⁶

A one year cross sectional study was conducted in Uttar Pradesh to find out the prevalence of anemia among rural school going adolescents and to identify the associated factors. They took 900 school going adolescents using multistage sampling technique. A structured schedule was used to collect the information. Chi-square test was applied to analyze data using SPSS software. On analysis of data, it was found that, the prevalence of anemia was higher in adolescents in age group 10-14 years (59.58%) as compared to 15-19 years age group (57.06%). It was significantly higher among females (65.11%) as compared to males (54.67%), ($p=0.002$). The prevalence of anemia was found to be higher among Muslims (62.04%), adolescents belonging to socio-economic class III (78.89%) and belonging to joint families (59.63%).⁷

A cross-sectional survey was executed among 400 female school students in the age group of 13-17 years in Chennai. The socio demographic details and anthropometric measurements were obtained. Hemoglobin was estimated using cyan method. Statistical analysis was done using IBM SPSS (Statistical Package for the Social Sciences). The results showed that the prevalence of anemia was found to be 78.75% among school students. Chi-square statistics shows significant association ($p<0.05$) of anemia with the type of family, socioeconomic status and dietary pattern. In this study 42.5% of girls with BMI<18 were found to be anemic.⁸

A cross-sectional study was conducted to determine the prevalence of iron deficiency anemia among adolescent school girls aged 14-20 years from 20 different high schools located in three educational areas of Kermanshah, Western Iran. Around 57.3% of anemic girls were iron deficient. The mean levels of hemoglobin (Hb), hematocrit (Hct), mean corpuscular volume (MCV), mean cell hemoglobin (MCH) and mean cell hemoglobin concentration (MCHC) in study of adolescent girls were found to be much lower. In conclusion, regarding the detrimental long-term effects and high prevalence of iron deficiency, iron deficiency

anemia and anemia in Kermanshah, Western Iran its prevention could be a high priority in the programs of health system of the country and supplementation of a weekly iron dose was recommended.⁹

A study on prevalence of Anemia was conducted among adolescent patients of rural Mathura, U.P., India. They had retrospective analysis of hemogram reports of adolescents of out patient department, investigated at laboratory during months of June & July 2016. Hemoglobin and Complete Blood Count was done on automated hematology analyzer XP series: XP-100. The result showed that total adolescent patients were 85 (50 boys & 35 girls) out of 759 patients investigated. Based on hemoglobin estimation, prevalence of anemia was 70.50%. Maximum number of anemic adolescents were in age group of 14. Distribution of iron deficiency anemia was slightly more in adolescent girls' i.e. 71.43% than adolescent boys i.e. 70.0%.¹⁰

An experimental study was done on Government Higher Secondary School at Thaiyur and Chenji in Villupuram District. There were 30 adolescent girls in experimental and Control group selected by Probability Simple Random Sampling technique. Level of anemia was measured by Sahli's hemoglobinometer. The result had shown that out of 60 samples, the level of Hemoglobin in pre-test among adolescent girls in Experimental and control, both group had 100% Moderate anemia. On Post-test level of Hemoglobin of adolescent girls in Experimental group 18(60%) of them were having normal hemoglobin and 12(40%) of them were having mild anemia. In control group 0(0%) of them were in normal, 10 (33%) of them were having mild anemia and 20(66.66%) of them were having moderate anemia. The unpaired 'test' value 9.45, table value 2.00 at ($P<0.05$) level of significance showed the significant effectiveness of Hemonutri ball on increasing the Hemoglobin level.¹¹

The investigator during her posting to the community area of Greater Noida, observed that there was a high prevalence of anemia in the adolescent girls of government schools. Investigator came across adolescent girls with unexplained lethargy and paleness, which was being assessed and diagnosed as iron deficiency anemia. Considering the magnitude of the problem, the investigator was motivated to introduce the dietary intake of iron supplement in the form of nutritional ball with the low cost available materials among adolescent girls for a period of time to improve

their level of hemoglobin.

OBJECTIVES OF THE STUDY

- To assess the level of Hemoglobin in control and experimental group among adolescent girls.
- To assess the effectiveness of nutritional ball on hemoglobin level among the adolescent girls in experimental group.
- To find out the association between the post-intervention hemoglobin level among adolescent girls with the selected variables in experimental group.

Hypotheses

- H₀₁-There will be a difference between the mean pre intervention and post intervention score of nutritional ball on Hemoglobin level among adolescent girls in experimental group.
- H₀₂-There will be significant association between mean post intervention score of nutritional ball on Hemoglobin level with the selected variables.

MATERIALS AND METHOD

Research approach used was Quantitative research approach

Research design used was quasi experimental design

Sample Size:

60. (30 control and 30 experimental).

Criteria For Sample Selection:

Inclusion Criteria:

- Adolescent Girls studying in selected government Schools of Greater Noida.
- Who are within the age of 13 to 16 years.
- Adolescent children whose Haemoglobin level is equal or less than 11 mg/ dl.

Exclusion Criteria:

- Who are not interested to participate in the study.

- Who are not available during the time of data collection.
- Girls who were menstruating at the time of data collection.

TOOLS OF THE STUDY

Section A-Demographic variables such as age of adolescent girls, educational status, religion, type of family, family monthly income, dietary pattern, age of menarche, regular menstruation, flow of bleeding during menstruation and educational status of mother was assessed.

Section B- Hemoglobin was tested in the laboratory.

Classifying the subjects according to the degree of anemia

Degrees of anemia

The classification of anemia as recommended by WHO (1992) and

National Institute Of Nutrition (NIN,1986) was followed for categorization of the subjects.

Level of Anemia	Score
No Anemia	>12 mg/dl
Mild Anemia	11-11.9mg/dl
Moderate anemia	8-10.9mg/dl
Severe anemia	<than 8mg/dl

Section C- Administration of nutritional ball.

Data Collection

The study was conducted from 5-03-2018 to 3-04-2018. Adolescent girls (n=60) aged between 13-16 years were selected by Non-Probability Purposive sampling technique at Government School, Tugalpur, Greater Noida, Uttar Pradesh.

Pre-test:

Adolescent girls aged between 13-16 years were divided into 2 groups as experimental group and control group. Informed consent was obtained from the adolescent girls who fulfilled the criteria. On the 1st day the hemoglobin level was checked for both the schools

among the adolescent girls based on Non-Probability Purposive sampling technique. The girls with the Hemoglobin level between 8-11.9mg/dl) were taken as samples.

Implementation:

47 grams of Nutritional ball was given daily for about 30 days for experimental group in morning, day and evening time. All 30 adolescent girls use to consume Nutritional ball in the presence of the investigator.

Post-test:

After 30 days, Hemoglobin level was checked for both the groups and the values were recorded.

Method of Data Collection

Phase I: To identify the accurate level of Hemoglobin level among adolescent girls with iron deficiency anemia by blood analysis.

Phase II: Nutritional ball was given to the adolescents whose Hemoglobin level was 11.9 or less than in experimental group.

Phase III: After a period of one month the blood was assessed for the level of Hemoglobin in both control and experimental group.

Ethical Consideration:

Informed written consent was obtained from the Head master of the school prior to the collection of the data.

Written consent was obtained from the adolescent girls to consume the nutritional ball.

Ethical clearance certificate was obtained from the ethics committee

The steps for analysis:

- The data will be organized in master sheet and tabulated.
- Using window Excel sheet data and percentage of the analysis of demographic data will be done.
- Mean, mean percentage and standard deviation of control group & experimental group.
- Post- test hemoglobin was compared by control group using mean difference.
- Association of hemoglobin level with selected demographic variable was done using chi-square test.

FINDINGS

Section A:

Distribution of demographic variables of the adolescent girls in experimental group and control group.

Section B:

Hemoglobin level of the adolescent girls in Experimental and Control group.

Section C:

Effectiveness of Nutritional ball after administration to the adolescent girls in Experimental group.

Section D:

Association between post-test level of Hemoglobin among adolescent girls with their selected variables in Experimental group.

Section – A: Distribution of Samples According To Their Demographic Variables

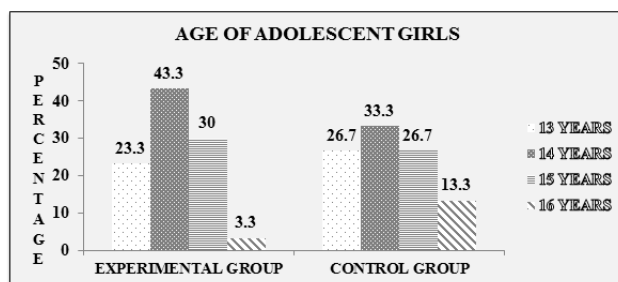


Figure No. 1: Diagram showing the percentage distribution of Experimental and Control group according to the Age of the Adolescent girls.

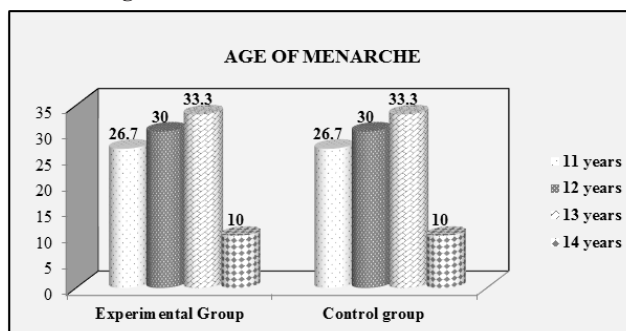


Figure No. 2: Diagram showing the percentage distribution of Experimental group and Control group according to the Age of Menarche.

Section-B: Assess The Hemoglobin Level of The Adolescent Girls In Experimental And Control Group

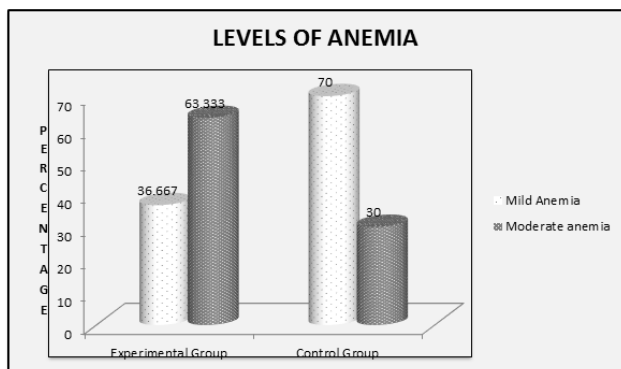


Figure No. 3: Diagram showing percentage distribution of the Pre-intervention Hemoglobin level of adolescent girls in experimental and control group.

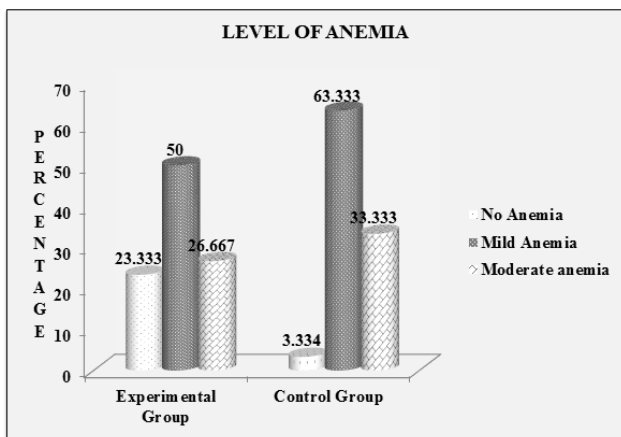


Figure No. 4: Diagram showing the distribution of post-intervention level of hemoglobin of the adolescent girls in Experimental and Control group

Section C:

To Evaluate The Effectiveness of Nutritional Ball After Administration On The Adolescent Girls In Experimental Group.

Table No. 1

Test	Mean	Standard Deviation	t Value	P value
Pre-test	10.6133	1.04312	4.649	0.001**
Post-test	11.0553	1.021340		

Pre-intervention and post-intervention scores of hemoglobin of the adolescent girls in experimental group

Above table shows that the average pre-intervention scores of the hemoglobin level among adolescent girls in experimental group is 10.6133(SD 1.04312) and the

post- intervention mean score is 11 (SD 1.021340).The t value is 4.649. This shows that there is a significant (at P<0.01 level) relationship between pre-intervention and post-intervention score on hemoglobin level among adolescent girls in the experimental group.

Table No. 2

Test	Mean	Standard Deviation	t Value	P value
Pre-test	11.0100	0.69399	0.682	0.501
Post-test	11.0200	0.69798		

Pre-intervention and post-intervention scores of hemoglobin of the adolescent girls in control group

This shows that there is no significant (at P>0.01 level) relationship between pre-intervention and post-intervention scores on hemoglobin level among adolescent girls in control group.

Section D:

Chi- square values were calculated to find out the association between post intervention scores on the levels of Hemoglobin in experimental group among adolescent girls with their variables.

It reveals that there was no significant association between post-intervention level of hemoglobin of Experimental group with any of the variables (P>0.01). It seems that Nutritional ball on

Hemoglobin level was effective to the experimental group irrespective of their variables.

DISCUSSION

Findings related to the level of Hemoglobin among adolescent girls in both group.

a) Experimental group for level of hemoglobin.

Pre-intervention

36.667 % of them were having mild anemia and 63.333 % of them were having moderate anemia.

Post-intervention

23.333% of them were not having anemia, 50% of them were having mild anemia, 26.667% were having

moderate anemia and none of them had severe anemia.

b) Control group for level of hemoglobin.

Pre-intervention

70% of them were having mild anemia and 30% of them were having moderate anemia

Post-intervention

3.33% of them were having no anemia, 63.33% of them were having mild anemia and 33.33% of them were having moderate anemia.

CONCLUSION

From the findings of the study it can be concluded that, most of the adolescent girls in experimental group fall at the age of 14 years and were from 7th standard. Most of the girls from experimental group were from nuclear family, the family monthly income was less than Rs.5000, and they were having mixed dietary pattern. Most of them attained menarche at the age of 13 and had irregular menstruation as well moderate flow of bleeding.

Most of the adolescent girls in the control group were of the age 14 and were from 8th standard. All the girls were from Hindu religion. Most of the girls from control group were from joint family and family monthly income was less than Rs.5000. They were having equal mixed and vegetarian diet pattern. Most of them attained menarche at the age of 13 and had irregular menstruation as well moderate flow of bleeding.

The administration of nutritional ball was effective in improving level of Hemoglobin among adolescent girls in experimental group.

Ethical Clearance- was obtained from the university registered ethics committee

Conflict of Interest – None

Source of Funding – Sharda University research committee had funded Rs.30000 for this project.

REFERENCES

1. Datta Parul, “A Textbook of Pediatric Nursing 2nd edition. Published by, “Jaypee brother medical publication” 2009; Pg.no.124.

2. UNICEF (United Nation Children’s Fund) [US], UNICEF Data: Monitoring the Situation of Children and Women; Updated Jun 2016. Available from: <https://data.unicef.org/topic/adolescents/adolescent-demographics/>
3. Encyclopedia Britannica, inc. Mihalyi Csikszentmihalyi; June 10, 2018. Adolescence; Available from: <https://www.britannica.com/science/adolescence>
4. Stopler. T. Medical Nutrition Therapy for Anemia. Krause’s Food and Nutrition Therapy. Ed. By LK Mahan and S Escott-Stump. 12th edition. 2008; 810-818.
5. World Health Organization. Anemia; 2017. Available from: <http://www.who.int/topics/anaemia/en/>
6. Shilpa S. Biradar, Somashekar P. Biradar, A.C. Alalagi, A.S. Wantamutte, P.R. Malur, Prevalence of Anaemia among Adolescent Girls: A One Year Cross-Sectional Study, Journal of Clinical and Diagnostic Research, 2012; vol.6: pg.no. 372 – 377. Available from: http://www.jcdr.net/article_fulltext.asp?id=2064
7. Ajay Kumar Agarwal¹, Hari Shankar Joshi², Syed Esam Mahmood³, Arun Singh⁴, Mahendra Sharma⁵, Epidemiological profile of Anemia among rural school going adolescents of district Bareilly, India, ORIGINAL ARTICLE pISSN 0976 3325 | eISSN 2229 6816, 2015. Available from: http://njcmindia.org/uploads/6-4_504-507.pdf
8. <https://www.omicsonline.org/prevalence-of-anemia-and-its-associated-factors-among-adolescent-school-girls-in-chennai-tamil-nadu-india-2161-1165.1000118.php?aid=8911>
9. Akramipour R, Rezaei M. Prevalence of iron deficiency anemia among adolescent school girls from Kermanshah, Western Iran. 2008 December 13 (6); 352-355.
10. Sanjeev M Chaudhary and Vasant R Dhage, 2008 “A Study of Anemia Among Adolescent Females in the Urban Area of UP, Indian Journal of Community Medicine, October, 33(4): 243–245.
11. <https://www.omicsonline.org/prevalence-of-anemia-and-its-associated-factors-among-adolescent-school-girls-in-chennai-tamil-nadu-india-2161-1165.1000118.php?aid=8911>

Analysis of Heavy Metal Distribution and Content in Coastal Area of Makassar, Indonesia

Ridwan Bohari¹, Sukri Palutturi²

¹Senior Lecturer, Faculty of Marine and Fisheries, ²Professor, Faculty of Public Health, Hasanuddin University, Makassar Indonesia

ABSTRACT

Coastal waters of Makassar have important roles not only for the fishermen but also for businessmen and tourism development. Based on landscape plan of Makassar, coastal waters of Makassar were designated for tourism development. In conjunction with those designations quality of the environment has to be kept in order maintaining the environment was still in a good condition. Therefore, a research on heavy metal content in the waters is necessary to be conducted by comparing the value with the environmental standard quality. Research on heavy metal (Hg, Cd, Pb and Cu) contents as a standard for water quality because of their toxicity on organisms live in a certain period of time. The objective of this research is to examine heavy metal content in Coastal waters of Makassar for fisheries and tourism purposes. In coastal waters of Makassar and several river mouths, water samples were taken with ten replications. In Makassar waters, at the beginning of this research sampling location was designated based on land and water activities. Samples were taken by using sampling bottles in the area of coastal waters of Makassar such as in the river mouth of Tello, Paotere Port, river mouth of Jeneberang, TanjungMerdeka, and Losari beach with using composite sampling methods. Five locations of sampling were designated based on 1) purpose of sample collection, 2) water resource would be collected, 3) water flow models would be sampled, and 4) water body flow model would be sampled. Based on the result of this research, Cd content was 0,083 – 0,129, Pb content was 0,434 – 0,838 and Cu content was 0,027-0,39 mg/l). Heavy metal content (Cu, Pb and Cu) in the coastal waters of Makassar was still in a safe condition and still below standard quality based on Kepmen-LH 51/2004.

Keywords: Heavy metal, coastal waters Makassar.

INTRODUCTION

The development of cities and industrial progress in Indonesia is increasing rapidly which will indirectly be followed by additional waste and other environmental problems¹⁻⁴. Other diseases also occur such as infectious diseases such as Tuberculosis and Diarrhea and noninfectious diseases such as stroke and traffic accident^{5,6}. Improper city management and poor industrial waste disposal processes and household waste can cause pollution and ultimately have a negative impact on the environment^{7,8}.

Pollutants that enter the environment will react with one or more environmental components^{9,10}. Changes in environmental components physically, chemically and biologically as a result of pollution materials bring about changes in environmental values called quality changes². Waste containing pollutants will change the quality of the environment if the environment is unable to restore its condition according to the carrying capacity it has. Therefore, it is important to know the nature of the waste and the pollutant components contained.

Initially industrial waste and household waste entering the sea either through rivers or sewers has a low pollutant power so it is not dangerous, but if the waste is more and more and exceeds the carrying capacity of the environment, it will slowly cause serious pollution to the marine environment¹¹⁻¹⁴.

Corresponding author:

Sukri Palutturi

E-mail: sukritanatoa72@gmail.com

The sea is a place of life for various organisms that are very influential in the aquatic environment¹⁵. Disposal of liquid waste from business activities, domestic waste, garbage or sewage that can continuously cause pollution to the sea is increasing, without the opportunity to purify them due to reduced or lost oxygen which is needed by the habitat of sea water quality¹⁶.

The coastal area of Makassar city is one of the industrial cities that is growing very rapidly where the population activities in this area are increasing along with the development of the economy¹⁷. Makassar, which is located on the coast, cannot be separated from various waste problems, both industrial waste, household waste and sea transportation which will eventually be wasted into the sea.

The waters around the Makassar coast are waters that are susceptible to being penetrated by various pollutants sourced from household waste inputs and industrial waste from sewage disposal and canals which lead to the Makassar coastal waters. Seeing these conditions that continue to take place, research is needed on the presence of heavy metals as contaminants in the coastal waters of Makassar.

The purpose of this study was to determine the distribution and content of heavy metals in the waters of Makassar Beach.

RESEARCH METHOD

Research Site

This research was carried out in the coastal waters of Makassar. Sample analysis was carried out at the Maros Soil Installation Laboratory.

Tools and materials

Tools and materials used are boats, pipettes, sample plastic bottles, compass geology, computer devices, atomic absorption spectrophotometers, global positioning systems.

Water Quality Sampling Techniques

Determination of observation stations

In the coastal areas of Makassar City and rivers, samples were taken in each river and carried out 10 times. In coastal areas, research begins with determining the location of sampling conducted with consideration to

represent activities on land, and activities in the waters. Water sampling was carried out using sample bottles in five coastal areas, namely the Tello River estuary, Paotere Port, Jeneberang River estuary, Tanjung Merdeka, and Losari Beach with composite sample technique. The sampling location was chosen / determined intentionally (purposive sampling). The determination of these five sampling locations is based on 1) the purpose of sampling, 2) the type of water source to be sampled, 3) the pattern of water flow to be sampled and 4) the flow pattern of water bodies to be sampled, specifically surface water.

Water Sampling

Water samples are taken in a composite using a sampling tool. Water samples are put in a bottle and labeled with a sample of water inserted into the cool box to be brought to the laboratory for analysis purposes. The time of sampling water together with the time of taking some supporting parameters such as temperature, pH, and brightness. This sample sample is then preserved with concentrated H₂SO₄ before analyzing it in the laboratory.

Position (latitude - longitude) of the sampling location or each observation station is determined using GPS (global positioning system). Water quality data collection was carried out for six months.

RESULTS AND DISCUSSION

Heavy metals in natural waters have very low levels, and will increase if there is pollution by pollutants containing heavy metals^{18,19}. Heavy metal materials, Hg, Cd, Pb, and Cu, are hazardous materials because they are toxic for the life of organisms within a certain period of time. Factors affecting the toxicity of heavy metals in water according to Bryan (1976), are the form of these heavy metal compounds, both organic, inorganic, neutral, and other metals. One of the properties of heavy metals is difficult to destroy naturally and tends to accumulate in natural food chains through a biomagnification process.

Cadmium (Cd) is a silver-white metal, soft, shiny, insoluble in alkaline, easy to react, and produces potassium oxide when it is pressed. Cd is commonly found in combination with chlorine (Cd chloride) or sulfur (Cd sulfite). Cd has an atomic number of 40, atomic weight of 112.4 g / mol, melting point of 3210C, and boiling point of 7670C. The range of Cd at the

study location. The range of Cadmium (Cd) at the study location was between range (0.083 - 0.129 mg / L). It can be seen that the presence of Cadmium in the research location is slightly above the water quality standard according to Minister of Environment Decree No. 51 of 2004, namely Cd = 0.05 - 0.1 mg / L. (as shown in Figure 1.)

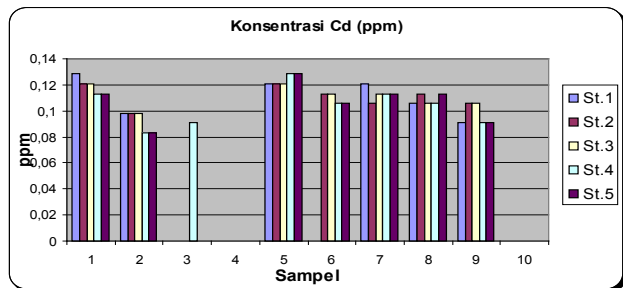


Figure 1. Cd concentration at the study site

Lead (Pb) is a heavy metal that is naturally present in the earth’s crust, but lead also comes from human activities²⁰. Pb has a low melting point, is easy to form, has active chemical properties, so it can be used to coat metal so that no arising will occur. Pb is a shiny, bluish gray soft metal that is easily purified from mining. Lead melts at 3280C (6620F); boiling point 17400 C (31640 F); and has a gravity of 11.34 with an atomic weight of 207.20. The range of Pb at the study location as shown in Figure 2. ranges from (0.434 - 0.838 mg / L). This can be seen that the presence of Pb at the study location is still below the standard quality standard of the Minister of Environment Decree No. 51 of 2004 (0.1 - 1.0 mg / L).

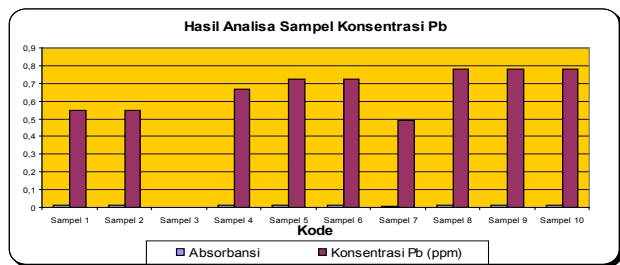


Figure 2. Concentration of Pb values at the study location

Kuprum or copper (Cu) has a cubic crystal system, which is physically yellow and when using a microscope it will be brownish to grayish. Cu is a metal group, red, and easily deformed. Physically, heavy metal Cu is classified into good conductor metal so that Cu is widely used in electronics. The range of Cu (Figure 3.) in the study location is in the range (0.027 - 0.039 mg / L) the presence of Cu in the study location is still below the standard quality standard of Minister of Environment Decree No. 51 of 2004 (2.0 - 3.0 mg / L) This indicates that the presence of Cu in the research location is still

permissible.

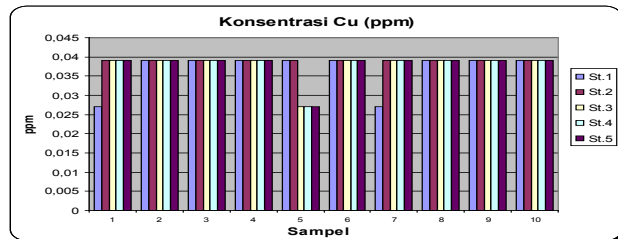


Figure 3. Cu concentration at the study site

Figure 4 explains that the relatively high Pb at the study site is thought to originate from anthropogenic activities, namely from the burning of fuel, both carried out on land (transportation and industry) and from activities in the sea (transportation). The same condition also occurred the concentration of Cd, namely Cd which entered the waters allegedly originating from industrial activities. In contrast to Pb and Cd, Cu concentrations in waters are relatively low. This is because Cu is needed for the formation of haemocyanin in invertebrate animals especially from phylum krustase.

CONCLUSION

This study concludes that the content of Cd in the coastal waters of Makassar is in the range of (0.083 - 0.129 mg / L), Pb content in the study location ranged from (0.434 - 0.838 mg / L) and Cu ranged from (0.027 to 0.039 mg / L), The content of heavy metals such as Cd, Pb and Cu in the coastal areas of Makassar coastal waters are still safe and are still below the standard quality standards, based on Minister of Environment Decree No. 51/2004.

Conflict of Interest: None

Source of Funding : Nil

Ethical Clearance: The study was approved by the Institutional Ethical Board of the Hasanuddin University, Makassar.

REFERENCES

1. Palutturi S, Zulkifli A, Syam A, et al. The Key Challenges and Recommendations for Healthy Cities Implementation of North Kolaka, Indonesia. Indian Journal of Public Health Research & Development. 2017;8(2).
2. Palutturi S, Rutherford S, Davey P, Chu C. Comparison Between Healthy Cities and Adipura in Indonesia. Malaysian Journal of Medicine and

- Health Sciences. 2013;9(1):35-43.
3. Palutturi S, Chu C, Moon JY, Nam EW. A Comparative Study on Healthy City Capacity Mapping: Indonesia and Korea. *The Social Sciences*. 2015;10(6):848-854.
 4. Mayer H. Air pollution in cities. *Atmospheric environment*. 1999;33(24-25):4029-4037.
 5. Lin H-C, Lin Y-J, Liu T-C, Chen C-S, Chiu W-T. Urbanization and stroke prevalence in Taiwan: analysis of a nationwide survey. *Journal of urban health*. 2007;84(4):604-614.
 6. Noor NB, Amiruddin R, Awal M, Palutturi S, Mallongi A. Proxy Model of Comorbidities with Stroke Incident in South Sulawesi. *Pakistan Journal of Nutrition*. 2017; 16(11):857-863.
 7. Guttikunda SK, Goel R, Pant P. Nature of air pollution, emission sources, and management in the Indian cities. *Atmospheric environment*. 2014;95:501-510.
 8. Palutturi S. *Healthy Cities: Global Concepts, Local Implementation for Indonesia*. Yogyakarta: Pustaka Pelajar; 2017.
 9. Förstner U, Wittmann GT. *Metal pollution in the aquatic environment*. Springer Science & Business Media; 2012.
 10. Derraik JG. The pollution of the marine environment by plastic debris: a review. *Marine pollution bulletin*. 2002;44(9):842-852.
 11. Waite R. *Household waste recycling*. Routledge; 2013.
 12. Slack R, Gronow J, Voulvoulis N. Household hazardous waste in municipal landfills: contaminants in leachate. *Science of the total environment*. 2005;337(1-3):119-137.
 13. Barr S. *Household waste in social perspective: values, attitudes, situation and behaviour*. Routledge; 2017.
 14. Dahuri HR. *Marine Biodiversity, Indonesia's Sustainable Development Assets*. Jakarta: PT. Gramedia Pustaka Utama; 2003.
 15. H. E. *Analysis of Water Quality*. Yogyakarta: Kanisius; 2003.
 16. Vlyssides A, Karlis P, Loizidou M, Zorpas A, Arapoglou D. Treatment of leachate from a domestic solid waste sanitary landfill by an electrolysis system. *Environmental technology*. 2001;22(12):1467-1476.
 17. Mallongi A, La Ane R, Birawida AB. Ecological risks of contaminated lead and the potential health risks among school children in Makassar coastal area, Indonesia. *J. Environ. Sci. Technol*. 2017;10:283-289.
 18. Duruibe JO, Ogwuegbu M, Ekwurugwu J. Heavy metal pollution and human biotoxic effects. *International Journal of physical sciences*. 2007;2(5):112-118.
 19. Li Z, Ma Z, van der Kuijp TJ, Yuan Z, Huang L. A review of soil heavy metal pollution from mines in China: pollution and health risk assessment. *Science of the total environment*. 2014;468:843-853.
 20. Chen T-B, Zheng Y-M, Lei M, et al. Assessment of heavy metal pollution in surface soils of urban parks in Beijing, China. *Chemosphere*. 2005;60(4):542-551.

Knowledge of Critical Care Nurses on Cardiac Medications-Need For Reinforcement Workshop

Melita Sheilini¹, Elsa Sanatombi Devi², Janet Pramila D'souza³

¹Asst.Professor-selection grade, ²Professor, Manipal. ³Asst.Professor-Junior Scale, Department of Medical Surgical Nursing, Manipal College of Nursing Manipal, MAHE, Manipal

ABSTRACT

Cardiovascular disease remains a major health problem in today's society. It is estimated that more than 6 million people have a history of myocardial infarction and/or angina. Hypertension is another major health problem affecting at least 50 million people in the United States. Due to the high prevalence of these conditions, many patients will be taking one or more cardiac medications. The present study was carried out with the objectives to assess the knowledge of critical care nurses on cardiac medications and to find out the association between the qualification, clinical experience and the previous experience of attending cardiac emergencies. The research approach used for this study was survey approach. Descriptive survey design was adopted. About 108 critical care nurses were selected using convenient sampling technique. The data collection instruments were: Demographic Proforma and Structured knowledge questionnaire on cardiac medications. Content validity of the tools was established by giving it to five experts in the field of nursing, general medicine cardiac medicine and pharmacology. Modifications were made according to experts' suggestions. The tools were pretested before use among five critical care nurses. Reliability coefficient of Structured knowledge questionnaire was found out by using Split half technique and the tool was found reliable ($r=0.806$). Descriptive statistics was used to analyze the data. The significant findings of the study were: Majority 74(68.5%) of the participants were between the age group of >25-40 years, Majority 85 (78.7%) were females. About 65 (60.2%) were with the GNM qualification, majority 62(57.4%) were with the clinical experience of >1-5 years and 35 (32.4%) mentioned that they had attended cardiac emergencies during their clinical experience. It was found that the majority 47 (43.5%) of the participants shared equally good and average knowledge on cardiac medications. It was found that there was no significant association between the knowledge of critical care nurses on cardiac medications and education ($\chi^2=2.295, p=0.317$) and clinical experience($\chi^2=8.551, p<0.200$).

Keywords: Knowledge, critical care, cardiac medications, reinforcement workshop.

INTRODUCTION

Non communicable diseases are increasing alarmingly at the global level. It has been anticipated that by 2020, there would be an 11% rise in cardiovascular deaths in India and hypertension is one of the major

contributing factor for the same.¹ In the hospital setting, emergencies typically occur in emergency departments (EDs) and intensive care units (ICUs). But many also take place in progressive care units or general nursing units. And when they do occur it can cause marked anxiety for nurses especially those unfamiliar or inexperienced with the drugs used in these emergencies.^{2,3} Nurses are expected to be mainly responsible for the efficient and effective management of patient care services. In the health care team nurses play a pivotal role in caring for patients. They are considered as the frontline case managers as they are the first ones to receive any emergencies arriving into their units. It is very important that they need to know the drugs in the crash cart. More

Correspondent address:

Dr. Elsa Sanatombi Devi

Professor, Department of Medical Surgical Nursing,
Manipal College of Nursing Manipal, MAHE,
Manipal-576104. Telephone no: 9880621665.

email: sanatombi2010@gmail.com

Fax: 0091-08202922572

importantly, it must be ensured that they are adequately trained in cardiac medications which is a crucial step in a patient's survival in cardiac emergencies. It is very important that every nurse working in an intensive care unit is able to think critically, analyze the situation and know the medication before administering. They should try to answer the 'WH' questions (why, what, when and how) in relation to the drugs which they are administering. That can really bring a great change in the health care settings and ultimately the nurses will be able to fetch a tremendous satisfaction seeing patients getting stabilized out of the emergencies. Lack of drug knowledge can cause medication errors. Regardless of what is ordered, nurses need to be able to recognize when a prescribed dose of a medication is too high or low. With each medication administration, nurses are accountable for knowing what possible side effects are to be monitored. The rate of preventable and potential adverse drug events is high in ICUs compared with non-ICU.^{4,5}

Patients' safety is increasingly recognized as essential in the practice of intensive care medicine. Patients in intensive care unit require high intensity care and may be at high risk for iatrogenic injury. Individuals have right to safe and effective quality health care. Patients in ICU are prescribed twice as many medications as non-ICU patients. The critical care safety demonstrated that 78% of serious errors in ICU patients are attributable to medication. A compassionate, knowledgeable, and skilled nurse caring for the patient in a critical care unit is an asset in the achievement of positive outcomes for the patient.^{6,7}

MATERIALS AND METHOD

The critical care nurses (108) were selected for the study conveniently. The research approach used for this study was survey approach with descriptive survey design. Objectives of the study were to assess the knowledge of critical care nurses on cardiac medications and to find out the association between the qualification, clinical experience and the previous experience of attending cardiac emergencies. The data collection instruments were: Demographic Proforma, Structured knowledge questionnaire on cardiac medications. The Knowledge questionnaire had 30 items and the scores were arbitrarily classified as poor (0-10), average (11-20) and good (21-30) knowledge. Content validity of the tools was established by giving it

to five experts in the field of nursing, general medicine cardiac medicine and pharmacology. Modifications were made according to experts' suggestions. The tools were pretested before use among five critical care nurses. Reliability coefficient of Structured knowledge questionnaire was found out by using spearman brown prophecy formula and the tool was found reliable ($r=0.806$). The ethical clearance was obtained from the Institutional Ethical Committee (IEC) before proceeding for data collection. Written informed consent was obtained from the participants before collecting the data. The tools were self-administered.

RESULTS AND DISCUSSION

The findings of the study show that majority 74(68.5%) of the participants were between the age group of >25-40 years, Majority 85 (78.7%) were females. About 65 (60.2%) were with the GNM qualification, majority 62(57.4%) were with the clinical experience of >1-5 years and 35 (32.4%) mentioned that they had attended cardiac emergencies during their clinical experience (Table 1). Majority 47 (43.5%) of the participants shared equally good and average knowledge on cardiac medications. The poor knowledge among 13% of the participants could be because 66% had not attended any cardiac emergencies (Table 2). The study also revealed that there is no significant association between the knowledge of critical care nurses on cardiac medications and education ($\chi^2=2.295, p=0.317$), clinical experience ($\chi^2=8.551, p=0.200$) and attending cardiac emergencies ($\chi^2=3.188, p=0.203$) (Table 3).

The above findings are supported by the study conducted by Devi, Mayya, Bairy, Mohan, Anjali, Aswathy et al on Knowledge of cardiac emergency drugs and its application in clinical practice among undergraduate nursing students of selected college of Udupi, Karnataka. The objectives of the study were to compare the level of knowledge and application of knowledge on cardiac emergency drugs among third and fourth year B.Sc. nursing students and to compare the opinion of fourth year and third year B.Sc. nursing students in learning pharmacology. The data was collected from 120 sample using descriptive survey approach. The result showed that 61.66% of the third year and 40% of fourth year B.Sc. Nursing students have poor level of knowledge as well as 60% of fourth year and 80% of third year did not have adequate theory knowledge of cardiac emergency drugs which clearly

indicates that the students require further input into the learning of cardiac emergency drugs for comprehensive care of cardiac patients.⁸

The findings of the present study is also supported by the study conducted by Anupriya on study to assess the knowledge about selected cardiovascular drugs among cardiac nurses. The study was conducted among fourty cardiac nurses from one of the Medical Sciences institute, Trivandrum. Convenient sampling technique was used for selecting the sample. A self-prepared questionnaire was used. Study showed that cardiac nurses knowledge on selected cardiovascular drugs is above average (10.75/15). There was no statistically significant difference the mean knowledge score and age, year of experience, place of work and training programme attended.⁹ The study by Suchithra GR among cardiac ICU nurses in Thiruvananthapuram, showed that out of 30 staff nurses, 17 (57%) had their knowledge on cardiac drugs between 61-80%.¹⁰

CONCLUSION

The result showed that there was only 14 (13%) were with the poor knowledge on cardiac medications. So the researcher did not feel the need for conducting the reinforcement workshop on cardiac medications. This is been discussed with the nursing administrator at the hospital and is considered as an important area which need to be emphasized in the plan as an ongoing activity in the Continuing Nursing Education Programme. Nurses' being knowledgeable in the handling and usage

of cardiac medications is the cornerstone for the care of patients in critical care units. As there are many new drugs been added every year to the pharmacopedia, it is very important for the nurses to keep abreast with the advances in the field of medicine.

Table 1: Sample characteristics of critical care nurses in terms of frequency and percentage

N=108

Sample Characteristics	Frequency (f)	Percentage (%)
Age in years		
< 25	27	25
>25-40	74	68.5
>40	7	6.5
Gender		
Male	23	21.3
Female	85	78.7
Education		
GNM	65	60.2
BSc (N)	43	39.8
MSc (N)	0	0
Clinical experience in years		
< 1	24	22.2
>1-5	62	57.4
>5-10	13	12
>10	9	8.3
Attending Cardiac emergencies		
Yes	36	33.3
No	72	66.7

Table 2: Frequency and percentage distribution of knowledge scores of critical care nurses on cardiac medications.

N=108

Range of knowledge scores	Frequency (f)	Percentage (%)
Poor (0-10)	14	13
Average (11-20)	47	43.5
Good (21-30)	47	43.5

Maximum possible score is 30.

Table 3: Chi-square values computed between the knowledge scores of critical care nurses and selected variables **N=108**

Variables	Good	Average	Poor	Chi-square (χ^2)Values	df	P Value
Education						
GNM	32	26	7	2.295(2)	2	0.317
BSc(N)	15	21	7			
Clinical experience in years						
< 1	9	9	6	8.551(6)	6	0.200
1-5	25	30	7			
5-10	6	6	1			
>10	7	2	0			
Attending cardiac emergencies						
Yes	36	28	9	3.188(2)	2	0.203
No	11	19	5			

p<0.05

*Significant

Ethical Clearance: Ethical clearance was sought from institutional ethical committee (IEC No.410/2014). Informed consent from the participants was obtained after explaining the purpose of the study and assuring confidentiality of information.

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

- Meshram II, Vishnu Vardhana RM, Sudershan RV, Laxmaiah A, Polasa K. Prevalence and Correlates of Hypertension & Diabetes among ≥ 18 Years Urban Population in India. *Br Biomed Bull.* 2015;3(2):176–89.
- Reynolds. Emergency Cardiac Drugs: Essential facts for medical-surgical nurses. *Am Nurse Today.* 2010;5(7).
- Yuan, Thompson. Review of cardiac medications for the orthopaedic nurse clinician. *Orthop Nurs.* 1998;17(1).
- Moyen E, Camire E, Thomas SH. Clinical review: Medication errors in critical care. *Crit care.* 2008;12:208.
- Almeida AO, Araujo IS, Darli M C, Araujo S. Theoretical knowledge of nurses working in non-hospital urgent and emergency care units concerning cardiopulmonary arrest and resuscitation. *Rev Latino-Am Enferm.* 2011;19(2).
- Essani RR, Ali TS. Knowledge and practice gaps among pediatric nurses at a tertiary care hospital Karachi Pakistan. *Pediatr Crit Care Med.* 2007;8(5).
- Yorganci M, Yaman H. Preparedness of primary health care centres for critical emergency situations in southwest Turkey. *Prehospital Disaster Med.* 2008;23(4):342.
- Devi ES, Mayya SS, Bairy KL, Mohan M, Anjali A, Aswathy M. Knowledge of cardiac emergency drugs and its application in clinical practice among undergraduate nursing students of selected college of Udupi, Karnataka. *Int J Nurs Educ.* 2010;2(1).
- Anupriya PS. A study to assess the knowledge about selected cardiovascular drugs among cardiac nurses. Sree Chitra Tirunal Institute for Medical Science and Technology, Trivandrum. 2010.
- Suchithra GN. A study to assess the knowledge of Cardiac Nurses about commonly administered drugs in Cardiac Surgical ICU in SCTIMST, Thiruvananthapuram. 2011.

Knowledge on Practice of Urinary Catheter Care and Compliance to Urinary Catheter Care Guidelines- A Hospital based Study

Maryl Candida Cutinho¹, Melita Sheilini², Harish B³

¹Department of Medical Surgical Nursing, MSc (N), MCON, MAHE, Manipal, ²Assistant, Professor, Department of Medical Surgical Nursing, Selection Grade, MCON, MAHE, Manipal, ³Lecturer, Department of Medical Surgical Nursing, MSc (N), MCON, MAHE, Manipal

ABSTRACT

Background: Catheter associated urinary tract infections are the leading cause of secondary health care-associated bacteremia. An infection that involves any of the organs or structures of urinary tract infection including the kidneys, urethra, bladder and ureter is called as urinary tract infection. About 75% of urinary tract infections acquired in the hospital are because of the urinary catheters. Prolonged use of indwelling urinary catheter is one of the main risk of catheter associated urinary tract infection.

Objective: To assess the knowledge on practice of urinary catheter care and compliance to urinary catheter care guidelines by the staff nurses.

Materials and Method: Quantitative approach with descriptive survey design was used for the study. Staff nurses available during data collection and willing to participate were included. Purposive sampling technique was used to recruit the participants to assess the knowledge. By concealed observation practices of urinary catheter care were made to assess the compliance.

Results: Majority 89(82.4%) of the participants had average knowledge, 18(16.7%) had good knowledge on prevention of catheter associated urinary tract infections. There was maximum noncompliance to the procedural steps while performing urine specimen collection, removal of urinary catheter and maintenance of urinary catheter.

Conclusion: Nurses have to be aware of hospital policies and CDC guidelines in carrying out procedures like urinary catheter insertion, collection of urine specimens and maintenance of indwelling urinary catheter. Compliance of staff nurses is vital in reducing and preventing the occurrence of health care associated infection.

Keywords: knowledge on practice, urinary catheter care, compliance to urinary catheter care guidelines.

INTRODUCTION

Health care-associated infection(HCAI), also referred to as “nosocomial” or “hospital” infection, is

that which is occurring in patient during the process of care in the hospital or health care facility which was not present or incubating at the time of admission¹.

Catheter associated urinary tract infections (CAUTI) are the leading cause of secondary health care-associated bacteremia. An infection that involves any of the organs or structures of urinary tract infection including the kidneys, urethra, bladder and ureter is called as urinary tract infection. About 75% of urinary tract infections acquired in the hospital are because of the urinary catheters. Prolonged use of indwelling

Correspondent author:

Dr. Melita Sheilini

Department of Medical Surgical Nursing,
Manipal College of Nursing Manipal,
MAHE, Manipal-576104. Telephone no: 8095976561.
email: shyli.mel@manipal.edu,
Fax: 0091-08202922572

urinary catheter is one of the main risk of catheter associated urinary tract infection. Catheter associated urinary tract infection is caused by many organisms. The frequent pathogens associated are E.Coli(21.4%), Candida spp (21%), Enterococcus(14.9%), Pseudomonas Aeruginosa(10%), Klebsiella Pneumoniae(7.75) and Enterobacterspp(4.15).^{2,8,11}

Urinary tract infections are the 4th most common type of hospital acquired infection with an estimated 93,300 urinary tract infections (UTI) in acute care hospitals in the year 2011². UTIs are accounting for more than 12% of infections reported by acute care hospitals. Research studies shows that when health care facilities, doctors, nurses and care teams are aware of infection problems, it is possible to take specific steps to prevent them. CAUTI can causes a number of complications like cystitis, prostatitis, endocarditis, pyelonephritis, orchitis, septic arthritis, endophthalmitis, meningitis in patients. Yearly 13,000 deaths occur due to urinary tract infection related to urethral catheters^{2, 9, 10, 16}. The present study aimed at assessing the knowledge on practice of urinary catheter care and compliance to urinary catheter care guidelines by the staff nurses working at a tertiary care hospital.

MATERIALS AND METHOD

The study was conducted in a tertiary care multi-specialty hospital in southern India among 108 staff nurses. Staff nurses working in the intensive care units were included in the study. The data was collected between 2nd January 2017 and 5th February 2017. After obtaining administrative permission and from Institutional Ethics Committee (IEC No. 748/2016) concealed observation of events such as urinary catheter insertion, urinary catheter removal, urine specimen collection and maintenance of urinary catheter were made. After this the staff nurses in the units were explained about the concealed observation and consent was sort and participant information sheet was given to them. The knowledge was assessed by using structured knowledge questionnaire which consisted of 30 items with domains such as hospital infection control committee guidelines, Centre for disease control guidelines, pathogenesis of catheter associated urinary tract infection. Each item consisted of four options from which participants were asked to choose the right one.

Compliance to different procedural steps of urinary catheter care practices was assessed by concealed

observation. Procedures like insertion of urinary catheter, removal of urinary catheter, urine specimen collection, maintenance of urinary catheter were observed using checklist. All the events available during data collection were observed. Confidentiality of study participants was maintained throughout the study.

Non probability Purposive sampling technique was used to assess the knowledge of staff nurses (n=108) on prevention of catheter associated urinary tract infection and for practices maximum number of observations were made by concealed observation.

Data was collected using structured knowledge questionnaire to assess knowledge and practices of urinary catheter care were made observed using observation checklist.

RESULTS AND DISCUSSION

Data was analysed using descriptive statistics. The findings of the study showed that out of 108 participants majority 95 (88%) were between the age group of 20 to 30. Majority 92 (85.2%) were females, 64(59.3%) were GNM qualified and majority 67(62%) were having experience of 1 to 5years. Out of 16 (14.8%) who had attended the training program on CAUTI; 14(13%) expressed having awareness on Evidence Based Guidelines of CAUTI preventive practices (Table 1).

Out of 108 participants, 89(82.4%) had average knowledge and only 1(0.9%) had poor knowledge on practice of urinary catheter care (Figure 1). The results of the study conducted by Prasanna at Nellore, India in 2015 on Knowledge regarding catheter care among 30 staff nurses showed that 46.7% had adequate knowledge and 20% had inadequate knowledge.³ The findings of the study done by Opina & Oducado at Iliolo city in 2014 reported that out of 30 staff nurses 70% had low level of knowledge and 30% had average knowledge.⁴ Study conducted by Purbia, Vyas, Sharma & Rathore among staff nurses working at Geetanajli Hospital Udaipur, Rajasthan India showed that 58.88% belonged to inadequate knowledge and 12.22% belonged to moderate knowledge.⁵

With regard to practices of urinary catheter insertion, out of 19 events observed there was noncompliance to procedural steps in the areas of hand hygiene before catheter insertion with soap and water though few of them used hand rub. Perineal hygiene with antiseptics was

observed in all the events but a single swab was used for multiple strokes 17(89.5%). Compliance was observed in securing the urinary catheter and hanging the urine bag below bladder level (Table 2). This finding is supported by a descriptive study which was conducted by Mark Lister & Ryan Michael in 2014 to assess the knowledge and practices of staff nurses regarding infection control practices for indwelling urinary catheters. The findings of the study reported that 40% of staff nurses did not perform hand washing before catheter insertion. It was identified that 66.7 % had poor practices on infection control. Out of 30 staff nurses who were observed for 30 days; handling of sterile equipments was 80%, wearing sterile glove before insertion is 83.3%, perineal care is 3.3%, placement of drainage bag was 100%⁴.

Out of 21 observations done; there was noncompliance in the areas of handhygiene, cleaning of port with disinfectant and aspiration of urine with sterile syringe, which was not performed in all the 21 observations. It was observed that urine specimen were collected either by disconnecting continuous drainage system for cultures or directly from urine collecting bag for routine tests (Table. 3). The findings of this study contradicts the findings of the study done in 2016 to assess the knowledge and practice on appropriate reasons in obtaining proper urine cultures and identifying catheter associated urinary tract infection. The results showed that out of 394 staff nurses 78.9% of them reported of collecting urine specimen from port by aspirating while 3.3% reported that urine specimen was collected from the drainage bag or by disconnecting the closed drainage⁶.

The findings also showed that with regard to practices of urinary catheter removal there was compliance observed in all events except in the area of routine perineal care 11(91.7%) after the catheter removal (Table 4). With regard to practices of maintenance of urinary catheter, out of 170 observations done noncompliance

was observed in the areas of handhygiene before procedure 50(29.41%), cleaning of perineal area with soap and water 20(11.76%), handhygiene after procedure 152(89.41%), securing the catheter 161(94.70%) and maintaining closed drainage system 161(94.70%) (Table. 5). A prospective observational study conducted in 5 general hospitals of Kansai area of Japan reported that the perineal care was given by only 56% of the nurses for the patients with urinary catheter.⁷

CONCLUSION

Healthcare associated infections are a threat to patient's safety. Nurses have a vital role in preventing healthcare associated infections. With developing technologies nurses need to update themselves to face the challenges of dealing with and preventing healthcare associated infections. Nurses have to be aware of hospital policies and CDC guidelines in carrying out procedures like urinary catheter insertion, collection of urine specimens and maintenance of indwelling urinary catheter. Compliance of staff nurses can reduce and also prevent the healthcare associated infection.^{12, 14, 17} In the present study majority (82.4%) of the staff nurses had adequate knowledge but there was noncompliance to procedural steps of urinary catheter insertion, urine specimen collection, maintenance of urinary catheter. The study findings has provided a base in finding out the compliance of staff nurses towards practices of prevention of urinary tract infection associated with indwelling urinary catheter. Though the staff nurses had adequate knowledge on prevention of catheter associated urinary tract infection there was maximum noncompliance observed in practices regarding catheter care. The study recommends that nurses need to enhance their knowledge on the hospital as well as CDC guidelines for prevention of urinary catheter care infections so as to be compliant to the procedures.

Table 1: Description of sample characteristics.

N=108

Sample characteristics	Frequency(f)	Percentage(%)
Age in years		
20-30	95	88
>30	13	12
Gender		
Male	16	14.8
Female	92	85.2

Cont... Table1: Description of sample characteristics.

N=108

Educational qualification		
GNM	64	59.3
B.SC	44	40.7
M.SC	0	0
Total Years of experience		
<1	10	9.3
1-5	67	62
>5	31	28.7
Attended training programs on catheter associated urinary tract infection		
Yes	16	14.8
No	92	85.2
Awareness of EBP on CAUTI		
Yes	14	13
No	94	87

N=108

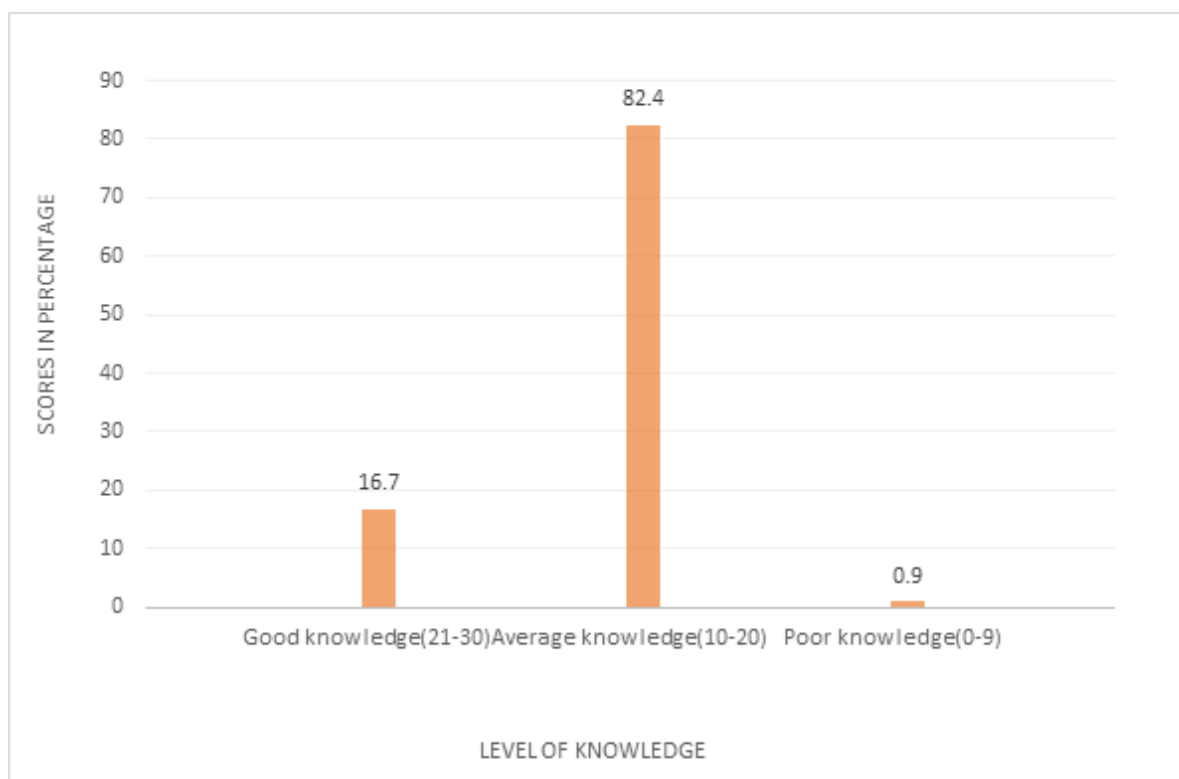


Figure1. Knowledge scores of nurses on prevention of catheter associated urinary tract infections.

Table 2: Frequency and percentage description of infection control practices while inserting urinary catheter
N=19

Sl.	Practices	Yes		No	
		Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
1.	Arrange sterile equipments	19	100	0	0
2.	Position patient supine with knee flexed	19	100	0	0
3.	Performs hand hygiene	0	0	19	100
4.	Don sterile gloves	19	100	0	0
5.	Perform perineal hygiene with antiseptics	2	10.5	17	89.5
6.	Select appropriate catheter(smaller bore)	19	100	0	0
7.	Lubrication	19	100	0	0
8.	Exposes meatus with non dominant hand.	19	100	0	0
9.	Sterile hand to pick up the catheter with the distal end on the sterile field	19	100	0	0
10.	Insert catheter into urethra until urine begins to drain.	19	100	0	0
11.	Inflate the retention ballon with 15ml of water	19	100	0	0
12.	Pull the tube gently to ensure placement	19	100	0	0
13.	Connect the distal end to urine collecting bag	19	100	0	0
14.	Secure catheter tubing on thigh	19	100	0	0
15.	Attach drainage bag below the bladder level	19	100	0	0
16.	Remove gloves and perform hand hygiene	19	100	0	0

Table 3: Frequency and perenatge description of infection control practices during urinary specimen collection.
N=21

Sl	Practices	Yes		No	
		Frequency(f)	Percentage (%)	Frequency (f)	Percentage (%)
1.	Performs hand hygiene	0	0	21	100
2.	Don gloves	21	100	0	0
3.	Clean the port of the tube with disinfectant	0	0	21	100
4.	Aspirate the urine from the port with sterile syringe	0	0	21	100
5.	Open the sterile urine container and drop the urine in and recap	21	100	0	0
6.	Discard gloves and perform hand hygiene	21	100	0	0

Table 4. Frequency and percentatge description of infection control practices during urinary catheter removal N=12

Sl.	Practices	Yes	No	No	No
				Frequency(f)	Percentage (%)
1.	Perform hand hygiene			0	0
2.	Don clean gloves			12	100
3.	Aspirate the water to deflate the balloon			12	100
4.	Slowly pull the tube out			12	100
5.	Routine care of perineal area			1	8.3
6.	Discard gloves and perform hand hygiene			12	100

Table 5. Description of infection control practices during urinary catheter maintenance N=170

Sl.	Practices	Yes	No	No	No
				Frequency(f)	Percentage (%)
1.	Perform hand hygiene			50	29.41
2.	Wear clean gloves			170	100
3.	Cleans the perineal area with soap and water			20	11.76
4.	Performs hand hygiene after procedure			152	89.41
5.	Catheter secured appropriately			161	94.70
6.	Maintain closed drainage system			161	94.70

Ethical Clearance: Ethical clearance was sought from institutional ethical committee (IEC No.748/2016), permission from Medical superintendent was sort and registered in CTRI. Informed consent from the participants was obtained after explaining the purpose of the study and assuring confidentiality of information.

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. World Health Organization [Internet]. 2017 [cited 2018 May 27]. Available from: http://www.who.int/gpsc/country_work/gpsc_ccisc_fact_sheet_en.pdf.

2016

2. Center for Disease Control [Internet]. [cited 1BC May 27]. Available from: <http://www.cdc.gov/hicpac/cauti/cauti>

3. Prasanna K. Knowledge Regarding Catheter Care Among Staff Nurses. *Int J Appl Res.* 2015;1(8):182–6.

4. Opina ML, Oducado RM. Infection Control In The Use Of Urethral Catheters: Knowledge And Practices Of Nurses In A Private Hospital In Iloilo City. *Asia Pacific J Educ Arts Sci.* 2015;1:93–100.

5. Purbia V, Vyas H, Sharma, MK, Rathore DA. Study To Assess The Effectiveness Of Planned Teaching

- Programme On Knowledge Of Staff Nurses Regarding Prevention Of Urinary Tract Infection Among Patients With Indwelling Catheter. *Int J Sci Res Publ.* 2014;4:1–4.
6. Jones K, Sibai J, Battjes R.,Fakih MG. How And When Nurses Collect Urine Cultures On Catheterized Patients: A Survey Of 5 Hospitals. *Am J Infect Control.* 2016;44:173–6.
 7. Tsuchida T, Makimoto K, Ohsako S, Fujino M, Kaneda M, Miyazaki T. Relationship Between Catheter Care And Catheter- Associated Urinary Tract Infection At Japanese General Hospitals: A Prospective Observational Study. *Int J Nurs Stud.* 2008;45:352–61.
 8. Amine AE, Helal MO, Bakr WM. Evaluation Of An Intervention Program To Prevent Hospital-Acquired Catheter-Associated Urinary Tract Infections In An ICU In A Rural Egypt Hospital. *GMS Hyg Infect Control.* 2014;9.
 9. Fink R, Gilmartin H, Richard A, Capezuti E, Boltz M, Wald H. Indwelling urinary catheter management and catheter-associated urinary tract infection prevention practices in Nurses Improving Care for Healthsystem Elders hospitals. *Am J Infect Control.* 2014;40:715–20.
 10. Jain M, Dogra V, Mishra B, Thakur A, Loomba PS. Knowledge And Attitude Of Doctors And Nurses Regarding Indication Of Catheterization And Prevention Of Catheter- associated Urinary Tract Infection In A Tertiary Care Hospital. *Indian J Crit Care Med.* 2015;19:76–81.
 11. Thomas KL. Reduction Of Catheter- Associated Urinary Tract Infections Through The Use Of An Evidence-Based Nursing Algorithm And The Implementation Of Shift Nursing Rounds. *J Wound Ostomy Cont Nurs.* 2016;43:183–7.
 12. Ana M, Chen S, Galecki A, McNamara S, Lansing B, Mody L. Impact Of Health Care Worker Policy Awareness On Hand Hygiene And Urinary Catheter Care In Nursing Homes : Results Of A Self - Reported Survey. *Am J Infect Control.* 2013;41:55–7.
 13. Datta P, Rani H, Chauhan R, Gombar S, Chander J. Health- care Associated Infections: Risk Factors and Epidemiology From Intensive Care Unit In Northern India. *Indian J Anesth.* 2014;58:30–5.
 14. Dougnon TV, Bankole HS, Johnson RC, Hounmanou G, Toure IM, Housessou C. Catheter- Associated Urinary Tract Infections At A Hospital In Zinvie, Benin(West Africa). *Int J Infect.* 2016;3:1–8.
 15. Miranda AL, Oliveira AL, Nacer DT, Aguiar CA. Results After Implementation Of A Protocol On The Incidence Of Urinary Tract Infection In An Intensive Care Unit. *Rev Latino- Am Enferm.* 2015;24.
 16. Najjar YW, Hdaib M T, Al-Momany SM. Improvement In Knowledge Level Of Associate Degree Nursing Students In Zarqa University College Regarding Care For Patients With Indwelling Urinary Catheters After Joining An Educational Session. *Glob J Health Sci.* 2015;7:39–45.
 17. Shamshiri M, Suh B F, Mohammadi N, Amjad RN. A Survey Of Adherence To Guidelines To Prevent Healthcare- Associated Infections In Iranian Intensive Care Units. *Iran Red Crescent Med J.* 2016;18(6).
 18. Vyawahare CR, Gandham NR, Misra RN, Jadhav SV, Gupta NS, Angadi KM. No Title. *Med J Dr DY Patil Univ.* 2015;8(5):585–9.

TB Iris: A Clinical Outcome among HIV Patients Receiving Antiretroviral Therapy in a Tuberculosis Prevalent Area

Yadlapati Sujani,¹ Achappa Basavaprabhu,² Bajpai Sukrit,³ Mahalingam Soundarya,⁴ Jain Simran⁵

¹Resident Physician, Department of Internal Medicine, Albert Einstein Medical Center, Philadelphia, PA, ²Associate Professor, Department of Medicine, Kasturba Medical College, affiliated to Manipal Academy of Higher Education, Mangalore, India, ³M.B.B.S Intern, Kasturba Medical College, affiliated to Manipal Academy of Higher Education, Mangalore, India, ⁴Associate Professor, Department of Paediatrics Kasturba Medical College, affiliated to Manipal Academy of Higher Education, Mangalore, India, ⁵M.B.B.S, Student, Kasturba Medical College, affiliated to Manipal Academy of Higher Education, Mangalore, India

ABSTRACT

Introduction: IRIS remains as a major obstacle in effective administration of antiretroviral therapy. This study primarily focuses on evaluating the frequency of occurrence of TB-IRIS among HIV patients on antiretroviral therapy. Secondly, it focuses on establishing risk factors or predictors in patients developing TB-IRIS and finally this study aims to determine the various clinical outcomes and effect of IRIS development on survival rates among these patient.

Materials & Method: This study is retrospective hospital based executed in the ART centre in Mangalore, Karnataka. Diagnosis of TB-IRIS was made as per INSHI consensus case definition provided for resource-limited settings. The Data from January 2008 till September 2012 was evaluated via semi-structured questionnaire. Inclusion Criteria Patients eligible to receive ART and were above the age of 18. Those patients who were non-compliant with treatment or HIV patients no ton ART were excluded from our sample population

Results: A total of 125 patients were included in this study. 37(29.6%) had diagnosed TB before starting the treatment. 6(16.2%) out of the 37 HIV with combined TB patients progressed to paradoxical TB-IRIS when ART drugs were initiated. 88(70.4%) patients did not have active TB when ART was started, among whom 6 patients developed “unmasking” TB-IRIS. 8 (66.7%) out of the 12 patients developed IRIS in a period of three months of initiation of ART rest 4 (33.3%) patients developed after the three month period. 10 (83.33%)out of the 12 patients were male. 5 out of the 6 patients with paradoxical TB-IRIS had extra-pulmonary TB at the time of ART initiation.

Conclusion: Consensus case definition for the resource limited setting is an effective tool in the diagnosis of TB-IRIS. TB-IRIS can be treated conservatively and although not fatal early diagnosis and management can prevent a complicated course of disease.

Keywords: tuberculosis, immune reconstitution inflammatory syndrome, HIV/AIDS, antiretroviral treatment, Co-Infection.

Corresponding Author:

Dr. Basavaprabhu Achappa

Associate Professor, Department of Internal Medicine
Kasturba Medical College, Mangalore
Affiliated to Manipal Academy of Higher Education
Phone Number: +919980170480
Email id : bachu1504@gmail.com

INTRODUCTION

HIV/TB coinfection has extensively contributed to the global health burden and this converging dual epidemic has relentlessly remained a major public health challenge. Co- treatment of HIV/TB poses many challenges ranging from programmatic challenges and high pill burden to drug interactions and immune

reconstitution inflammatory syndrome (IRIS). Of these issues IRIS remains as a major obstacle in effective administration of antiretroviral therapy.^{(1), (2)} Current theories concerning the pathogenesis of the syndrome involve a combination of underlying antigenic burden, the degree of immune restoration following antiretroviral therapy, and host genetic susceptibility.⁽³⁾ It's a disorder commonly observed in severely immune-compromised patients who are initiated on antiretroviral therapy where the recovering immune system responds to a previously acquired opportunistic infection with an overwhelming inflammatory response that making the symptoms of the infection worse. HIV/TB co-infection is a leading cause of IRIS.⁽⁴⁾ It has been demonstrated that patients with subclinical disease started on antiretroviral therapy may rapidly progress to symptomatic TB disease during the first three months of initiation of therapy as a result of immune reconstitution.

Two subsets of TB-IRIS have been described according to AIDS clinical trial group (ACTG) ^{(5) (1)} "paradoxical" TB-IRIS: paradoxical worsening of clinical symptoms occurs after the start of ART in patients receiving anti-tubercular therapy ⁽²⁾ "unmasking" TB-IRIS: a new presentation of tuberculosis that is "unmasked" in the weeks following initiation of ART with an exaggerated inflammatory response. The consensus case-definition proposed by international network for the study of HIV-associated IRIS (INSHI) ⁽⁶⁾ and meinjtes et al is a useful tool in resource-limited settings for the diagnosis of TB-associated IRIS, as was demonstrated in studies done in India by Sharma SK et al and Kumaraswamy et al. ^{(7), (8), (9)} TB-associated IRIS in co-infected patients is most often self-limiting and may not be associated with significant long term effects but may complicate the management of both conditions and the assessment of clinical deterioration. ⁽¹⁰⁾

This study primarily focuses on evaluating the frequency of occurrence of TB-IRIS, both unmasking and paradoxical TB-IRIS among HIV patients on antiretroviral therapy. Secondly, it focuses on establishing risk factors or predictors in patients developing TB-IRIS which can serve as screening tools to help foresee and manage this condition in the future and finally this study aims to determine the various clinical outcomes and effect of IRIS development on survival rates among these patient.

MATERIALS AND METHOD

This study is retrospective hospital based executed in the ART centre located in tertiary care hospital in Mangalore, Karnataka. Records of 125 HIV patients newly initiated on ART from January 2008 to September 2012 were evaluated using a semi-structured questionnaire. The study population included those who were eligible to receive ART and above the age of 18. Those patients who were non-compliant with treatment or HIV patients no ton ART were excluded from our sample population. Case of "paradoxical" and "unmasking" TB-IRIS was determined as per INSHI (International network for study of HIV associated IRIS) consensus case definition provided for diagnosis of TB-IRIS in resource- limited settings. Baseline parameters and demographic details were collected before starting the treatment with Anti Tubercular Therapy and further on that data was compared with patients progressing to TB-IRIS (cases) with those not progressing TB-IRIS (control group). Clinical outcomes and survival rates of patients developing TB-IRIS were noted. Data was analysed using SPSS version 11.5. The qualitative data was analysed using chi-square test and continuous data using Student t Test, P value less than 0.05 was considered statistically significant.

Case definitions:

Criteria drafted by International Network for Study of HIV-associated IRIS (INSHI) ⁽⁶⁾ was taken into consideration for cases who show signs and/or symptoms of paradoxical TB-IRIS.

RESULTS AND DISCUSSION

125 HIV patients newly initiated on ART were included in the study.

Characteristics	Frequency	Percentage
Age group(years)		
<30	13	10.4
30-40	55	44
41-50	43	34.4
>50	14	11.2
Gender		
Male	81	64.8
Female	44	35.2

Interval between Diagnosis and ART initiation		
<1 year	55	44
1-5 years	49	39.2
>5 years	21	16.8
Active TB at initiation of ART		
Extra-pulmonary TB	34	27.2
Pulmonary TB	3	2.4

Table 1 shows the baseline characteristics of study sample. The mean age was 40.05 years, ranging from 18 to 73 years. 81(64.8%) were male and 44(35.2%) were female. Mean interval between diagnosis of HIV and ART initiation was 2.88 years (sd 3.59). 39(31.2%) had active TB at the time of treatment. 34(27.2%) patients had extra-pulmonary TB and 5(4%) had pulmonary TB.

Prevalence of IRIS

A total of 12(9.6%) patients developed IRIS. At the time of initiation of ART 37(29.6%) had active TB, among whom 6 (16.2%) patients developed paradoxical TB-IRIS. 6 of 88 (6.81%) patients who did not have active TB at ART initiation developed “unmasking” TB-IRIS. 8 (66.7%) out of 12 patients developed IRIS within 3 months of initiation of ART. 4 (33.3%) patients developed IRIS between 3months to 2 years following ART initiation. The median duration for development of IRIS was 2 months.

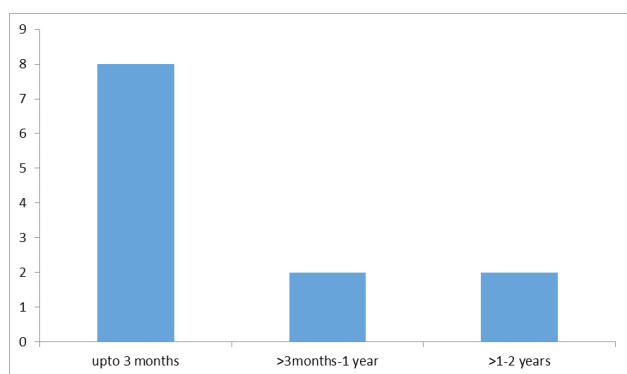


Figure 1 shows that among 37 patients with active TB at the time of ART initiation 6(16.2%) developed paradoxical TB-IRIS and among the 88 patients who did not have TB at ART initiation 6(6.81%) developed unmasking TB-IRIS. This also shows that frequency of occurrence of paradoxical IRIS is more than unmasking IRIS.

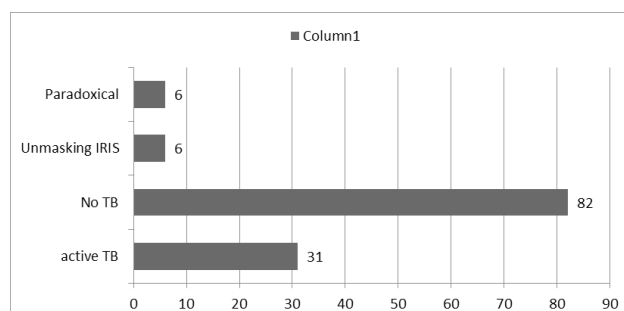


Figure 2 depicts the duration of IRIS development. 8(66.67%) patients developed IRIS within 3months of ART initiation. 2(16.67%) patients developed IRIS between 3 months to 1 year. and 2(16.67%) patients developed IRIS within 1-2 years.

Sub-group Analysis:

A total of 12(9.6%) patients developed IRIS. At the time of initiation of ART 37(29.6%) had active TB, among whom 6 (16.2%) patients developed paradoxical TB-IRIS. While evaluating for Paradoxical TB-IRIS we found that all 6 patients were male. 5 out of the 6 patients had extra-pulmonary TB at ART initiation. All 6 patients developed paradoxical TB-IRIS within 3 months of initiation of ART (range: 8-90 days, mean: 46 days). Majority of the patients developing paradoxical TB-IRIS had extra-pulmonary TB, elevated ESR at the time of initiation of ART and short interval between ATT and ART initiation. 5 out of 6 patients recovered and one died within a week after admission due to Type I RF.

At ART initiation 88(70.4%) out of the 125 patients did not have active TB. 6(6.8%) out of the 88 patients developed unmasking TB-IRIS. 4 out of the 6 patients were male and 2 patients were female. All the patients developing unmasking TB-IRIS were given CAT I ATT treatment, 5 out of 6 patients recovered and one of them didn't recover and had features suggestive of disseminated TB

DISCUSSION

A total of 125 patients newly initiated on ART were included in this retrospective study. 37(29.6%) had diagnosed TB before starting the treatment. 6(16.2%) out of the 37 HIV with combined TB patients progressed to paradoxical TB-IRIS when ART drugs were initiated. The incidence of paradoxical TB-IRIS we found somewhat near to the results which were obtained by a meta-analysis done by Müller M et al. that took into consideration various IRIS studies till 2009 (with 95% CI 9.7- 24.5) ⁽¹¹⁾. A study conducted by Kumaraswamy et al ⁽¹²⁾ in south India reported a TB-IRIS incidence of around 8%. However studies conducted in high

income countries have reported a greater incidence of IRIS ranging from 11-43%⁽¹³⁻¹⁶⁾. The discrepancy in the incidence of IRIS between developed nations and developing nations can be attributed to various factors like lack of universal standardization of case definitions for TB-IRIS, or difference in protocols for initiation of ART.

When evaluating for predictors of paradoxical TB-IRIS we found that all 6 patients were male (Fischer exact: 0.12, Mid P value: 0.057). 5 out of the 6 patients had extra-pulmonary TB at ART initiation which was however not clinically significant on uni-variate analysis possibly due to our small sample size. All 6 patients developed paradoxical TB-IRIS within 3 months of initiation of ART (range: 8-90 days, mean: 46 days). Majority of the patients developing paradoxical TB-IRIS had extra-pulmonary TB, elevated ESR at the time of initiation of ART and short interval between ATT and ART initiation. However, we could not achieve the clear-cut conclusion of risk of TB-IRIS possibly because of small sample size.

At ART initiation 88(70.4%) out of the 125 patients did not have active TB. 6(6.8%) out of the 88 patients developed unmasking TB-IRIS. 4 out of the 6 patients were male and 2 patients were female. 2 out of the 6 patients developed unmasking TB IRIS within 3 months and 4 patients developed symptoms between 3 months to 2 years. Patients developing unmasking TB IRIS had an average ESR of 91 (p= 0.24) as to those did not progress to develop TB, for whom the average ESR was 67. Although not statistically significant in our study we believe that this warrants further evaluation with a larger sample population. No other relevant predictors yielded significant results.

Clinical presentation of TB-IRIS can significantly vary from patient to patient, but literature from Kumaraswamy et al and Lawn et al ^{(12), (17)} reported cervical lymphadenitis as a frequent manifestation. In our study however majority of the patients with paradoxical TB-IRIS developed constitutional symptoms such as fever, weight loss. 4 out of the 6 patients presented with newly developed pleural effusion or some form of serositis which was confirmed by radio-imaging. On the other hand, we found a wide spectrum of presentation in patients with unmasking TB IRIS including TB lymphadenitis, TB spine, TB oesophagus, abdominal TB and disseminated TB. This shows that TB-IRIS has

a vast spectrum of clinical manifestations.

Most patients developing IRIS were treated conservatively with anti-pyretic, steroids, or were symptomatically managed with no specific changes being made to their ATT or ART regimen. All our IRIS patients were managed on an inpatient basis with the average duration of hospitalization being 7-10 days. 10 out of the 12 patients recovered and 2 patients died during the course of hospitalization due to complications of retroviral disease other than TB-IRIS. Therefore we can conclude that although TB-IRIS may not be fatal, it complicates the course of disease and quality of life of the patient. Early diagnosis of TB-IRIS is possible using the consensus case definition despite the lack of access to investigations such as viral RNA load. We were unable to establish predictors for TB IRIS due to certain drawbacks, such as the lack of documentation of certain parameters like viral load and CD4 counts at regular intervals, as our study was retrospective.

CONCLUSIONS

Consensus case definition for the resource limited setting is an effective tool in the diagnosis of TB-IRIS. TB-IRIS can be treated conservatively and although not fatal early diagnosis and management can prevent a complicated course of disease.

Conflict of Interest – None

Source of Funding- Self Funded

Ethical Clearance - Ethical approval was obtained from the ethics committee of Institution Kasturba Medical College, Manipal Academy of Higher Education, located in Mangalore.

REFERENCES

1. Naidoo K, Yende-zuma.N, Padayatchi N, Jithoo N, Naidoo K, Nair G, et al. The Immune Reconstitution Inflammatory Syndrome after Antiretroviral Therapy Initiation in patients with Tuberculosis: Findings from SAPiT trial. *Annals of Internal Medicine*. 2012; 157(5): 313-324.
2. Karmakar S, Sharma SK, Vashishtha R, Sharma A, Ranjan S, Gupta D, et al. Clinical characteristics of tuberculosis-associated immune reconstitution inflammatory syndrome in North Indian population of HIV/AIDS patients receiving HAART. *Clinical Developmental Immunology*. 2011; <http://www>.

- hindawi.com/journals/cdi/2011/239021 (accessed on may 25, 2013).
3. Murdoch DM, Venter WD, VanRie A, Feldman C: Immune reconstitution inflammatory syndrome (IRIS): review of common infectious manifestations and treatment options. *AIDS Research and Therapy*. 2007; 4: 9-13.
 4. Worodria W, Massinga-Loembe M, Mayanja-Kizza H, Namaganda J, Kambugu A, Manabe Y et al. Antiretroviral treatment-associated tuberculosis in a prospective cohort of HIV-infected patients starting ART. *Clinical Developmental Immunology*. 2011; <http://www.hindawi.com/journals/cdi/2011/758350> (accessed on May 25 2013).
 5. Aids clinical trials group network. IRIS case-definitions. 2009. https://actgnetwork.org/IRIS_Case_Definitions
 6. General IRIS case definition [Accessed September 10, 2018];International Association for the Study of HIV-Associated IRIS (INSHI) website. http://www.inshi.umn.edu/definitions/General_IRIS/home.html
 7. Meintjies G, Lawn SD, Scano F, Maartens G, French M, Woordria W et al. Tuberculosis-associated immune reconstitution inflammatory syndrome: case definitions for use in resource-limited settings. *Lancet Infect Dis*. 2008; 8:516–23.
 8. Sharma SK, Dhooria S, Barwad P, Kadhiravan T, Ranjan S, Miglani S, Gupta DA. study of TB-associated immune reconstitution inflammatory syndrome using the consensus case-definition. *AIIMS. Indian Journal of Medical Research*. 2010; 131:804-8.
 9. Kumarasamy N, Venkatesh K, Vignesh R, Devaleenal B, Poongulali S, Yephthomi T et al. Clinical Outcomes among HIV-Tuberculosis Co-infected Patients Developing Immune Reconstitution Inflammatory Syndrome after HAART Initiation in South India. *Journal of International Association of Physicians in AIDS Care*.2013; 12(1):28-31.
 10. Lawn SD, Myer L, Bekker LG, Wood R. Tuberculosis-associated immune reconstitution disease: incidence, risk factors and impact in an anti-retroviral treatment service in South Africa. *AIDS*. 2007; 21:335–341.
 11. Müller M, Wandel S, Colebunders R, Attia S, Furrer H et al. (2010) Immune reconstitution inflammatory syndrome in patients starting antiretroviral therapy for HIV infection: a systematic review and meta-analysis. *Lancet Infect Dis* 10: 251-261.
 12. Kumarasamy N, Chaguturu S, Mayer KH, Solomon S, Yephthomi HT, Balakrishnan P, et al. Incidence of immune reconstitution syndrome in HIV/tuberculosis-coinfected patients after initiation of generic antiretroviral therapy in Indian journal of Acquired ImmuneDeficiency Syndrome 2004; 37:1574–1576.
 13. Wendel KA, Alwood KS, Gachuhi R, Chaisson RE, Bishai WR, Sterling TR. Paradoxical worsening of tuberculosis in HIVinfected persons. *Chest* 2001; 120:193–197.
 14. Breen RA, Smith CJ, Bettinson H, Dart S, Bannister B, Johnson MA, et al. Paradoxical reactions during tuberculosis treatment in patients with and without HIV co-infection. *Thorax* 2004;59:704–707.
 15. Narita M, Ashkin D, Hollender ES, Pitchenik AE. Paradoxical worsening of tuberculosis following antiretroviral therapy in patients with AIDS. *Am J Respir Crit Care Med* 1998; 158:157–161.
 16. Shelburne SA, Visnegarwala F, Darcourt J, Graviss EA, Giordano TP, White AC Jr, et al. Incidence and risk factors for immune reconstitution inflammatory syndrome during highly active antiretroviral therapy. *AIDS* 2005; 19:399–406.
 17. Lawn SD, Bekker LG, Miller RF. Immune reconstitution disease associated with mycobacterial infections in HIV-infected individuals receiving antiretrovirals. *Lancet Infect Dis* 2005;5:361–373.

The Use of Education Booklet for Anemia Prevention on Teenage Girls

Riyanti¹, Riny Natalina¹

¹ Department of Midwifery, Poltekkes Palangka Raya, Indonesia

ABSTRACT

Background: The prevalence of anemia increased recently, in Central Kalimantan Province, Indonesia. This study aims to determine differences in knowledge, attitudes, and practices in peer education by using booklets and Modules on anemia in a teenage girl.

Method: The research method used is non-equivalent pretest-posttest with the control group. The study population was all high school girls or equivalent in Palangka Raya City in 2016 which totaled 4348 people. The sample in this study were girls of junior high schools in the City of Palangka Raya totaling 60 people. The treatment group were teenage girls in high school who were given intervention while the control group was teenage girls in high school who were not given intervention. Comparison of knowledge, attitudes, and behavior before and after education is made using the Wilcoxon test, while to compare knowledge, attitudes, and behavior between leaflets and booklets, the Mann-Whitney test was used.

Results: Wilcoxon test results showed that the increase in knowledge scores with a p-value of 0.211 ($p > 0.05$), an increase in attitude scores with a p-value of 0.022 ($p > 0.05$), an increase in behavioral scores with a p-value of 0.022 ($p > 0.05$). The results of the comparison test of the effectiveness of the use of leaflet and booklet media with the Mann-Whitney test for p-value knowledge is 0.669 ($p > 0.05$), the attitude of p-value is 0.623 ($p > 0.05$), and behavior p-value is 0.935 ($p > 0.05$). It

Conclusion: There was a significant increase in knowledge, attitudes, and behavior after the use of booklet media and modules on prevention of anemia in peer education in teenagers girls the use of media leaflets and booklets had the same effectiveness in increasing the knowledge, attitudes, and behavior of teenage girls about anemia prevention.

Keywords: *Booklet, Peer Education, Behavior, Anemia Prevention, Young Women*

INTRODUCTION

Anemia is the most common medical problem worldwide, as well as being a significant health problem for the community, especially in developing countries⁽¹⁾. Anemia can occur in any age group including a teenager. Anemia in a teenager is a severe public health problem because it can slow psychomotor and cognitive

development⁽²⁾. According to WHO, the teenager (10 to 19 years) is a period of susceptibility to anemia due to rapid growth and changes in behavior, diet and lifestyle habits. Young women have a ten times greater risk of anemia than young men. This is because girls experience menstruation every month and are in their infancy, so they need more iron intake. Besides, an imbalance in nutrient intake is also a cause of anemia in a teenager. Young women are usually very concerned about body shape, making so many limits on food consumption and various restrictions on food⁽³⁾. Therefore, the target of nutritional anemia prevention programs has been developed to reach girls in junior high school, and women outside of school as a strategic effort to break

Corresponding author:

Riyanti

Department of Midwifery Poltekkes Palangka Raya, Indonesia, email: riyantihelena@gmail.com

the cycle of nutrition problems. Even so, the prevalence of anemia among young women is still classified as high. The results showed that the incidence of nutritional anemia in teenage girls in Jakarta regions was 44.6% ⁽¹⁰⁾.

Though various efforts have been made by the government to overcome the problem of anemia in teenagers today, such as giving blood tablets, but other initiatives should be considered for example by involving the participation of peers in the youth group to prevent anemia in a teenager. The youth care health care program has not been maximized because not all schools have implemented this program, so other efforts are needed to be considered by optimizing the role of the teenagers themselves in this case, namely peers to prevent anemia ⁽¹¹⁾.

Previous studies have suggested that peer group education affects the knowledge, attitudes, and skills of women of childbearing age in preventing anemia. ⁽⁴⁾ This is also supported by research which states that peer group support can increase knowledge, attitudes, and actions of pregnant women in preventing anemia. Peer group support helps pregnant women to get a lot of information from other members and also helps them to find a way out of their problems about preventing anemia ⁽⁵⁾.

METHOD

This research is an analytic study with a quasi-experimental design with pretest-posttest with control group design with the intervention of using booklets and modules on peer education about preventing anemia in young women. The population of the study was female teenagers of high school students in the City of Palangkaraya and the sample was 60 young women. The sampling method in this study is to use probability sampling with the simple random sampling technique.

RESULTS

The table below shows the characteristics of respondents in the control and intervention groups at the time of pretest and posttest. The intervention group showed 53% high knowledge and 50% control group. Details of respondent's reaction can be seen in Table 1 below. According to WHO, prevention of anemia requires an approach that has the potential to overcome all factors. Interventions to prevent iron deficiency include steps to increase iron intake through a food-based approach, diversification, namely diet and iron-fortified foods; iron supplementation; improvement of health services and sanitation ⁽¹²⁾. One form of prevention of anemia in teenagers is education through booklets with the help of peers

Table 1. Characteristics of Respondents in the Control and Intervention Groups

Variable	Intervention Group				Control Group			
	Pre-Test		Post Test		Pre Test		Post Test	
	n	%	n	%	n	%	n	%
Knowledge	16	53.3	14	46.7	15	50	13	43
	14	46.7	16	53.3	15	50	17	57
Attitude	11	36.7	7	23.3	15	50	15	50
	19	63.3	23	76.7	15	50	15	50
Behavior	16	63.3	14	36.3	15	50	14	36.3
	14	36.7	16	63.6	15	50	16	63.6

Table 2. Comparative Testing of Knowledge, Attitude, and Prevention Behavior Anemia

Variable	Booklet Group			Module Group		
	Mean ± SD		p-value	Mean ± SD		p-value
	Pre-test	Post-test		Pre-test	Post-test	
Knowledge	10.43± 1.79	12.47± 0.94	0.000	10.57± 1.36	11.63± 1.47	0.001
Attitude	38.87± 6.99	44.97± 5.15	0.000	42.47± 2.54	45.13± 1.63	0.000
Behavior	49.13 ±4.87	56.67 ±3.30	0.010	51.30±3.95	55.13± 4.22	0.000

Based on Table 1 and 2 it can be analyzed the comparison of knowledge between before and after peer education using booklet media. The average knowledge score before being given training was 10.43 ± 1.79 and the average knowledge score after being given instruction utilizing the booklet media was 12.47 ± 0.94 . The descriptive test indicated an increase in knowledge scores. Using the Wilcoxon test, a p-value of 0.000 was obtained ($p < 0.05$). From this test, it was shown that the increase in the knowledge score was statistically significant and higher than the module group.

The comparison of the effectiveness of using media modules and booklets in improving knowledge, attitude, and prevention behavior of anemia in young women is shown in Table 3.

Table 3. Comparison of the Effectiveness of Using Media Modules and Booklets

Variable	Mean ± SD		p-value
	Booklet	Module	
Knowledge	12.47 ± 0.94	11.63 ± 1.47	0.022
Attitude	44.97 ± 5.15	45.13 ± 1.63	0.002
Behavior	56.67 ± 5.30	55.13 ± 4.22	0.049

DISCUSSIONS

Peer association can influence premarital sexual behavior. The influence can be positive and negative⁽¹³⁾. The results showed more than half (54.3%) of the role of peers active in providing information about reproductive health. There is a relationship between positive peer roles and premarital sexual behavior, where respondents with passive peers have 2.6 times the chance of premarital sexual behavior compared to respondents with active peers. Peer roles in sexual behavior are not influenced by confounding variables (knowledge, attitudes, parental roles, and mass media exposure)⁽⁹⁾.

The knowledge value of teenagers who use the Module media is 11.63 ± 1.47 , and the average knowledge score of young women who use booklet

media is 12.47 ± 0.94 . By using the Mann-Whitney test, the p-value was obtained at 0.022 ($p < 0.05$). From this test it is shown that knowledge scores differ statistically significant, it can be concluded that the use of booklet media has higher effectiveness than media Modules in increasing the knowledge of young women about preventing anemia. The results of previous studies showed that there were significant differences between the use of Module media and booklets in the prevention of teenagers anemia education with a value of $p < 0.05$, this proved that the booklet media was more effective to use. But one interesting thing is, education through peers about the prevention of teenagers anemia has a significant meaning in changing the knowledge, attitudes, and behavior of teenagers⁽⁶⁾. This study was also supported by significant differences between expertise before and

after peer group education interventions. Substantially the difference is very significant to the behavior changes in preventing iron nutritional anemia in teenagers. If someone already knows health, it will facilitate the formation of health behaviors ⁽⁷⁾.

The value of the attitude of teenagers, who use the module media is 45.13 ± 1.63 , and the average attitude score of young women who use booklet media is 44.97 ± 5.15 . By using the Mann-Whitney test, the p-value was obtained at 0.002 ($p < 0.05$). From this test, it is shown that attitude scores differ statistically significant, or in other words, the use of booklet media has higher effectiveness than media modules in improving the attitudes of young women about preventing anemia. Using the Wilcoxon test, a p-value of 0.000 was obtained ($p < 0.05$). In connection with this study, peer education about anemia prevention is expected to help young women determine their attitudes towards preventing anemia, because in peer groups develop mutual respect and support each other and be responsible for things that have been agreed upon together. Research shows that peer groups influence students both in attitude formation and can lead to motivation and learning activities. The better the peer group relationship, the higher the student's motivation is. Conversely, if the relationship between peer groups is not good, learning motivation will be lower ⁽⁸⁾.

The value of the teenager's behavior, which uses the module media is 55.13 ± 4.22 , and the average behavior score of young women who use booklet media is 56.67 ± 5.30 . By using the Mann-Whitney test, the p-value obtained was 0.049 ($p < 0.05$). From this test, it is shown that the behavioral scores differ statistically significant. In this study, there was a difference in behavior between before and after peer education using booklet media. An increase in scores indicates this. By using the Wilcoxon test, a p-value was obtained at 0.010 ($p < 0.05$). Based on behavioral science, those behavioral changes occur gradually, there is a change in knowledge, then changes in attitude and after being internalized, there is a change in perspective ⁽⁷⁾.

Previous research shows that in teenagers, the closeness of the relationship between teenagers and peers increases dramatically, and at the same time the proximity of the relationship between teenagers and parents decreases significantly. In teenagers communication and trust in parents diminish and turn to peers to meet the need for attachment. Noting the

importance of the role of peers, the development of a positive peer environment is an effective way that can be taken to support the development of teenagers. A positive peer culture provides opportunities for teenagers to test the effectiveness of communication, behavior, perceptions, and values they have ⁽¹³⁾.

CONCLUSION

There is a significant difference in knowledge before and after the use of media booklets and modules on anemia in peer education in young women. The method of booklet media is more effective in increasing attitude changes compared to the module in peer education. Booklet media means can significantly change the behavior of prevention of female teenager compared to the module on anemia in peer education in teenager girls.

Ethical Clearance: The Ministry of Health Polytechnic approved this research in Central Kalimantan, Indonesia. We also wish to thank all the participants who contributed to this study.

Conflict of Interest: Nil.

Source of Funding: The Ministry of Health Polytechnic Palangkaraya, Indonesia.

REFERENCES

1. Bakta IM. Pendekatan terhadap pasien anemia. Sudoyo AW, Setiyohadi B, Alwi I, Simadibrata M, Setiati S, penyunting. Buku Ajar Ilmu Penyakit Dalam (5th ed). Jakarta Pusat: Interna Publishing Cunningham, FG, dkk. 2006.
2. Dyah PA. Faktor-faktor yang berhubungan dengan status Anemia Gizi Besi pada siswi SMU di wilayah DKI Jakarta. Poltekkes Jakarta II. Skripsi. 2011.
3. Backstrand JR, Allen LH, Black AK, de Mata M, Pelto GH. Diet and iron status of nonpregnant women in rural Central Mexico. The American journal of clinical nutrition. 2002 Jul 1;76(1):156-64.
4. Briawan D. Efikasi suplementasi besi-multivitamin terhadap perbaikan status besi remaja wanita [disertasi]. Bogor : Sekolah Pasca Sarjana, Institut Pertanian Bogor. 2008.
5. Pareek P, Hafiz A. A study on anemia related knowledge among adolescent girls. International

- journal of nutrition and food sciences. 2015;4(3):273-6.
6. Angadi N, Ranjitha A. Knowledge, attitude, and practice about anemia among adolescent girls in urban slums of Davangere City, Karnataka. *International journal of medical science and public health*. 2016 Mar 1;5(3):416.
 7. Ross AC, Manson JE, Abrams SA, Aloia JF, Brannon PM, Clinton SK, Durazo-Arvizu RA, Gallagher JC, Gallo RL, Jones G, Kovacs CS. The 2011 report on dietary reference intakes for calcium and vitamin D from the Institute of Medicine: what clinicians need to know. *The journal of clinical endocrinology & metabolism*. 2011 Jan 1;96(1):53-8.
 8. Guse K, Levine D, Martins S, Lira A, Gaarde J, Westmorland W, Gilliam M. Interventions using new digital media to improve adolescent sexual health: a systematic review. *Journal of adolescent health*. 2012 Dec 1;51(6):535-43.
 9. Manafe LA. Hubungan antara Pengetahuan, Sikap, Peran Guru, Media Informasi (Internet) dan Peran Teman Sebaya dengan Tindakan Pencegahan HIV/AIDS pada Siswa di SMA Negeri 4 Manado. *JIKMU*. 2014;4(4).
 10. Minakshi R, Varghese R, Ravindra H N. A study to assess the effectiveness of structured teaching program on knowledge regarding iron deficiency anemia and its prevention among early adolescent girls in selected schools of Bhavnagar district. *Indian journal of research*. 2015; 4(5).
 11. Sekhar DL, Murray-Kolb LE, Kunselman AR, Weisman CS, Paul IM. Differences in risk factors for anemia between adolescent and adult women. *Journal of women's health*. 2016 May 1;25(5):505-13.
 12. Simba DO, Kakoko DC. Volunteerism among out-of-school adolescent reproductive health peer educators: is it a sustainable strategy in resource-constrained countries?. *African journal of reproductive health*. 2009;13(3).
 13. Suparmi S, Isfandari S. Peran teman sebaya terhadap perilaku seksual pranikah pada remaja laki-laki dan perempuan di Indonesia. *Buletin penelitian kesehatan*. 2016;44(2):139-46.

A Preliminary Host Toxicity Study of *Pterocarpus Marsupium* on Lymphocytes Isolated from Cord Blood

Sujita Pradhan¹, Santosh Kumar Sahu², Mahesh Chandra Sahu³,
Sudhansu Sekhar Mishra⁴, Prafulla Kumar Chinara¹

¹Department of Anatomy, IMS and SUM Hospital, Siksha 'O' Anusandhan Deemed to be University, K8, Kalinga Nagar, Bhubaneswar, Odisha, India, ²Department of Anatomy, SCB Medical College, Cuttack, Odisha, India, ³Directorate of Medical Research, ⁴Department of Pharmacology, IMS and SUM Hospital, Siksha 'O' Anusandhan Deemed to be University, K8, Kalinga Nagar, Bhubaneswar, Odisha, India

ABSTRACT

Aim and objectives: *In vitro* study of the toxic activity of aqueous extract of heart wood of *Pterocarpus marsupium* on lymphocytes of human cord blood. *Pterocarpus marsupium* is a traditional drug used as an anti-diabetic agent for ages in India. Many research works have proved its efficacy as antidiabetic medication, but there is hardly any report regarding its toxicity on from the available literature. This study was undertaken to conduct its toxicity study.

Material and Method: Lymphocytes from human cord blood were cultured in Dulbecco's modified eagle's medium. The toxicity of the aqueous extract of heart wood *Pterocarpus marsupium* was assessed by Acridine orange/Ethidium Bromide(AO/EB) Staining method as well as by 3-[4,5- dimethylthiazol-2-yl]2,5-diphenyl tetrazolium bromide(MTT) assay. The results were analyzed statistically.

Results: *Pterocarpus marsupium* extracts showed that extract amounts up to 50 mg/ml are found safe based on the absence of abnormal blood cell counts and blood chemistry values and the absence of extract-related adverse events

Keyword: Heart wood of *Pterocarpus marsupium*, lymphocyte, toxicity, cord blood.

INTRODUCTION

In the present scenario the most prevalent disease affecting world-wide is diabetes mellitus. Many medications are being introduced to treat this disease. Along with modern medicines many medicines derived from natural herbs are also being tried for this purpose. One of such potent natural herb is *Pterocarpus marsupium*. This plant is commonly known as Indian Kino and also known as Vijayasar in Sanskrit, Bijjal, Bibla etc. It is a long deciduous tree which belongs to Leguminaceae family. It is mostly found in evergreen forest of central, western and southern parts of India. (manish et al 2009, Gariote et al.,2010)^{1,2}. It is a medium to larged sized tree of height ranging from 15 to 20 mts. Leaves are compound and imparipinnate. Flowers are yellow in terminal panicles. Fruits are circular. (patil et al 2011)³

Its medicinal value is known since age long from period of charaka and sushruta. The beauty of this tree is its multidimensional activity. In ancient literature like charaka samhita, prameha chikitsa it is described as rasayana or immunomodulators. Many work shows its potency as hypoglycaemic drug and has capacity for beta cell regeneration.^{4, 5} It also has its action on liver mostly Hepatoprotective activity.⁶ Its antidiabetic activities are also due to its Anti-hyperinsulinaemic and anti-hypertriglyceridaemic activities⁷. It helps to reduce sugar level in the body as it is having Insulin like action⁸⁻¹³, has Increased expression of glucose transporter¹⁴ and has inhibition of digestive enzymes amylase and glucosidase¹⁵. It is also having the potency of decreasing the elevated TNF- α (kirana halagappa)¹⁶. Its antidiabetic effect also potentiates its anti cataract effect¹⁷. it is also used as astringent, antiinflammatory, antihemotic agent. This plant with so many efficacies is

a boon for mankind¹⁸.

This drug with varied range of medicinal activities is mostly known for its antidiabetic effect used in diabetic patients for ages. Many toxicity studies has been carried out with animal models to see its toxic dosage^{8,17,18}. This study is done to see its toxic effect, which is done on human cells. In this study we evaluate the toxicity of aqueous extract of *Pterocarpus marsupium* with human chord blood lymphocytes.

MATERIAL AND METHOD

The heartwood of *pterocarpus marsupium* was collected from local market. It was dried properly in shade at room temperature¹⁹. Then the woods were cut into small pieces and grinded in electric grinder. The powder obtained was soaked in equal amount of water for 24 hrs. The macerated pulp was filtered through coarse sieve^{19,17}. The filterate was dried in water bath at temperature ranging from 40°C to 60°C. A sticky consistency of filterate was obtained. This filterate was completely lyophilized by continuous freeze drying operation to obtain a dry powder²⁰.

Isolation of Lymphocytes

Umbilical cord blood (UCB) was collected in a sterile 50 mL falcon tube (Tarsons, Kolkata, India) containing 500 µL of 1000 IU heparin (HiMedia). The UCB that was collected immediately after the delivery of an infant, and the blood sample (50 mL) was stored at 4°C until use. Lymphocytes were isolated immediately or within 24 hours after the collection. For the isolation of lymphocytes, the collected UCB sample was diluted with an equal volume of phosphate-buffered saline (PBS) solution. The mixture was carefully loaded for overlaying into a centrifuge tube with lymphocyte separating medium (LSM; HiMedia), which was one-third the total volume of the mixture. The total mixture was then centrifuged at 1800g for 25 minutes at room temperature. The buffy coat with mononuclear cells was carefully removed from the tube with layers. The layers (heavy to light) obtained are red blood cell, LSM, buffy coat, and plasma. The cells of the buffy coat layer, after dilution with another aliquot of PBS at the 1:1 ratio, were recentrifuged at 2000g for 5 minutes. The lymphocytes pellets were used for culturing, and the cell counts were measured using a hemocytometer.

Growth of lymphocytes and assessment of toxicity by staining method

The UCB-derived lymphocytes were diluted to the density of 1×10^6 cells/mL with a required volume of Dulbecco's modified Eagle's medium with low glucose (HiMedia), and were loaded into a six-well culture plate (Tarsons), which contained 15% fetal bovine serum (Sigma, Taufkirchen, Germany), 1% penicillin-streptomycin, and 1% sodium pyruvate, along with different concentrations of aqueous extract of heartwood of *Pterocarpus marsupium* (50, 25, 12.5, 6.25, and 3.125 mg/mL) with 10% DMSO solution for the growth of UCB-derived lymphocytes. The stock solution of the *P. marsupium* extract was prepared by dissolving 50 mg of extract of the plant in a 1 mL aliquot of 10% DMSO solution, and the stock solution was stored at 4 °C for further use; the total volume of 2 mL was maintained for each well of the culture plate with extract. The cells were incubated with different concentrations of the extract (50, 25, 12.5, 6.25, 3.125, and 0 mg/mL) at 37°C under 5% atmospheric CO₂ concentration for 24 hours. Their viability was investigated using the acridine orange/ethidium bromide (AO/EB) staining under a fluorescent microscope (Magnus, Noida, New Delhi, India). The AO/EB solution was prepared in PBS at the concentration of 100 mg/mL. Green color indicated live cells, whereas cells with orange and red color were apoptotic and necrotic cells, respectively. Toxicity values were obtained with concentrations of 50, 25, 12.5, 6.25, 3.125, and 0 mg/mL aqueous heart wood extract, after 24 hours of incubation. Percentages of lethality values of the third repeated experiment were converted to probit values (Finney's method), which were plotted against the corresponding log₁₀ values of aqueous leaf extract²¹. The probit values of the observed lethality percentages are from statistical tables of probit transformations²².

RESULTS

Treatment of lymphocytes with different concentrations of methanolic leaf extract of plant *pterocarpus marsupium* for 24 hours resulted in a limited decreasing pattern of living cell counts. The number of dead cells increased a little upon increasing the leaf extract level from 3.125 to 50 mg/mL. Probit values presented in Table 1 were used in the ordinate and log₁₀ values of plant extract concentrations in the abscissa for the construction of the plot (Fig. 1), from which it was ascertained that for values of lethal

concentration 25 (LC25), the corresponding log10 concentration value was 1.77. Antilog values of the obtained log10 concentration value were 58.88 mg/mL, which is regarded as the LC25 value of the leaf extract against human lymphocytes.

Table 1: Probit transformation and computations of probit values of both observed and expected partial lethal ranges for the leaf extract a during toxicity studies with lymphocytes assessed by AO/EB staining.

Concentration	Log ₁₀ concentration	Percent lethality	Probit values
0		0	4.28
50	1.698	23.6	4.07
12.5	1.397	17.7	3.81
6.25	1.096	11.8	3.81
3.125	0.795	11.8	3.43

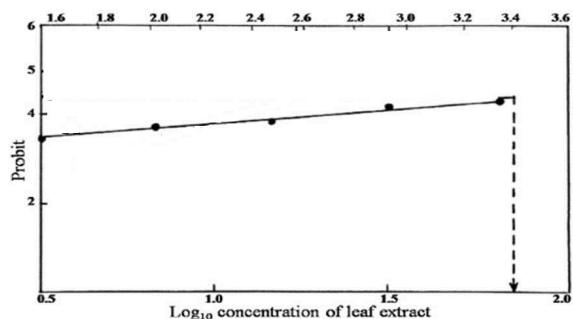


Fig 1: Probit analysis LC₂₅ of the plant extract

DISCUSSION

Pterocarpus marsupium is a valuable drug for its multidimensional activity so its toxicity study becomes although more important. Toxicity study on animals can risk their lives. So study on human cord blood is a better choice as there is no life threats. This study shows The MIC value to be 200 mg/lit. So the drug is safe for human consumption. Acute toxicity study done on animal by oral administration of pterocarpus marsupium in various doses of 500, 1000, 2000, 4000 and 8000 mg/kg indicated no mortality up to 7 days after treatment²³. There was no toxic effect found in neurological system

upto a dose of 3000mg/kg body weight of PMS when done on wistar albino rats²⁴. No toxic effect was found up to 20 to 50 times of the effective dose of the aqueous extract of *Pterocarpus marsupium*²⁵. So this drug is totally safe as per the dose prescribed by ICMR project²⁶

CONCLUSIONS

Since, the 25 mg/l or 25000 mg/ml as MIC was far more than the LC₂₅ value of 134.896 mg/ml, it was inferred that there was no cytotoxicity due to 50 mg/ml of the extract on human lymphocytes. Thus the plant is totally non-toxic to man.

Ethical Clearance: This study is approve from our institutional ethics committee.

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Devgun M, Nanda A, Ansari SH. *Pterocarpus marsupium* Roxb.-A comprehensive review. *Pharmacognosy reviews*. 2009 Jul 1;3(6):359.
2. Gairola S, Gupta V, Singh B, Maithani M, Bansal P. Phytochemistry and pharmacological activities of *Pterocarpus marsupium*: a review. *Int Res J Pharm*. 2010;1:100-4.
3. Patil UH, Dattatraya KG. *Pterocarpus marsupium*: A valuable medicinal plant in diabetes management.
4. Chakravarthy Bk, Gupta S, Gambhir SS, Gode KD. Pancreatic beta cell regeneration a novel antidiabetic mechanism of *Pterocarpus marsupium* Roxb. *Indian journal of pharmacology*. 1980; 12(2): 123-127
5. Garud N, Garud A, Balakrishnan N, Tomar V. Antidiabetic activity of ethanolic extract of *Trigonella foenium* seeds and *Pterocarpus Marsupium* wood. *An international Biannual journal*. 2009 ;17:45]
6. Rane GND. Hepatoprotective activity of *Pterocarpus marsupium* and *Butea koen-ex-Roxb*. *Ind J Pharm Sci* 1998; 5: 182-184.
7. Jahromi MAF, Ray AB. Antihyperlipidaemic effect of flavonoids from *Pterocarpus marsupium*. *J Nat Prod*. 1993;56 (7): 989-994.
8. Mohankumar SK, O'Shea T, McFarlane JR. Insulintrophic and insulin - like effects of a high molecular weight aqueous extract of *Pterocarpus marsupium* Roxb. hardwood. *Journal of*

- Ethnopharmacology. 2012;141(1):72 - 79.
9. Mishra A, Srivastava R, Srivastava SP, Gautam S, Tamrakar AK, Maurya R, et al. Antidiabetic activity of heart wood of *Pterocarpus marsupium* Roxb. And analysis of phytoconstituents. *Indian Journal of Experimental Biology*. 2013; 51(5):363 - 374.
 10. Anandharajan R, Pathmanathan K, Shankernarayanan NP, Vishwakarma RA, Balakrishnan A. Upregulation of GLUT – 4 and PPAR γ by an isoflavone from *Pterocarpus marsupium* on L6 myotubes: A possible mechanism of action. *Journal of Ethnopharmacology*. 2005;97(2):253 - 260.
 11. Gayathri M, Kannabiran K. Studies on the ameliorative potential of aqueous extract of bark of *Pterocarpus marsupium* Roxb in streptozotocin - induced diabetic rats. *Journal of Natural Remedies*. 2010; 10(1):36 - 43.
 12. Gaster M, Nehlin JO, Minet AD. Impaired TCA cycle flux in mitochondria in skeletal muscle from type 2 diabetic subjects: Marker or maker of the diabetic phenotype? *Archives of Physiology and Biochemistry*. 2012;118(3):156-189.
 14. Anandharajan R¹, Pathmanathan K, Shankernarayanan NP, Vishwakarma RA, Balakrishnan A. Upregulation of Glut-4 and PPAR gamma by an isoflavone from *Pterocarpus marsupium* on L6 myotubes: a possible mechanism of action. *J Ethnopharmacol*. 2005 Feb 28;97(2):253-60.
 15. Poongunran J, Perera HKI, Fernando WI T, Jayasinghe L, Sivakanesan R. α - glucosidase and α - amylase inhibitory activities of nine Sri Lankan antidiabetic plants. *British Journal of Pharmaceutical Research*. 2015;7(5):365 - 374.
 16. Halagappa K, Girish HN, Srinivasan BP. The study of aqueous extract of *Pterocarpus marsupium* Roxb. on cytokine TNF- α in type 2 diabetic rats. *Indian journal of pharmacology*. 2010 Dec;42(6):392.
 17. Vats V, Yadav SP, Biswas NR, Grover JK. Anti - cataract activity of *Pterocarpus marsupium* bark and *Trigonella foenum – graecum* seeds extract in alloxan diabetic rats. *Journal of Ethnopharmacology*. 2004;93(2):289 - 294.
 18. Hariharan RS, Venkataraman S, Sunitha P, Rajalakshmi S, Samal KC, Routray BM. Efficacy of vijayasar (*Pterocarpus marsupium*) in the treatment of newly diagnosed patients with type 2 diabetes mellitus: A flexible dose double – blind multicenter randomized controlled trial. *Diabetologia Croatica*. 2005;34(1):13 - 20.
 19. Maruthupandian A, Mohan VR. Antidiabetic, antihyperlipidaemic and antioxidant activity of *Pterocarpus marsupium* Roxb. in alloxan induced diabetic rats. *International Journal of Pharm Tech Research*. 2011;3(3):1681 – 16
 20. J.K. Grover, V. Vats and S. Yadav. Effect of feeding aqueous extract of *Pterocarpus marsupium* on glycogen content of tissues and the key enzymes of carbohydrate metabolism. *Mol Cell Biochem*. s241(1-2): 53-59 (2002).
 21. Wardlaw. Chichester, UK: Wiley; 1985. AC. Practical statistics for experimental biologists
 22. Sahu MC, Patnaik R, Padhy RN. In vitro combinational efficacy of ceftriaxone and leaf extract of *Combretum albidum* G. Don against multidrug-resistant *Pseudomonas aeruginosa* and host-toxicity testing with lymphocytes from human cord blood. *Journal of Acute Medicine*. 2014 Mar 31;4(1):26-37.
 23. Joshi MC, Dorababu M, Prabha T, Kumar MM, Goel RK. Effects of *Pterocarpus marsupium* on NIDDM-induced rat gastric ulceration and mucosal offensive and defensive factors. *Indian journal of pharmacology*. 2004 Sep 1;36(5):296.
 24. Patil UK. Antidiabetic activity of the ethanolic extract of heartwood of bijasar (*Pterocarpus marsupium* roxb.) in streptozotocin-nicotinamide induced type 2 diabetic rats. *African Journal of Traditional, Complementary and Alternative medicines (AJTCAM)*. 2009 May 3;6:398.
 25. Gayathri M, Kannabiran K. Ameliorative potential of aqueous extract of *Pterocarpus marsupium* Roxb bark on diabetes associated metabolic alterations. *Current Trends in Biotechnology and Pharmacy*. 2008;2(2):327-33.
 26. Hsia SH, Bazargan M, Davidson MB. Effect of Pancreas Tonic (an ayurvedic herbal supplement) in type 2 diabetes mellitus. *Metabolism*. 2004 Sep 30;53(9):1166-73.

Comparative Study of Indian Hospital Planning Guidelines for Inpatient Wards

Lalit Varma¹, A P Pandit²

¹PhD Scholar, ²Prof & HOD, Symbiosis Institute of Health Sciences, Pune

ABSTRACT

Historically, inpatient accommodation has been the core component of the hospital and accounts for a significant proportion of space in a hospital.¹

As the inpatient beds account for almost 70% to 80% of the revenue beds in a tertiary care private hospital, it is important to functionalize the size of rooms and focus on patient and family needs.

Space efficiency in a hospital is perhaps the most important element of any design. Coupled with adequacy, space efficiency can have a significant bearing on capital cost, operational cost as well as proper functioning of a hospital.

Government agencies involved in the granting of permission to build hospitals in India, be it planning agencies or accreditation agencies, are silent on the aspect of space planning, adequacy or efficiency.

Keywords: *Inpatient, Planning Guidelines, Design Parameters, Components*

INTRODUCTION

With increasing cost of real estate and non-availability of large spaces in cities, space utilization and efficiency can provide a solution in delivering effective and competitive healthcare. Space efficiency can help in increasing the quantum as well as scope of services of a healthcare provider.

Private healthcare in India constitutes almost 74% of the total healthcare expenditure and 40% of hospital beds in the country². Absence of a comprehensive planning guideline has led to several Government organizations publishing their own guidelines while the Private sector depends on their internal systems. Several countries like USA, UK and Australia have published comprehensive guidelines on Hospital Planning.

AIM

Comparative study of the Indian Planning Guidelines – Indian Public Health Standards and Indian Standards

OBJECTIVE

1. To study the Indian Planning Guidelines published by Ministry of Health & Family Welfare, Government of India & Bureau of Indian Standards.
2. Identify the design parameters of Inpatient wards amongst all the studied guidelines
3. Identify the components of Inpatient wards amongst all the studied guidelines
4. Suggest recommendations to rationalize the design parameters and components of inpatient wards

LITERATURE REVIEW

Following is the extract of planning guidelines:

1. **Indian Public Health Standards. Guidelines for Sub-district/Sub-divisional Hospitals (31 to 100 Bedded) Revised 2012.3**

Address for Correspondence:

Lalit Varma

PhD Scholar, Symbiosis International University,
Pune - 411 004, E-mail: lvarmaa@gmail.com,
Mob.: +91 9930124508

Categories of inpatient beds

General ward – Male & Female

Private wards: 10% of the total bed strength is recommended as private ward beds.

Wards for specialities

20% of the total beds should be earmarked for day care facilities

Size of ward

Nurse station should cater to around 40 – 45 beds

Circulation areas

Circulation areas in the hospital should not be more than 55% of the total floor area of the building

Components of wards

Nursing station

Duty doctor's room

Pantry

Isolation room

Treatment room

Nursing store

Wards & Toilets

2. Indian Public Health Standards for 101 – 200 bedded District Hospitals – January 2007.4

Categories of inpatient beds

General wards: male & female

Private wards: 10% of the total bed strength is recommended as private ward beds.

Wards for specialities

Size of ward

On an average, one nursing station per ward will be provided. However it should be ensured that nursing station caters to about 40 – 45 beds

Circulation areas

Circulation areas like corridors, toilets, lifts, ramps and other common spaces etc. in the hospital should not be more than 55% of the total floor area of the building

Components of wards

Nursing station

Duty doctor's room

Pantry

Isolation room

Treatment room

Nursing store

Toilets

3. Indian Public Health Standards (IPHS) Guidelines for District Hospitals (101 – 500 bedded) Revised 2012.5

Categories of beds

General IPD beds shall be categorized as following

- Male medical ward
- Male surgical ward
- Female medical ward
- Female surgical ward
- Maternity ward
- Paediatric ward
- Nursery
- Isolation ward

10% of the total bed strength is recommended as private ward beds.

20% of the beds may be earmarked for day care facilities

Size of ward

On an average, one nursing station per ward will be provided. However it should be ensured that nursing station caters to about 40 – 45 beds

Circulation areas

Corridors shall be at least 3 m wide

Area per bed

Floor space for hospital beds (General): 15 to 18 sqm per bed

Bed space : 7 sqm

Bed spacing / clearances

Minimum distance between two bed centres: 2.5 m

Clearance at foot end of bed : 1.2 m

Components of wards

Nurse station

Duty doctor's room

Pantry

Isolation room

Treatment room

Nursing store

Toilets
 Dirty utility room
 Janitor room

4. Indian Standard 10905 (Part 2) 1984 (Reaffirmed 2003). Recommendations for basic requirements of General Hospital Buildings. 6

Categories of inpatient beds

General Wards
 Wards for specialities
 Intensive care Unit

Two single bedded rooms per ward for isolation should be provided of an area of 14 sqm should be provided.

Size of ward

Normally a ward shall comprise of 25 – 36 beds

Layout of ward

Wards may be Nightingale or Rigs type

Area per bed

An area of 7 sqm per bed is recommended

Isolation room : 14 sqm + toilet

Single room : 14 sqm + 3.5 sqm toilet

Twin room : 21 sqm + 3.5 sqm toilet

Common toilets for two rooms: 5.25 sqm

Bed spacing / clearances

Minimum distance between two bed centres: 2.25 m

Clearance between bed and wall : 200 mm

Planning grid

A usable space planning module of 14 sqm based on basic space unit of 3.5 sqm has been stipulated in order to rationalize the requirements of various facilities of the hospital. The space planning module is derived by assuming planning grid of 1.6 m. Six such grid units that is 3.2 x 4.8 m will lead to a carpet area of about 14 sqm after deducting space taken by walls. Fractional variation in floor spaces in actual planning may be ignored

Components of wards

- Nurse station : 14 to 17.5 sqm
- Staff toilet : Included in above
- Duty doctor room with toilet : 17.5 sqm
- Clean utility room : No mention

- Treatment room : 10.5 to 17 sqm
- Laboratory : 7 sqm (common to two wards)
- Pantry : 10.5 sqm
- Ward Store : 10.5 to 17 sqm
- Trolley bay : 10.5 sqm
- Sluice room : 10.5 to 14 sqm
- Janitor closet : 3.5 sqm
- Day space : 14 sqm
- Patient relatives waiting with toilets : 14 to 17.5 sqm

5. Indian Standard 12433 (Part 1) 1988 (Reaffirmed 1998). Basic requirements for Hospital planning (Part 1 up to 30 bedded hospital)7

Categories of inpatient beds

One single bedded rooms per ward for isolation should be provided. An area of 14 sqm should be provided

Layout of ward

Wards may be Nightingale or Rigs type

Circulation areas

Circulation areas should not be less than 30% of the total building area

Area per bed

An area of 7 sqm per bed should be provided

Bed spacing / clearances

Minimum distance between two bed centres : 2.25 m

Clearance between bed and wall : 200 mm

Components of wards

- Nurse station
- Treatment room
- Ward pantry

- Ward store
- Sluice room
- Day space
- Sanitary facilities
- Clean utility
- Trolley bay
- Doctors rest room
- Nurses duty room

6. Indian Standard 12433 (Part 2) 2001 (Reaffirmed 2011). Basic requirements for Hospital planning (Part 2 up to 100 bedded hospital)8

Categories of inpatient beds

One single bedded rooms per ward for isolation should be provided. An area of 14 sqm should be provided

General wards

Private wards (optional)

Wards for specialities

Layout of ward

Wards may be Nightingale or Rigs type

Circulation areas

Conversion factor for circulation space is 40% over the carpet area. Circulation space includes corridors, stairs, fire escapes, walls, ramps lifts etc.

Circulation area should not be more than 40% of the total floor area

Area per bed

An area of 7 sqm per bed should be provided

Bed spacing / clearances

Minimum distance between two bed centres : 2.25 m

Clearance between bed and wall : 200 mm

Components

- Nurse station with clean utility
- Treatment room
- Ward pantry
- Ward store
- Sluice room
- Day space
- Patient conveniences

- Single room toilet : 3.5 sqm
- Twin room toilet : 3.5 sqm
- Shared toilet : 5.25 sqm

7. Indian Standard 15902 - 2010. Guidelines for nursing homes.9

Categories of inpatient wards

General wards for male, female and paediatric patients

Private ward

Intensive care ward

Components

- Nurse station with CU & DU : 14 sqm
- Treatment room : 10.5 sqm
- Ward pantry : 7 sqm
- Ward store : 7 sqm
- Sluice room : 3.5 sqm
- Day space : 10.5 sqm
- Patient conveniences : No mention
- Isolation bed with attached toilet : 14 sqm
- General bed : 7 sqm
- Janitor closet : 3.5 sqm
- Single bed : 14 sqm
- Toilet for single ward : 5.25 sqm
- Twin bed : 21 sqm
- Toilet for twin bed : 5.25 sqm

METHODOLOGY

Seven Indian guidelines were taken up for the comparative study. The design parameters for inpatient wards mentioned in all the above planning guidelines were identified along with the commonalities amongst them

In the next step, components of the Inpatient ward listed in all the planning guidelines were listed and commonalities identified.

FINDINGS

List of design parameters of inpatient wards collated from all Planning Guides is listed below:

- 1. Categories of inpatient beds**
- 2. Size of ward**
- 3. Layout of ward**

- | | |
|---------------------------|----------------------------|
| 4. Circulation areas | 9. Duty Doctor room |
| 5. Width of corridors | 10. Nurse duty room |
| 6. Area per bed | 11. Staff toilets |
| 7. Spacing between beds | 12. Dirty Utility / Sluice |
| 8. Clearance on head side | 13. Janitor |
| 9. Clearance on foot end | 14. Day space |
| 10. Planning grid | 15. Waiting with toilets |

List of components of inpatient ward collated form all Planning Guides is listed below:

1. Nurse station
2. Clean Utility
3. Trolley bay
4. Treatment room
5. Laboratory
6. Nursing store
7. Ward store
8. Pantry

OBSERVATIONS

It has been observed that there is a wide variation in the design parameters and components of wards in the studied Indian Planning Guidelines. The commonalities are few.

List of various design parameters of the Inpatient ward as mentioned in the seven Indian Planning Guidelines are mentioned in Table 1.

Table 1: Design parameters of Inpatient wards

Sr	Parameter	IPHS 31-100 ³	IPHS 1010-200 ⁴	IPHS 101-500 ⁵	IS 10905 (2) ⁶	IS 12433 (1) ⁷	IS 12433 (2) ⁸	IS 15902 ⁹
1	Categories of IP beds	Yes	Yes	Yes				
a	General ward – male	Yes	Yes	Yes	Yes	X	Yes	Yes
b	General ward - female	10% of beds	10% of beds	10% of beds	X	X	X	Yes
c	Private ward	X	X	X	Yes	X	Yes	Yes
d	Twin beds	X	X	X	Yes	X	X	X
e	Wards for specialities	Yes	Yes	Yes	Yes	X	Yes	Paediatrics
f	Beds for day care	20% of beds	X	20% of beds	X	X	X	X
g	Isolation ward	X	X	Yes	2 per ward	1 per ward	1 per ward	Yes
2	Size of ward	40 – 45 beds	40 – 45 beds	40 – 45 beds	25 -36 beds	X	X	X
3	Layout of ward	X	X	X	Nightingale or Rigs	Nightingale or Rigs	Nightingale or Rigs	X
4	Circulation areas	55% of total area	55% of total area	X	X	30% of total area	40% of total area	X
5	Width of corridor	X	X	3 m	X	X	X	X
6	Areas for beds							
a	Bed space	X	X	7 sqm	7 sqm	7 sqm	X	X
b	Floor space for beds	X	X	15 - 18 sqm	X	X	X	X
c	Single room	X	X	X	14 sqm	X	X	X
d	Twin room	X	X	X	21 sqm	X	X	X
e	Isolation room	X	X	X	14 sqm	X	14 sqm	X

Cont... Table 1: Design parameters of Inpatient wards

7	Bed spacing / clearances							
	a Between beds	X	X	2.5 m	2.25 m	2.25 m	2.25 m	X
	b Foot end	X	X	1.2 m	X	X	X	X
b	Head end	X	X	X	200 mm	200 mm	200 mm	X
8	Planning grid	X	X	X	Unit – 3.5 sqm	X	X	X

The commonalities of the design parameters are given in table 2

Table 2: Commonalities in Design Parameters

Sr	Parameter	Commonality
1	Categories of IP beds	
a	General ward – male	6 out of 7
b	General ward - female	6 out of 7
c	Private ward	6 out of 7
d	Twin beds	1 out of 7
e	Wards for specialities	5 out of 7
f	Beds for day care	2 out of 7
g	Isolation ward	4 out of 7
2	Size of ward	4 out of 7
3	Layout of ward	3 out of 7
4	Circulation areas	4 out of 7
5	Width of corridor	1 out of 7

Cont... Table 2:

Sr	Parameter	Commonality
6	Areas for beds	
a	Bed space	3 out of 7
b	Floor space for beds	1 out of 7
c	Single room	1 out of 7
d	Twin room	1 out of 7
e	Isolation room	2 out of 7
7	Bed spacing / clearances	
a	Between beds	4 out of 7
b	Foot end	1 out of 7
c	Head end	3 out of 7
8	Planning grid	1 out of 7

List of various components of an Inpatient ward as mentioned in the seven Indian Planning Guidelines are mentioned in Table 3

Table3: List of components of Inpatient wards

Sr	Component	IPHS 31-100 ³	IPHS 101-200 ⁴	IPHS 101-500 ⁵	IS 10905 (2) ⁶	IS 12433 (1) ⁷	IS 12433 (2) ⁸	IS 15902 ⁹
1	Nurse station	√	√	√	√	√	√	√
2	Clean Utility	X	X	X	√	√	√	√
3	Trolley bay	X	X	X	√	√	X	X
4	Treatment room	√	√	√	√	√	√	√
5	Laboratory	X	X	X	√	X	X	X
6	Nursing store	√	√	√	X	X	X	X
7	Ward store	X	X	X	√	√	√	√
8	Pantry	√	√	√	√	√	√	√
9	Duty Doctor's room	√	√	√	√	√	X	X
10	Nurses duty room	X	X	X	X	√	X	X
11	Staff toilets	X	√	√	√	X	X	X
12	Dirty utility / sluice	X	X	√	√	√	√	√
13	Janitor	X	X	√	√	X	X	√
14	Day space	X	X	X	√	√	√	√
15	Waiting with toilets	X	X	X	√	X	X	X

The commonalities of components of an Inpatient ward are given in Table 4

Table 4: Commonalities in components of Inpatient wards

Sr	Parameter	Commonality
1	Nurse station	7 out of 7
2	Clean Utility	4 out of 7
3	Trolley bay	2 out of 7
4	Treatment room	7 out of 7
5	Laboratory	1 out of 7
6	Nursing store	3 out of 7
7	Ward store	4 out of 7
8	Pantry	7 out of 7
9	Duty Doctor’s room	5 out of 7
10	Nurses duty room	1 out of 7
11	Staff toilets	3 out of 7
12	Dirty utility / sluice	5 out of 7
13	Janitor	3 out of 7
14	Day space	4 out of 7
15	Waiting with toilets	1 out of 7

It can be observed that out of 15 listed parameters only three elements i.e. Nurse Station, Treatment room & Pantry are common to all the planning guides.

RECOMMENDATIONS

In view of the variation and limited commonalities in the planning guidelines it is recommended that two sections be incorporated in all the planning guidelines as listed below:

Planning parameters:

- Size of inpatient ward i.e. number of beds in a ward
- Categories of inpatient beds
 - o General ward – Male & Female
 - o Single beds
 - o Isolation beds
 - o Twin sharing beds

- Area for beds
 - o General ward
 - o Single beds
 - o Isolation beds
 - o Twin sharing beds
- Space around beds
 - o Distance between beds
 - o Clearance from foot end
 - o Clearance from sides
- Width of Inpatient corridor

Components of a ward

- Nurse station
- Clean Utility
- Ward store / Store
- Treatment room
- Stretcher / trolley bay
- Pantry
- Duty Doctors room
- Nurse in charge room
- Waiting area with toilets
- Staff toilets
- Dirty Utility / Sluice
- Janitor room

CONCLUSION

An inpatient ward is perhaps the largest component of a Hospital where the patient spends a significant time of the stay in a hospital. As the inpatient beds account for almost 70% to 80% of the revenue beds in a tertiary care private hospital, it is important to functionalize the size of inpatient rooms and focus on patient and family needs.

Government agencies involved in the granting of permission to build hospitals in India, be it planning agencies or accreditation agencies, are silent on the aspect of space planning, adequacy or efficiency.

A comprehensive planning guideline is essential to bring about efficiency and completeness in the process.

There is no **Conflict of Interest**.

The study is **Not Funded** by any agency.

The article is an outcome of PhD Research Process

There were no interventions on human/ animals, hence no Ethical Committee clearance was required.

REFERENCES

1. Department of Health, Government of UK. Health Building Note 04-01: adult Inpatient Facilities. 2013.
2. ICRA Report on Indian Healthcare, ibef.org.
3. Indian Public Health Standards. Guidelines for Sub-district/Sub-divisional Hospitals (31 to 100 Bedded) Revised 2012.
4. Indian Public Health Standards for 101 – 200 bedded District Hospitals – January 2007.
5. Indian Public Health Standards (IPHS) Guidelines for District Hospitals (101 – 500 bedded) Revised 2012.
6. Indian Standard 10905 (Part 2) 1984. Recommendations for basic requirements of General Hospital Buildings
7. Indian Standard 12433 (Part 1) 1988. Basic requirements for Hospital planning (Part 1 up to 30 bedded hospital)
8. Indian Standard 12433 (Part 2) 2001. Basic requirements for Hospital planning (Part 2 up to 100 bedded hospital)
9. Indian Standard 15902 - 2010. Guidelines for nursing homes

Correlation of Hematological Profile with CD4 Counts in Human Immunodeficiency Virus-Positive Patients in a Rural Area of South India

Abilash Sasidharananir Chandrakumari^{1,5}, Pammy Sinha², Shreelakshmidevi Singaravelu^{3,5}, Jaikumar S⁴

¹Associate Professor, Department of Pathology, Shri Sathya Sai Medical College & Research Institute, ²Professor & Head, Department of Pathology, Sri Lakshmi Narayana Institute of Medical Science Medical College & Hospital, ³Associate Professor, Department of Pharmacology, Shri Sathya Sai Medical College & Research Institute, ⁴Professor, Department of Pharmacology, Sri Lakshmi Narayana Institute of Medical Science Medical College & Hospital, ⁵Research Scholar, Bharath Institute of Higher Education and Research, Chennai

ABSTARCT

Aim: Hematological manifestations are routinely encountered in individuals infected with Human immunodeficiency virus (HIV). The Study is aimed at analysing the significance of haematological parameters in HIV-infected patients and to correlate with CD4+ counts.

Materials & Method: The study was carried out over a period of two years and a total of 120 HIV positive patients were included. Patients were categorized into two groups, Group A include patients receiving Highly Active Anti-Retroviral Therapy (HAART) (n=68) & Group B include patients who were not on HAART (n=52). Hematological parameters inclusive of haemoglobin (Hb), total leukocyte count (TLC), differential count (DC), platelet count & CD4 counts were recorded.

Results: Prevalence of anemia in our study was (67.5%). Morphologically normocytic normochromic (NCNC) anemia was the most common variant accounting for 50% in group A and 57.78% in group B. prevalence of leukopenia in our study population was 28.33% with a slightly higher prevalence in group B (42.31%) than group A (17.65%). Total number of patients with low CD4+ count was 46 (38.33%).

Conclusion: Anemia is the commonest hematological abnormality encountered throughout the stages of HIV infection. Prevalence of anemia is higher among patients who are not on HAART. Anemia and leukopenia can also serve as an excellent screening tool to assess the disease progression in HIV patients.

Keywords: HIV, Anemia, Leukopenia, HAART.

INTRODUCTION

Human immunodeficiency virus (HIV) is a great threat to the humankind across the globe. HIV infection

causes intense immunodeficiency state. According to the World Health Organization (WHO) HIV has infected 33.2 million people worldwide and In India, approximately 6 million populations are infected by the virus while about 1.5 million suffer from full-blown acquired immunodeficiency syndrome (AIDS)^{1,2}.

Corresponding Author:

Dr. Abilash Sasidharananir Chandrakumari

Associate Professor Department of Pathology,
Shri Sathya Sai Medical College & Research Institute
Ammappettai, Nellikuppam, Tiruporur-Guduvancherry
Main Road, Kancheepuram, Tamilnadu India – 603108
Phone: +919894346193, Email: abey4aris@gmail.com

The disease affects the immune system, making individuals susceptible to various infections and disorders, among that hematological disorder are very common in all stages of HIV infection. Variations in Red Blood cells (RBC's), White blood cells (WBC's) and platelets parameters may be the initial presentation with

HIV infection. These abnormalities are the consequences of HIV associated opportunistic infections, neoplasms or therapy related^{3,4,5}.

Hematological assessment which forms the preliminary investigation helps the clinicians to a great extent for ensuring better management of HIV infected individuals for improving the quality of their life, hence it is mandatory to follow the haematological parameters of individuals infected with HIV.

The study is aimed at analysing the haematological parameters in correlation with CD4 counts in HIV-infected patients. The objectives were to assess the degree and morphological type of anemia, to evaluate the prevalence of leukopenia and thrombocytopenia in the HIV seropositive individuals and to correlate with the CD4+ counts.

MATERIALS & METHOD

The current study was a prospective and observational study conducted on 120 HIV-positive individuals who attended the tertiary care hospital in Chidambaram, Tamilnadu, India for performing haematological investigation during the period of May 2009 to April 2011. The study was accepted and approved by the institutional ethical committee.

Cases were subjected to inclusion and exclusion criteria. To improve the accuracy of study, HIV infected individuals between the ages of 15 to 60 years, who were willing to participate was included in the study group after obtaining the consent. Patients included in this study were grouped into two, Group A include patients receiving HAART (n=68) & Group B include patients who were not on HAART (n=52)

The inclusion criteria included HIV-positive patients, symptomatic as well as asymptomatic, diagnosed by enzyme-linked immunosorbent assay (ELISA) method according to the National AIDS Control Organization (NACO) guidelines. HIV cases who were not in the age range, any primary hematologic disorder (such as thalassemia, leukemia, etc.), chronic renal/liver disease, receiving cytotoxic/immune modulating chemotherapy, pregnant and lactating women, individuals who were not willing to enroll themselves in the study were excluded from the study.

Two ml of venous blood collected under standard procedure protocol from all 120 individuals after

getting their consent in two ethylene diamine tetra acetic acid (EDTA) Vacutainers. One sample was analyzed using an automated hematology cell counter, the quality checks of the instrument were performed according to the manufacturer's instructions. The values of blood count Erythrocyte (RBC) count, Hemoglobin (Hb), Haematocrit, Mean corpuscular volume, Mean corpuscular Hemoglobin concentration, Red cell distribution width, total leukocyte count (TLC), differential count & platelet count were recorded. Another sample was processed in a flow cytometer for CD4 counts. The values were tabulated and compared to the standard values of grading of anemia according to WHO guidelines

Anemia was defined using WHO criteria WHO/NMH/NHD/MNM/11.1. The hemoglobin cut off used to define anemia in men aged 15years and above was 13 gm / dl and non-pregnant women aged 15 and above was 12 gm / dl. Anemia was further graded as mild (Hb 11.0 - 11.9 g/dl), moderate (Hb = 8.0 -10.9 g/dl) and severe (Hb<8.0 g/dl) based on hemoglobin values

Statistical analysis

The statistical analysis were conducted by using IBM Statistical Package for the Social Sciences (SPSS) Software version 21. Univariate analysis to find out frequency, mean and standard deviation (SD). Multivariate analysis was performed for sex, age, CD4+ counts with the occurrence of cytopenia. Significance of the statistical tests at P value less than 0.05 was based on 95% confidence interval.

RESULTS

Of the 120 patients, 64 (53.33%) were females and 56 (46.67%) were males. The female to male ratio is 1.16:1. Forty (26.67%) are below age 10, 98 (65.33%) are within the age group of 21-50 years. Mean age was 34.49 (SD 9.13). The clustering of age and the sex profile are shown in fig no.1.

Anemia

Among the total study population 81 patients (67.5%) had anemia. Mean Hb was found to be 10.84 g/dl. About 79.69% (n=51) of female patients and 53.57% (n=30) of male patients were found to be anemic. The prevalence of anemia was higher among group B (86.54%, n=45) than group A (52.94%, n=36). The difference in prevalence among two groups was statistically significant

($P < 0.005$). Grading of anemia among two groups was shown in table no.1. Morphologically normocytic normochromic (NCNC) anemia was the frequent type accounting for 18 cases (50%) in group A and 26 cases (57.78%) in group B, Microcytic Hypochromic (MCHC) was noted in 16 cases (44.44%) of group A and 19 cases (42.22%) patients in group B, Dimorphic anemia was observed in two cases (5.56%) in Group A. Of the 81 anemic patients, anemia with leukopenia was seen in 23 and anemia with thrombocytopenia was observed in 6 cases

White blood cell profile

Overall prevalence of leukopenia (Total Leukocyte Count $< 4000/\text{mL}$) in our study population was 28.33% ($n=34$) with a slightly higher prevalence in group B 42.31% ($n=22$) than group A 17.65% ($n=12$). Mean total leukocyte count was $5764/\text{mL}$. Among the total leukopenic patients, absolute lymphopenia ($< 1000/\text{mL}$) was noted in 18 cases (52.94%), absolute neutropenia ($< 1500/\text{mL}$) was observed in six cases (17.65%) and both lymphopenia and neutropenia was noticed in 10 cases (29.41%). Leukopenia with thrombocytopenia was observed in 9 cases and pancytopenia was seen 7 cases.

CD4+ profile

Total number of patients with low CD4 count (< 200 cells/ μL) was 46 (38.33%). Mean CD4 count was $454.5/\mu\text{L}$. The lowest count was $76/\mu\text{L}$; highest was $1300/\mu\text{L}$. Distribution of patients with low CD counts in two different groups (group A and group B) is shown in table no.2. Of the 46 patients with low CD4 count 35 cases had anemia, 18 cases had leukopenia and thrombocytopenia was seen in two cases. The percentage of patients having anemia and leukopenia with low CD4 counts in two different groups was shown in fig no.2.

Platelet profile

A total of 23 patients presented with thrombocytopenia (platelet count $< 1.5 \times 10^5/\text{dl}$) with an overall prevalence rate of 19.17%. Mean platelet count was found to be $2.11 \times 10^5/\text{dl}$. Twelve patients (17.65%) in group A and eleven patients (21.15%) in group B showed thrombocytopenia respectively.

Table 1: Grading of Anemia among two Groups

Category	Group A (n=36)	Group B (n=45)
Mild	20 (55.56%)	18 (40%)
Moderate	13 (36.11%)	22 (48.89%)
Severe	03 (8.33%)	05 (11.11%)

Table 2: Distribution of patients in group A and group B with low CD4 counts

Category	Group A (n=68)	Group B (n=52)
CD4 <200	17 (25%)	29 (55.77%)
CD4 >200	51 (75%)	23 (44.23%)
	68 (100%)	52 (100%)

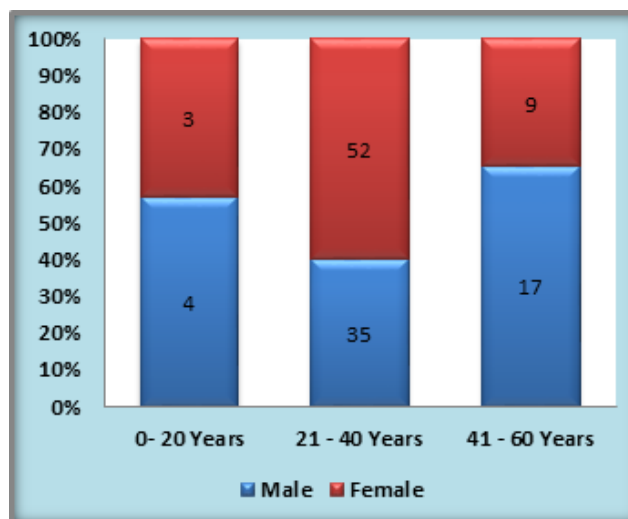


Fig 1: Age clustering and sex profile of HIV patients

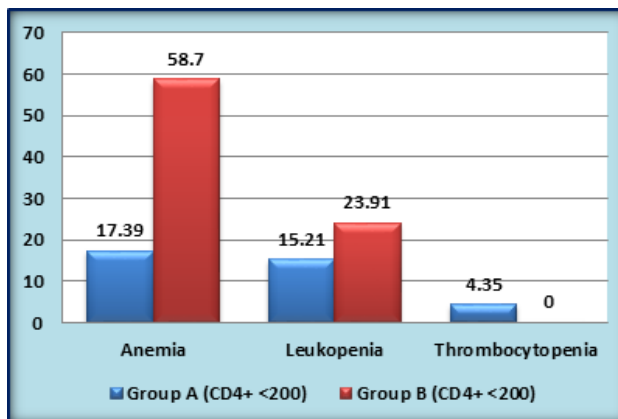


Fig 2: Percentage of patients with low CD4 counts in two different groups having anemia, leukopenia and thrombocytopenia

DISCUSSION

Anemia is the most common haematological manifestation encountered in the study. Incidence of anemia among group A might be attributed to the infections with HIV itself, co-existing iron deficiency, opportunistic infections, and suppression of bone marrow by anti-retroviral and other drugs used in the prophylaxis/treatment of opportunistic infections caused by HIV. Overall prevalence of anemia in our study was 67.5% which was marginally higher than other similar studies.

The current study confirmed that Group B patients had significantly outrageous prevalence rate of anemia when compared to the treatment Group A. Patwardhan et al revealed in their study that the patients who were not receiving HAART had higher prevalence of anemia, which is in accord with the current study⁶. The study also demonstrated that majority of the anemia patients in Group A (55.56%) had milder degree and its predominantly (48.89%) of moderate degree in Group B, these findings were contradictory with the study done by Thulasi, R Raman et al⁷.

Our analysis confirmed that the normocytic normochromic anemia was the most common morphologic type succeeded by microcytic hypochromic anemia. The dominance of NCNC anemia (54.32%) is eminently significant ($p < 0.005$). Dimorphic blood picture was observed in 2.47% ($n=2$) of anemic patients undergoing HAART, this might be due to therapy induced macrocytosis. These findings are in concordant with the other studies^{8,9}.

In the study about 28.33% of cases showed leukopenia with a considerably higher prevalence rate among Group B (42.31%), this is certainly at a higher fraction when compared to the other similar studies which reported leukopenia in the range of 10% -16%^{8,9,10}. The increased prevalence of leukopenia in the current study is not related to the clinical stage of the disease. About 60.7% of total leukopenic patients demonstrated anemia. This findings were in compliance with the studies done by Mathews SE et al⁹ & Zon et al¹¹ who reported that an appreciable amount of hematologic abnormalities can coexists

All cases of pancytopenia showed low CD4+ counts and all patients with low CD4+ count showed leukopenia of which majority of the patient were lymphopenic

which is in concurrent with the studied done by other authors. Considering the reality that the number of pancytopenia cases recorded in the study was only seven, an effective correlation cannot be determined. It may not be presumptuous to surmise that a low CD4+ count predisposes to pancytopenia thus alluding to pancytopenia being a harbinger of the low CD4+ count.

In the study it was observed that Group B had more number of patients with low CD4+ counts and mean CD4+ count was higher among Group A. In this multivariate analysis CD4+ counts were significantly correlated with anemia and leukopenia. Remarkable variation in the hematological parameters observed in patients with HAART, which might be because of the fact that HAART improves the CD4+ counts by lowering the CD4 destruction. It is certain that administration of HAART reduces the HIV load and might effect in diminishing the action of immune effectors, thereby ameliorating anemia and leukopenia. Anemia is the most frequent hematological manifestations encountered in patients with the reduced CD4+ count. This finding is in concurrence with other similar studies^{12,13}.

The study showed substantial consensus between lymphopenia and low CD4+ counts. Similar concurrence was also conceded by Amballi et al¹⁴. Overall prevalence of thrombocytopenia in our study was 19.17% ($n = 23$) the rate is higher compared to other similar studies^{2,15}.

LIMITATIONS

Few limitations required to be acknowledged concerning this study, this was a single hospital based study with limited sample size, so results cannot be generalised. Although routine hematologic investigations were taken into consideration, further specific investigations (viz iron studies, high-performance liquid chromatography, and Hb electrophoresis) should be carried out in such studies to rule out other causes of anemia.

CONCLUSION

Hematological irregularities are frequent phenomenon throughout the stages of HIV infection. Anemia & leukopenia serve as an excellent screening tool to assess the disease progression; these abnormalities also indicate patients' immune status and response to antiretroviral treatment.

Conflict of Interest: Nil

Funding: No

REFERENCES

1. Fauci AS, Lane H. Infections due to human immunodeficiency virus and other human retroviruses. In: Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson JL, *et al.*, editors. *Harrison's Principles of Internal Medicine*. 17th ed. New York: Mc Graw Hill Medical; 2008. p. 1109-34.
2. Attili SV, Singh VP, Rai M, Datla VV, Gulati AK, Sundar S. Hematological profile of HIV patients in relation to immune status-a hospital-based cohort from Varanasi, North India. *Turk J Hematol* 2008;25:13-9.
3. Rosenberg ES, Altfeld M, Poon SH, Phillips MN, Wilkes BM, Eldridge RL, *et al.* Immune control of HIV-1 after early treatment of acute infection. *Nature* 2000 Sep 28;407(6803):523-6.
4. Lim ST, Levine AM. Hematological aspects of human immunodeficiency syndrome. In: Lichtman MA, Beutler E, Kipps TJ, Seligsohn U, Kaushansky K, Prchal JT, editors. *William's Hematology*. 7th ed. New York: McGraw Hill Medical; 2006. p. 1109-34.
5. Mdogwe J, Semvua H, Msangi R *et al.* The evolution of haematological and biochemical indices in HIV patients during a six-month treatment period. *Afr Health Sci* 2012;12:2-7.
6. Patwardhan MS, Golwilkar AS, Abhyankar JR, Atr MC. Hematological profile of HIV positive patients. *Indian J Pathol Microbiol*. 2002;45:147-50.
7. Thulasi, R Raman *et al.* Hematological abnormalities in HIV infected individuals in correlation to CD4 counts and ART status. **Asian Journal of Medical Sciences** jul 2016; 7(4): 14-18.
8. Tripathi AK, Kalra P, Misra R, Kumar A, Gupta N. Study of bone marrow abnormalities in patients with HIV disease. *J Assoc Physicians India*. 2005;53:105-10.
9. Mathews SE, Srivastava D, Balayadav R, Sharma A. Association of hematological profile of human immunodeficiency virus-positive patients with clinicoimmunologic stages of the disease. *J Lab Physicians* 2013; 5: 34- 37
10. Huang SS, Barbour JD, Deeks SG *et al.* Reversal of human immunodeficiency virus type 1-associated hematosuppression by effective antiretroviral therapy. *Clin Infect Dis* 2000; 30: 504- 510.
11. Zon LI, Arkin C, Groopman JE. Haematologic manifestations of the human immune deficiency virus (HIV) *Br J Haematol*. 1987;66:251-6.
12. Dikshit B, Wanchu A, Sachdeva RK, Sharma A, Das R. Profile of hematological abnormalities of Indian HIV infected individuals. *BMC Blood Disord* 2009;9:5.
13. Sullivan PS, Hanson DL, Chu SY, Jones JL, Ward JW. Epidemiology of anemia in human immunodeficiency virus (HIV)-infected persons: Results from the multistate adult and adolescent spectrum of HIV disease surveillance project. *Blood* 1998;91:301-8.
14. Ogun SA, Ajibola A, Amballi AA. Demographic pattern and haematological profile in people living with HIV/ AIDS in a university teaching hospital. *Sci Res Essay* 2007;2:315-8.
15. Debarshi Saha, Jyoti R. Kini, Reshmi Subramaniam. A Study of the Hematological Profile of Human Immunodeficiency Virus Positive Patients in Coastal South Indian Region. *J Med Sci* 2015;35(5):190-193.

Mammogram Analysis using Diffusion Wavelets

G.Prathibha¹ , B.Chandra Mohan²

¹Assistant Professor, Department of ECE, ANUCET, ANU, Guntur, A.P, India, ²Professor, Department of ECE, Bapatla Engineering College, Bapatla, Guntur, A.P, India

ABSTRACT

An algorithm for classification of benign and malignant masses in digital mammograms is proposed in this paper. Feature vector is formulated based on the Diffusion Wavelets. Diffusion Wavelets are fast multi-scale framework for the analysis of functions on discrete (or discretize continuous) structures. Diffusion wavelets construct a compressed form of representation of the dyadic powers of a symmetric or non-symmetric square matrix by representing the associated matrices at each scale. Diffusion Wavelet coefficients are calculated for ROI's of preprocessed mammograms obtained from DDSM data base (Digital Database for Screening Mammography). Statistical parameters are calculated from Diffusion Wavelet Coefficients. The area under the curve $A_z=0.92$ is achieved using KNN classifier for classification of malignant and benign ROI's of mammograms.

Index Terms—Mammograms, Diffusion Wavelets, KNN classifier, Area Under the Curve(AUC)

INTRODUCTION

Wavelets are powerful tools for analyzing mammograms. The class of functions that are used to localize an image in both space and scaling are called Wavelets¹, which are constructed from a function known as a mother wavelet that has a finite interval. A set of functions are generated through scaling and dilation operation on the mother wavelet that form an orthogonal or biorthogonal bases. Similar to the Fourier analysis any signal can be decomposed using the inner product of orthogonal or biorthogonal bases.

The inner product of the input functions with the dilated and scaled waveforms yields the transform coefficients. Therefore, the wavelet basis functions are useful for a localized representation of mammograms that fail to address the geometric structures on the surface without considering the mesh connection of the geometric model. However, the modes of structural variation can be constructed using a Laplacian graph,

which is a graph space².

The Laplacian graph method can efficiently capture the shape variations of mammograms by embedding them in a vector space, whose dimensions span the modes of shape variations

Diffusion Wavelets proposed by Moggioni and Coifman⁹ are based on compressed representation of dyadic powers of a diffusion operator T whose repeated application interacts with the underlying graph or manifold space.

The theory of diffusion polynomial that is constructed on a multiscale matrix based on orthonormal bases for the L_2 space of finite measure space is proposed by Maggioni and Mhaskar et. al.,⁴. Besov approximation functions that are defined in terms of suitable K -functional and frame transforms are used to study the approximation properties of the resulting multi-scale. The summability operator must be uniformly bounded for the development of diffusion polynomial.

The construction of wavelets based on compact differentiable manifolds proposed by Geller⁵ can be done by defining scaling using the pseudo differential operator tLe^{-tL}

Corresponding Author :

G.Prathibha,

Assistant Professor, Dept. of ECE, ANUCET, Acharya Nagarjuna University.

Email Id : prathibhamails@gmail.com

where, t is a scale parameter and L is the manifold Laplace- Beltrami operator.

Wavelet transforms of functions on the vertices of an arbitrary finite weighted graph proposed by Hammond et. al.,⁶ is constructed by defining the scaling using graph Laplacian L . The scaled wavelet operator is defined as $T_{tL} = g(tL)$, where g is the wavelet generating kernel and t is the scale parameter. Localization is a small scale limit that forms the spectral graph wavelets. A chebyshev polynomial approximation algorithm is used to compute the wavelet transform. However, the value of wavelet generating kernel g is not fixed and need to be optimized depending on the application. The other disadvantage is that the chebyshev polynomial may be used for large problems on unstructured yet sparse graphs.

Diffusion Wavelet packets generalize the classical wavelet packets and enrich the diffusion scaling function as well as wavelet bases. The construction of diffusion wavelet packets was done by anisotropic diffusion on a circle illustrating the effect of anisotropy on the structure of wavelet packets and applying Laplace-Beltrami diffusion operator T on a sphere. Flexible multiscale space-frequency analysis for the functions on the manifolds and graphs is allowed using diffusion wavelet packets.

The method of constructing an efficient representation of bases functions proposed by Mahadevan et. al.,⁷ is based on two approaches, out of which the first approach is using the Eigen functions of the Laplacian which in turn performs a global fourier analysis on the graph. The second approach is based on generalizing the graphs by using multiscale dilations induced by powers of diffusion operator or by random walk on the graph.. A top down framework for multiscale analysis on manifolds and graphs is proposed by Szlam et. al.,⁸.

The powers of the diffusion operator from finer scale to the coarser scale are used for dilation and the rank constraint to sample the multiresolution subspace are used for the construction of wavelets and wavelet packets in Euclidean space .

The dyadic decomposition of the Euclidean space can be done by the second Eigen function and the restriction of diffusion operator to functions is supported on each subdivided part. Local cosine packets on manifolds and generalized local cosines in Euclidean spaces are obtained by dyadic decomposition, which can

be used for compression, denoising, approximation and learning of functions on a manifold. But, this algorithm requires n^3 oscillations making it expensive and slow.

A novel bottom-up construction that generalizes orthogonal diffusion wavelet in representing manifolds and graphs proposed by Maggioni et al.,⁹ leads to biorthogonal diffusion wavelet. The orthonormal bases calculated in Diffusion Wavelet are less compactly supported since the input matrix T_j is obtained from the sums of the selected columns.

The multiscale analysis of Diffusion Wavelet on document corpora dataset was proposed by Maggioni and Coiffman et. al.,¹⁰ by using scaling functions at various scales. A coherent as well as effective multiscale analysis of the space and functions on the space, can be done by Diffusion Wavelet that are a promising new tool in classification and learning tasks.

Based on the vast literature on the evolution and applications of Diffusion Wavelet, multiscale feature vectors are extracted from the mammograms of DDSM database. Many techniques have been proposed for classification of mammograms from DDSM database in the literature.

In this paper review of Diffusion Wavelet is described in the Introduction. The theory behind the Diffusion Wavelet and the algorithms used for application on mammograms was described . Calculation of statistical features from Diffusion Wavelet coefficients and experimental results are depicted. Conclusions are also presented explaining the superior performance of Diffusion Wavelet.

DIFFUSION WAVELET³

Diffusion Wavelet introduces a multiresolution geometric construction for the efficient computation of high powers of local operators. Diffusion Wavelets are constructed by considering Markov transition matrix T that enables fast computation of functions associated with greens function. The Markov transition matrix T is computed for an image. The matrix T can be compressed and orthogonalized to obtain coarser subspace $T^{2^{j+1}}$. The dilations of dyadic powers of T produces smoothly bumped functions Φ_j known as scaling functions and smoothly localized oscillatory functions Ψ_j

known as orthogonal wavelets. These scaling functions and orthogonal wavelets comprise a diffusion

wavelet tree.

The diffusion operator T is self-adjoint which represents orthonormal basis.

A set of functions can be obtained from the columns of T based on the number of decomposition levels by local multiscale orthogonalization procedure, which is stored in sparse matrix of size $N \times N$. This local multiscale orthogonalization procedure is achieved by QR factorization. The function which is the basis for subspace V_1 is coarser since they are the result of applying dilations to T . The orthogonal sub space of V_1 is W_1 , whose basis function is Ψ_1 .

This procedure is repeated up to the specified number of decomposition levels. In order to obtain coarser and coarser basis functions Φ_j , the dyadic powers of T are down sampled. The three steps to construct a diffusion wavelet at each scale are Down sampling, Orthogonalization, Operator compression

Diffusion Wavelet Coefficients

Algorithm 1 explains the procedure for the extraction of coefficients from the mammograms. The mammograms were preprocessed and the noise present in the mammograms is removed using anisotropic diffusion without disturbing the edges and local structure of the mammogram. The anisotropic diffusion is governed by the factors, such as conduction parameter, gradient threshold parameter and the number of iterations. The anisotropic diffused image is shown in Figure 1. This diffused image with the largest scale parameter is then normalized by using Bimarkov function.

Algorithm 2 explains the procedure for obtaining diffusion scaling functions and Diffusion Wavelet functions when Bimarkov normalized kernel is given as an input to the Diffusion Wavelet. The wavelet basis function with respect to the initial basis must be represented by a Diffusion Wavelet function. Diffusion Wavelet coefficients are extracted from the Diffusion Wavelet functions which are then used for calculating features such as Mean, Standard Deviation, Kurtosis and Skewness

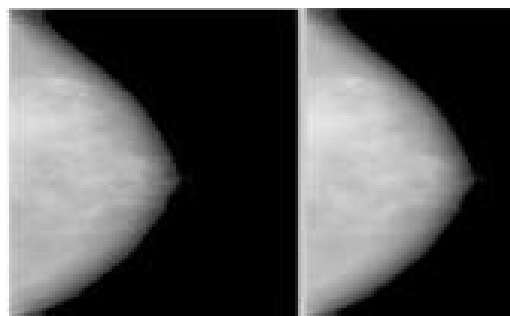


Fig. 1: Anisotropic diffusion of image to remove noise

Algorithm 1 An Algorithm to obtain Coefficients for a Mammogram

```

Input : Read Image
ad = anisodiff2D(im, num_iter, delta_t,
kappa,option)
performs anisotropic diffusion on the input image
// Inputs:
// im : input image
// num_iter : number of iterations
// delta_t : integration constant set to maximum value
// kappa : is the gradient modulus threshold that
controls the conduction
// option : conduction coefficient function chosen 1 for high
contrast edges over low-contrast edges and 2
for wide regions over smaller ones.
// Output : diffused image with the largest scale space
parameter.

```

```

[T, p]= Bimarkov(K, options)
// Computes the Bimarkov normalization function for the
non negative symmetric kernel using an iterative scheme
// Inputs :
// Km : an N X N matrix specifying a
non-negative, symmetric kernel with nonzero row sums,
which is the diffused image ad
// options : contains the maximum number of iterations, 100
// Output :
// Tb : Bimarkov normalized kernel
// p : column vector giving the Bimarkov normalization
function

Tree {[phi_j]_{phi_0}, [psi_j]_{psi_0}} = Diffusion Wavelet(T, epsilon, F_theta, R_theta, J, kappa)
This function generates bases and operators for a given
diffusion operator
nlevel=size(Tree,1)

```

```

for i=1 to nlevel do
k=size(Tree{i,1}.ExtBasis,2)
Print the level and the number of Wavelet functions
end for

```

```

[F,coeff] = DWBasisFcn(Tree, Level,Node,Index)
// This function represents a particular Wavelet packet basis
function with respect to the initial basis.
// Inputs:
// Tree: Diffusion Wavelet tree
// Level: a scalar or vector giving the level or levels of
the basis functions to extract
// Node: a scalar or vector giving the index of the node
or the nodes
// Index : indices of the basis function
// Outputs:
// an MXN array specifying N basis functions

```

```

CoeffTree=DWCoeffs(Tree, Fcns)
Compute the coefficient of the given function in each of the
subspaces represented in the given Diffusion Wavelet

```

EXPERIMENTAL RESULTS

A subset of DDSM¹³ database is chosen for experimentation. From the total number of 2620 cases in the DDSM database, a total of 839 mammograms consisting of 396 malignant and 443 benign images are obtained.

The gallery of mammograms obtained from DDSM are shown in Figure 2. The mammograms of DDSM database are preprocessed to remove tape artifacts and noise. The Region of Interest (ROI) are extracted from these preprocessed mammograms as shown in Figure 3.

The Diffusion coefficients are obtained for 120 benign and 120 malignant preprocessed ROI's obtained from the mammograms. Mean, Standard Deviation, Skewness and Kurtosis are calculated for benign and malignant mammograms which are shown in Table I by using Diffusion Wavelet. The Lifting DWT in contrast to the DWT divides the signal to which prediction update operations are applied. The ease of construction, lower computational complexity and flexible adaptivity are the advantages of Lifting DWT.

Basic Lifting scheme for DWT proposed by

Daubechies et. al.,¹¹ consists of three steps, i.e. splitting, predicting and updating. In splitting the signal is divided into even and odd arrays. Even array is then used to predict the odd array. The difference between the existing array and the predicted one is redefined as an odd array. Coarser coefficients can be obtained by updating the even array by using the filtered new odd array. Extraction of coefficients from mammograms by using the Lifting DWT have been proposed, which are used to calculate the statistical texture features¹².

Statistical features calculated using DWT, Lifting DWT and Diffusion Wavelet are shown in Table II for benign and malignant ROI's of mammograms which are classified using KNN based on 80-20 cross validation. Features of the Diffusion Wavelet are superior compared to DWT and Lifting DWT due to extraction of multiscale features from finer to coarser level.

A plot of ROC curve using Diffusion Wavelet, Lifting DWT and DWT is shown in Figure 4. Area Under the Curve(AUC) is 0.92 obtained by classifying the statistical features obtained from coefficients of the Diffusion Wavelet, which is higher compared to AUC using Lifting DWT and DWT.

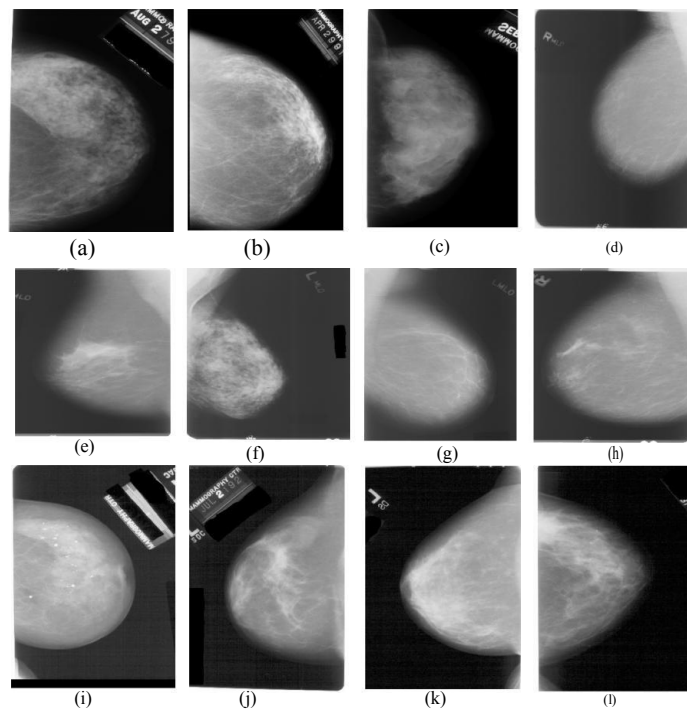


Fig. 2: Mammograms from DDSM database

(a),(b),(c),(d) Normal mammograms-A_002, A_0237, A_0366, B_3669 (e),(f),(g),(h) Benign mammograms-B_3114, B_3357, C_0321, B_3103 (i),(j),(k),(l) Malignant mammograms-A_1114, A_1486, A_1641, A_1730

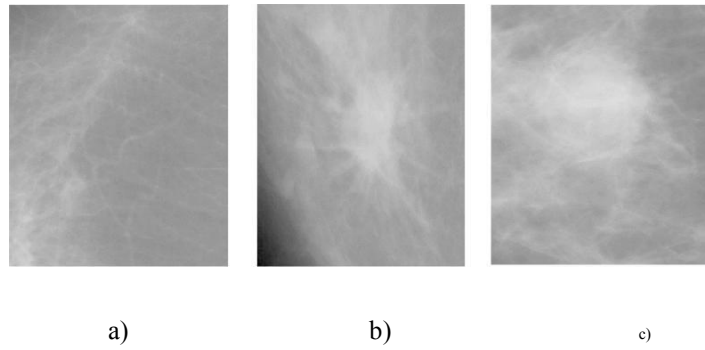


Fig. 3: ROIs extracted from mammograms of DDSM data base a) Normal A_1992_1.LEFT_CC.LJPEG b) Malignant A_1112_1.LEFT_CC.LJPEG c) Benign A_1688_1.LEFT_CC.LJPEG

TABLE I: Statistical Features Computed for Benign and Malignant mammogram using the Coefficients of Diffusion Wavelet

Feature	Benign	Malignant
Mean	2.89×10^{-5}	2.94×10^{-5}
Standard Deviation	68×10^{-5}	71×10^{-5}
Kurtosis	0.019	0.024
Skewness	2.98	3.14

TABLE II: Statistical features obtained for a mammogram using DWT, Lifting DWT and Diffusion Wavelet.

Transform	Benign				Malignant			
	Mean	Standard deviation	Kurtosis	Skewness	Mean	Standard deviation	Kurtosis	Skewness
DWT	2.7×10^{-6}	84.9×10^{-6}	0.245	3.726	2.87×10^{-6}	0.007	0.09	3.44
Lifting DWT	0.66	0.13	0.43	2.09	0.62	0.03	0.44	3.69
Diffusion Wavelet	3.29	9.26	8.33	2.64	5.55	15.67	8.36	2.64

Algorithm 2 : An Algorithm to obtain Diffusion Wavelet Coefficients

$Tree \{ [\phi_j]_{\psi_0}, [\psi_j]_{\psi_0} \} = Diffusion \ Wavelet(T, \epsilon, F_\theta, R_\theta, J, \kappa)$

This function generates bases and operators for a given diffusion operator

// **INPUT:**
 // T : Diffusion operator represented in the delta basis
 // ϵ : Desired precision for modified Gram-Schmidt
 // F_θ : Threshold for two column inner product in modified Gram-Schmidt orthogonalization
 // R_θ : Threshold for R component, which is obtained from modified Gram-Schmidt orthogonalization
 // J : Desired levels for scaling that terminates the program
 // κ : When columns are less or equal to κ in extended diffusion scaling function

OUTPUT:

$[\phi_j]_{\psi_0}$: Extended diffusion scaling functions at scale j
 // $[\psi_j]_{\psi_0}$: Extended diffusion scaling functions at scale j
 // $[\phi_0] = I$; where I is the unit vector

for j=0 to J-1 **do**
 ($[\phi_{j+1}]_{\psi_0}, [T^{2j} \phi_j]_{\psi_0}$) = QRgramschmidt($[T^{2j} \phi_j]_{\psi_0}^T, \epsilon, F_\theta, R_\theta$)
 $[\phi_{j+1}]_{\psi_0} = [\phi_{j+1}]_{\psi_0} [\phi_j]_{\psi_0}$
 $[\phi_j]_{\psi_0} = QRgramschmidt(I_{\phi_j} - [\phi_{j+1}]_{\psi_0} [\phi_{j+1}]_{\psi_0}^T, \epsilon, F_\theta, R_\theta)$
 $[\psi_{j+1}]_{\psi_0} = [\psi_{j+1}]_{\psi_0} [\phi_j]_{\psi_0}$
 $[T^{2j+1} \phi_{j+1}]_{\psi_0} = [T^{2j} \phi_j]_{\psi_0}^{j+1}$
end for

Computational cost of calculating the coefficients by using DWT, Lifting DWT and Diffusion wavelet is shown in Table III which indicates that the Diffusion wavelets diffuse at a faster rate compared to DWT and Lifting DWT.

CONCLUSION

In this paper DWT, Lifting DWT and Diffusion Wavelet explored on DDSM dataset. Diffusion Wavelet provides a fast multiscale dyadic decomposition of the mammograms from finer to coarser level.

Statistical texture features are calculated by using the coefficients of DWT, Lifting DWT and Diffusion Wavelet which are classified using KNN classifier. The Area under the Curve(AUC) using Diffusion Wavelet classified by KNN is found to be 0.92 emphasizing that the selection of classifier also plays a key role for the classification of benign and malignant ROI's of the mammograms.

Conflict-of-Interest Statement: The authors do not have any conflicts in the subject matter or materials discussed in this manuscript.

Source of Funding: The authors have no source of funding from any agencies.

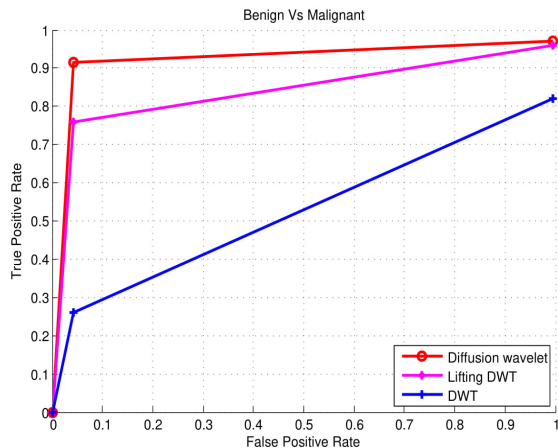


Fig 4: ROC curve for classification of Benign and Malignant mammograms

TABLE III: Computational cost for obtaining coefficients using DWT, Lifting DWT and Diffusion Wavelets from a mammogram

Transform	Computational Cost(in seconds)
DWT	1.56
Lifting DWT	1.91
Diffusion Wavelet	1.42

Ethical Clearance: Taken from the DEAN, Faculty of Engineering, ANU College of Engineering and Technology, Acharya Nagarjuna niversity and Department Research Committee (DRC) members to publish this work

REFERENCES

1. Mallat, Stéphane. A wavelet tour of signal processing. Elsevier, 1999.
2. Chung, Fan RK. "Spectral graph theory (CBMS regional conference series in mathematics, No. 92)." (1996).
3. Coifman, Ronald R., and Mauro Maggioni. "Diffusion wavelets". Applied and Computational Harmonic Analysis 21.1 (2006): 53-94.
4. Maggioni, M., and H. N. Mhaskar. "Diffusion polynomial frames on metric measure spaces." Applied and Computational Harmonic Analysis 24.3 (2008): 329-353.
5. Geller, Daryl, and Azita Mayeli. "Continuous wavelets on compact manifolds." Mathematische Zeitschrift 262.4 (2009): 895.
6. Hammond, David K., Pierre Vandergheynst, and Rémi Gribonval. "Wavelets on graphs via spectral graph theory." Applied and Compu-tational Harmonic Analysis 30.2 (2011): 129-150.
7. Mahadevan, Sridhar, and Mauro Maggioni. "Value function approxima-tion with diffusion wavelets and Laplacian eigenfunctions." Advances in neural information processing systems. 2006.
8. Prathibha, G., et al. "Content Based Medical Image Retrieval Using Lifting Scheme Based Discrete Wavelet Transform." International Journal of Computer Science and Information Technologies 5.2 (2014).
9. Szlam, Arthur D., et al. "Diffusion-driven multiscale analysis on mani-folds and graphs: top-down and bottom-up constructions." Wavelets XI. Vol. 5914. International Society for Optics and Photonics, 2005.
10. Maggioni, Mauro, et al. "Biorthogonal diffusion wavelets for multiscale representations on manifolds and graphs." Wavelets XI. Vol. 5914. International Society for Optics and Photonics, 2005.

11. Maggioni, Mauro, and Ronald R. Coifman. "Multiscale analysis of data sets with diffusion wavelets." 7th SIAM International Conference on Data Mining, Minneapolis, MN. 2007.
12. Daubechies, Ingrid, and Wim Sweldens. "Factoring wavelet transforms into lifting steps." *Journal of Fourier analysis and applications* 4.3 (1998): 247-269.
13. Heath, Michael, et al. "The digital database for screening mammogra-phy." *Proceedings of the 5th international workshop on digital mammog-raphy*. Medical Physics Publishing, 2000.

Two Phase Therapy for Skeletal Class II Malocclusion – A Case Report

Ritesh Singla¹, Arun S Urala², Nishu Singla³

¹Associate Professor, Department of Orthodontics, ²Professor and HOD, Department of Orthodontics, ³Reader, Dept of Public Health Dentistry, Manipal College of Dental Sciences, Manipal, Manipal Academy of Higher Education, Manipal, Karnataka, India

ABSTRACT

In the treatment of Class II malocclusion, treatment possessing the capability to alter patients' facial growth is of particular interest, namely by means of functional appliances, extraoral traction appliances, or a combination of both. There are certain clinical indications where functional appliances can be used successfully in class II malocclusion e.g. in a growing patient. The use of these appliances is greatly dependent on the patient's compliance and they simplify the fixed appliance phase. This is a case report of young growing male patient who had increased overjet and overbite, and an unaesthetic smile. The case was treated with Twin Block appliance followed by fixed appliance to detail the occlusion.

Keywords: Functional appliance, twin block appliance, two phase therapy, Class II malocclusion.

INTRODUCTION

Class II Division 1 malocclusions are characterized primarily by the mandibular canines and molars in distal relationships relative to the corresponding maxillary teeth, as well as by protrusion of the maxillary anterior teeth.¹ The Class II malocclusion is a common malocclusion with a prevalence ranging between 5% and 29%.² Class II malocclusions can be treated by several means, according to the characteristics associated with the problem, such as anteroposterior discrepancy, age, and patient compliance. Methods include extraoral appliances, functional appliances and fixed appliances associated with Class II intermaxillary elastics. On the other hand, correction of Class II malocclusions in nongrowing patients usually includes orthognathic surgery or selective removal of permanent teeth, with subsequent dental camouflage to mask the skeletal discrepancy.

Following is a case report of a young growing individual with mandibular retrognathia. Treatment was planned in two stages with the use of twin block during the first phase for correction of skeletal malocclusion and forward positioning of the mandible, followed by the second phase of fixed pre-adjusted edgewise orthodontic appliance for achieving a stable harmonious occlusion.

Case Report

A 13years-old male patient came to the Department of Orthodontics, MCOOS, Manipal with the chief complaint of forwardly placed upper anterior teeth and unaesthetic smile. He was physically healthy and had no history of medical or dental trauma. No signs or symptoms of temporomandibular joint dysfunction or trauma were noted at the initial examination. Extra orally he had a mesoprosopic facial form, mesomorphic body type with a convex facial profile, without any gross asymmetry. Intra orally he had class II molar relation and class II canine relation on both sides, with an overjet of 8mm, and overbite of 7mm, caries in relation to 14, spacing of 3mm in the upper arch and 1.5mm in the lower arch. The Orthopantomograph confirmed the presence of all permanent teeth including the developing third molars. In the cephalometric assessment, the ANB value of 8° suggested a class II skeletal pattern. The

Corresponding Author:

Nishu Singla

Reader, Dept of Public Health Dentistry, Manipal College of Dental Sciences, Madhav Nagar, Manipal, Karnataka – 576104, Phone numbers – 9964504403
E-mail address – nishu-gupta@hotmail.com

vertical proportions were within normal value. The upper incisors were proclined at 115° and the lower incisors were of average inclination at 95°. The interincisal angle was reduced at 120. The lower incisor to APo and the lower lip to E line were reduced by 1mm and 2mm respectively. Skeletal maturation evaluation using Cervical vertebrae shows the acceleration stage, means growth acceleration begins at this stage with 65%-85% of adolescent growth expected (Fig.1).

Visual Treatment Objective was positive; So, a treatment plan involving mandibular advancement with a twin block was considered.

Treatment objectives

The main objectives for phase I of the treatment were as follows:

1. Reduce the overbite and overjet.
2. Achieve class I canine and molar relationship and gain anchorage.
3. Enhance facial esthetics

In phase II of the treatment, the aims were:

1. Level and align the arches.
2. Closure of spacing in both upper and lower arches.
3. Finishing and detailing

Treatment rationale

Phase I of treatment involved the use of functional appliance (Clark Twin Block appliance) to reduce the overjet, achieve class I molar relationships and gain anchorage at the start of treatment to simplify the fixed appliance stage (Fig. 2). Furthermore, there is the

theoretical advantage of improving the patient's profile by causing a small skeletal change (O'Brien et al., 2003b). This phase was followed with upper and lower fixed appliances (0.02200 slot brackets) to close spaces, detailing and finishing of the case.

Treatment progress

The aims of the functional treatment phase were achieved successfully due to good patient compliance. This phase of treatment was completed over 9 months. The upper incisors were retroclined by 2° while the lower incisors proclined by 4°. This resulted in reduction of the overjet.

The second phase of treatment with the fixed appliances aimed to close the remaining spaces and finish the case which lasted 10 months. The overall treatment time was 21 months i.e. 9 months functional appliance wear, 2 months transient phase between functional and fixed and 10 months fixed appliance treatment.

The case was debonded after 10 months of active treatment. Upper Hawley's retainer and lower lingual bonded retainer from canine to canine were given.

Treatment results

The treatment objectives were achieved. The profile of the patient has improved after the treatment. The spaces of the upper and lower arches were closed during the fixed appliance phase of treatment. The incisor, canine and molar relationships were class I at the end of treatment (Fig.3). The overbite and overjet were reduced to the average values. The overall changes are tabulated in Table 1.

Table 1: Shows Pre & Post treatment Cephalometric findings

Variable	Normal	Pre-treatment	Post-treatment
SNA	82° ± 3	86°	84°
SNB	79° ± 3	78°	82°
ANB	3° ± 1	8°	2°
Upper incisor to maxillary plane angle	108° ± 5	115°	112°
Lower incisor to mandibular plane angle	92° ± 5	95°	99°
Interincisal angle	133° ± 10	120°	125°
Maxillary-mandibular plane angle	27° ± 5	29°	31°
Face height ratio	55%	54%	57%
Lower incisor to Apo line	0-2mm	-1mm	1mm
Lower lip to Rickett's E plane	-2mm	-4mm	-2mm

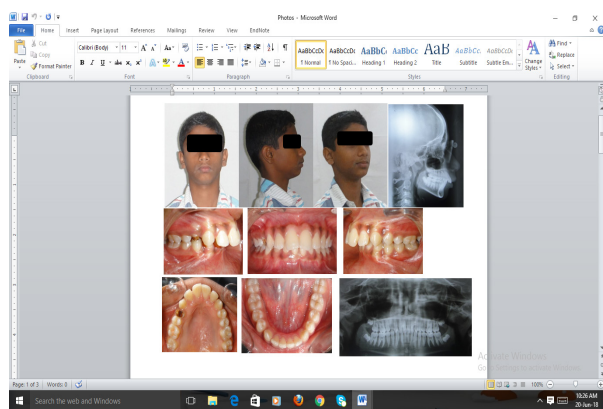


Fig.1: Pre-treatment records.

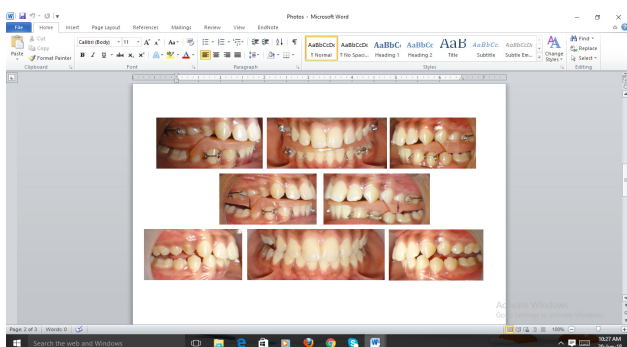


Fig.2: Treatment progress- with Twin block, trimming and after twin block.

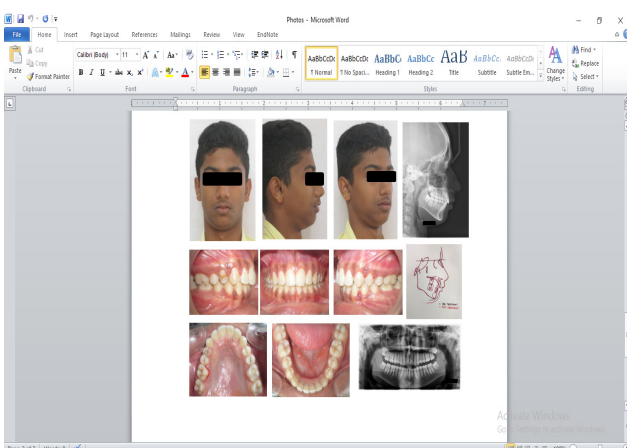


Fig.3: Post-treatment records.

DISCUSSION

Twin Block functional appliance has several well established advantages including the fact that it is well tolerated by patients, robust, easy to repair and it is suitable to use in the permanent and mixed dentition.^{3,4} There are potential disadvantages such as the proclination of the lower incisors and development of posterior open bites. In this case, the treatment objectives were achieved largely due to the good compliance by the patient. The patient's chief complaint was the increased overjet. Thus by reducing the overjet with the functional appliance, the patient's confidence has improved and also the risk of

sustaining trauma to the upper incisor was minimised.⁵

During treatment, the SNA value was reduced by 2° while the SNB value increased by 4°. As a consequence the ANB value decreased by 6° towards class I skeletal pattern. The maxillary mandibular plane angle remained relatively unchanged. The upper incisor inclination reduced to 112°. The lower incisors were proclined by 4°. The vertical proportions increased during treatment. The lower incisors to the APo line and the lower lip to the E plane were increased by 2 mm. This has resulted in improvement in the patient's profile which is largely attributed to the favourable growth and may be partly due to the functional appliance.

CONCLUSION

The use of Twin- block in Class II therapy not only corrects the malocclusion, but is also effective in improving the soft tissue profile and the intermaxillary relationship. Early treatment can eliminate etiologic factors such as sucking habits, restoring normal growth and reducing the severity of skeletal abnormalities. Once the growth period is over, treatment options become more limited.

Ethical Clearance: Taken from ethical committee of the institution.

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Angle EH. Classification of malocclusion. Dent Cosmos 1899;41:248-64.
2. Massler M, Frankel JM. Prevalence of malocclusion in children aged 14 to 18 years. Am J Orthod 1951;37 (10):751-68.
3. Clark WJ. The Twin Block Technique- A functional orthopaedic appliance system. Am J Orthod Dentofacial Orthop. 1988; 93(1):1-18.
4. Chadwick SM, Banks P, Wright JL. The use of my functional appliances in the UK: a survey of British orthodontists. Dent Update 1998; 25 (7):302-8.
5. O'Brien Kevin, et al. Effectiveness of early orthodontic treatment with the Twinblock appliance: A multicenter, randomized, controlled trial. Part 2: Psychosocial effect. Am J Orthod Dentofacial Orthop. 2003;124:488-9.

In Vitro Study of Antimicrobial Activity of *Lactobacillus Fermentum* against Germ Tube Positive *Candida* spp

Suresh P¹, V Sreenivasulu Reddy², V Praveen Kumar¹, P Vamsimuni Krishna¹

¹Ph.D Scholars at Bharath Institute of Higher Education and Research, Chennai, ²Professor, Department of Microbiology Srilaxmi Narayana Institute of Medical Sciences, Pondicherry

ABSTRACT

Background and Purpose: *Lactobacilli* are involved in the microbial homeostasis in the gastrointestinal tract and female genital tract. Due to the high prevalence of fungal and bacterial infections of the female genital tract and the emerging resistance of microbial pathogens to various antimicrobial agents, alternative measures to control these infections are increasingly felt by the scientific community. *Lactobacillus* was considered as probiotic used in controlling some bacterial infections because of the property of *Lactobacillus* exhibiting antimicrobial activity and thus augmenting the therapy by antimicrobial drugs.

Material and method: Many studies were undertaken to evaluate the probiotic properties of *Lactobacillus* against germ tube positive *Candida* spp. namely *C.albicans* & *C. dubliniensis*. The probiotic potential was investigated by using the following criteria: (i) adhesion to host epithelial cells and mucus, (ii) biofilm formation, (iii) co-aggregation with bacterial pathogens, (iv) inhibition of pathogen adhesion to mucus and HeLa cells, and (v) antimicrobial activity. Documented studies reveal *lactobacilli* adhered to mucin, co-aggregated with all genital microorganisms, and displayed antimicrobial activity. *L. fermentum* produced a moderate biofilm and a higher level of co-aggregation and mucin binding. The displacement assay demonstrated that all *Lactobacillus* strains inhibit *C.albicans* & *C.dubliniensis* binding to mucin ($p < 0.001$), likely due to the production of substances with antimicrobial activity.

Results: In this study Clinical isolates of *C.albicans* & *C.dubliniensis* associated with vaginal candidiasis were inhibited by *L. fermentum*. Our data suggest that *L. fermentum* isolated from two days fermented goat milk is a potential probiotic candidate, particularly to complement candidiasis treatment.

Conclusion: *Lactobacillus fermentum* isolated from two days fermented Goat milk had good effect preventing the growth of Germ tube positive *Candida* species (*Candida albicans* and *Candida dubliniensis*).

Keywords: *Candida albicans*, *Candida dubliniensis*, Vitek-II compact system, and YST, YS02 (BIOMERIX IN INDIA)

INTRODUCTION

Candida albicans is an opportunistic fungal pathogen that is responsible for candidiasis in human hosts. *C.albicans* grow in several different

morphological forms, ranging from unicellular budding yeast to true hyphae with parallel-side wall.¹ Typically, *C.albicans* live as harmless commensal in the gastrointestinal and female genitourinary tract and are found in over 70% of the population. Overgrowth of these organisms, however, will lead to disease, and it usually occurs in immunocompromised individuals, such as HIV-infected victims, transplant recipients, chemotherapy patients, and low birth-weight babies.² There are three major forms of disease: oropharyngeal candidiasis, vulvovaginal candidiasis, and invasive

Corresponding author:

Suresh P

Ph.D Scholars at Bharath Institute of Higher Education and Research, Chennai,
email: sureshraja25@gmail.com

candidiasis. Over 75% of women will suffer from a *C. albicans* infection, usually vulvovaginal candidiasis, in their lifetimes, and 40-50% of them will have additional occurrences(s). Interestingly, *C. albicans* is considered as one of the leading cause for nosocomial infections in patients undergoing treatment for metabolic disorders, severe systemic bacterial infections, and immunocompromised patients. This *Candididial* infection could result in an extremely life-threatening, systemic infection in hospital patients with a mortality rate of 30%.³ *Candida dubliniensis* is also germ tube-positive yeast which has been recovered primarily from the oral cavities of human immunodeficiency virus (HIV)-infected individuals and AIDS patients.⁴ *Candida dubliniensis* was first described in 1995 from oral cavities of human immunodeficiency virus (HIV)-infected individuals. The species forms only a minor component of normal microbiota but has a worldwide distribution. Despite its close relationship with *C. albicans*, which is the predominant pathogenic species, the etiopathologic role of *C. dubliniensis* has mostly been restricted to oral candidiasis. In recent years, however, *C. dubliniensis* has increasingly been reported from patients with candidemia. Although the species is significantly less than *C. albicans*, the reasons for its expanding role in invasive disease remain largely unknown.⁵

In women of childbearing age, the vaginal ecosystem is dominated by *Lactobacillus* spp.⁶ These microorganisms can prevent the colonization of the urogenital tract by pathogens and they are important for women's reproductive tract health.⁷ *Lactobacilli* modulate the vaginal microbiota by different mechanisms such as: (i) auto-aggregation, (ii) production of lactic acid, hydrogen peroxide, bacteriocins, and biosurfactants, (iii) co-aggregation with pathogenic microorganisms, and (iv) adhesion to epithelial cells. Vulvovaginal candidiasis is the most prevalent vaginal infections worldwide. Vaginal thrush is responsible for up to 50% of all the cases of vaginal infections and it is characterized by a significant reduction in lactobacilli population, and increase in facultative aerobic and anaerobic pathogens.⁸

AIM

The aim of this research was to study the *Invitro* effect of *L. fermentum*, isolated from two days fermented goat milk, against Germ tube positive *Candida* spp. (*C. albicans* and *C. dubliniensis*)

causing Vulvovaginal *candidiasis* infection.

MATERIAL AND METHOD

1. Isolation of *C. albicans* and *C. dubliniensis* from clinical specimens

A. Collection of samples

In total 135 High vaginal swabs samples were collected from Tertiary care Hospital, Pondicherry. Samples were aseptically collected and processed.

B. Culture and Identification of Germ tube positive *Candida* spp.

Vaginal swabs were collected with aseptic precautions and immediately inoculated onto Sabouraud dextrose agar & *Candida* chrome agar media (CHROMOGEN IN INDIA) and incubated at 37°C for 24hrs. After incubation, identification of *Candida* from positive cultures was done with standard microbiological techniques which includes AES *Biomerix* (Vitec-II Compact system) in India, Grams stain, biochemical reactions.¹¹



Fig-1. *Candida albicans* in *Candida* chrome agar

C. Confirmation of Germ tube positive *Candida* species

Germ Tube Test is a screening test which is used to differentiate *Candida albicans* from other yeast. Germ tube (GT) formation was first reported by Reynolds and Braude in 1956. When *Candida* is grown in human or sheep serum at 37°C for 3 hours, they forms a germ tubes, which can be detected with a wet KOH films as filamentous outgrowth extending from yeast cells. It is positive for *Candida albicans* and *Candida dubliniensis*. Approximately 95 – 97% of *Candida albicans* isolated develop germ tubes when incubated in a proteinaceous media.

D. Principle of Germ Tube Test

Formation of germ tube is associated with increased synthesis of protein and ribonucleic acid. Germ tube is one of the virulence factors of *Candida albicans*. This is a rapid test for the presumptive identification of *C. albicans*.

E. Procedure of Germ Tube Test

Place 0.5 ml of sheep or human serum into a small tube.

Note: Fetal bovine serum can also be used instead of human serum.

Using a Pasteur pipette, touch a colony of yeast and gently emulsify it in the serum.
Note: Too large of an inoculum will inhibit germ tube formation.

Incubated the tube at 37°C for 2 to 4 hours.

Transfer a drop of the serum to a slide and place cover slip for examination.

Examine microscopically under low power and high power objectives.

F. Results and Interpretation of Germ Tube Test

Positive Test: A short hyphal (filamentous) extension arising laterally from a yeast cell, with no constriction at the point of origin. Germ tube is half the width and 3 to 4 times the length of the yeast cell and there is no presence of nucleus. **Examples:** *Candida albicans* and *Candida dubliniensis*

Negative Test: No hyphal (filamentous) extension arising from a yeast cell or a short hyphal extension constricted at the point of origin. **Examples:** *C. tropicalis*, *C. glabrata* and other yeasts.

G. Quality Control in Germ Tube Test

Positive Control: *C. albicans* (ATCC 10231)

Negative Control: *C. tropicalis* (ATCC 13803), *C. glabrata* (ATCC 2001)

H. Limitations of Germ Tube Test

1. *C. tropicalis* may form early pseudohyphae which may be falsely interpreted as germ tubes.

2. The yeast formerly named *Candida stellatoidea* also produces germ tubes; however, it has

been combined with *C. albicans* and no longer exists as separate species.

3. This test is only part of the overall scheme for identification of yeasts. Further testing is required for definite identification.⁹

2. *Lactobacillus* isolation from fermented Goat milk

A. Isolation and Identification *Lactobacillus* from 2 days fermented goat milk:

Two days fermented goat milk was serially diluted in saline (0.85%) and 100 µl of each dilutions (10⁻¹ to 10⁻⁶) were spread plated onto MRS (De Man Rogosa and Sharpe) to isolate the *Lactobacillus* spp. Plates were incubated at 37°C for 48 - 72 h at anaerobic conditions.¹⁰ Isolates were identified on the basis of growth, cell morphology, gram staining and catalase activity. Further, identification was performed according to carbohydrate fermentation patterns and growth at 15°C and 45°C in the MRS broth based on the characteristics of the *lactobacilli* as described in Bergey's Manual of Determinative Bacteriology and also through molecular technique 16s rRNA sequencing.¹¹ The *lactobacilli* grown on solid MRS medium was inoculated in liquid MRS medium, and after 24hour liquid MRS broth was removed and transferred to another fresh MRS broth, in order to strengthen the growth of *lactobacilli*.¹²

B. Quality control reference of the *Lactobacillus* isolates

For QC reference, *Lactobacillus strains* (ATCC NO:9224) was considered

C. Antimicrobial Activity Determination

Using a sterile swab, *Candida albicans* and *Candida dubliniensis* adjusted to 0.50 to 3.00 McFarland dilutions were inoculated into the surface of the Sabuards dextrose agar plates. On the surface of SDA plates, holes 5 mm in diameter and depth were created under sterile conditions using a Pasteur pipette. The MRS broth containing *Lactobacillus fermentum* was centrifuged at 6000 rpm for 10 minutes. Concentration of *Lactobacilli* adjusted to six different concentrations (100000 IU, 150000 IU, 200000 IU, 250000 IU, 300000 IU, and 350000 IU). Then 100 µg of solution of each concentration of *lactobacilli* was poured into a separate well. Plates were kept in the refrigerator for 2 hours

until the liquid was absorbed, then transferred into the incubator and incubated for 14 to 15 hours at 37°C. After incubation, the diameter of the inhibition zones (mm) around the well was measured using a ruler.¹³ The antagonistic effect of lactobacillus fermentum against *Candida* spp. was interpreted on the bases of inhibitory growth zones as follows.¹⁴

Inhibitory growth zones were interpreted as follows: negative (-) at <11 mm; medium (+) at 11–16 mm; strong (++) at 17–22 mm; very strong (+++) at >22 mm.

RESULTS

Among the 135 samples, a total of 66 were *Candida* positive. Out of these 38 isolates were identified as *Candida albicans* and 13 *Candida dubliniensis* remaining 15 are non germ tube positive *Candida* species. In this study *Lb. fermentum* had shown antagonistic properties on germ tube positive *Candida* species. It was observed that *Lactobacillus* had a significant antagonistic effect on *Candida albicans* and *Candida dubliniensis*. (Table 1) & (Table 2).

Table-1: Zone of inhibition of *Candida albicans*

C.albicans turbidity in MaC forland	Lactobacillus fermentum					
	100000IU	150000IU	200000IU	250000IU	300000IU	350000IU
0.50	20mm	28mm	33mm	40mm	42mm	>45mm
1.00	18mm	23mm	29mm	32mm	36mm	39mm
1.50	15mm	21mm	26mm	28mm	30mm	36mm
2.00	13mm	19mm	21mm	23mm	27mm	31mm
2.50	08mm	13mm	15mm	18mm	22mm	27mm
3.00	R	7.5mm	11mm	13mm	17mm	20mm

Inhibitory growth zones were interpreted as follows: negative (-) at <11 mm; medium (+) at 11–16 mm; strong (++) at 17–22 mm; very strong (+++) at >22 mm.

Table: 2 Zone of inhibition *Candida dubliniensis*

<i>Candida dubliniensis</i> Turbidity in MaC forland	Lactobacillus fermentum					
	100000IU	150000IU	200000IU	2.50000IU	300000IU	350000IU
0.50	24mm	32mm	36mm	39mm	42mm	>48mm
1.00	22mm	28mm	32mm	37mm	44mm	45mm
1.50	19mm	23mm	28mm	33mm	37mm	43mm
2.00	16mm	20mm	24mm	30mm	31mm	41mm
2.50	11mm	17mm	19mm	27mm	29mm	38mm
3.00	9mm	12mm	18mm	22mm	24mm	30mm

Inhibitory growth zones were interpreted as follows: negative (-) at <11 mm; medium (+) at 11–16 mm; strong (++) at 17–22 mm; very strong (+++) at >22 mm.

DISCUSSION

Literature evidence suggest the production of organic acids helps to keep the vaginal pH below 4.5 and creates a hostile environment for the growth and survival of pathogenic microorganisms.¹⁵ The highest amount of lactic acid was produced by *L.fermentum*. Hydrogen peroxide is another antagonistic compound produced by lactobacilli and its production is normally assessed by using qualitative methods, such as incorporation of the peroxide in agar medium and revelation by addition of tetramethylbenzidine.¹⁶ However, quantitative results may help to better understand the role of H₂O₂ in healthy and infected vaginal environments. ¹⁷ H₂O₂ is converted to reactive oxygen species (ROS) such as superoxide anions, hydrogen peroxide and hydroxyl free radicals that are highly toxic against several microorganisms.¹⁸ Besides that, lactobacilli keep a high oxireduction potential in the vaginal environment, which inhibits multiplication of strictly microorganisms.¹⁵ Some vaginal Lactobacillus species are capable of synthesizing antimicrobial peptides known as bacteriocins.¹⁹ Osset et al.²⁰ Studied the production of bacteriocin by several Lactobacilli isolates against *C.albicans* and *C.dubliniensis* when agar plate method was used.

Conclusion

Lactobacillus fermentum isolated from two days fermented Goat milk exhibited good effect of preventing the growth of Germ tube positive *Candida* species (*Candida albicans* and *Candida dubliniensis*) grown on Sabouraud dextrose agar.

Ethical Clearance: Taken from Institutional Ethics Committee (Human Studies) Ref. no. IEC/C-p/49/2014.

Conflicts of Interest : The authors of the current study declare no conflicts of interest.

Financial Disclosure: Self-funded.

REFERENCES

1. Sudbery P, Gow N, Berman J. The distinct morphogenic states of *Candida albicans*. Trends in Microbiology. 2004 12(7):317-24. .
2. Kabir MA, Hussain MA, Ahmad Z. 2012. *Candida albicans*: A Model Organism for Studying Fungal Pathogens. ISRN Microbiology. ;2012 5386943.
3. Pfaller. Virulence. 2001 (2): 119–128.
4. J. Clin. Microbiol MA, Diekema DJ. 2007. Epidemiology of Invasive Candidiasis: a Persistent Public Health Problem. February 1998 vol. 36 no. 2 329-334.
5. “*Candida dubliniensis*: An Appraisal of Its Clinical Significance as a Bloodstream Pathogens” Published March 2, 2012: <https://doi.org/10.1371/journal.pone.0032952>
6. Wilks, M.; Wiggins, R.; Whiley, A.; Hennessy, E.; Warwick, S.; Porter, H.; Corfield, A.; Millar, M. Identification and H₂O₂ production of vaginal lactobacilli from pregnant women at high risk of preterm birth and relation with outcome. *J. Clin. Microbiol.*, (2004) 42, 713-717.
7. Zárate, G.; Nader-Macías, M.E. Influence of probiotic vaginal lactobacilli on *in vitro* adhesion of urogenital pathogens to vaginal epithelial cells. *Lett. Appl. Microbiol.*, (2006) 43, 174-180.
8. Braz. J. Microbiol. vol.41 no.1 São Paulo Jan./ Mar. 2010 <http://dx.doi.org/10.1590/S1517-83822010000100002>.
9. Sagar Aryal “Germ Tube Test- Principle, Procedure, Results, Interpretation and Limitations”Jan.05.2015 www.microbiologyinfo.com.
10. J. C. M. De Man, Rogosa, and M. E. Sharpe, “A medium for the cultivation of Lactobacilli,” Journal of Applied Microbiology, 1960. vol. 23, no. 1, pp. 130-135.
11. International Journal of Life Sciences Biotechnology and Pharma Research April 2015 Vol.4, No. 2 .
12. Jara S., Sanchez M., Vera R., Cofre J., Castro E. The inhibitory activity of *Lactobacillus* spp. isolated from breast milk on gastrointestinal pathogenic bacteria of nosocomial origin. *Anaerobe*. 2011 ;17:474–477.
13. Gita Eslamisudabeh Taheri EznollahAzargashb, Rahelehkarimiravesh Inhibitory Effect of *Lactobacillus rhamnosus* on pathogenic bacteria Isolated from women with Bacterial Vaginosis. *Novel Biomed* 2014 (2):64-68;
14. Tsai CC, Lin p.p., Hsieh Y.M. Three *Lactobacillus* strains from healthy infant stool inhibit enterotoxigenic *Escherichia coli* grown in vitro *Anaerobe*.2008.14:61-67.

15. Aroutcheva, A.; Gariti, D.; Simon, M.; Shott, S.; Faro, J.; Simoes, JA; Gurguis, A; Faro, S. Defense factors of vaginal lactobacilli. *Am. J. Obstet. Gynecol.*, (2001) 185, 375-379.
16. Mija, V.D.; Duki, S.V.; Opavski, N.Z.; Duki, M.K.; Ranin, L.T. Hydrogen peroxide producing lactobacilli in women with vaginal infections. *Eur. J. Obst. Gynecol. Reprod. Biol.*, (2006). 129, 69-76.
17. Tomas, M.S.; Bru, E.; Nader-Macías, M.E. Comparison of the growth and hydrogen peroxide production by vaginal lactobacilli under different culture conditions. *Am. J. Obstet. Gynecol.*, (2003). 188, 35-44.
18. Kulisaar, T.; Zilmer, M.; Mikelsaar, M.; Vihalemm, T.; Annuk, H.; Kairane, C.; Kilk, A. Two antioxidative lactobacilli strains as promising probiotics. *Int. J. Food Microbiol.*, (2002). 72, 215-224.
19. Boris, S.; Barbès, C. Role played by *Lactobacillus* in controlling the population of vaginal pathogens. *Microbes Infect.*, (2000). 2, 543-546.
20. Ocaña, V.S.; Nader-Macías, M.E. Vaginal lactobacilli: self- and co-aggregation ability. *Br. J. Biomed. Sci.*, (2002). 59, 183-190.

Effect of Auditory Verbal Working Memory Training on Speech Perception in Noise in Older Adults

Ashwini Sandra¹, Somashekara Haralakatta Shivananjappa², Arivudai Nambi Pitchaimuthu³

¹Postgraduate Student, ²Assistant Professor (Selection Grade), ³Associate Professor, Department of Audiology and Speech language Pathology, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education (MAHE), Mangalore, Karnataka, India

ABSTRACT

Background: Older adults exhibit poor speech perception in noise due to poor spectral, temporal and cognitive processing. According to “ease of language understanding model” good working memory capacity is required to compensate for aberration in peripheral auditory processing so that optimum level speech of understanding can be maintained. However, there is no consensus on the effect of enhanced working memory capacity through auditory training on speech perception. Hence, the effect of working memory training on speech perception in noise in older adults needs to be investigated.

Objective: To investigate the effect of auditory verbal working memory training on speech perception in noise in older adults.

Method: The present study involved a “two groups, nonrandom selection, pre-test, post-test” study design. Twenty-nine normal hearing older adults within the age range of 61-80 years and 14 of them formed the control group, and 15 of them formed an experimental group. In Phase, I of study, working memory ability and speech perception in noise (SNR-50) were assessed in both the groups. In Phase II the participants in the experimental group were trained using working memory training module. In the last phase of the study, working memory, and SNR-50 were reassessed. Then the pre and post-training scores were compared in both groups.

Results : Wilcoxon’s signed rank test revealed that working memory training had positive effect on working memory ability and SNR-50.

Conclusions: Working memory training can improve working memory capacity which can in turn improve speech perception in noise.

Keywords: Older adults; working memory capacity; digit backward recall; stroop task; SNR50

INTRODUCTION

One of the growing concerns among elderly individual is age related changes in sensory abilities.

Corresponding author:

Arivudai Nambi Pitchaimuthu,

Associate Professor, Department of Audiology & Pathology, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education (MAHE), Mangalore-575001, Karnataka, India

Mobile: +919731141315

Email address: arivudai.nambi@manipal.edu

Age related changes in auditory processing and also called as “auditory aging” starts as early as the fourth decade onwards ¹. A pervasive characteristic of aging is an inability to understand speech particularly in the presence of background noise or reverberation ². Studies have shown that older adults have more difficulty in understanding speech compared to younger adults even when they are matched to hearing acuity ³ and for the ability to understand speech in quiet ^{4,5} based both peripherally and centrally, has been an important topic of hearing research for several decades. In this review, recent investigations are classified into five problem areas: the prevalence and temporal progression of IAIA

and their relation to presbycusis sensorineural hearing loss; the deficit of speech understanding in aging; other auditory abilities affected by age; the etiology of IAIA; and the rehabilitation of auditory functions in the elderly. The work reviewed bears witness to a vigorous current worldwide interest in these questions by researchers in various disciplines. The intense research effort, however, is in contrast with the low prevalence of hearing aid use by the elderly with auditory handicap. (C. Possible reasons for poor speech perception could be a decline in auditory temporal, spectral and cognitive processing. Additionally, the aging process reduces the working memory ability ^{6,7}a key determinant of many higher-order cognitive functions, declines in old age. Current research attempts to develop process-specific WM training procedures, which may lead to general cognitive improvement. Adaptivity of the training as well as the comparison of training gains to performance changes of an active control group are key factors in evaluating the effectiveness of a specific training program. In the present study, 55 younger adults (20-30 years of age. Due to poor storage capacity ⁸, elderly listeners may not be able to hold the necessary information's required to understand speech resulting in poor speech perception abilities. Since older adults have working memory deficits, they are also more susceptible to the distracting effects of background noise resulting in poor speech perception in noise ⁹. The contribution of working memory to speech perception in noise can be best explained using Ease of Language Understanding (ELU) model ¹⁰. This model assumes that speech perception is a result of implicit and explicit information processing. When a clean speech signal is presented, phonological matching to memory representations occurs rapidly, and speech understanding takes place implicitly. However, when the target speech is corrupted by background noise, matching to phonological representations does not occur rapidly. Hence implicit processing fails, and explicit processing is needed. Explicit processing utilizes the working memory resources to repair the misunderstandings and loss of information's caused by background noise. In older adults, implicit processing of speech in noise is affected because of degradation of target speech by noise and poor auditory processing ¹¹. Hence, there is higher demand for explicit processing. According to this model, good working memory capacity is required to compensate for aberration in peripheral auditory processing so that optimum level speech of understanding can be maintained. However,

less empirical evidence is available for supporting this hypothesis. Hence, effect of working memory training on speech perception in noise in older adults needs to be investigated. Few attempts have been made to study the effect of working memory training on speech perception in noise in young adults ⁶ and in individuals with hearing impairment ¹². However, the assessment and training procedures are not available in the Kannada language and also the assessment and training of verbal working memory is mostly language dependent. Hence, it is essential to investigate the effect of auditory working memory training (in Kannada language) on speech perception in noise in Kannada speaking older adults.

METHOD

Participants

The present study involved "two groups, nonrandom selection, pre-test, post-test" study design. The study protocol was approved by institutional ethical committee of Kasturba Medical College, Mangalore. Twenty-nine normal hearing older adults within the age range of 61-80 with the mean age of 66.8 years participated in the current study. The participants who were native speakers of Kannada possessing the pure tone thresholds ≤ 25 dBHL at audiometric octave frequency from 250 Hz to 4 KHz and also a score ≥ 26 on mini mental status examination (MMSE) were included in the study. The participants were then divided into two groups using block random sampling method (1) Control group (2) Experimental group, with 15 in experimental group and 14 in control group. An informed consent was obtained from all the participants prior to the conduction of the study.

Procedure

In phase I, the working memory ability and speech perception in noise were assessed in all the participants of both the groups. The working memory ability was assessed using digit backward recall (DBR) and stroop task. In phase II of the study, experimental group was subjected to working memory training. The training was carried out for duration of two weeks. In phase III, working memory ability and speech perception in noise were reassessed in both the groups.

Experimental tasks

Stroop task.

Two speech tokens /gʌndʌsu/ and /heŋʌsu/ meaning

male and female respectively spoken by both male and female in Kannada were recorded and used. Congruent trials consisted of the word “/g^nd^su/” spoken by male speaker, and the word “/heη^su/” spoken by the female speaker. In contrast, incongruent trials consisted of the word “/g^nd^su/” spoken by a female speaker and the word “/heη^su/” spoken by the male speaker. Twenty congruent trials and twenty incongruent trials were presented to all the participants. Participants were asked to respond as quickly as possible by pressing the right arrow key whenever they heard a male voice and left arrow key whenever they heard a female voice. The reaction time for every correct response for all the four conditions was noted and averaged.

Digit backward recall task

Numbers from 1-9 excluding 2 and 9 in Kannada spoken by the female speaker was recorded. These tokens were presented randomly in sequential order with interstimulus interval of 250 sec. Participants were asked to repeat the series of spoken digits in the backward order. The test began with a span length of 3 digits and progressed until a particular span length was repeated incorrectly. With every correct response, the series increased in number till the participant responded incorrectly, following which the length decreased by 1 step. The procedure was terminated after four consecutive trials. If the reversal ended with a correct response, it was taken as the score, if it ended with an incorrect response; the final correct response was taken as the score.

Speech perception in noise (SNR50).

QuickSIN protocol was used to estimate speech perception in noise. The target signal was kept constant whereas the root mean square amplitude of noise (4 talker speech babble- 2 males and 2 females) was varied to form sentences with varying Signal to Noise Ratio (SNR), ranging from +20 to -10dB. Two lists of Kannada QuickSIN, containing seven sentences in each list were used. In each list the first sentence was presented at +20 dB SNR and the SNR was reduced in 5 dB steps for the subsequent sentences. Thus, the last sentence was presented at -10 dB SNR. Each listener's task during the test was to repeat the sentences presented. Each participant was instructed to listen carefully and repeat the word. They were told to guess, if necessary. Each correctly repeated word was awarded one point

for a total possible score of 35 points per list. Further, using Spearman and Karber equation, total score was converted into SNR50. Finally, SNR-50 of both the lists was averaged.

Training Procedure

Participants in the experimental group underwent training intended to enhance verbal working memory. The training phase consisted of 4 levels. Level I consisted of three word meaningful sentences e.g., /na:εmɖa fαεε rαdʒε/; Level II consisted of four word meaningful sentences, e.g., /na:vu εla:ronɖε αdʒi ma:neεε hogu:εve/; Level III consisted of five word meaningful sentences, e.g., /mɖu nαnαεε fαεjαli ba:huma:nagαlu ɖorαku:αdε/; Level IV consisted of six word meaningful sentences, e.g., /a: ɖina ba:hαja ma:εja:guɖαnu ba:laki:ju nodu:ɖi:αu/. In the first session participants were presented 15 sentences from the level I through the headphone. The instructions given included- (1) Repeat the sentence in the reverse order; (2) Repeat the sentence in the order of word length; (3) Tell the number of syllable in the given word and further tell the syllable in the reverse order. Following the response given by the participant for an instruction, subsequently, the next instruction would follow. Subsequent levels were followed in the similar fashion. The training was terminated at level IV which included six word sentences.

Participants were also trained for selective attention using stroop stimulus. Two speech token “/ba:la ki:vi/” and “/εda ki:vi/” were used for stroop task. The token “/ba:la ki:vi/” and “/εda ki:vi/” mean right ear and left ear respectively in Kannada language. The tokens were presented randomly in one of the ears. Ten congruent and ten incongruent trials were presented. The participants were instructed to press “/ba:la ki:vi/” on the screen if the word was heard in the right ear, and “/εda ki:vi/” if it was heard in the left ear irrespective of the word presented. The duration for which response token was available on the screen was controlled, and the participants were trained for the response token duration within 4 seconds initially, the timings were further reduced to 3seconds once the responses in the 4 seconds were stabilized. The same was carried out for 2 seconds and 1second.

Instrumentation

The stimuli for experiments were presented from Acer Aspire one E 15 laptop. Psychopy2 version 1.77.01 software was used to generate and present the stimulus

for the stroop task. Output of the laptop was routed through 24-bit Creative sound blaster X Fi USB2 sound card. TDH-39 headphone with circum-aural PELTER earmuffs was used to present the stimuli for experimental procedures.

RESULTS

Stroop Task

Wilcoxon Signed rank test revealed a significant main effect of training on stroop reaction time in the experimental group ($Z = -2.329, p = .020$). Difference in stroop reaction time between pre-test and post-test session was significant even in the control group ($Z = -2.669, p = .008$). Stroop reaction time was reduced in post-training session when compare to pre-training session in experimental group. Stroop reaction time was reduced in post-test when compare to pre-test even in control group. However, the reduction in stroop reaction time was larger for experimental group. Median values for stroop reaction time for both groups is represented in Figure 1.

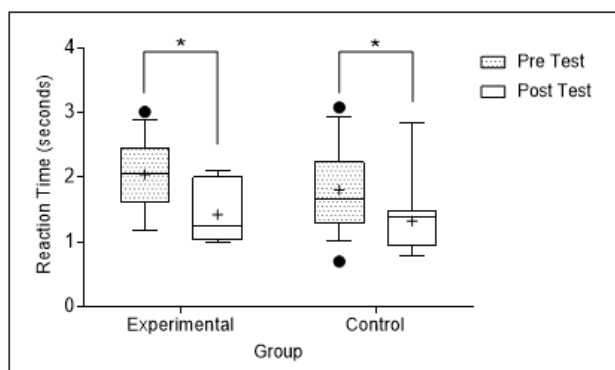


Figure1: whiskers represent median and 10th to 90th percentile values of stroop reaction time.

Digit Backward Recall Task

Wilcoxon Signed rank test was used to investigate the pre-post training effect on DBR. Analysis showed no significant difference in digit backward recall span length ($Z = -2.828, p = .530$) on pre-post-test in control group. However, significant main effect of training on DBR was seen in experimental group ($Z = -1.414, p = .331$). DBR improved following training in experimental group. Median values for DBR task for both experimental and control group is represented in Figure 2.

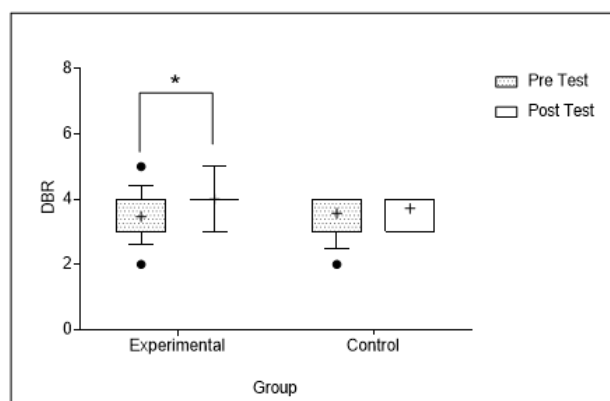


Figure 2: whiskers represent median and 10th to 90th percentile values of stroop reaction time.

SNR-50

To investigate if there is significant main effect of WM training on SNR-50, Wilcoxon Signed rank test was used. The analysis in the experimental group revealed that, there was significant main effect of training on SNR-50 ($Z = -2.50, p = .012$). SNR50 of individuals in experimental group was significantly improved following working memory training. However, comparison of pre-test and post-test SNR 50 in the control group revealed no significant difference ($Z = -.33, p = .739$). Median values for SNR-50 for both experimental and control group is represented in Figure 3.

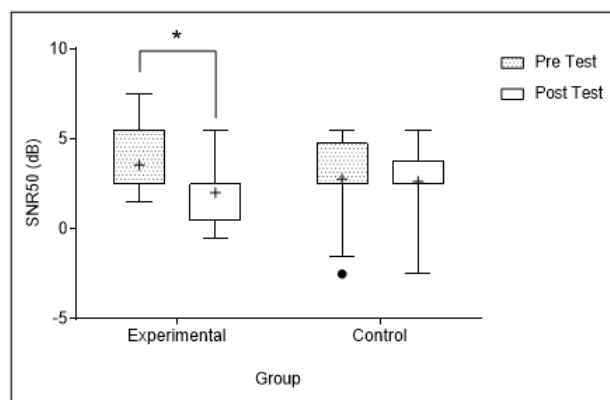


Figure 3: whiskers represent median and 10th to 90th percentile values of stroop reaction time.

DISCUSSION

The positive effect of working memory training on DBR, stroop reaction time and SNR-50 can be explained using transfer effects - near and far transfer effects. In the present study the positive effect of training on DBR and Stroop task can be attributed to near transfer effect, as the tasks used for training was similar to DBR and Stroop tasks. Earlier studies also have shown the presence of near transfer effect but absence of far transfer effect of

working memory training in older adults¹³⁻¹⁵ young-old (65-74 years). Similarly, near transfer effect of working memory training on complex span task is also reported¹⁵. However, Schmiedek¹⁶ reported a far transfer effect too in older adults. Transfer effect seen in the current study can be probably due to plastic changes in the brain following training. For the Transfer effect to take to place, training procedure and outcome assessment procedure should share some common neural mechanism¹⁷.

One important observation in the current study is that, working memory training had improved SNR50 indicating a possible far-transfer. Similar far transfer effect of short term working memory training on SNR50 was reported in young adults¹⁸. Improvement in SNR50 following working memory training can be explained with the help of Ease of Language Understanding (ELU) model^{10,19}. According to ELU, poorly defined speech sound representations leads to mismatch in phonologically challenging tasks and to resolve this mismatch, increased working memory capacity is essential. When the speech signal is corrupted by noise, automatic matching of each syllable of the input signal to stored representations in long-term memory fails. Hence, working memory plays a major role decoding the information from the noise corrupted signal. As per this framework if, an individual's working memory is enhanced there can be improvement in speech understanding in noise. In the current study, working memory training has enhanced working memory capacity which would have led to better SNR50 in older adults. The training related enhancement in speech perception could be also because of facilitation of individuals' ability to inhibit distracting information such as background noise. It has been observed that several cognitive abilities, such as attention and inhibition, are thought to interact with WM²⁰.

CONCLUSION

Working memory training can improve working memory capacity which in turn improve speech perception in noise.

Conflicts of Interest and Source of Funding:

None declared.

REFERENCES

1. Kumar AU, Sangamanatha A V. Temporal processing abilities across different age groups. *J Am Acad Audiol* [Internet]. 2011 Jan;22(1):5-12. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21419065>
2. Crandell CC. Individual differences in speech recognition ability: implications for hearing aid selection. *Ear Hear*. 1991 Dec;12(6 Suppl):100S-108S.
3. Arivudainambi PM, Sangamanatha AV, Vikas MD, Bhat JS, Shama K. Perception of Spectral Ripples and Speech Perception in Noise by Older Adults. *Ageing Int* [Internet]. 2016 Sep 15 [cited 2016 Sep 28];41(3):283-97. Available from: <http://link.springer.com/10.1007/s12126-016-9248-4>
4. Divenyi PL, Simon HJ. Hearing in aging: issues old and young. *Curr Opin Otolaryngol Head Neck Surg*. 1999;7(5):282-9.
5. Pichora-Fuller MK, Souza PE. Effects of aging on auditory processing of speech. *Int J Audiol*. 2003 Jul;42 Suppl 2:S11-6.
6. Brehmer Y, Westerberg H, Bäckman L. Working-memory training in younger and older adults: training gains, transfer, and maintenance. *Front Hum Neurosci*. 2012 Jan;6(17):63.
7. Hussey EK, Novick JM. The benefits of executive control training and the implications for language processing. *Front Psychol*. 2012 Jan;3:158.
8. Berryhill ME, Chein J, Olson IR. At the intersection of attention and memory: The mechanistic role of the posterior parietal lobe in working memory. *Neuropsychologia*. 2011;49(5):1306-15.
9. Tun PA, O'Kane G, Wingfield A. Distraction by competing speech in young and older adult listeners. *Psychol Aging* [Internet]. 2002 Sep [cited 2014 Jan 28];17(3):453-67. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/12243387>
10. Rönnerberg J, Rudner M, Foo C, Lunner T. Cognition counts: a working memory system for ease of language understanding (ELU). *Int J Audiol* [Internet]. 2008 Nov [cited 2014 Jan 9];47 Suppl 2:S99-105. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19012117>
11. Salthouse TA. The processing-speed theory of adult age differences in cognition. *Psychol Rev*. 1996;103:403-28.
12. Rudner M, Rönnerberg J, Lunner T. Working memory supports listening in noise for persons with hearing

- impairment. *J Am Acad Audiol.* 2011;22:156–67.
13. De Beni R, Borella E, Carretti B. Reading comprehension in aging: The role of working memory and metacomprehension. *Aging, Neuropsychol Cogn.* 2007 Mar;14(2):189–212.
 14. Brehmer Y, Rieckmann A, Bellander M, Westerberg H, Fischer H, Backman L. Neural correlates of training-related working-memory gains in old age. *Neuroimage.* 2011;58(4):1110–20.
 15. Richmond LL, Morrison AB, Chein JM, Olson IR. Working memory training and transfer in older adults. *Psychol Aging.* 2011;26(4):813–22.
 16. Schmiedek. Hundred days of cognitive training enhance broad cognitive abilities in adulthood: findings from the COGITO study. *Front Aging Neurosci* [Internet]. 2010;2(July):1–10. Available from: <http://journal.frontiersin.org/article/10.3389/fnagi.2010.00027/abstract>
 17. Dahlin E, Neely AS, Larsson A, Bäckman L, Nyberg L. Transfer of learning after updating training mediated by the striatum. *Science.* 2008 Jun;320(5882):1510–2.
 18. Ingvalson EM, Dhar S, Wong PCM, Liu H. Working memory training to improve speech perception in noise across languages. *J Acoust Soc Am* [Internet]. 2015 Jun [cited 2016 Feb 18];137(6):3477–86. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26093435>
 19. Rönnerberg J, Lunner T, Zekveld A, Sörqvist P, Danielsson H, Lyxell B, et al. The Ease of Language Understanding (ELU) model: theoretical, empirical, and clinical advances. *Front Syst Neurosci.* 2013;7:31.
 20. Baddeley AD, Hitch GJ. Developments in the concept of working memory. *Neuropsychology.* 1994;8(4):485–93.

Cognitive Functions after Neonatal Encephalopathy in a Coastal City of South India-A Retrospective Cohort Study

Aby Dany Varghese¹, Vaman Kulkarni², Sowmini P.Kamath³, Rathika D Shenoy,⁴ Shanthram Baliga B⁵

¹Assistant Professor, Department of Pediatrics, Believers Church Medical College Hospital, Thiruvalla, Kerala,

²Associate Professor, Department of Community Medicine, Kasturba Medical College, (a constituent unit of Manipal Academy of Higher Education, Mangalore, India, ³Associate Professor, Department of Pediatrics, Kasturba Medical College, (a constituent unit of Manipal Academy of Higher Education, Mangalore, India,

⁴Professor, Department of Pediatrics, K S Hegde Medical Academy, NITTE University, Deralakatte, Mangalore, India, ⁵Professor, Department of Pediatrics, Kasturba Medical College, (a constituent unit of Manipal Academy of Higher Education, Mangalore, India

ABSTRACT

Background: Cognitive impairment either with presence or absence of neuromotor disability is a pertinent issue after neonatal encephalopathy (NE).

Aims and objectives: To assess motor and cognitive functions in survivors of NE and to correlate them with NE clinical scoring/staging.

Methodology: A hospital based retrospective cohort study was conducted at a tertiary teaching medical college hospital. Medical records were studied and survivors of term neonates with NE that were managed in the neonatal intensive care unit (NICU) were considered as cases. Children born as term babies during the same period requiring no intensive care were taken as controls. A onetime follow up of study subjects at 6 – 8 years of age was carried out to assess the motor and cognitive function by standard tests. Data was entered and analyzed by SPSS Version 11.

Results: As per Millers encephalopathy scores, majority (52.6%) had an encephalopathy score of one. Seventeen (89.5%) cases were found to be normal by Gross Motor Function Classification System (GMFCS). By Bender Gestalt II visual motor and visual perception tests, five (26.3%) cases and nine (47.4%) cases were in the 0-25 percentile for age respectively. The difference in mean IQ level between cases and controls was significant statistically ($p < 0.001$). The mean values of Malins verbal and performance tests, IQ, Bender copy and recall tests between cases and controls with the encephalopathy scores showed statistical significance ($p < 0.05$).

Conclusions: Children who had suffered NE had significant affection of IQ, visual-motor, visual perception and memory in comparison to controls. Greater the encephalopathy score, greater was the cognitive impairment.

Keywords: Child, Cognition, Critical care, Bender Gestalt test, Visual perception.

Corresponding author:

Sowmini P Kamath

Associate Professor, Department of Pediatrics, Kasturba Medical College, (a constituent unit of Manipal Academy of Higher Education, Mangalore-575001, India. Email id: kamathsowmini@gmail.com

INTRODUCTION

Neonatal encephalopathy (NE) is a clinical syndrome noted in the early days of life of a term infant characterized with neurological impairment. Clinical manifestations include depression of tone/reflexes, difficulty in initiating and maintaining respiration, subnormal level

of consciousness and seizures.¹ A clinical scoring by Miller and staging by Sarnat and Sarnat are widely used in identifying and grading of NE.^{2,3} The incidence of NE is between 2-6 per 1000 term neonates.⁴⁻⁸ NE is associated with early neonatal mortality and long term neurodevelopmental sequel.^{9,10}

The etiology of NE is heterogeneous and neonates with birth asphyxia and hypoxic ischemic encephalopathy (HIE) constitute the majority. The other etiologies would include metabolic causes like hypoglycemia with persistent seizures, inborn errors of metabolism, central nervous system (CNS) malformations and infections. Role of antepartum and intrapartum factors in the pathogenesis of NE have been studied.^{6,11} However using magnetic resonance imaging modality in cohorts of NE, it was found that most of the brain injuries usually occurred near or at the time of birth.^{12,13}

Functional motor deficits can be detected early during infancy, however cognitive deficits appear slowly and may become obvious during preschool and school period, hence constant follow up is mandatory among the NE survivors. Cognitive development includes the ability to read, talk, learn to write, memorize, calculate, organize, conceptualize, paying attention and social interaction with appropriate behavior. Cognitive dysfunction manifests with scholastic backwardness, poor coordination, behavioral problems, and hyperactivity along with specific learning disabilities. This follow up study was conducted to determine the motor and cognitive functions of term neonates with neonatal encephalopathy, managed in our neonatal unit, at school age.

MATERIALS AND METHOD

A hospital based retrospective cohort study was conducted at the pediatric outpatient services of a tertiary teaching medical college hospital, Mangalore between July 2009 and June 2010. Survivors of term neonates who fulfilled the criteria for NE^{1,2} during the first 72 hours of life and managed in the NICU between 2001 and 2003 in the same hospital were taken as cases. Children born as term babies during the same period requiring no intensive care were taken as controls. Neonates with prematurity, major congenital malformations, intra uterine infections, sepsis, pulmonary and cardiovascular disorders resulting in hypoxia were excluded from the study.

After obtaining the approval from the institutional Ethics Committee (IEC), necessary permissions were taken from the hospital authorities. The study subjects were selected using convenient sampling technique. NICU admission/discharge records between 2001 and 2003 were analyzed. Subjects and controls fulfilling the inclusion criteria were requested for a follow up visit at the OPD services of the hospital. Details of antenatal, natal, postnatal data and NICU course were entered in a semi structured pretested proforma. Clinical Scoring and staging of NE were documented.

A onetime follow up at 6 – 8 years of age was carried out to assess the motor and cognitive function. Subject's parents/guardians were approached and explained about the objectives of the study in a language they understood and a participant information letter was provided to them. A written informed consent was obtained from each one of the parent/guardian. A detailed physical examination with specific emphasis on development and neurological evaluation was carried out.

The disability was assessed by GMFCS, a five level classification system designed to detect cerebral palsy.¹⁴ Visual motor and perception functions were assessed by Bender Gestalt II test, which is a psychological assessment tool that evaluates visual maturity, visual motor integration skills and recall phase (for visual memory).¹⁵ Cognitive abilities were assessed by Malin's Intelligence scale for Indian children, which generates a performance IQ, verbal IQ, and a total IQ score.¹⁶ In case of parental concerns on hearing and speech defects appropriate referral was done for a detailed assessment. All the tests that had been used in this study had been validated in the pediatric population.

Analysis was done using Statistical Package for Social Sciences (SPSS Version 11.5, Chicago IL). Correlations of data between the cases and controls and within the risk groups were done by Kruskal Wallis test and Mann Whitney U test. A p value of <0.05 was considered significant.

RESULTS

Of the 40 cases enrolled, 19 cases were included. The baseline characteristics of the study are as in table 1. Table 2 depicts the Millers encephalopathy scoring for the study subjects. Greater than half of the cases (52.6%) had an encephalopathy score of one. Functional and cognitive assessment tests are as in table 3. By GMFCS,

majority had no motor disabilities. As per the Bender Gestalt II tests, visual motor and visual perception was severely affected in five (26.3%) and 9 (47.4%) cases (Table 3).

Malins verbal and performance tests had affected cases more than controls, the difference being significant (Table 4). The mean IQ level between the cases and controls was significant statistically ($p < 0.001$). Recall and recopy tests of Bender Gestalt II (table 4) revealed that the memory was more affected in cases than in controls and was found to be statistically significant ($p < 0.001$). The mean values of Malins verbal / performance tests, IQ and Bender copy/ recall tests were studied individually with the encephalopathy scores (table 5). The mean values in the above tests with encephalopathy score 1 and 2 were almost equal. The mean values of all the above tests were of higher values in cases with encephalopathy score 4 than with encephalopathy score 3. This difference was probably attributed to the early stimulation by the motivated and determined parents for their children who had encephalopathy score of 4. Among the behavioral problems, in our study, 6(31.6%) cases had temper tantrums. There were no children who had associated ADHD and autism.

Table 1: Basic characteristics of cases (n=19) and controls (n=19)

Variable	Cases (N=19) n(%)	Control (N=19) n(%)
Age in years		
6	9(47.4)	3(15.8)
7	6(31.6)	7(36.8)
8	4(21.1)	9(47.4)
Gender		
Males	12(63.2)	8(42.1)
females	7(36.8)	11(57.9)
Parity of mothers		
Primigravida mothers	16(84.2)	13(68.4)
Multigravida mothers	3(15.8)	6(31.6)
Evidence of developmental delay		
Present	5(26.3)	0
Absent	14(73.7)	19(100)

Cont... Table 1: Basic characteristics of cases (n=19) and controls (n=19)

Gross motor function classification system		
Normal	17(89.5)	19(100)
Abnormal	2(10.5)	0
HIE stage(Sarnat and Sarnat)		
Stage 1	11(57.9)	-
Stage 2	6(31.6)	-
Stage 3	2(10.5)	-

Table 2: Encephalopathy score distribution among cases and controls

Encephalopathy score	Groups	
	Cases (N=19) n(%)	Controls (N=19) n(%)
0	0	19(100%)
1	10(52.6%)	0
2	1(5.3%)	0
3	4(21.1%)	0
4	4(21.1%)	0
5	0	0

Table 3: Functional and cognitive assessment tests among cases and controls

Name of the tests	Groups	
	Cases(N=19) n (%)	Controls(N=19) n (%)
Gross motor function classification system		
Normal	17(89.5)	19(100%)
Abnormal	2(10.5)	0
Bender motor (percentile for age)		
0-25	5(26.3%)	0
26-50	2(10.5%)	1(5.3%)
51-75	3(15.8%)	4(21.1%)
76-100	9(47.4%)	14(73.7%)
Bender visual perception (percentile for age)		
0-25	9(47.4)	4(21.1)
26-50	4(21.1)	1(5.3)
51-75	2(10.5)	0
76-100	4(21.1)	14(73.7)

Table 4: Comparison of cognitive assessment tests among cases (N=19) and controls (N=19)

	Group	Mean ±SD	P value
Malin verbal	Cases	83.93(±22.15)	p<0.001
	Controls	121.53(±13.82)	
Malin Performance	Cases	65.44(±28.26)	p<0.001
	Controls	113.05(±11.13)	
IQ	Cases	74.65(±22.24)	p<0.001
	Controls	117.29(±11.96)	
Bender copy	Cases	67.24(±41.77)	p<0.001
	Controls	94.01(±13.39)	
Bender reall	Cases	30.67(±25.43)	p<0.001
	Controls	83.43(±20.63)	

*Mann Whitney test

Table 5: Comparison of cognitive assessment tests with encephalopathy scores

Test name	Encephalopathy score	Number of cases	Mean values±	p value
Malin verbal	1	10	96.75 (±15.04)	0.014
	2	1	102.00	
	3	4	56.88 (±19.41)	
	4	4	74.44 (±11.66)	
Malin performance	1	10	80.70 (±11.09)	0.02
	2	1	87.20	
	3	4	39.44(± 28.67)	
	4	4	47.88(± 36.80)	
IQ	1	10	88.66(±10.77)	0.012
	2	1	94.6	
	3	4	48.19(±9.45)	
	4	4	61.13(±23.81)	
Bender copy	1	10	89.55(±20.13)	0.043
	2	1	99.90	
	3	4	21.83(±31.5)	
	4	4	48.70(±55.11)	
Bender recall	1	10	40.40(±23.3)	0.022
	2	1	76.83	
	3	4	8.39(±9.87)	
	4	4	17.07(±14.88)	

*Kruskal-Wallis test

DISCUSSION

The deficits in cognition and motor functional deficits are of great concern among NE survivors. Studies show that neonates with mild NE had no greater increased risk of cognitive deficits or subtle motor impairments.¹⁷⁻¹⁹ However neonates with severe NE had more risk of mental retardation and cerebral palsy.¹⁹⁻²¹

Studies have documented neonates with moderate NE had visual motor/perceptive dysfunction, memory impairments and hyperactivity as cognitive deficits with no functional motor deficits.^{17,18,20-22} Most often, there was delayed readiness to school with requirement of appropriate age based interventions at school and was not restricted to mental retardation .

Robertson et al studied HIE neonatal cohorts with age matched controls. Survivors without disability who had moderate NE had a greater risk of delayed readiness to school, lower scores for auditory memory, letter recognition, quantitative language, lower IQ and visual-motor integration (VMI) scores. They were similar to controls as in perceptual motor skills and receptive vocabulary, however there was significant delay in spelling, arithmetic and reading.¹⁹ Similarly other studies showed cognitive dysfunction among moderate to severe NE.²⁰⁻²² In our study, IQ levels visual-motor, visual perception and memory were more lower in the cases than the controls with worsening as the encephalopathy scores increased.

Gonzalez et al in his review study documented that despite absence of functional motor deficits, moderate /severe NE survivors had risk of developing cognitive defects especially if Magnetic resonance imaging (MRI) brain showed watershed pattern of injury.²³

In a review study on neonatal encephalopathy by van Handel M et al, children with mild NE had a near normal outcome while, children with severe NE had severe involvement of educational general intellectual capabilities and neuropsychological outcomes. There was heterogeneity with respect to outcomes in children with moderate NE and most of them had involvement of the domains such as arithmetic/mathematics, spelling and reading.²⁴

Among the behavioural problems in children with moderate NE, hyperactivity^{19,21,22} and autism with moderate and severe NE²⁵ have been reported. In our

study there was no case of ADHD observed.

NE survivors with abnormal MRI either had impaired neurological functions or minor difficulties in motor and perceptual functions when assessed at 5–6 years of age.¹⁷ In our study MRI was not done in study period mainly due to the feasibility issues. Based on brain injury patterns associated with NE on MRI, cognitive and behavioral issues could arise. Striatum and hippocampus were the most affected areas.²⁶⁻²⁸ These areas have been related with cognitive functions corresponding to attention and memory and may attribute to the pathogenesis of autism, ADHD and schizophrenia.^{28,29}

The present study has limitations. Good Enough Draw a man test which was initially planned as part of cognition assessment was not done due to subjective reasons most common being losing interest during the course of the administration of various tests. The sample size was small. There was a onetime contact with the subject. Studies on a large scale and using more tests with multiple interactions with subjects would help us to better understand affected areas of cognition and motor function.

CONCLUSIONS

Thus to conclude, there was statistical significant difference in IQ level between the cases and controls ($P < 0.001$) .Visual-motor, visual perception ($P < 0.001$) and memory was affected in cases compared to controls. Greater the encephalopathy score the IQ, visual motor, visual perception and memory were more affected.

Conflicts of Interest: The authors declare no conflict of interest

Source of Funding: None

Acknowledgements: We thank the children, parents/guardians who consented to participate in the study

Ethical Clearance taken from Institutional Ethics Committee, Kasturba Medical College, Mangalore, (a constituent unit of Manipal University)

REFERENCES

1. Nelson KB, Leviton A. How much of neonatal encephalopathy is due to birth asphyxia? *Am J Dis Child.* 1991;145:1325-31.

2. Millers SP, Latal B, Clark H, Barnwell A, Glidden D, Barkovich AJ, *et al.* Clinical signs predict 30 month Neurodevelopment outcome after neonatal encephalopathy. *Am J Obstet Gynaecol.* 2004; 190: 93-9.
3. Sarnat HB, Sarnat MS. Neonatal encephalopathy following fetal distress. A clinical and electroencephalographic study. *Arch Neurol.*1976; 33:696-705.
4. Volpe J. Neurology of the newborn. Philadelphia: WB Saunders; 2000.
5. Evans K, Rigby AS, Hamilton P, Titchiner N, Hall DM. The relationship between neonatal encephalopathy and cerebral palsy: a cohort study. *J Obstet Gynaecol.* 2001; 21:114–20.
6. Badawi N, Kurinczuk JJ, Keogh JM, Alessandri LM, O’Sullivan F, Burton PR, *et al.* Intrapartum risk factors for newborn encephalopathy: the Western Australian case–control study. *BMJ.*1998;317:1554–8.
7. Ellis M, Manandhar N, Manandhar DS, Costello AM. Risk factors for neonatal encephalopathy in Kathmandu, Nepal, a developing country: unmatched case– control study. *BMJ.*2000;320:1229–36.
8. Brown JK, Purvis RJ, Forfar JO, Cockburn F. Neurological aspects of perinatal asphyxia. *Dev Med Child Neurol.* 1974;16:567–80.
9. Levene MI. Management and outcome of birth asphyxia. In: Levene MI, Lilford RJ, Bennett MJ, Punt J, editors. *Fetal and neonatal neurology and neurosurgery.* London: Churchill Livingstone; 1995. pp. 427–442.
10. Ellis M, Manandhar DS, Manandhar N, Wyatt J, Bolam AJ, Costello AM . Stillbirths and neonatal encephalopathy in Kathmandu, Nepal: an estimate of the contribution of birth asphyxia to perinatal mortality in a low income urban population. *Paediatr Perinat Epidemiol.* 2000;14:39–52.
11. Badawi N, Kurinczuk JJ, Keogh JM, Alessandri LM, O’Sullivan F, Burton PR, *et al.* Antepartum risk factors for newborn encephalopathy: the Western Australian case control study. *BMJ.* 1998;317:1549-53.
12. Cowan F, Rutherford M, Groenendaal F, Eken P, Mercuri E, Bydder GM, *et al.* Origin and timing of brain lesions in term infants with neonatal encephalopathy. *Lancet.* 2003;361:736–42.
13. Miller SP, Ramaswamy V, Michelson D, Barkovich AJ, Holshouser B, Wycliffe N, *et al.* Patterns of brain injury in term neonatal encephalopathy. *J Pediatr.* 2005;146:453–60.
14. Palisano R, Rosenbaum P, Walter S, Russell D, Wood E, Galuppi B. Development and reliability of a system to classify gross motor function in children with cerebral palsy. *Dev Med Child Neurol.*1997;39:214-23.
15. Stinnett TA, Havey JM, Oehler Stinnett J. Current test usage by practicing school psychologists: a national survey. *J Psychoeduc Assess.*1994;12:331-50.
16. Malins AJ. Malins intelligence scale for children. *Indian J Ment Retard.*1971; 4:15-25.
17. Barnett A, Mercuri E, Rutherford M, Haataja L, Frisone MF, Henderson S, *et al.* Neurological and perceptual–motor outcome at 5–6 years of age in children with neonatal encephalopathy: relationship with neonatal brain MRI. *Neuropediatrics* 2002;33:242–8.
18. Robertson CM, Finer NN, Grace MG. School performance of survivors of neonatal encephalopathy associated with birth asphyxia at term. *J Pediatr.* 1989;114:753–60.
19. Robertson CM, Finer NN. Educational readiness of survivors of neonatal encephalopathy associated with birth asphyxia at term. *J Dev Behav Pediatr.*1988;9:298–306.
20. Dixon G, Badawi N, Kurinczuk JJ, Keogh JM, Silburn SR, Zubrick SR, *et al.* Early developmental outcomes after newborn encephalopathy. *Pediatrics.*2002;109:26–33.
21. Marlow N, Rose AS, Rands CE, Draper ES. Neuropsychological and educational problems at school age associated with neonatal encephalopathy. *Arch Dis Child Fetal Neonatal Ed.* 2005;90: F380–7.
22. Moster D, Lie RT, Markestad T. Joint association of Apgar scores and early neonatal symptoms with minor disabilities at school age. *Arch Dis Child Fetal Neonatal Ed.* 2002;86:F16–21.
23. Gonzalez FF, Miller SP. Does perinatal asphyxia impair cognitive function without cerebral palsy? *Arch Dis Child Fetal Neonatal Ed.* 2006; 91:F454-9.

24. van Handel M, Swaab H, de Vries LS, Jongmans MJ. Long-term cognitive and behavioral consequences of neonatal encephalopathy following perinatal asphyxia: a review. *Eur J Pediatr.* 2007;166:645-54.
25. Badawi N, Dixon G, Felix JF, Keogh JM, Petterson B, Stanley FJ, *et al.* Autism following a history of newborn encephalopathy: more than a coincidence? *Dev Med child Neurol.* 2006; 48:85-9.
26. Barkovich AJ. MR and CT evaluation of profound neonatal and infantile asphyxia. *AJNR Am J Neuroradiol.* 1992; 13:959-72.
27. Maneru C, Serra-Grabulosa JM, Junque C, Salgado-Pineda P, Bargallo N, Olondo M, *et al.* Residual hippocampal atrophy in asphyxiated term neonates. *J Neuroimaging.* 2003;13:68-74.
28. Toft PB. Prenatal and perinatal striatal injury: a hypothetical cause of attention deficit hyperactivity disorder? *Pediatr Neurol.* 1999; 21:602-10.
29. Delong GR. Autism, amnesia, hippocampus and learning. *Neurosci Biobehav Rev.* 1992;16:63-70.

Evaluation of Differentiation Tests for *Mycobacterium tuberculosis* from *Non tuberculous Mycobacteria* by MPT64 TB Rapid Test and Selective Inhibition with p-nitrobenzoic Acid

V Praveen Kumar¹, V Sreenivasulu Reddy², P Suresh¹, P Vamsi Muni Krishna¹, E Prabhakar Reddy³

¹Ph.D Scholar, Bharath University, Agaram Road, Selaiyur, Chennai, Tamilnadu, ²Professor, Dept. of Microbiology, ³Professor, Dept. of Biochemistry, Sri Lakshminarayana Institute of Medical Sciences, Pondicherry

ABSTRACT

Introduction: Rapid differentiation of the *Mycobacterium tuberculosis* complex (MTBC) and Non tuberculosis mycobacteria (NTM) is crucial to facilitate early and effective treatment of the patients. An immunochemistry-based MPT64 antigen detection test (MPT64 test) has reported higher sensitivity in the rapid diagnosis of *Mycobacterium tuberculosis* and differentiation from non tuberculous mycobacterium compared with conventional methods. **Materials and method:** A total of 927 clinical specimens were processed for tuberculosis. All the samples were decontaminated using NALC-NaOH and re-suspended sediments were inoculated for culture in Bact Alert 3D automation system, and in LJ media with Para nitro benzoic acid(Hi media) at a concentration of 500 µg/ml. **Results:** Of the 927 specimens processed for acid-fast bacilli, 462 were positive on solid and liquid media. 371 of the 462 positive cultures were identified as *Mycobacterium tuberculosis*, 91 isolates were identified as *Nontuberculous mycobacteria* by PRA -hsp65, PRA-16S 23S rRNA ITS. 368 out of 371 positive results for *M.tuberculosis* by MPT64 TB rapid test. Of the 91 *Non tuberculous mycobacteria* 90 had exhibited growth on LJ media with para nitro benzoic acid. **Conclusion:** Proper diagnosis is the first step towards better management and prevention of tuberculosis transmission. The immunochromatographic assay is a simple and rapid test with high specificity in discriminating between *Mycobacterium tuberculosis complex* and *Non tuberculous mycobacteria* in liquid cultures.

Keywords: Para nitro benzoic acid, MPT64 TB rapid test, Non tuberculosis mycobacteria, *Mycobacterium tuberculosis complex*.

INTRODUCTION

Tuberculosis is a highly infectious disease caused by *Mycobacterium tuberculosis complex* (MTBC) a potentially fatal disease of human and is now recognised as one of the most common opportunistic infection among immunocompromised presenting in the form of pulmonary, extrapulmonary and disseminated opportunistic infections.^{1,2}

Until recently, NTMs were not considered clinically important because they were not found to cause diseases. However, lately, the prevalence of clinical NTMs, especially pulmonary NTMs, has been on the increase worldwide. NTMs are clinically important as they triggers disease and true infection. The signs and symptoms of pulmonary infection due to MTBC or NTM often resemble, and their differentiation through acid fast stain is incomprehensible. There are over 170 species identified to date, and unlike *M. tuberculosis*, NTMs are generally free-living, ubiquitous organisms in the environment. The ecology of NTMs makes it easier for human exposure.^{3, 4, 5,6}

Corresponding author:

V. Praveen Kumar

Ph.D Scholar, Sri Lakshminarayana Institute of Medical Sciences, (Affiliated to Bharath University) Pondicherry – 605502, Mobile: 91 8142037662, 91 7674038096, Email: vpraveenkumar4@gmail.com

Among NTM, rapidly growing mycobacteria (RGM) are those which show visible growth on solid

culture media within seven days.⁷ *Mycobacterium tuberculosis* complex (MTBC) and non-tuberculous mycobacteria (NTM) may or may not have same clinical presentations, but the treatment regimens are always different.¹ NTM is easily misdiagnosed as *M.tuberculosis* and multidrug-resistant(MDR), XDR (Extreme drug resistant) TB and are inappropriately managed with 1st line anti tubercular drugs because of lack of discrimination between MTB and NTMs in small hospital laboratories.⁸

Introduction of the liquid culture automated systems has significantly shortened the cultivation time of mycobacteria.⁹ In 2007 WHO recommended liquid TB culture rapid detection and drug susceptibility test as standard method for TB diagnosis and case management, automated culture system like MGIT, BACTEC 460, MB Bact alert 3D automation system have significantly reduced the turnaround time for culture but do not help in differentiating MTB and NTMs.³ Liquid cultures positive for acid-fast bacilli (AFB) indicate the presence of mycobacteria, requiring discrimination between *Mycobacterium tuberculosis complex* and nontuberculous mycobacteria¹⁰

Excretory proteins such as MPB64 and MPT63 secreted during bacterial growth have shown potential for differentiating *Mycobacterium tuberculosis complex* and Nontuberculous mycobacteria with high accuracy.^{11,12} A new rapid Immunochromatographic test kit(SD Bioline MPT64TB Ag Kit) for detection of MPT 64 Antigen in *M. tuberculosis* isolates using mouse monoclonal MPT 64 Antibody developed by SD Bioline, South Korea and Growth on LJ medium containing Para nitro benzoic acid was evaluated for rapid identification of *M. tuberculosis* isolates.¹³

MATERIALS AND METHOD

The present study was conducted over a period of one year (February 2014- January 2015) in Department of Microbiology, Sri Lakshminarayana Institute of Medical Sciences, Pondicherry to investigate the prevalence of NTM strains. A total of 927 clinical specimens suspected of pulmonary and extra pulmonary tuberculosis were processed. The samples were decontaminated using NALC-NaOH and re-suspended sediments inoculated for culture in Bact Alert 3D automation system, as per the manufacturer's guidelines on routine basis. Simultaneously in LJ media with Para nitro benzoic

acid(Hi media) at a concentration of 500 µg/ml., then incubated at 37 °C for a maximum of eight weeks. Growth of *M. tuberculosis* is inhibited by p-Nitrobenzoic acid (PNB), whereas, NTM are resistant.¹¹

The test uses monoclonal anti-MPT64 antibodies to detect MTBC in samples from positive MB Bact alert 3D automation system. MPT64 - ICA displays a strong reaction band with organisms belonging to the *M. tuberculosis* complex but not with *Non tuberculosis mycobacteria*.⁵

RESULTS

A total of the 927 specimens processed for acid-fast bacilli, 462 were positive on solid and liquid media concurrently with conventional phenotypic methods like growth on LJ media and Bact alert 3D automation system, molecular methods like PRA-hsp65, RFLP 16S 23S rRNA ITS gene and hsp65 gene sequencing and the MPT64 assay. Of the 462 positive liquid cultures, 371 were identified as *Mycobacterium tuberculosis*, 91 isolates were identified as *Non tuberculous mycobacteria* by PRA -hsp65, RFLP 16S 23S rRNA ITS gene and hsp65 gene sequencing. The sensitivity of MPT64 assay is 99.1%, 368 out of 371 positive results for *M.tuberculosis* in liquid cultures.

Of the 91 *Non tuberculous mycobacteria* 90 had grown on LJ media with para nitro benzoic acid, one strain of NTM doesn't exhibited growth, it was identified as *M. simiae* by hsp 65 gene sequencing. (Table: 1)

Table - 1: Sensitivity pattern of SD Bioline MPT 64 Ag rapid test and selective growth inhibition of M.tuberculosis by para-nitrobenzoic acid in LJ medium.

Test method	Result	MTBC	NTM
SD Bioline MPT 64 Rapid test	Positive	368	0
	Negative	3	91
	Total	371	91
Growth on LJ medium with PNBA	Positive	0	90
	Negative	371	1
	Total	371	91

DISCUSSION

To identify mycobacteria, conventional biochemical tests are traditionally used. Key tests can be used to identify species, or further preliminary grouping may be used. Other approaches to identifying some species of mycobacteria are available. They include the *p*-nitrobenzoic acid and *p*-nitro- α -acetylamino- β -hydroxypropiofenone tests for discrimination of the *M. tuberculosis* complex from mycobacteria other than *M. tuberculosis*.¹³

The study was undertaken to evaluate the performance of the SD Bioline TB Ag MPT64 assay, some tuberculosis culture laboratories still rely on para-nitrobenzoic acid (PNB), a traditional technique that requires sub-culturing of clinical isolates and two to three weeks to give results. Rapid identification tests have improved turnaround times for mycobacterial culture results. Considering the challenges of the PNB method, we assessed the performance of the SD Bioline TB Ag MPT64 assay by using PNB as gold standard to detect *M. tuberculosis* complex from acid-fast bacilli (AFB) positive cultures.

In our study we reported 99.1% sensitivity with SD Bioline immunochromatography kit, many researchers from India had evaluated SD Bioline kit similar findings were seen with Maurya et al from Lucknow reported 99.1% sensitivity. Kannade et al from Mumbai had reported and observed sensitivity of 99.19%, in contrast a study from Mysore by Vijay G.S Kumar reported 100% sensitivity.^{14, 15, 16}

We reported three false negative findings because of small MPT64 antigen quantity, due to a small AFB count so it is recommended to perform repeated testing after further incubation with AFB-positive.

In our study, we reported 98.9% accuracy with PNB in LJ media almost similar results were reported by Sharma.B *et al.*, from Jaipur, a study from Delhi by Varma – Basil.M *et al.*, and a study by Nepali.S *et al.*, from Nepal reported 100% sensitivity with PNB on LJ media.^{11, 17, 18}

CONCLUSION

Proper diagnosis is the first step towards better management and prevention of tuberculosis transmission. Conventional identification methods are laborious,

cumbersome and time-consuming, while molecular identification methods are expensive and require skilled technical personnel and established molecular laboratory infrastructure. Immunochromatographic assays (ICAs) is found to be rapid, reliable and low cost for diagnosis and differentiation of *M. tuberculosis* complex from Non tuberculous mycobacteria.

Conflicts of Interest: No conflicts.

Source of Funding: Self.

Ethical Clearance: Institutional ethical clearance obtained.

REFERENCES

1. Amresh Kumar Singh, Anand Kumar Maurya, Jyoti Umrao, Surya Kant, Ram Awadh Singh Kushwaha, Vijaya Laskshmi Nag, and Tapan N Dhole. Role of GenoType[®] Mycobacterium Common Mycobacteria/ Additional Species Assay for Rapid Differentiation Between Mycobacterium tuberculosis Complex and Different Species of Non-Tuberculous Mycobacteria. J Lab Physicians. 2013 Jul-Dec; 5(2): 83–89.
2. S Mahapatra, A Mahapatra, S Tripathy, G Rath, AK Dash, A Mahapatra. Mycobacterium avium intracellulerae complex associated extrapulmonary axillary lymphadenitis in a HIV- seropositive infant – a rare case report. Indian Journal of Medical Microbiology, (2005) 23 (3): 192-194.
3. Pratibha Sharma, Deepthi Nair, Monorama Deb. Rapid Characterization of Mycobacterium tuberculosis Complex isolated from Clinical Samples by SD TB Ag MPT 64 kits. J. Commun. Dis. 2015. ; 47(4).
4. ID Otchere, A Asante-Poku, S Osei-Wusu, SY Aboagye, and D Yeboah-Manu. Isolation and Characterization of Nontuberculous Mycobacteria from Patients with Pulmonary Tuberculosis in Ghana. Int J Mycobacteriol. 2017 Jan-Mar; 6(1): 70–75.
5. Jyoti Arora, Gavish Kumar, Ajoy Kumar Verma, Manpreet Bhalla, Rohit Sarin,¹ and Vithal Prasad Myneedu. Utility of MPT64 Antigen Detection for Rapid Confirmation of Mycobacterium tuberculosis Complex. J Glob Infect Dis. 2015 Apr-Jun; 7(2): 66–69.
6. Fedrizzi T, Meehan CJ, Grottola A, Giacobazzi E, Fregni Serpini G, Tagliazucchi S, Fabio A, Bettua

- C, Bertorelli R, De Sanctis V, Rumpianesi F, Pecorari M, Jousson O, Tortoli E, Segata N. Genomic characterization of Nontuberculous Mycobacteria. *Sci Rep.* 2017 Mar 27;7:45258.
7. IK Neonakis, Z Gitti, F Kontos, S Baritaki, E Petinaki, M Baritaki, L Zerva, DA Spandidos. Mycobacterium thermoresistibile: Case report of a rarely isolated mycobacterium from Europe and review of literature. *Indian Journal of Medical Microbiology*, Vol. 27, No. 3, July-September, 2009, pp. 264-267.
 8. Tapti Sengupta, Parijat Das and Tirthankar Saha. Epidemiology and Drug Resistance of Non Tuberculous Mycobacteria in India: a Mini Review. *Biostat Biometrics Open Acc J.* 2017;1(4): 555568.
 9. Dinnes J, Deeks J, Kunst H, Gibson A, Cummins E, Waugh N, et al. A systematic review of rapid diagnostic tests for the detection of tuberculosis infection. *Health Technol Assess.* 2007;11(3):1–196.
 10. Považan A, Vukelić A, Savković T, Kurucin T. Use of immunochromatographic assay for rapid identification of Mycobacterium tuberculosis complex from liquid culture . *Bosnian Journal of Basic Medical Sciences.* 2012;12(1):33-36.
 11. Sharma B, Pal N, Malhotra B, Vyas L. Evaluation of a Rapid Differentiation Test for Mycobacterium Tuberculosis from other Mycobacteria by Selective Inhibition with p-nitrobenzoic Acid using MGIT 960. *Journal of Laboratory Physicians.* 2010;2(2):89-92. doi:10.4103/0974-2727.72157.
 12. Ismail NA, Baba K, Pombo D, Hoosen AA. Use of an immunochromatographic kit for the rapid detection of Mycobacterium tuberculosis from broth cultures. *Int J Tuberc Lung Dis.* 2009;13:1045–1047.
 13. Chiyoji Abe, Kazue Hirano, Tetsuo Tomiyama. Simple and Rapid Identification of the Mycobacterium tuberculosis Complex by Immunochromatographic Assay Using Anti-MPB64 Monoclonal Antibodies. *Journal of clinical microbiology.* 1999 Nov; 37(11): 3693–3697.
 14. Maurya AK, Nag VL, Kant S, Kushwaha RA, Kumar M, Mishra V, et al. Evaluation of an immunochromatographic test for discrimination between Mycobacterium tuberculosis complex and non tuberculous mycobacteria in clinical isolates from extra-pulmonary tuberculosis. *Indian J Med Res* 2012; 135:901-6.
 15. Kanade S, Nataraj G, Suryawanshi R, Mehta P. Utility of MPT 64 antigen detection assay for rapid characterization of mycobacteria in a resource constrained setting. *Indian J Tuberc* 2012;59:92-6. Back to cited text no. 11.
 16. Vijay GS Kumar, Tejashree A Urs and Rajani R Ranganath. MPT 64 Antigen detection for Rapid confirmation of M.tuberculosis isolates. *BMC Res Notes.* v.4; 2011.
 17. Varma-Basil M¹, Kumar S, Yadav J, Kumar N, Bose M. A simple method to differentiate between Mycobacterium tuberculosis and non-tuberculous mycobacteria directly on clinical specimens. *Southeast Asian J Trop Med Public Health.* 2007 Jan;38(1):111-4.
 18. Nepali S, Ghimire P, Khadka D. K., Acharya S. Selective inhibition of mycobacterium tuberculosis by para-nitrobenzoic acid (PNB) used in lowenstein –jensen medium. *saarc j. tuber. lung dis. HIV/AIDS;* 2008 v (1).

Effect of Flexibility with Resisted Exercise on Foot Vibration Perception Threshold in Diabetic Neuropathy in Type II Diabetes : A Pilot Study

Kannan Dhasaradharaman¹, Prathapsuganthirababu², K Mohanraj³

¹Research Scholar, Department of Physiotherapy, Saveetha University, Chennai, ²Assistant Professor, Department of Physiotherapy, College of Health Sciences, Gulf Medical University, UAE, ³Professor, Department of Physiotherapy, KG College of Physiotherapy, Coimbatore

ABSTRACT

Objective: Diabetes have mild to moderate nervous system damage which includes impaired sensation, pain in the feet, hands and other nerve problems. Diabetic peripheral neuropathy(DPN) is the common complication of diabetes in which symptoms are affecting lower extremities such as pain, paraesthesia, loss of vibratory sensation threshold, muscle weakness, balance instability. The present study aimed to evaluate the effect of 8-week of flexibility with resisted exercises on foot vibration perception threshold in type 2 diabetic neuropathy patients.

Materials and Method: A pilot study was carried out in a tertiary setting. There were 15 participants with type 2 diabetes who were eligible for the study as they had clinical neuropathy which was defined by mild and moderate form based on the modified toronto clinical neuropathy score. Following which, biothesiometer was used to measure the foot vibration threshold and the patients were assigned to a 8-week pre and post test program. A paired t test was used for data analysis.

Results: After the 8-week flexibility with resisted exercise on diabetic peripheral neuropathy patients there was a significant difference in pre-post intervention in scores with a mean difference of) 0.53 ± 0.13 mV of vibration threshold

Conclusion: A Flexibility exercise program with resisted exercise showing a reduction in vibration perception threshold in peripheral neuropathy in type 2 diabetes

Keywords: Flexibility exercises, Resisted exercises, Biothesiometer, Diabetic neuropathy, Modified Toronto clinical neuropathy scale.

INTRODUCTION

Diabetes have mild to moderate nervous system damage which includes impaired sensation, pain in the feet, hands and other nerve problems and they are biochemical and vascular factors leads to high blood glucose, ischemia and affecting nerve fibre mechanism. They are variety of neuropathy in that most common one is symmetric polyneuropathy, in which symptoms are affecting lower extremities such as pain, paraesthesia, loss of vibratory sensation, muscle weakness, balance instability. General measures are glycaemic control, drug management, foot care, exercises.

Diabetic Peripheral neuropathy(DPN) starts in the toes and gradually moves proximally. Once it is well established in the LE, it affects the upper limbs with sensory loss following a typical 'Glove and Stocking' pattern of distribution¹. Nerve conduction tests are the objective indication of the condition which shows the abnormality².

The coordination and integration of sympathetic nervous system is extremely important in the maintenance of blood glucose at rest and exercise. Strong evidences support that intensity and duration of exercises are very important in determining the fuel usage during exercise³. With prolonged exercise duration, glucose would be

used as primary fuel source and the production of glucose shifts from glycogenolysis to gluconeogenesis⁴. Use of the vibration perception threshold (VPT) is a simple way of detecting large-fiber dysfunction, thus identifying individuals with diabetes at risk of ulceration⁵.

Hence the present study aimed to evaluate the effect of 8-week of flexibility exercise program along with resisted exercises on foot vibration perception threshold in type 2 diabetic neuropathy patients.

METHOD

An observational pilot study was carried out in a tertiary setting. People with type 2 diabetes were eligible for the study if they had clinical neuropathy which was defined by Modified Toronto clinical neuropathy score. The exclusion criteria included the following: an inability to walk independently of assistance, presence of any lower-limb amputation, significant foot deformity (e.g., Charcot), open foot ulcers, history of cerebral injury and poor visual acuity, severe cardio pulmonary involvement.

Tool

Biothesiometer: This is the measure of vibration sensation indicating the condition of the nerves in diabetes, a value of more than 25 volts indicates the presence of significant neuropathy. As a procedure a probe is applied to the part of the foot on big toe and the probe could be made to vibrate at increased intensity by turning a dial. When tested indicates as soon as participants can feel the vibration and the reading on the dial at the point is recorded. The biothesiometer can have a reading from 0-50 volts.

Exercise Protocol

Flexibility exercises: General flexibility exercise involving all major muscle groups for 15 minutes duration.(Upper limb, Lower limb, Trunk) 2 to 4 repetitions, static stretching holding 15 seconds described by AHA statement, Mark A. Williams⁶.

Resisted exercises involving major muscle group for 10 repetitions, 2 sets, mild intensity, described by Ronald J sigal MD MPH et.al⁷

Statistical Analyses

All statistical analyses were performed using the SPSS software version 20 with 95% confidence interval

and p value significance kept less than 0.05. Descriptive statistics and paired t test was used for pre –post comparisons.

RESULTS

The present study included 15 DPN subjects with the mean age of 56.28±4.18. The descriptive statistics of the subjects are given in Table 1.

Table 1: Descriptive statistics of Participants

Characteristics	Group [N=15] Mean ± SD
Age (years)	56.28±4.18
Height (cm)	161.18±4.93
Weight (kg)	65.45±7.12
BMI	25.78± 0.52
HbA _{1c}	7.43 ±0.66

A paired sample t test showed that there was significant difference between the point of measurements (pre and post intervention) for foot vibration threshold (Table 2 & figure1).

Table 2: Paired t test result for foot vibration threshold

Mean difference	Standard error	t value	P value
0.53	0.133	4.0000	<0.05

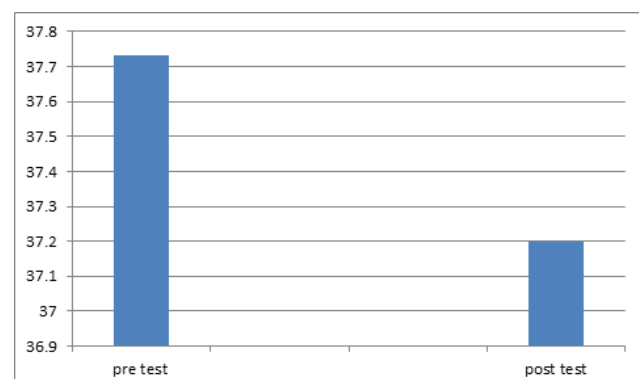


Figure 1: Foot vibration threshold (pre and post exercises intervention)

DISCUSSION

The present study used 15 DPN subjects and aimed to evaluate the effect of 8-week Flexibility with resisted exercises on foot vibration threshold. The result showed

the statistically significant reduction in foot vibration threshold after the interventional exercise programme. The pre- test mean was 37.73, post- test mean was 37.20 and mean difference was 0.53, which showed that there was reduction of VPT in the biothesiometer in response to exercises intervention. The result of the present study is also in line with the results of other studies in DPN subjects which used biothesiometer to assess the vibration perception threshold.

Similarly, In a study the percentage of diabetic patients who developed increased VPT (25 V) was significantly higher in the control than the exercise group (21.3% vs. 12.9%, $P < 0.05$).⁸ The diagnosis of diabetic neuropathy by biothesiometer has been reliable and Vibration perception threshold (VPT) is considered as a gold standard for diagnosis of diabetic peripheral neuropathy^{9,10}. In the non diabetic control subjects, height demonstrated the best correlation with VPT measures, and a reference range was thus established with percentile charts, using mean VPT and height. VPTs were higher in the diabetic sample, compared with the non diabetic sample ($P < 0.05$)¹¹. The insulin mediated blood glucose transport is predominant at rest and while exercising muscle contractions remain as the major factor for transport of blood glucose as a fuel source into the muscle. Glucose transporter 4 (GLUT 4) a type of protein is the main factor in transporting glucose into the muscles with insulin as well as contractions by muscles during exercise¹². A randomized controlled trial on the effect of blood glucose in T2DM reported of 46% increase in insulin action after 16-week programme of resistance exercises¹³. A total of 100 patients, 21 patients had normal (15 volts) value, 35 had grade I (16-25volts) and 44 had grade II (>25 volts) on the biothesiometer machine¹⁴.

The mean VPT in the non-diabetic group was 14.4 whereas in the diabetic group it was

16.19. There was statistically significant difference between the non-diabetic group and diabetic group ($p < 0.05$)¹⁵.

CONCLUSION

Flexibility exercise program with resisted exercises showed a reduction of foot vibration threshold in diabetic type 2 Peripheral neuropathy.

Funding: Self- financed.

Conflict of Interest: No conflict of interest as authors concerned.

Ethical Considerations: The study was initiated after getting the approval from the Institutional Human Ethics Committee of Saveetha University, Chennai. The whole procedure of the study was very well explained to the participants by providing them with information sheet. Their doubts were cleared and the informed consent was obtained. Translation of the information sheet and the informed consent to the local language was done. Confidentiality of the data was ensured.

REFERENCES

1. Tesafye S, Boulton, A.J.M., Dyck, P.J., Freeman, R., Horowitz, M., Kempler, P., Lauria, G., Malik, R. A., Spallone, V., Vinik, A., Bernardi, L., Valensi, P. and on behalf of Toronto Diabetic Neuropathy Expert group. 2010, Diabetic Care. 33(10): 2285-2293.
2. Tesfaye. S. Recent advances in management of diabetic symmetrical polyneuropathy. Journal of Diabetes invest. (2010). 2: 33-42.
3. Bajpeyi S, Tanner, C.J., Slentz, C.A..Effect of exercise intensity and volume on persistence of insulin sensitivity during training cessation. JApplPhysiol. 2009 106(4):1079-85.
4. Suh,S.H., Paik, I.Y., Jacobs, K. Regulation of bloodglucose homeostasis during prolonged exercise. 2007 Mol Cells.23(3):272-9.
5. Laura Maffei, MD, Valeria Premrou, MD,et. al J Diabetes Sci Technol Vibration Perception Threshold in the Screening of Sensorimotor Distal Symmetric Polyneuropathy.2014 May; 8 (3): 621– 622.
6. MarkA.williams PhD, williamL.Haskell, PhD: A scientific statment from the American Heart Association council on clinical cardiology and council on Nutrition, physical Activity and Metabolisam, 2007, 116:572-584.
7. Ronald J.SignalMD,MPH, GlenP.Kenny, PHD: Physical activity/Exercise and Type II diabetes diabetic care, 2004, vol.27 No.10 october.
8. StefanoBalducci,GianlucaIacobellis et.al, Exercise training can modify the natural history of diabetic peripheral neuropathy, Journal of Diabetes and its Complications, Volume 20, Issue

4, July–August 2006, Pages 216-223.

9. Dr M Madhavi Latha, Dr Susmitha Yella, Investigating the use of biothesiometer for detecting the Severity of Diabetic Neuropathy in Diabetic Type- II Patients, JMSCR Volume 05 Issue 10 October 2017
10. P. Jayaprakash, Anil Bhansali et.al . Validation of bedside methods in evaluation of diabetic peripheral neuropathy, Indian J Med Res 133, June 2011, pp 645-649
11. E A Davis, FRACP, T W Jones, FRACP, et.al The Use of Biothesiometry to Detect Neuropathy in Children and Adolescents With IDDM, Diabetes Care 1997 Sep; 20(9): 1448-1453.
12. Holten M, Zacho M, Gaster M, Juel C, Wojtaszewski J, et al. Strength training increases insulin-mediated glucose uptake, GLUT4 content and insulin signaling in skeletal muscle in patients with Type 2 diabetes. Diabetes 2004 53: 294-305.
13. Ibanez J, Izquierdo M, Arguelles I et al. Twice-weekly progressive resistance training decreases abdominal fat and improves insulin sensitivity in older men with type 2 diabetes. Diabetes Care, 2005, 28(3):662-7.
14. Nazeefajavad, Syedadnanhussain et.al, An Experience with the Use of Biothesiometer in Diabetics at a Tertiary Care Centre, P J M H S Vol. 9, NO. 1, JAN – MAR 2015
15. BMK Aruna, R. Haragopal. Role of Biothesiometry in the diagnosis of diabetic neuropathy, Indian Journal of Clinical Anatomy and Physiology, July-September, 2017; 4(3):329-331.

Bone Grafts in Periodontal Regeneration

Prabhu Manickam Natarajan

Assistant Professor, College of Dentistry, Gulf Medical University, Ajman, United Arab Emirates

ABSTRACT

The most serious consequence of Periodontal disease is the loss of the periodontal supporting structures, which includes the periodontal ligament, alveolar bone and cementum resulting in the early loss of teeth. Bone replacement grafts are widely used to promote new bone formation and periodontal regeneration in periodontal therapy especially in intrabony defects. Bone grafts are used as a filler and scaffold to facilitate bone formation and promote wound healing. These grafts are bioresorbable and have no antigen-antibody reaction. These bone grafts act as a mineral reservoir which induces new bone formation. In this original research, bone grafting was done to replace the lost bone due to periodontal defects and the results are shown in the photographs attached. The various periodontal parameters were also recorded for the purpose of evaluating the success of bone grafts.

Keywords: *Bone graft, regeneration, periodontal index, regenerative therapy, periodontitis.*

INTRODUCTION

The goal of periodontal therapy remains to provide a dentition that functions in health and comfort for the life of the patient. Periodontal therapy involves two primary components. First, elimination of the periodontal infection, by eliminating the pathogenic periodontal microflora, which induces substantial favorable clinical changes in the periodontium. However, the anatomic defect resulting from active periodontitis still persists and is represented clinically by loss of clinical attachment, increased probing depths and radiographic bone loss. The substantial efforts made to alter this defect represent the second component of periodontal therapy. The primary approaches to correcting these defects include new attachment, resective and regenerative procedures¹.

Regenerative treatment has as its goal elimination of periodontal defects by regenerating the lost periodontium including bone, cementum and periodontal ligament².

Advances in the understanding of periodontal regeneration provide a basis for applying the fruits of molecular biology to periodontal treatment. Thus, factors that stimulate formation of bone, ligament and cementum can potentially be used to augment the normal healing process and stimulate periodontal regeneration³.

Alloplastic materials used recently to reconstruct osseous periodontal defects include ceramics, collagen and polymers. Although several therapeutic approaches have been investigated, current scientific interest in alloplastic replacements is focused on HTR polymer⁴.

MATERIALS AND METHOD

Five patients were selected from those attending the Dental College Hospital as out – patient for the treatment of chronic Adult Periodontitis. They were 3 male and 2 females of the age group of 25 to 45 years. Prior to their admission to the study a detailed medical history was taken from each patient to ascertain that they had no systemic disease that might influence their periodontal condition or contraindicate periodontal surgery. Other exclusion criteria were allergies, pregnancy. No patients wearing prosthesis, orthodontic appliance, or endodontically treated teeth was admitted into the study, for admission to the study each patient was required to have at least two periodontal angular osseous defects.

Corresponding author:

Dr. Prabhu Manickam Natarajan MDS,PhD,
College of Dentistry, Gulf Medical University, Ajman,
United Arab Emirates.
Email: prabhuperio@gmail.com

INITIAL THERAPY

All patients completed a course of treatment involving root planning and plaque control. The duration of this preparatory phase varied depending upon the response of the patient to the plaque control program. All patients maintained an excellent standard of oral hygiene with consistently low levels of plaque, during last few assessment preceding surgery. Informed consent was obtained from all patients admitted to the study in addition to an agreement to attend regular follow up visits.

EXPERIMENTAL PARAMETERS

Before surgery the following indices were measured in a sequential manner from the involved teeth as follows.

Plaque index score – (Silness and Loe – 1964)

Mobility index score – (Millers mobility index 1950).

Gingival index score – (Loe and Silness – 1963)

Sulcus bleeding index score – (Muhlemann and Mazor – 1958)

A customized acrylic occlusal stent was prepared on the study cast for each patients. A No 559 fissure bur was used to groove the stent in an occluso – apical direction at a point where the graft materials has to be placed. The groove provided reproducible alignment of an endodontic silver point. The base of the stent served as a reference point to take the soft tissue measurements.

The following soft tissue measurements could be recorded with the help of the acrylic occlusal stent and endodontic silver point.

Height of the gingival margin – HGM (stent to coronal extent of the gingival margin).

Probing clinical attachments level – PCAL (stent to base of periodontal pocket).

Probing pocket depth – PPD (gingival margin to base or periodontal pocket)

PRE SURGICAL PROCEDURE

Intra - oral periapical radiographs of each defect

were exposed by Bisecting Angle technique.

SURGICAL PROCEDURE

Preoperative pictures and radiographs are taken initially.(Figure1 and Figure 5)The patients were made to sit comfortably on a dental chair. Under local Anesthesia [lignocaine with adrenaline 1:8000] a crevicular incision was made from the base of the pocket to the crest of the bone using Bard parker knife and blade number 15.

A full thickness mucoperiosteal flap was raised using a periosteal elevator. The granulation tissues were removed from the defects and root planing was done. The area was then irrigated with saline.

The following hard tissue measurements were recorded using the customized acrylic stent and the endodontic silver point.

Crestal height of alveolar bone – CHAB (stent alveolar crest) (Figure 2)

Bone loss (stent to base of osseous defect)

Depth of the Defect – DD (Alveolar crest to the base of the osseous defect)

The graft materials were mixed with a drop of sterile saline to get putty like consistency. It was then packed into the defect upto the most coronal level of the surrounding bony wall(Figure 3). The flaps were sutured using vertical mattress method of suturing (with the help of polyvicryl 5-0 resorbable sutures) (Figure 4). This formed the test site.Immediate post operative radiograph was taken.(Figure 6).

The other defect forming control site was debrided of granulation tissue and left ungrafted. The flaps were sutured using interrupted (polyvicryl 5-0 resorbable suture).

A periodontal pack was given after the surgical procedures in both the test and control sites respectively.

POST SURGICAL FOLLOW UP

The dressing was removed one week after surgery and the surgical site was thoroughly irrigated with saline. Patient was asked to continue with chlorhexidine mouth rinse 0.12% for another one week. Recall appointments were made after 2 weeks, 1st month, 3rd month and 6th month respectively. At each visit scaling was done and

oral hygiene instructions were given.

At the end of the 6th month each site was reassessed of all clinical soft tissue parameters. The soft tissue and hard tissue measurements were made with the same acrylic stent which was fabricated six months earlier to avoid calculation errors.

Radiographs were taken and it was compared to the radiographs taken six months earlier prior to compare the changes in the bone morphology.

CLINICAL PHOTOGRAPHS



Fig: 1 Pre operative view of the site



Fig: 2 Soft tissue assessment



Fig 3 Placement of graft



Fig 4 Suturing

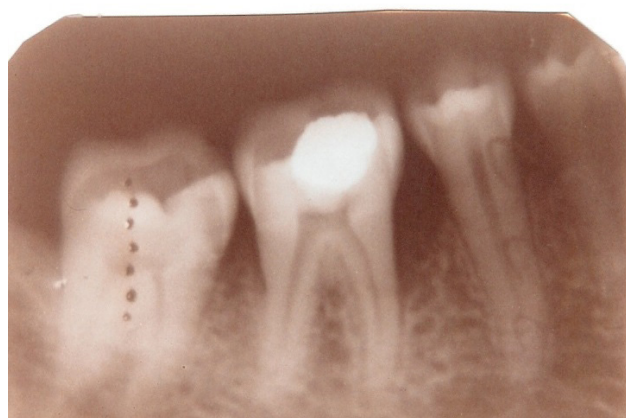


Fig: 5 Pre operative radiograph

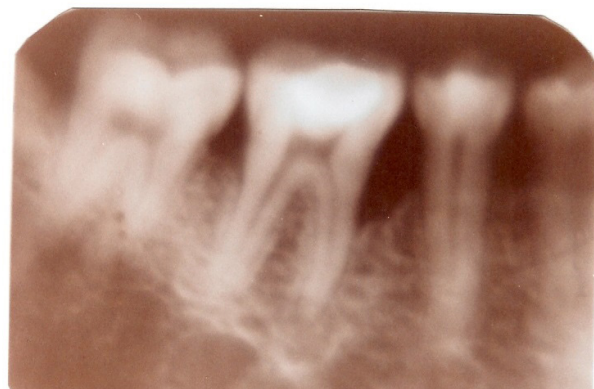


Fig: 6 Post operative radiograph

DISCUSSION

The regeneration of the Periodontium destroyed by inflammatory periodontal diseases has been an elusive goal sought by all who treat periodontal problems. Biomaterials suitable for the restoration of periodontal osseous defects continue to be a subject of particular interest and challenge⁶; materials ranging from bone grafts to alloplastic implants have been used with varying degree of success⁷.

A total of 10 osseous defects in 5 patients were assessed to evaluate the efficacy of the bone graft material in the management of periodontal osseous defect. The patients were assigned randomly to bone

grafting and conventionally debrided control group.

In light of the above, the present study sought to comparatively assess the efficacy of bone graft in regenerating periodontal bone loss in contrast to conventional open flap debridement procedures.

The test and control group documented a statistically reduction in probing pocket depth with the test group out performing the control group.

Probing clinical attachment levels in both the test and control showed a significant reduction, when compared test group showed a greater significance.

None of the groups showed a significant decrease in the height of the alveolar crest, although marginal decrease did occur in the control groups, which when compared, did not yield a significance.

The test group showed a significant bone again when compared to the control group.

CONCLUSION

Several factors such as case selection, treatment objects and clinical application play an influential role and a longitudinal study with a larger patient sample may yield better conclusions⁸. With active investigations directed toward understanding the biology of the healing site, including identifying appropriate cells to target, coupled with designing delivery systems that can control release of agents at the local site, establishing the required environment for regeneration of periodontal tissues should be feasible^{9,10}.

REFERENCES

1. Brunsvold, James, T. Mellonig. Bone grafts and Periodontal Regeneration. *Periodontol* 2000. 1993

Feb;1(1):80-91.

2. Li Shue. Biomaterials for periodontal regeneration. *Biomatter*. 2012 Oct 1; 2(4): 271–277.

3. Hashimoto, M. Observation on implants of porous hydroxyapatite granules in Periodontal Osseous Defects. *Kokubyo – Gakkai – Zasshi*. 1990; 57 : 116-145.

4. Jack. G. Caton & Gary Greenstein – Factors related to Periodontal Regeneration *Perio* 2000. 1993; I : 9-15.

5. King G.N. New Regenerative Techniques- Rational Potential for periodontal regeneration. *Dental Update*. 2001; 28: 7-12.

6. Rabalais, Dr. M. L. Yukuna, R.A. Mayer, E.T. Evaluation of durapatite ceramic as an alloplastic implant in periodontal osseous defects. *Journal of Periodontal*.1981; 53: 680-9.

7. Stahl SS, Frouch SJ. Tarnow & Human Clinical and Histological response to placement of HTR polymer particle in intra bony lesion. *Journal of Periodontal*. 1990; 61: 269-274.

8. Yukna. HTR Polymer Grafts in Human Periodontal Osseous Defects. *Journal of Periodontal*.1990; 61: 633-642.

9. Garrett S. Periodontal regeneration around natural teeth. *Ann Periodontol*. 1996; 1: 621-666.

10. Froum SJ, Weinberg MA, Rosenberg E et al. A comparative study utilizing open flap debridement with and without enamel matrix derivative in the treatment of periodontal intrabony defects: a 12-month re-entry study. *J Periodontal*. 2001; 72: 25-34.

Improvement Efforts of Hazardous Waste Management Implementation in Karimun Regency Fabrication Yard, Indonesia

Sharyne Sylvani¹, Haryoto Kusnopranto²

¹Department of Environmental Health, Faculty of Public Health, University of Indonesia, Depok, Indonesia,

²Department of Environmental Health, Faculty of Public Health and Graduate School of Environment, University of Indonesia, Depok, Indonesia

ABSTRACT

In its activities, a Fabrication Yard can produce up to 400,000 kg of waste within 90 days despite implementing maintained procedure on hazardous waste management, which based on the government regulation. The objective of this study is to analyze the improvement efforts of hazardous waste management implemented in the Fabrication Yard. This study uses primary and secondary data with qualitative approach seen from the characteristics of the hazardous and toxic waste produced as well as the implementation of their overall hazardous waste management system. The study design is descriptive and data analysis using the data triangulation. The hazardous waste generated came from 12 facilities out of 17 facilities with 18 different types of waste. The amount of waste generated is influenced by the type of activity and types of materials used in the yard. While management efforts undertaken in the form of waste minimization, waste collection, waste storage, and waste transportation, on which the process of collection, storage and transportation of the hazardous and toxic waste are partially align with the requirements from government regulations. Although aligned, there are rooms to improve the hazardous waste management like implementing strict rules on working on waste segregation and provide necessary training to personnel involved regarding hazardous waste management.

Keywords: hazardous waste, toxic waste, waste management, fabrication yard.

INTRODUCTION

Indicators of a construction project are often only associated with economic aspects, quality, quality, and time.⁽¹⁾ The construction industry in developing countries such as Indonesia has not been enough to give a deep concern for the links between the construction project and the environmental aspects. Whereas in its activities, also produce waste that can affect the environment.

Waste is classified as hazardous and toxic waste and non-hazardous waste, judging from their characters such as flammable, corrosive, or toxic. General hazardous waste generated at construction sites include asbestos, lead (as contained in the paint), mercury, solvents / thinners, fuels, oils / lubricants, compressed gas cylinders, until the aerosol cans.⁽²⁾ A good hazardous waste management can be done to avoid the hazardous

characteristic to risk the environment. Waste management can be implemented by enacting government regulation to the applicable national or international standards.

A Fabrication Yard in the Karimun Regency produces offshore construction, jacket and platform, topsides for the FPSO, sub-sea components with a total production up to 65,000 tons / year. The total number of production per year affects the amount of waste generated by the activities held in the yard. According to the documentation, Fabrication Yard can produce waste up to 400 tons within 90 days, for that the Fabrication Yard tried numerous efforts on their hazardous waste management to reduce the number of waste it generates. Based on these circumstances, the objective of this study is to analyze the improvement efforts of hazardous waste management implemented.

METHOD

For the verification of the objectives proposed by this work, an exploratory qualitative research will be made using through primary data and secondary data. All in order to substantiate and justify the formulation of an in-depth interview and participant observation in the primary data collection process, while the secondary data obtained through the literature review of public policies, national waste policy and Fabrication Yard's documentation. The qualitative approach will also analyze the characteristics of hazardous waste produced in the yard (the source, the type and the number of waste generated), and the implementation of each hazardous waste management phase.

Observation will collect data from the object of research, in this case, the steps of hazardous waste management implemented, while in-depth interview will involve informants consisted of the management (HSE Department) and the user (Supervisor / superintendent or person in charge of each facility generating hazardous waste). To be more accurate, the informant was chosen with purposive sampling, with the consideration that the selected informant is someone who directly involved with the research focus.

Another way to test the validity of this study is by triangulation. The triangulation performed in this study includes triangulation of sources, which conducted by cross-checking data and facts from informants to get reliable answers related to the research topics, and triangulation of methods which comparing each data with several methods, namely in-depth interviews, direct observations and literature reviews.

RESULTS AND DISCUSSION

The Fabrication Yard is located in the western part of Karimun Regency, Karimunbesar Island. Karimun Regency was chosen to be a good place for yard based on the consideration of its strategic location, Batam Island in the East and Singapore in the North. Based on Government Regulation No. 48 of 2007, Karimun Regency was also announced as the Free Ports Zone and Free Trade Zone (FTZ) that allows Fabrication Yard to have the exemption of import duties for certain goods and the availability of large ports with the adequate fleet to supply the required materials in Fabrication Yard.

With a total area approximately 1,390,000 m², the

Fabrication Yard is equipped with numerous facilities divided into two major areas: Non Industrial and Industrial. The hazardous waste generated inside the Industrial area came from 12 facilities out of 17 facilities namely Water Treatment Area, Power Plant Area, Gas Storage Area, General Warehouse, Project Store, Piping Workshop, Prefabrication Workshop, Painting/Blasting Area, NDT Bunker, Maintenance Workshop Area, Assembly Hall and Erection Area.

Based on observations and literature reviews, there are 18 types of Hazardous Waste produced in the yard according to Appendix 1 of Government Regulation No. 101 of 2014 regarding Hazardous Waste Management, where 12 types of hazardous waste derived from Specific Source and other 6 types comes from Specific Sources. According to the Yard's data, Maintenance Workshop and Painting/Blasting Area are facilities with the most hazardous waste produced. On the other hand, the most common type of hazardous waste formed is the used container of hazardous material since its produced by most facilities in Fabrication Yard.

The HSE Department who responsible for waste handling classify the 18 types of waste into group, which based on the calculation conducted by the Department, the Paint, Varnishes and Solvents waste is the highest waste generated with $\pm 94,467$ kg in 90 days, while Light Tubes / Mercury Lamps waste is the lowest waste generated with only ± 234 kg in 90 days, and it is known that the average generation of Hazardous Waste as many as ± 207.396 kg / 90 days.

The amount of waste generation is an indication of how well the implementation of waste management has been applied to measure the quantity of waste generation interval.⁽³⁾ However, the Yard Environmental Coordinator stated that waste generation numbers are affected by the type of activities carried out in the field, as well as the type of material used so that waste generation numbers are not always stable therefore the amount of waste generated in this case cannot be used as an indication of how well the implementation because of the amount of waste is influenced by several factors.

Several ways can be done in waste minimization phase. Waste minimization activities undertaken in the yard are waste segregation at the source, housekeeping practices, material substitution, environmental friendly technologies, and reuse. The observation found that

although there were four different containers for every waste category was provided in the yard, workers were still mixing the waste. This action was acknowledged by the Structural Supervisor that supervise the Erection Area, he admitted that workers sometimes too lazy to segregate the waste by their types and just threw into the closest containers without considering the characteristics of the waste.

The correct segregation procedure can ensure the waste will be treated according to their hazardous characteristics. Neglecting waste segregation can be dangerous if incompatible hazardous waste characters were mixed, such as the flammable to the toxic and/or corrosive. To segregate, the Fabrication Yard provides helper in the Hazardous Waste Storage to separate the hazardous waste according to their characteristics. In the similar study, it is stated that inspections in the field on a regular basis and review the performance of the waste management in this case waste segregation regularly is required to identify ways to minimize wastes.⁽⁴⁾

Good housekeeping practice has been implemented in all industrial facilities. This fact was supported by the daily briefing by the person in charge to the personnel, where the person in charge repeatedly reminds the personnel to prioritize good housekeeping by the principle of preventive maintenance. The personnel would have to regularly check the state of the materials and tools used, spill kits and Material Safety Data Sheets (MSDS) to prevent any risk. This shows good communication in between supervisors and personnel, and good communication is beneficial to later explain the policies of the hazardous waste management at the corporate level and the field level.⁽⁵⁾

Substitution is done through the replacement of raw materials or auxiliary materials originally containing B3 into raw materials that are more environmentally friendly.^(6,7) Material substitution in Fabrication Yard is done before each project begins the fabrication process. Engineers will have to consider the harmful substances in each material before purchasing. However, according to HSE Systems Personnel, to substitute materials need big considerations since the Fabrication Yard mainly works under Client's request, and so to substitute materials needs Client's approval.

The use of environmental friendly technology is the most effective method in minimizing the amount of

waste generation at source.⁽⁷⁾ Environmental friendly technologies found on two facilities; Painting/Blasting Area and NDT Bunker. Painting/Blasting Area use the technology called Grit Recovery Systems to help them keep the steel grit and steel shot clean to then reusing them in the blasting process. The following figure 2 shows the Grit Recovery Systems technology.



Fig. 1: Grit Recovery System

Another environmental friendly technology used in the yard is the computed radiography for NDT activities. The computed radiography used digital technology so that the liquid fixer and developer are no longer generated. Computed radiography is highly compatible with most conventional x-ray systems are widely used.⁽⁸⁾ The use of computed radiography can save costs and other purposes because it does not require the film, hazardous chemicals, dark room, and storage space.

Waste reduction and reuse is the most effective way to conserve natural resources, protect the environment and save money on waste management.⁽⁹⁾ Reuse carried out at three facilities, namely Painting / Blasting to reuse the steel grit and steel shot with the help of Grit Recovery System, General Warehouse use their inventory control to offer goods that have been unused to be used again by other vessels / yard in need, and Project Store that maximize the use of waste material from previous projects. Similar study suggests control of inventory is one way to control waste and minimize waste generation at the source.⁽¹⁰⁾

Hazardous Waste Storage is a facility dedicated to storing all the hazardous waste produced in yard temporarily before being transported for further treatment. In storing the hazardous waste, Fabrication Yard has not yet considered the characteristics of the waste as they store everything in the same place without separation. This was not aligned with the Ministry of Environment and Forestry Regulation No. 30 of 2009 that requires

a dividing line for each type and characteristics of the waste stored, yet seen from the location and supporting equipment available in the Hazardous Waste Storage has complied with the same regulation.

Based on waste records, the yard has been producing for more than 50 kg of waste accumulatively in one day. According to the Government Regulation No. 101 of 2014, waste generated more than 50 kg a day has the storage time limit a maximum of 90 days. However, the duration of waste stored in the Hazardous Waste Storage not be known from observation, interviews, and review of the document since there were no records found on the date the waste being stored and being transported out.

Construction for the container that holds the waste in the waste collection process is aligned with the requirements established referring to Government Regulation No. 101 2014 and the documents as saying that a container to hold hazardous waste must be made of a material that can store the hazardous waste according to its characteristics, is able to accommodate hazardous waste to remain in packaging, has a strong seal to prevent spills, and are in good condition, no leaks, no rust or damaged. Correct symbols and label of hazardous waste must also be attached in the hazardous waste container as stated in the Ministry of Environment Regulation No. 14 of 2013 regarding Symbols and Labels of Hazardous Waste. The labels must at least contain the name of the producer, waste classification, date of production, waste volume and waste destinations, while in the yard label attached was only contains the category of waste such as Hazardous Waste, Organic Waste, and Non Organic Waste.

Based on Government Regulation No. 101 2014, to transport hazardous waste must be done by using the enclosed conveyance for the category 1, and can be performed using the enclosed or open conveyance category 2. This refers to the characteristics of category 1 hazardous waste that is acute, reactive, and can be harmful to the environment in a short amount of time. The conveyances used to transport the waste from each facility to the Hazardous Waste Storage is a pick-up truck, the same truck is also used to transport category 1 waste which should have been transported using enclosed conveyance. To transport the waste from Hazardous Waste Storage to further treatment outside the Fabrication yard is also using the open conveyance

although covered by a tarpaulin.

Subsequently, to the activity of Hazardous Waste Utilization, Processing and Hazardous Waste Landfill are not done by Fabrication Yard, but performed by Subcontractors who have cooperated with Fabrication Yard.

CONCLUSIONS

The study has described that there are 18 different types of waste produced in the Fabrication Yard, with different characteristics that need to be considered for each phase of the hazardous waste management. It also shows that the number of waste generated each time cannot represent to indicate how well the implementation of hazardous waste management. The study also found that each phase of hazardous waste management in Fabrication Yard partially aligned with the local regulation oversees them. Although aligned, there are rooms to improve the hazardous waste management like implementing strict rules on working on waste segregation and provide necessary training to personnel involved regarding waste management. Provide good records of the waste storage and treat the waste according to their characteristics will also help the sustainability of hazardous waste management.

Conflict of Interest Statement: The authors of this research declare that there is no conflict of interest related to this study

Source of Funding: All funds used to support this research come from the Universitas Indonesia, Hibah PITTA Program.

Ethical Clearance: The ethical clearance of this research taken from Ethics Committee of Faculty of Public Health, Universitas Indonesia,

REFERENCES

1. Sihombing D. Analisis Limbah Material Padat di Pekerjaan Struktur Atas Pembangunan Gedung Kementerian. 2011;.
2. RCRA. RCRA Infocus: Construction, Demolition and Renovation [Internet]. US EPA; 2004 [cited 4 September 2018]. Available from: <https://www.epa.gov/sites/production/files/2015-01/documents/rif-cd.pdf>
3. Wulandari P. –Upaya Minimisasi dan Pengelolaan

- Limbah B3 di Rumah Sakit Haji Jakarta Tahun 2011. Depok: Universitas Indonesia; 2011.
4. Poon C, Yu A, Wong S, Cheung E. Management of construction waste in public housing projects in Hong Kong. *Construction Management and Economics*. 2004;22(7):675-689.
 5. Kulatunga U, Amaratunga D, Haigh R, Rameezdeen R. Attitudes and perceptions of construction workforce on construction waste in Sri Lanka. *Management of Environmental Quality: An International Journal*. 2006;17(1):57-72.
 6. Mallak K, Ishak M, Kasim M, Samah M. Assessing the Effectiveness of Waste Minimization Methods in Solid Waste Reduction at the Source by Manufacturing Firms in Malaysia. *Polish Journal of Environmental Studies*. 2015;24:2063-2071.
 7. Seibert J. Digital Radiography: The bottom line comparison of CR and DR technology. *Applied Radiology*. 2009;21(4):315-323.
 8. US EPA. Basics of Hazardous Waste [Internet]. US EPA. [cited 14 July 2018]. Available from: <https://www.epa.gov/hw/learn-basics-hazardous-waste#hwid>.
 9. Clelland I, Dean T, Douglas T. Stepping Towards Sustainable Business: An Evaluation of Waste Minimization Practices in US Manufacturing. *Interfaces*. 2000;30(3):107-124.

Distribution and Seasonal Variations of Copepoda in Euphrates River at Samawah City, Iraq

Sahib Shanon Ibrahim

Faculty of Nursing, University of Muthanna, Iraq

ABSTRACT

The aim of the current study is to investigate the physicochemical parameters of three stations S1, S2, S3 that were selected on the Euphrates River at Samawa City, south Iraq. In addition, the density, distribution, and biodiversity of Copepods were investigated from March 2017 to February 2018. The recorded temperatures of the water were between 11.5- 30 °C. The densities of Copepods species were 1425 indiv /m³, 841 indiv / m³ and 1081 indiv /m³ in stations S1, S2 and S3 respectively. And the highest density was recorded in S1, S3 during spring and autumn 2017.

The present study demonstrated that only *Macrocylops sp.*, and *Halicyclops sp.* were noticed at station S1, while mesocyclops leucarti., and Lernaea sp. were observed in S1 and S3. The most common genera were Cyclops, three taxonomic units. *Cyclops Scutifers* and *Cyclops Scutifers* were noticed in all the study stations. *Eucyclops*, *Paracyclops* and Copepoda Naupli were observed in all station and the most common species in stations S1 and S3 were *Diatomus Franciscanus* during. In contrast, only *E. macrurus* appeared only two times in the S3 station during this study. The current data found that the similarity between the three stations was 70%. And the lowest value of the qualitative deficit was 25% between station S1 and station S3. Suggesting that both station S1 and S2 environment is suitable for the availability of more species than stations S2. Also, this study noticed that the highest diversity of Copepods was recorded at the station S1 in November 2017. While low Biodiversity was seen at all stations.

Keyword: Copepods, Zoo Plankton, Invertebrate, Euphrates River.

INTRODUCTION

Copepods are considering as a source of food for small fish in the rivers around the worlds. However, it could be intermediate hosts for several fish parasites as well as a vector for human infectious disease¹. Copepods belong to the Cyclopoida order and this creature and their nauplii are crucial and valuable food items in aquaculture². This multicellular animal grows abundantly in the bottom of the oceans and lakes, subterranean water, temporary ponds, small water bodies and even on the water surface of bromeliad leaf³. Identify of the zooplankton populations and its location

distribution deliver an important information for the study of water bodies, and gives a deep knowledge of this atmosphere, as results allowing to provide of management programs and adequate monitoring⁴. A study has shown that seasonal variation plays an important role in zooplankton distribution, for example, it was the maximum in the summer following an ed by winter and it was the minimum at the Monsoon⁵.

It has been reported that approximately 29 species of calanoid, cyclopoid and harpacticoid copepods are found in the water of NW Arabian Gulf Khor Abdulla and Khor Al-Zubair⁶⁻⁹. Another local study collected a copepod from the lower Zab and Tigris River has been shown that *Halicycloes sp.*, *Paracyclops fimbriatus*, and *Nitoscr* spare the most dominated species¹⁰. A study was aimed to investigate the Distribution and abundance of zooplankton in Shatt Al-Basrah and Khor Al-Zubair Channels, Basrah, IRAQ, showed that the

Corresponding author

Sahib Shanon Ibrahim

E-Mail: sahibkinani@mu.edu.iq

Contact: +9647802708141

Crustacea was the dominated group 62.9 %. Copepoda constituted about 44.7 %¹¹. A study has been detected a six species of Copepoda in Diyala river and the species were *Diatomus Reighard*, *Mesocyclops laukartu*, *C. dimorphus*, *Paracyclops affinis*, *C. vicious* and *Cyclops vernalis*¹². Due to insufficient data about the effects of water quality on the biodiversity of Copepoda in the Euphrates River at Samawa City. Therefore, this study aimed to identify: firstly, the monthly changes in physicochemical factors. This means studying both diversity and similarity of Copepoda in the Euphrates River at Samawa City. Secondly, the correlation of physicochemical Characteristics and how its effects on the abundance and biodiversity of Copepoda. Suggesting that the data of this study could be a database of an environmental condition for Copepoda lifecycle in Iraq.

MATERIALS AND METHOD

Description of Study Area

Three stations were selected S1, S2, and S3 which are located on the Euphrates River at Samawa City. Samawa is a town located about 270 km south of Baghdad, capital of Iraq.

Sampling collections

Water samples were collected monthly from the three study stations S1, S2, and S3 of Euphrates River at Samawa City, from March 2017 to February 2018. A forty liters of water were collected from banks and sides of each station on the same river. The concentrated samples were identified using a light microscope, And the resulting individual / m³ (indv / m³).¹³⁻¹⁵. Collection procedure that was used in this study depending on a procedure that described by¹⁶. Water samples were transferred to further analysis in the laboratory were reported by¹⁷. Water temperature, pH, The Dissolved oxygen (D.O), and Biochemical Oxygen Demand (BOD₅) were measured using modification Winkler-Azide¹⁸. Total organic carbon in sediments was measured as described by¹⁹. In the terms of electrical conductivity values mill Siemens /cm (mS /cm) of water, the salinity values (‰) were calculated according to²⁰.

Statistical analysis:

Pearson correlation coefficient (r) was used to correlate physicochemical parameters and density of Copepods by using SPSS 14.0 software at 5% to compare the means of physicochemical parameters measured and

used to test the significance of differences.

Sorensen Similarity²⁰ was used to determine the similarity in stations taxa composition. $S = 2J / (a + b) * 100$, where J=number of common species occurred in both station. A= number of species in (a) station. B= number of species in (b) station.

RESULTS AND DISCUSSION

Physical and Chemical Properties:

This study noticed that the water temperature was increased in the summer, starting from April until October. And the highest recorded temperature was observed in July at all the stations but it was more pronounced in station S2. This increase in water pH might be due to an increase in the level of CO₂ in the water as a result of increases of the Zooplankton activity in this time of the year¹⁶. This possibly because the increase in the ability of the CO₂ to dissolve in a low temperature as results a Carbonic acid might be generated which cause this decrease in the pH during winter²². The current study agreed with previous studies on other river water in Iraq because of the abundance of bicarbonate and carbonate ions²³ and¹⁶.

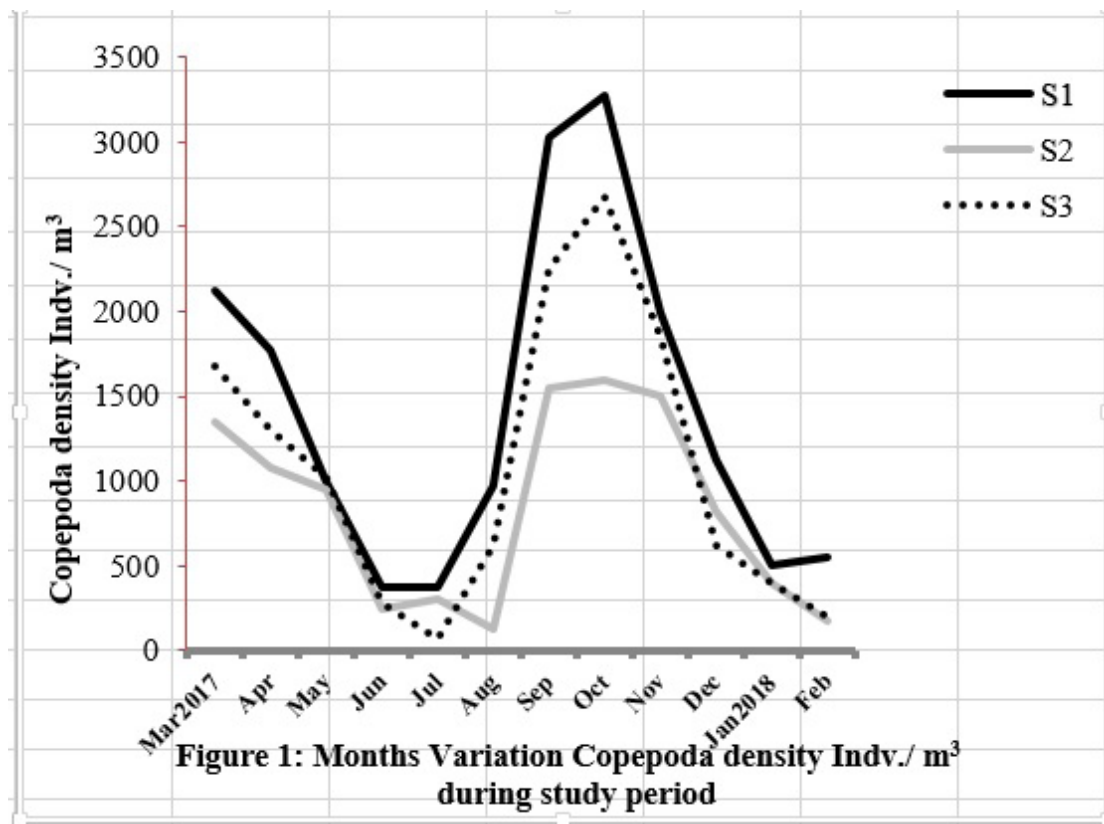
The electrical conductivity (EC) depends on the concentration of the ionic substances that are dissolved in the water sample, also it depends on the temperature of the water.²⁴. The highest value was 2.67 mS /cm recorded in April 2017 at station S3. The concentration of dissolved oxygen in water can be affected by several factors such as daily and seasonal changes in the in temperature, the density of living organisms, type of the water and organic contamination²³. In addition, the increasing of organic lysis is more pronounced in this time of year, which might lead to an increase in oxygen consumption²⁵. The results of the current study showed an increase in the B.O.D in the summertime, while lower values of B.O.D were noticed in winter. This increases in the B.O.D is maybe due to abundance in the organic materials in present of good ventilation, this could promote to increase in the oxygen level²³.

The taxonomic and quantitative study of Copepods:

A total of 5 taxa were classified as common taxa with 38.4% of the taxonomic units that were diagnosed from Copepoda during the study period. Also, this study recorded 12, 9 taxonomic units at station S1, S3

respectively, and 6 taxa were found in the station S2 which is the lower numbers between other stations Table 2, 3 and 3. Only *Macrocylops sp.*, and *Halicyclops sp.* were noticed at station S1, while mesocyclops leucarti., and *Lernaea sp.* were observed in S1 and S3. The most common genera were *Cyclops* in the studied time and it was 3 taxonomic units. *Cyclops Scutifers* and *Cyclops Scutifers* were noticed in all the three stations. This study noticed a significant difference of some species from one station to another, this might due to the major difference

in temperature, salinity, dissolved oxygen, and pH. In addition, the Copepoda and its adult stages might enter into the hibernation phase which could explain their disappearance in some months. Figure 1 shows that the highest monthly densities recorded during the spring months of 2017 and the months of September, October, and November of the same year. This indicates that there are two peaks of density, similar to what was founded by ¹⁶ in the Diwaniyah River.



The Similarity Index and Species Diversity:

Sorensen Similarity: For comparing the similarity of studied stations (taxa composition), Sorensen Similarity was used for this purpose¹⁸. The highest value was recorded 76.2 in this study was between stations S1 and S3 using Sorensen Similarity statistic tool table 1.

Table 1: Sorensen similarity index (%) of three stations

Stations	Sorensen similarity index (%)
S1,S2	66.7
S1,S3	76.2
S2,S3	66.7

The frequency (F %) : The frequency of Copepoda occurrence taxa were calculated by using the F index which described by ²⁷ were classified in: Constant species (F > 50%), Common (10 < F < 49%) and Rarely species (F < 10%). Table 2. The highest number of species in the station S1 was recorded during March, September, October, and November in 2017, with the number of 12 species. The current study showing that the lowest species recorded during the summer months in all study stations. Table 2,3 and 4.

(+) = detected

Table 2: Monthly Abandons and (The frequency F %) of Copepoda species in Station S1.

Taxa	2017										2018		(F%) INDEX
	M	A	M	J	J	A	S	O	N	D	J	F	
Copepoda													
Calanoida													
Diaptomus fraciscanus	+	+	+	+		+	+	+	+	+	+	+	100 %
Cyclopaedia													
CyclopsScutifers	+	+	+		+	+	+	+	+	+			100%
<i>C.venustus</i>	+	+					+	+	+	+			100%
<i>C.vicinus</i>	+		+				+	+	+	+		+	8%
Eucyclops agalis	+	+	+				+	+	+	+		+	15%
E. macrurus													8%
<i>Halicyclops sp.</i>	+	+		+		+	+	+	+	+			8%
<i>Macrocyclops sp.</i>	+	+	+				+	+	+		+		8%
<i>Mesocyclops leuckarti</i>	+	+	+	+			+	+	+		+	+	15%
<i>Paracyclops affinis</i>	+	+	+				+	+	+				15%

Table 3: Monthly Abandens and (The frequency F %) of Copepoda species in Station S2.

Taxa	2017										2018		(F%) INDEX
	M	A	M	J	J	A	S	O	N	D	J	F	
Copepoda													
Calanoida													
Diaptomus fraciscanus	+	+	+	+			+	+	+	+	+	+	100%
Cyclopaedia													
CyclopsScutifers	+	+	+		+	+	+	+	+	+			100%
<i>C.venustus</i>	+	+	+				+	+	+	+			100%
<i>C.vicinus</i>													8%
Eucyclops agalis	+	+	+				+	+	+	+		+	15%
E. macrurus													8%
<i>Halicyclops sp.</i>													8%
<i>Macrocyclops sp.</i>													8%
<i>Mesocyclops leuckarti</i>													15%
<i>Paracyclops affinis</i>													15%
<i>Paracyclops fimberius</i>	+	+	+	+			+	+	+	+	+		100%
Parasitic copepods													
Lernaea sp.													15%
Copepoda nauplii	+	+	+	+	+		+	+	+	+	+	+	100%
Total Taxa	6	6	6	3	2	1	6	6	6	6	3	3	

(+) = detected

Table 4: Monthly Abandens and (The frequency F %) of Copepoda species in Station S3.

Taxa	2017											2018		(F%) INDEX
	M	A	M	J	J	A	S	O	N	D	J	F		
Copepoda														
Calanoida														
Diaptomus frasciscanus	+	+	+			+	+	+	+			+		100%
Cyclopaedia														
CyclopsScutifers	+	+	+		+	+	+	+	+	+				100%
<i>C.venstus</i>	+	+					+	+	+	+				100%
<i>C.vicinus</i>														8%
Eucyclops ages														15%
<i>E. macrurus</i>			+	+	+					+				8%
<i>Halicyclops sp.</i>														8% ⁰
<i>Macrocyclus sp.</i>														8% ⁰
<i>Mesocyclops leuckarti</i>	+	+				+	+	+	+			+		15%
<i>Paracyclops affinis</i>	+	+		+	+		+	+	+		+			15 %
<i>Paracyclops fimberiatius</i>	+	+	+	+			+	+	+	+	+			100%
Parasiticcopepoda														
<i>Lernaea sp.</i>	+	+	+	+	+		+	+	+		+	+		15 %
Copepoda nauplii	+	+	+	+		+	+	+	+	+	+	+		100%
Total Taxa	8	8	6	5	4	4	8	8	9	4	4	3		

(+) = detected

Species deficit: The species deficits among the three stations were applied during the study time, and it was between (S1, S2), (S1, S2) and (S3, S2) as in (table 5).

Table 5: Specific deficit among the stations:

Stations	Species deficit %
S1,S2	50%
S1,S3	25%
S3,S2	33%

Species Diversity: This study evaluated the biodiversity of all three stations, and the results showed a decrease in the species diversity of Copepods during the study period.

It has been reported that the biodiversity of some species of plankton can be affected by physical and chemical changes and pollution ¹⁶. The diversity and density of zooplankton are negatively affected by the presence of contaminants that reach the rivers of the Euphrates River at the city of Samawah directly without treatment or refining ²⁸.

CONCLUSION

In the current study was observed a significant

increase in the density of the species during the studied period. A significant correlation also noticed between the number of individual and Water Temperature, Dissolved Oxygen, pH, Salinity and the organic content of bottom sediments. In conclusion, this study provides a decent data about the prevalence and density of different species of Copepods in the study area during the different time of the months of study.

Conflict of Interest : The author declares no conflict of interest.

Source of Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical Clearance: The study was approved by the Iraqi Medical Ethics Committee in the University of Muthanna, Iraq.

REFERENCES

1. Piasecki W, Goodwin AE, Eiras JC, Nowak BF. Importance of Copepoda in freshwater aquaculture. *Zoological Studies* 2004;43:193-205.
2. Szlauer B, Szlauer L. The use of lake zooplankton as feed for carp (*Cyprinus carpio* L.) fry in pond culture. *Acta Ichthyologica et Piscatoria*

- 1980;10:79-102.
3. Thorp JH, Covich AP. Ecology and classification of North American freshwater invertebrates: Academic press, 2009.
 4. Santos JS, Simões NR, Sonoda SL. Spatial distribution and temporal variation of microcrustaceans assembly (Cladocera and Copepoda) in different compartments of a reservoir in the Brazilian semiarid region. *Acta Limnologica Brasiliensia* 2018;30.
 5. Kumar SD, Rakhi U. A study of seasonal variations in zooplankton diversity of Pagara dam of Morena district, Madhya Pradesh, India. *Int J of Life Sciences* 2018;6:409-414.
 6. Khalaf T. Calanoid Copepoda of Iraqi waters of the Arabian Gulf. Systematic account I. Calanoida, families Calanoidae through Temoridae. *Marina Mesopotamica* 1988;3:173-207.
 7. Khalaf T. A new calanoid copepod of the genus *Acartia* from Khor Abdulla and Khor Al-Zubair waters, Iraq. *Marina Mesopotamia* 1991;6:80-91.
 8. Khalaf T. Three calanoid copepods new to the Arabian Gulf. *Marina Mesopotamica/Majelat Wadi al-Rafedian li A'loum al-Behar* 1992;7:167-174.
 9. Khalaf TA. Post-Naupliar Stages of *Acartia* (*Acartiella*) forensics, Khalaf (Copepoda: Calanoida), from Khor Al-Zubair South of Iraq. *International Journal of Oceans and Oceanography* 2007;2:179-186.
 10. LI, A, A. RIYAD, A. SAMIRA, A. Studying the environment of invertebrates in the lower Zab and Tigris River in Iraq. *Journal of Umm Salamah*, 2005. 2(3) 350-354.
 11. Ajeel SG. Distribution and abundance of zooplankton in Shatt Al-Basrah and Khor Al-Zubair Channels, Basrah, IRAQ. *Journal of Basrah Researches (Sciences)* 2012;38:10-28.
 12. Al-Doori M. Monthly variation in the qualitative and qualitative Composition of zooplankton (Copepoda, Cladocera) In Diyala river and two of its branches. *Ibn AL-Haitham Journal For Pure and Applied Science* 2009;22.
 13. Smith DG. *Pennak's freshwater invertebrates of the United States: Porifera to Crustacea*: John Wiley & Sons, 2001.
 14. Edmondson W. *Methods and Equipment in Freshwater biology* 2nd ed. John Willey and Sons. Inc, NewYork 1959;1202.
 15. Pontin RM. A key to the freshwater planktonic and semi-planktonic Rotifera of the British Isles: Hyperion Books, 1978.
 16. Ibrahim SS. Biological Diversity Of Invertebrates in Al-Dagharaa and Al-Diwaniya Rivers/Iraq: Ph D. Education College, the University of Al-Qadissiya (In Arabic), 2005.
 17. APHA A. Standard methods for the examination of water and wastewater, American Public Health Association. Inc, Washington DC 1998.
 18. Rovers JP. A practical guide to pharmaceutical care: APhA Publications, 2003.
 19. Gaudette HE, Flight WR, Toner L, Folger DW. An inexpensive titration method for the determination of organic carbon in recent sediments. *Journal of Sedimentary Research* 1974;44:249-253.
 20. Mackereth FJH, Heron J, Talling JF, Association FB. *Water analysis: some revised methods for limnologists*. 1978.
 21. Meynell E. Pseudo-fi+ I-like sex factor, R62 (I), selective for increased pilus synthesis. *Journal of bacteriology* 1973;113:502.
 22. Lind OT. *Handbook of common methods in Limnology*: The CV Mosley Company, 1979.
 23. Ibrahim SS. Use Of Oligochaete- Annelida As Bio-Indicator Of Pollution In The Diwaniyah River/ Iraq. Faculty Of Education Iraq: University Of Qadisiyah, 2000.
 24. Association APH, Association AWW. Standard methods for the examination of water and wastewater: American public health association, 1989.
 25. Jones CG, Lawton JH, Shachak M. Positive and negative effects of organisms as physical ecosystem engineers. *Ecology* 1997;78:1946-1957.
 26. Ibrahim, Sahib Shannon. Use of Tubificidae (Annelida- oligochaete) in evaluating the organic pollution in the Euphrates river in the city of al-samawa-Iraq. *Journal of muthanna University for agricultural research*. 2015; 3(1): 39-46.
 27. Muniz P, Venturini N. Spatial distribution of the macrozoobenthos in the Solís Grande stream estuary (Canelones-Maldonado, Uruguay). *Brazilian Journal of Biology* 2001;61:409-420.
 28. Abd al-Moneim AA. Effect of wastewater on some physical and chemical properties of the Euphrates River at the city of Samawah, Iraq. *Muthanna Journal of Pure Science* 2012;1:52-67.

Sociodemographic the Characteristics of “Slum and Urban Area” Customer Behavior Depot and Identification of Escherchia Coli with RT-PCR by Gen EF-Tu

Alfina Baharuddin^{1,2}, Anwar Daud³, Thahir Abdullah⁴, Mochammad Hatta⁵

¹Department of Environmenytal Health Muslim University of Indonesia, ² Postgraduate School Students Faculty of Medicine, Hasanuddin University, ³Department of Environmental Health, Faculty of Public Health, Hasanuddin University, ⁴Department Reproductive Health; Faculty of Public Health, Hasanuddin University ⁵Department of Microbiology, Faculty of Medicine, Hasanuddin University

ABSTRACT

Reverse Transcription Polymerase Chain Reaction (RT-PCR) Is a process that takes place in the presence of an additional cycle namely the change of RNA to cDNA (complementary DNA) using the Reverse Transcriptase enzyme .. EF-Tu is a prokaryotic prolongation factor that plays a key role in genetic translation by connecting with aminoacylated tRNAs that carry amino acids to the ribosome. The purpose of this study was to identify the EF-Tu Bacteria Escherchia coli gene in refill drinking water. The research design was observational with quasy experiment method. As for the sample, there were 5 depots in the Mario district (slum are) and in Panakkukang district (urban area) with a total sample of 30 samples measured on inlets, processes and outlets. Boom DNA extract method, DNA amplification by RT-PCR, PCR product detection, the results obtained in the form of RNA black band pattern (RNA band) where the electrophoresis results obtained RNA band (RNA band) at 470 bp. The result show that sifgnificant relationship between customer behavior and depot on quality measurement of refill drinking water. RT-PCR on EF-Tu gene can be used to detect bacteriy Escherchia coli quickly and more accurately the results obtained.

Keywords: *EF-Tu, RT-PCR, Escherchia.coli,*

INTRODUCTION

The fulfillment of drinking water and sanitation facilities according to WHO in Indonesia is still low compared to other countries in Southeast Asia. It is estimated that Indonesia’s population in 2015 is 218 million, of which 103 million or 47% do not have access to sanitation and 47 million people or 22% do not have access to clean water. Larger numbers are seen in rural populations, where an estimated 62% or 73 million people do not have access to sanitation and 31% or 36 million people who do not have access to clean water.¹

The fulfillment of the quality of healthy drinking water needs to get great attention because it concerns the

lives of many people. if this problem does not receive serious attention, it will certainly cause more problems later in life such as diarrhea². In the process of packaging or refilling drinking water refill, re-pollution can occur if the officers do not pay attention to sanitation of the equipment and place even individual hygiene of each depot officer. Usually there are bacteria that contaminate refill drinking water because the tank is not clean.³

Escherichia coli is a bacteria that normally lives in human digestion and warm-blooded animals are even permanent residents. This coli class of bacteria is used as an indicator of water pollution, because it is easy to find in a simple, harmless way, has a short survival compared to other pathogenic bacteria. The types of E. coli bacteria found in drinking water include: EIEC EHEC EAggEC EPEC ETEC⁵. The presence of bacteria is not related to sanitation hygiene and personal hygiene.⁶

Corresponding author:

Alfina Baharuddin

E-mail: alfina.riyadi@gmail.com

Polymerase Chain Reaction (PCR) is one technique that is able to multiply a sequence of 105-106-times the number of nanogram template DNA in a large background on irrelevant sequences (for example from total genomic DNA Reverse Transcriptase is an enzyme that can synthesize DNA molecules in vitro use the RNA template.⁷ EF-Tu is one of the prokaryotic elongation factors. The elongation factor is part of the mechanism that synthesizes new proteins by translation in the ribosome.⁸ In this mechanism, individual amino acids are linked to proteins that develop by transferring RNA which also fits the messenger RNA chain. The ribosome makes the protein follow the codon sequence the mRNA presents and facilitates the subsequent binding of the tRNA with the bound amino acid.⁹ EF-Tu participates in the polypeptide elongation process of protein synthesis. In prokaryotes, the main function of the EF-Tu is to transport aa-tRNA is correct to A-site ribosome. As a G-protein, it uses GTP to facilitate its function¹⁰.

EF-Tu prokaryotic factors help aminoacyl tRNA move to free sites in the ribosome. In the cytoplasm, the EF-Tu binds to a charged (aminoacylation) tRNA molecule; and this complex then enters the ribosome. EF-Tu is a prokaryotic elongation factor that plays a key role in genetic translation by connecting with aminoacylated tRNAs that carry amino acids to the ribosome. EF-Tu is GTPase whose hydrolysis activity is paired with the codon step in mRNA.⁹

The business of drinking water depots that is growing rapidly today has an important meaning in the provision of drinking water that is affordable by the community. From various studies it is known that there are several factors that can cause a decrease in the quality

of drinking water depots, among others, the ignorance of the drinking water depot owners / operators regarding the handling of raw water quality, improper management and use of filters and disinfection equipment. To be directly consumed, drinking water produced by drinking water depots must meet health requirements.¹¹

Based on a preliminary survey conducted that several refill drinking water depots (DAMIU) in Panakkukang Subdistrict and Mariso District of Makassar City were seen from a physical perspective, they did not meet the standards and DAMIU had not done the processing correctly and correctly. In addition to handling processed water, the type of equipment used, as well as the absence of routine checks on the quality of drinking water produced¹².

Based on this description the purpose of this study was to determine the Sociodemographic Characteristics “slum and urban area” customer behavior depot and Identification of bacterium *Escherichia coli* With RT-PCR By Gen EF-Tu

METHOD

Design research is observational mixed quasy experiment method to identify the presence of pathogenic *Escherichia coli* bacteria as an indicator of the quality determination of refill drinking water with Reverse Transcriptase – PCR (RT-PCR) technique with EF-Tu target gene. The population in this study were 10 refill drinking water in the Mariso and Panakukang sub-districts. Examination of the sample was carried out in the Laboratory of immunology and microbiology of UNHAS medical faculty.

Table 1 Sequences and Positions of Primary Nucleotides

Gen	Forward	Reverse	Size (bp)	Access number
EF-II	5'CGCTGGAAGGCGACGCAGAG 3' (From 1253)	5'CGGAAGTAGAACTGCGGAACGGTAG3 (From 1698)	470	X57091

Tools and materials

The tools used in this study were sample bottles, cool boxes, incubators, safety cabinets, vortex shakers, gyrotary shakers, Eppendorf tubes and shelves, centrifugation devices, disposable gloves, micropipets, thermocyclers (Hybaid, Ashford, UK), freezer -20 °C,

4°C refrigerator, electrophoresis machine, UV light.¹³

Materials

for sampling are 70% alcohol, cotton and materials for DNA extraction, namely Diatom suspension, L6 (Lysis buffer) solution, L2 (Washing buffer) solution,

70% ethanol, acetone and TE (Tris-EDTA) solution elution buffer. The ingredients used for PCR were DNA extract, PCR mix (100 mM Tris-HCl, Ph 8.3, 1.5 mM MgCl₂, 50 mM KCl, 0.1% gelatin), deoxynucleotide triphosphate (dNTP), dATP, Materials for electrophoresis are 1.5% agarose gel containing 0.5 mg / Lethidium bromide, Tris acetic acid-EDTA electrophoresis buffer (242 g Tris Base, 57 mL acetic acid, and 100 mL of 0.5 mol / L EDTA, pH 8.0).¹⁴

DATA ANALYSIS

The results of PCR detection by electrophoresis

were analyzed based on whether or not the pieces on the DNA band (DNA band) were formed and the data were presented descriptively using tables and images.

RESULT

According to table 2 from 30 depot customer respondents in Kec Panakukang generally were 15 women (100%), education of depot customers in Mariso Subdistrict and most Panakukang sub-districts were 9 (46.7%) and 10 (66, respectively) 7%).

Table 2: The Characteristics of Respondents Customers Refill Drinking Water Depots

Location	Type of variable N		Total	
				%
Slum area	Sex	Men	1	6,7
		Women	14	93,3
	Education	Yunior high school	6	33,3
		Senior high school	9	46,7
		Schoolar	0	20,0
Urban area	Sex	Men	0	0
		Women	15	100
	Education	Yunior High School	2	13,3
		Senior High School	10	66,7
		Schoolar	3	20

Based on table 3, AMIU's storage time is at the highest number of houses, namely the old category (≥ 4 days) in Mariso (slum area) and Panakukang (urban area), respectively 8 (53.3%) and 7 (46.7%).

Table 3: Characteristics of the Length of Storage of Drinking Water at Home

Location	Variable	N	%
Slum area	long (≥ 4 days)	8	53,3
	medium (3 days)	4	26,7
	Enough (≥ 2 days)	3	20
Urban area	Long (≥ 4 days)	7	46,7
	Medium (3 days)	5	33,3
	Enough (≥ 2 days)	3	20

Based on table 4 shows that the behavior of depot customers is based on the level of knowledge about bactericoliciform whole which does not meet the requirements 18 (100%), negative customer behavior of depots and does not meet the requirements of 13 (87,7%). and depot customer actions and did not meet the requirements of bacteri coliform presence as much as 21 (84,0%)

Table 4: Relationship Between Behavior Of Depot customer depot With Identification Of Bacteri coliform

Type variable	Bacteri coliform (Ouput)						p	
	Not Eligible		Eligible		N	%		
	N	%	n	%				
Knowledge	Less	18	100	0	0	18	100	0,002
	Enough	6	50	6	50	12	100	
Actitude	Negatif	13	87,7	2	13,3	15	100	0,651
	Positif	11	73,3	4	26,7	15	100	
Behavior	less	21	84,0	4	40	25	100	0,254
	Good	3	60	2	40	5	100	

Analysis RT-PCR in the gene EF-Tu found in the samples A. 13 (positive *Escherichia Coli*) while the other samples undetected, as shown in table 5

Table 5: Results of RT-PCR *Escherichiacoli* 16S RNA-gene on DWRS in district Mariso

Slot	Sample Code	RT-PCR Results	NOTE
1	Marker	-	
2	A. 1.1	(-)	Not detected
3	A. 1.2	(-)	Not detected
4	A. 1.3	(+)	Detected
5	A. 2.1	(-)	Not detected
6	A. 2.2	(-)	Not detected
7	A. 2.3	(-)	Not detected
8	A. 3.1	(-)	Not detected
9	A. 3.2	(-)	Not detected
10	A. 3.3	(-)	Not detected
11	A. 4.1	(-)	Not detected
12	A. 4.2	(-)	Not detected
13	A. 4.3	(-)	Not detected
14	A. 5.1	(-)	Not detected
15	A. 5.2	(-)	Not detected
16	A.5.3	(-)	Not detected
17	Negative Control	(-)	Not detected

Analysis RT-PCR in the gene EF-Tu found in the samples b. 2.1, b. 2.2 and b.3.3 (Positive *Escherichia Coli*) while the other samples undetected as shown in table 6

Table 6: Results of RT-PCR *Escherichia coli* EF-Tu RNA-gene on DWRS in district Panakukkang

Slot	Sample Code	RT-PCR Results	NOTE
1	Marker	-	
2	B. 1.1	(-)	Not detected
3	B. 1.2	(-)	Not detected
4	B. 1.3	(-)	Not detected
5	B. 2.1	(+)	Detected
6	B. 2.2	(+)	Detected
7	B. 2.3	(+)	Detected
8	B. 3.1	(-)	Not detected
9	B. 3.2	(-)	Not detected
10	B. 3.3	(-)	Not detected
11	B. 4.1	(-)	Not detected
12	B. 4.2	(-)	Not detected
13	B. 4.3	(-)	Not detected
14	B. 5.1	(-)	Not detected
15	B. 5.2	(-)	Not detected
16	B. 5.3	(-)	Not detected
17	Positive Control	(-)	Not detected

DISCUSSION

EF-Tu is part of the mechanism that synthesizes new proteins through translation in the ribosome. RNA transfer (tRNAs) carries individual amino acids that are integrated into protein sequences, and have anticodons for the specific amino acids they fill. Messenger RNA (mRNA) carries genetic information that encodes the main structure of proteins, and contains code that encodes each amino acid. The ribosome creates a chain of proteins by following the mRNA code and integrating the aminoacyl-tRNA amino acid (also known as charged tRNA) into the growing polypeptide chain.

Together with ribosomes, EF-Tu is one of the most important targets for inhibition of antibiotic translation. Antibiotics that target EF-Tu can be categorized into one of two groups, depending on the mechanism of action, and one in four structural families. The first group included antibiotics pulvomycin and GE2270A, and inhibited the formation of ternary complexes. The second group included the antibiotics chirromycin and enacyloxin, and prevented the release of EF-Tu from the ribosome after hydrolysis of GTP.¹⁵

With the contamination of *E. coli* bacteria in raw water in Panakukkang, due to the non-functioning of one of the processing equipment at the depot, the quality of the drinking water produced will not be different from the raw water that has not been processed, especially the content of *E. coli* bacteria. The ineffectiveness of ozonation at the time of processing can affect the quality of treated drinking water. Drinking water that is processed without ozonation can cause Coliform¹⁶ bacteria to grow rapidly, so that drinking water at the depot can be contaminated with Coliform¹⁶ bacteria. Especially if the processed drinking water has been stored for more than three days, the bacteria will continue to multiply in processed water. that. This is because the growth of bacteria in the water is very fast. Within 2 to 3 days Coliform bacteria can contaminate drinking water because during the ozonation process when processing is not effective.¹⁷

Handling of containers carried by consumers also plays an important role in influencing water quality. Even if the quality of the water produced is good but the handling of containers is not considered, it will reduce water quality because contamination can occur from

outside the production process. Good handling is done by washing using various types of special detergents which we call food grade and clean water with temperatures ranging from 60-85 ° C, then rinsed with enough product water to remove detergent residues used for washing.¹⁸

All depots that were sampled in Mariso Subdistrict did not handle the containers carried by the buyer in accordance with the regulation. The most common method used by most depots now is to brush and rinse with product water afterwards, then fill it immediately. In Mariso sub-district, 38.46% of the samples were brushing and rinsing and 60% of them produced drinking water with quality according to the regulations while the rest showed positive results. While the depot only rinsed, which was 46.15%, all the drinking water produced contained coliform bacteria. The rest of the depots who do not brushing and rinsing the container of the buyer are found to have total bactericolidiform content.

CONCLUSION

There is a significant relationship between customer depot behavior and quality measurement of refill drinking water. RT-PCR genome in EF-Tu gene was found to be positive for Bacteria *Escherchia coli* both in slum and urban area in 470 bp.

Ethical Clearance- Taken from Hasanuddin University Ethics Committee, approval number: 195 / H4.8.4.5.31 / PP36-KOMETIK / 2017.

Source of Funding - Self-funding

Conflict of Interest- The author declares no conflict interest regard this research

REFERENCES

1. WHO/UNICEF Progress on Sanitation and Drinking-Water: Update WHO/UNICEF 2013. Available from: <http://www.wssinfo.org/definitions-methods>.
2. Rahman Shahedur, Identification And Quantification Of Escherchia Coli From Drinking Water In Bangladesh. International Journal Of Microbiology Research Vol 14 pp 047-051, April 2013 available from URL http://www/academee_researchjournal.org/journal/ijmir. ISSN 2327-7769@2013 Academee_research journal.
3. Iqbal Pratama, Contamination of Coliform Bacteria in Refillable Drinking Water in Ilie Village, Ulee Kareng Sub-District, Banda Aceh City, 2016, J of Vet Med, ISSN: 0853-1943 Vol. 10 No. 1, February 2016,
4. Baharuddin, A. Faktor yang berhubungan dengan kualitas Bakteriologis Air Minum Isi Ulang (AMIU) di Kota Makassar. 2014. Jurnal kesehatan ISSN 2088-0340, Vol 3, edisi 2 Juni Tahun 2014.
5. Bain R, Fecal Contamination Of Drinking Water In Low And Nidle Income Country: A systematic Review and Metan alysis. PLOS Medicine. 2015, Available from URL: <http://www/plosmedicine.org>. PLoS Med 11(5): e1001644. doi:10.1371/j.pmed.1001644
6. Andrée F. Maheux, Molecular Method for Detection of Total Coliforms in Drinking Water Samples. Journal asm.org. Applied and Environmental Microbiology, 2014. p. 4074–4084 July 2014 Volume 80 Number 14.
7. Winter, P.C., Polymerase Chain Reaction (PCR), Encyclopedia Of Life Sciences (2005) doi: 10.1038/Npg.Els.0005339 1507 0099-2240/08/\$08.00_0 doi:10.1128/AEM.02125-07.
8. Bain R, Accounting For Water Quality In Monitoring Access To Safe Drinking-Water As Part Of The Millennium Development Goals: lessons from five countries. Bull World Health Organ (2012) 90: 228–235A.
9. Begum J, Ahmed K, Bora KN, Isolation And Identification Of Coliform Bacteria From Different Sources Of Drinking Water Nature, Envi and Pollution Tec (2010) 3: 51–53.
10. Bharath J, Microbial Quality Of Domestic And Imported Brands Of Bottled Water In Trinidad. 2013 Int J Food Microbiol 81: 53–62.
11. Chen D, Lan L. The Analysis Of Drinking-Water Sanitation In Cities And Towns Of Nanping In The Year 2008-2010. Chinese J of Health Laboratory Technology (2014) 21: 2519–2521.
12. Ronny, Syam, D. Study of Sanitation Conditions with Bacteriological Quality of Drinking Water Depots Refill in Panakkukang District, Makassar City. Journal of Hygiene, (2015) 2 (2), 81-90.
13. Morin, N, J Gong Z, And Xing-Fang L, Reverse Transcriptase- Multiples PCR Assay For Simultaneous Detection Of Escherchia Coli 0157: H7, Vibrio Cholera O1 And Salmonella Typhy,

- 2004, *Clinical Chemistry*, 5:11, 2037-2044
14. Molee neda Molaee , Hamid Abtahi and Ehsanollah Ghaznavi-Rad Masoude Karimi , Mohammad Javad Ghannadzadeh, Application of Reverse Transcriptase –PCR (RT-PCR) for rapid detection of viable *Escherichia coli* in drinking water samples. *J of Envi Health Science & Engineering* . 2015. 13:24 DOI 10.1186/s40201-015-0177-z.
 15. Hasyim, H, Analysis Of Personal Hygiene And Sanitation Facilities In The Implementation Of Food Stalls Serving On Campus. 2014 *International Journal of Research in Health Sciences*. Oct–Dec 2014 Volume-2,
 16. Wulandari B. Relationship Between Hygiene Practices With Bacteria Presence In Smoke Fish On Fish Curing Sentra Bandarharjo Semarang . 2014, *Unnes Journal of Public Health*; 3 (2)
 17. Wandrivel R, suharti N, Y. Lestari. Drinking Water Quality Produced By Drinking Water Refill Depots In The District Of Padang Bungus Under The Terms Of Microbiology. *Andalas Medical Journal*. 2012; 1 (3): 129-132.
 18. Copeland CC, Beers BB, Thompson MR, Fitzgerald RP, Barrett LJ, Sevilleja JE, Faecal contamination of drinking water in a Brazilian shanty town: Importance Of Household Storage And New Human Faecal Marker Testing. *J of Water and Health*. 2009: 7 (2): 324-31.

Prevalence and Determinants of High-Risk Women in Pregnancy, Labor and Postpartum with Premarital Screening in Semarang City, Central Java, Indonesia

Dewi Puspitaningrum¹, Nuke Devi Indrawati¹, Indri Astuti Purwanti²

¹Midwifery Lecture, University of Muhammadiyah, ²Public Health Lecture University of Muhammadiyah Semarang

ABSTRACT

Introduction: Maternal Mortality Rate (MMR) is among health indicators in Indonesia. According to IDHS, in 2012 MMR increased to 359 maternal deaths per 100,000 live births but according to SUPAS in 2015, MMR decreased to 305 maternal deaths per 100,000 live births. Maternal Mortality Rate (MMR) in Semarang city is mostly (77%) caused by puerperium. The purpose of this study is to investigate factors affecting maternal mortality in pregnancy, labor and high risk particularly in Semarang City.

Material and Method: This study was conducted in Semarang City of 37 Puskesmas, conducted surveys and observations by using screening for pregnancy women, labor, postpartum and analyzed bivariate and multivariate with logistic regression.

Findings: The factors correlations with premarital screening were maternal secondary infertility risk p-value 0.013 and postpartum haemorrhage with placental retention with p-value of 0.04. The most influential factors with premarital screening that were only partially weakly affected were pregnant with chronic hypertension (OR = 0.39), delivery with history of SC (OR = 0.14), postpartum with placental retention (OR = 0.09) and secondary infertility (OR = 0.05)

Conclusion: Factors influencing high risk for women an effect on morbidity and mortality, in this case are infections in postpartum women with a frequency of 92.4 %. So it is very necessary promotion and preventive efforts with appropriate health care for women preconception. As well as the existence of a comprehensive program premarital with attention to patient privacy and approval of both patients.

Keywords: *Pregnancy, Labor, Postpartum, High Risk, Screening*

INTRODUCTION

According to WHO data, 99 percent of maternal deaths due to labor or birth problems occur in developing countries. The maternal mortality ratio in developing countries is the highest with 450 maternal deaths per 100,000 live births compared to the maternal

mortality ratio in nine developed countries and 51 commonwealth countries. However, data from WHO, UNICEF, UNFPA and the World Bank show maternal mortality to date is still less than one percent per year. In 2005, 536,000 women died due to labor problems, lower than the number of 576,000 deaths in 1990¹. Death during pregnancy or within a period of 42 days after the end of pregnancy, due to all causes associated with or aggravated by pregnancy or handling, but not caused by an accident/injury. The success of the health effort of one sensitive indicator in a country's people is maternal mortality. According to the data of the 2012 SDKI that increased MMR to 359 maternal deaths per 100,000 live births but according to SUPAS 2015 results, MMR

Corresponding author:

Dewi Puspitaningrum

Email: dewipuspita@unimus.ac.id

Phone: +6282136001683

Kedungmundu Raya Street No.18 Semarang Central Java Indonesia

decreased to 305 maternal deaths per 100,000 live births.

In addition from the data of Maternal Mortality Rate (MMR) in Semarang City many causes are pre-eclampsia, bleeding and others, 77% of bleeding in the puerperium where the city of Semarang ranked second after the city of Brebes in terms of¹. In the health service close to the community is Puskesmas which is a health facility that serves primary services in public health in a preventive and promotive and affordable for all community groups.

Puskesmas is a health service facility that organizes public health efforts and individual health efforts of the first level, by prioritizing promotive and preventive efforts, to achieve the highest degree of public health in its working area²⁶. The number of Puskesmas in Semarang city are 37 *puskesmas* can have potential in conducting survey on women with high-risk pregnancy, mothers with high-risk pregnancy and restrictive mother¹. So it is necessary once the study of the picture for the causes of factors that influence maternal, labor and postpartum become high risk.

MATERIAL AND METHOD

The research method used survey. Survey is one of the research approaches that are generally used for large and multiple data collection. This study was conducted on large populations. Survey research is used to gather information from opinions from a large number of people on a particular topic. There are three characteristics of survey : information is gathered from a large group of people to describe some aspect or certain characteristics, the submission collect of either written or oral questions of a population, information obtained from the sample, not from the population. Survey research is not only intended to determine the status of symptoms, but also to determine the similarity of status by comparing it with the standard that has been selected or determined. In addition, also to prove or justify a hypothesis². The sample in this study were patients who performed the examination of pregnancy, labor, and postpartum at 37 *Puskesmas* Kota Semarang, Central Java, Indonesia in 2017.

Data will be input using SPSS version 17.00. The frequency of distribution is based on the category of screening in pregnant women with high-risk. Survey results are presented with tables and frequencies. The most influential factor by using factor analysis is

multiple regression. The data analysis used bivariate and multivariate with logistic regression.

FINDINGS

Total of 37 *Puskesmas* surveys in 1 year showed that the highest risk pregnant women secondary infertility pregnant 2nd> 5 years as many as 5543 (25.54), seen from pregnant mother or suffering high risk most pregnant women with history of chronic hypertension equal to 714 (36.2), birth history the greatest complication of 3647 (88.1) of birth reports was SC, the biggest complication of delivery was severe Preeclampsia of 22 (33.8), postpartum haemorrhage in the puerperium most with retained placenta of 13 (50) and puerperal infections with the highest number of cases sepsis of 5 (71.4).

Tabel 1 Premarital Screening In Puskesmas Semarang City were:

Premarital Screening Test	N(%)
Comprehensive Test	15 (40.5)
Partial Test	22 (59.5)
Total	37(100)

Table 2 showed that from the total 37 *Puskesmas*, 15 (40.5%) carried comprehensive screening test, and 22 (59.5%) carried partial screening test. In the comprehensive test, there were laboratory test, comprehensive physical and psychical test proved by anamnesis, TT immunization and in the partial test, the health center provided PP test, HIV rapid test, Hb rapid test, HBsAg rapid test and TT immunization.

Table 2: Bivariate With Premarital Screening in Public Health Center Semarang :

Variable	Coefficient	p-value
Secondary Infertility	6.182	0.013
Pregnant history chronic hypertension	.778	0.378
History SC	2.754	0.097
Labor Severe Preeclampsia	.028	0.867
Postpartum haemorrhage with retained placenta	4.185	0.041
Postpartum infection	.334	0.563

Table 2 shows the correlation premarital screening at the Puskesmas Kota Semarang with p-value <0.5 is with the mother secondary infertility 2nd>5th risk factor with p-value 0.013 and postpartum haemorrhage bleeding with retained placenta of p-value 0.041.

Table 3 Results of Multivariate Logistic Regression Analysis

	Variable	Koefisien	P	OR (IK 95%)
Step 1	Secondary Infertility	-.019	0.048	0.98(0.96-1)
Partial Test	Pregnant history chronic hypertension	.026	0.391	1.03(0.97-1)
	History SC	.011	0.138	1.01(0.99-1)
	Labor Severe Preeclamsia	-.088	0.867	0.92(0.33-2.56)
	Postpartum haemorrhage with retained placenta	1.314	0.083	3.72(0.84-16.5)
	Postpartum infection	-.897	0.562	0.41(0.02-8.5)
Step 2	Secondary Infertility	-.028	0.046	0.98(0.88-0.98)
Partial Test	Pregnant history hipertension cronic	.029	0.388	1.01(0.95-1,22)
	History SC	.013	0.135	1.01(0.99-1)
	Postpartum haemorrhage with retained placenta	1.311	0.086	3.69(0.82-15.3)

The result according Table 3 that the variables affecting premarital screening are secondary infertility 2nd>5th, pregnancy with chronic hypertension, delivery with history of SC and postpartum with retained placenta. The strength of the relationship from the largest to the smallest was pregnant with chronic hypertension (OR = 0.39), delivery with history of SC (OR = 0.14), postpartum with placental retention (OR = 0.09) and secondary infertility (OR = 0.05). With very weak links with the partial test.

The variables were linked bivariately with premarital screening at the Puskesmas Semarang City, the results showed a premarital screening relationship with maternal secondary infertility risk and postpartum haemorrhage with retained placenta. So we can know the risk factors that need to be prepared in the premarital is about secondary infertility and postpartum haemorrhage with retained placenta. So with knowing the results need to be done prevention and preparation for premarital women to prepare the design of pregnant planning in healthy

reproductive age (20-30 years)⁵. The cases mainly related to the mother age which was considered into post healthy reproductive period, so that there were more risk factors during the pregnancy and delivery which may lead to baby defect, baby stuck, and bleeding²⁰. The preparation of nutrients that can improve a woman's fertility later. And also sometimes there is the impact of infertility in women if there is a history of abortion with induction and postpartum infections so it is expected when premarital screening can be informed so that it can be planned better conditions²¹. According to another research secondary infertility can occur because of a lot of parity and the causes of infertility that interfere with female reproduction²².

Prevention of postpartum haemorrhage with retained placenta by taking into account the nutrients that can increase hemoglobin and vitamin Fe consumption in the prevention of blood deficiency in women before marriage⁷. Also, the need for vitamin C can help prepare the needs during pregnancy and breastfeeding by 95 mg/

day⁶. In addition, in preventing cases for premarital it is also advisable to consume folic acid, vitamin B12 in the decrease of anemia, as many premarital women have anemia and hypermenorrhoea supported by the lack of vitamin consumption, dietary patterns and decreased meat consumption⁸. In addition, anemia can be prevented by a combination of iron fortification of the appropriate food combined with iron supplements in certain population groups has proven to be efficient²⁴. So it can be used as a premarital screening program in the prevention of postpartum haemorrhage with retained placenta. The preparation given to the premarital can help premarital women begin to pay attention to his health later life during pregnancy, maternity labor and postpartum. The preparation to prevent that women with multiparity will be at risk of postpartum haemorrhage with retained placenta²³.

The expected that experts also play a role in helping the promotion of health with these important messages with media that are interesting and easy to understand every woman who reads can be through premarital classes, attractive leaflets, banners that can make women have a habit of continuing with the health of reproduction¹⁰. In addition, there is also a program of knowledge of premarital women in reducing the expectation of idealistic marriage is the most important health between couples, and it is very effective to inculcate teenagers in looking for a good and healthy partner¹³. Premarital health education can helpful for women to always care about health besides the above risks also need health education about healthy sex, HIV / AIDS, and hepatitis because it is a contagious disease and at risk later when married¹⁴.

In addition to these findings after multivariate data processing, it was found that with premarital screening, the most significant effect of this study was the most influential sequence of pregnant chronic hypertension (OR = 0.39), delivery with history of SC (OR = 0.14), postpartum with retained placenta (OR = 0.09) and secondary infertility (OR = 0.05). The results show that the risks that can be answered by screening are in part only 4 of the 6 biggest risks in a mother and have not responded to the influence of all risk.

The incidence of the risk that causes the death of the mother can be prevented and the standard of service in providing premarital counseling in preparing healthy reproduction and healthy family planning.

As well as in the premarital screening program, the human rights should be kept secret for health data, but apart of screening premarital screening is concerned with the agreement of both patient, but it is worth noting that premarital screening has a good purpose that is effectively used in the prevention of spreading disease and survival of individuals and communities¹¹. In other countries, the premarital screening program is very successful and has significantly improved which is better seen from the interpersonal skills and overall relationship quality¹². Premarital programs are needed knowledge and attitude toward voluntary screening of marriage because all require awareness of each individual so it is necessary once health promotion about it if the premarital screening program is successful and has a very good impact¹⁵. This premarital education program is also very effective in improving the quality of couples before marriage and can become a reference partner later in forming a healthy family¹⁶. Premarital counseling can be done with the cooperation of religious clerics in will marry couples by providing advice that can strengthen into a better family¹⁷. The couples will be better prepared in the deal of marriage later so that the need for experienced providers to be effective in providing premarital counseling¹⁸. In addition, premarital screening program is very effective in detecting hemoglobinopathies that impacted later when pregnant, but many couples continue their marriage and always check up the disease so it becomes the preventive breakthrough for couples for the importance of premarital screening¹⁹. The relevancy of premarital screening in mental health for the improvement of health services with expert resources in mental psychology²⁵.

CONCLUSION

The factors correlations with premarital screening were maternal secondary infertility risk p-value 0.013 and postpartum haemorrhage with retained placenta with p-value of 0.04. The most influential factors with premarital screening that were only partially weakly affected were pregnant with chronic hypertension (OR = 0.39), delivery with history of SC (OR = 0.14), postpartum with retained placenta (OR = 0.09) and secondary infertility (OR = 0.05).

Conflict of Interest : There is no

Source of Funding: DRPM Indonesia

Ethical Clearance: The ethical issue of the Medical Research Bioethics Commission of Medicine Faculty of Medicine Universitas Sultan Agung Semarang Central Java Indonesia.

REFERENCES

- Central Java Provincial Health Office. Health Profile of Central Java Province 2015. http://dinkesjatengprov.go.id/v2015/dokumen/profil2015/Profil_2015_fix.pdf. Accessed on 25 April 2017
- Rofiah, Fikrotur. Research Survey. <http://www.eurekapedidikan.com/2015/01/penelitian-survei.html>, Copied and Published via Eureka Education. 2015
- Emmanuelle Paré; Samuel Parry; Thomas F. McElrath; Dominick Pucci; Amy Newton; Kee-Hak Lim. Clinical Risk Factors for Preeclampsia in the 21st Century. *Obstetrics & Gynecology*. 124 (4): 763-770. doi: 10.1097 / AOG.000000000000045
- P Tommi. SPSS for paramedic. Ardhana Media. 2006; I (175-177) .ISBN: 979-1118-04-3.96p
- Wiknjosastro, Hanifa. Ilmu Kandungan, Jakarta : Yayasan Bina Pustaka Sarwono Prawirohardjo. 1999. 153p
- Ibrahim, N. K. R. et al. An educational program about premarital screening for unmarried female students in King Abdul-Aziz University, Jeddah', *Journal of Infection and Public Health*, 2011, 4(1), pp. 30–40. doi: 10.1016/j.jiph.2010.11.001
- German Nutrition Society (DGE), G. N. S. 'New Reference Values for Vitamin C Intake.', *Annals of nutrition & metabolism*, 2015, 67(1), pp. 13–20. doi: 10.1159/000434757
- Wuryanti, A. Hubungan Anemia dalam Kehamilan dengan Perdarahan Postpartum karena Atonia Uteri di RSUD Wonogiri. 2013, <http://eprints.uns.ac.id/107/1/167420309201012551.pdf>. Access on 25 April
- Karabulut, A. et al. 'Premarital screening of 466 Mediterranean women for serum ferritin, vitamin B12, and folate concentrations', *Turkish Journal of Medical Sciences*, 2015, 45(2), pp. 358–363. doi: 10.3906/sag-1401-25
- Emilia, Ova. Promosi Kesehatan Dalam Lingkup Kesehatan Reproduksi, 2009, Yogyakarta: Pustaka Press, 35p
- Alahmad, G. 'Testing: Premarital', in *Encyclopedia of Global Bioethics*, 2015, pp. 1–8. doi: 10.1007/978-3-319-05544-2_418-1.
- Carroll, J. S. and Doherty, W. J. 'Evaluating the Effectiveness of Premarital Prevention Programs: A Meta-Analytic Review of Outcome Research', *Family Relations*, 2003, 52(2), pp. 105–118. doi: 10.1111/j.1741-3729.2003.00105.x.
- Rajabi, G. et al. 'Premarital education program based on premarital interpersonal choices and knowledge program on idealistic marital expectation in single students', *Iranian Journal of Psychiatry and Clinical Psychology*, 2016, 22(3), pp. 212–221. doi: <http://dx.doi.org/10.18869/acadpub.ijpcp.22.3.212>
- E., H. 'Effect of premarital health education on girls' knowledge about sexual health, AIDS and hepatitis B', *International Journal of Gynecological Cancer*, 2011, p. S1366. Available at: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed10&NEWS=N&AN=70660685>
- Wang, P. et al. 'Factors influencing the decision to participate in medical premarital examinations in Hubei Province, Mid-China', *BMC Public Health*, 2013, 13(1). doi: 10.1186/1471-2458-13-217
- Fawcett, E. B. et al. 'Do Premarital Education Programs Really Work? A Meta-analytic Study', *Family Relations*, 2010, 59(3), pp. 232–239. doi: 10.1111/j.1741-3729.2010.00598.x
- Bruhn, D. M. and Hill, R. 'Designing a Premarital Counseling Program', *The Family Journal*, 2004, pp. 389–391. doi: 10.1177/1066480704267233
- Knutson, L. and Olson, D. H. 'Effectiveness of PREPARE program with premarital couples in community settings', *Marriage & Family: A Christian Journal*, 6(4), 2003, pp. 529–546
- Al-Allawi, N. A. S. et al. 'Premarital screening for hemoglobinopathies: Experience of a single center in Kurdistan, Iraq', *Public Health Genomics*, 2015, 18(2), pp. 97–103. doi: 10.1159/000368960
- Rochjati, Poedji. *Skrining Antenatal Pada Ibu Hamil*, 2011, Surabaya: Airlangga University Press, 56p
- Samani, E. N. and Amini, L. 'The relationship between adverse pregnancy outcomes and secondary infertility.', *Journal of Reproduction & Infertility*,

- 2010, pp. 121–153. Available at: <http://www.jri.ir>
22. I, F. and V., C. 'Evaluation of the quality of life (QoL) of infertile patients in the public health sector in Chile', *Human Reproduction*, 31, 2016, pp. i345–i346. doi: 10.1093/humrep/31.Supplement_1.1
23. Owolabi AT, Dare FO, Fasubaa OB, Ogunlola IO, Kuti O, B. LA. 'Risk Factors for Retained Placenta in Southwestern Nigeria', *Singapore Med J.*, 2008, 49(7), pp. 532–7. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/18695860>
24. Deye, N., Vincent, F., Michel, P., Ehrmann, S., Da Silva, D., Piagnerelli, M., ... Laterre, P.-F. Changes in cardiac arrest patients' temperature management after the 2013 'TTM' trial: Results from an international survey. *Annals of Intensive Care*, 6(1). <http://doi.org/10.1186/s13613-015-0104-6> et al. (2014) 'Prevalence of anemia among pregnant women in Ethiopia and its management: A review', *International Research Journal of Pharmacy*, 2016, 5(10), pp. 737–750. doi: 10.7897/2230-8407.0510151
25. Deye, N., Vincent, F., Michel, P., Ehrmann, S., Da Silva, D., Piagnerelli, M., ... Laterre, P.-F. Changes in cardiac arrest patients' temperature management after the 2013 'TTM' trial: Results from an international survey. *Annals of Intensive Care*, 6(1). <http://doi.org/10.1186/s13613-015-0104-6> et al. (2016) 'Public health professionals' perceptions of mental health services in equatorial guinea, central-west Africa', *Pan African Medical Journal*, 25, 2016, doi: 10.11604/pamj.2016.25.236.10220
26. Ministry of Health of the Republic of Indonesia. Maternal Health Situation 2014. Infodatin: Data Center and Information Ministry of Health RI.

Mothers' Behaviour Regarding School-Aged Children's Nutrition: in Indonesia

Eka Mishbahatul Marah Has¹, Della Febien Prahasiwi², Sylvia Dwi Wahyuni³, Nursalam⁴, Ferry Efendi⁴,

¹Doctoral Degree Student, ²Bachelor Degree Student, ³Lecturer, ⁴Professor, Faculty of Nursing, Universitas Airlangga, Mulyorejo Street (Kampus C), Surabaya City, East Java, Indonesia

INTRODUCTION

Malnutrition in school-aged children in the coastal area of Indonesia, increased every year. This can be caused by improper nutrition intake. Such as in Bulak Banteng Village, East Java, presumably, it was mothers' behaviour in providing children's nutritional needs that caused the malnutrition. This research aimed to evaluate factors which influenced mothers' behaviour in the coastal area of Indonesia in the fulfilment of school-aged children's nutrition based on health promotion model. **Method:** This was an observational analysis study with a cross-sectional approach. Samples were 100 mothers of school-age children who lived at Bulak Banteng Village, East Java, Indonesia. Samples were taken by using a stratified random sampling technique. Independent variables were mother's prior related behaviour, self-motivation, perceived benefits, perceived barriers, perceived self-efficacy, activity-related affect, and commitment in fulfilling nutrition. The dependent variable was the mother's behaviour in fulfilling nutrition. The data were collected by using questionnaire, then analysed by using linear regression. **Result and Analysis:** Linear regression analysis indicated that motivation ($p=0.020$), perceived barriers ($p=0.000$), self-efficacy ($p=0.003$), and activity-related affect ($p=0.000$) were influenced mother's behaviour in fulfilling school-aged children nutrition by $p<0.05$. **Discussion:** Mother's motivation, self-efficacy, and activity-related affect have a role in mother's behaviour in fulfilling school-aged children nutrition. Nurses should create health promotion which can increase mother's motivation, efficacy, and affect in fulfilling school-aged children nutrition.

Keywords: health promotion model, mothers' behaviour, nutrition, school-aged children

INTRODUCTION

Indonesia is facing a double burden of malnutrition on school-age children with the prevalence of underweight and obesity increasing. Malnutrition has negative effects on health and quality of life⁽¹⁾. Data from Basic Health Research (Riskesdas) in 2007 shows that malnutrition exists in children less than 6-14 years old: 13.3% male and 10.9% female⁽²⁾. This increased in 2013 for both men and women by 11.2%.

Health Survey Result of Basic Elementary Students in Surabaya city by 2015 showed that from 52,865 elementary school children, there were 2,057 children with malnutrition. The prevalence of hunger malnutrition in the work area of Puskesmas Bulak Banteng is the second highest in Surabaya City, that is equal to 33.26%⁽³⁾.

Bulak Banteng Village was located on the coastal area of Surabaya, near Madura Strait. People in this village were living in a slum area with a poor economic condition and a low level of education⁽⁴⁾. The previous study using an interview on ten mothers who live at Bulak Banteng Village find that eight mothers said their only take 1-2 meals per day (missed breakfast), mother cooks as their children request, although it is less nutritious. The kind of food which is often consumed was rice with fried egg only. There

Corresponding author:

Eka Mishbahatul Marah Has

Doctoral Degree Student

Faculty of Nursing, Universitas Airlangga

Mulyorejo Street (Kampus C), Surabaya City, East

Java, Indonesia, Email: eka.m.has@fkn.unair.ac.id

were 7 out of 10 mothers said that their child didn't like vegetables and fruits⁽⁵⁾.

Malnutrition directly caused by inadequate dietary intake and disease, indirectly caused by parenting style, food availability, social-economy, culture, and politic⁽⁶⁾. Malnutrition reflects imbalanced nutrition between intake and needs⁽⁷⁾. If it's not treated immediately, it can cause physical growth and intellectual development failure, reduce productivity, reduce endurance, increase child morbidity, and death.

Many factors can influence mothers' behaviours in meeting the nutritional requirement of their children. Factors that affect the mother in the fulfilment of nutrition can be associated with a behavioural model, one of it was the Health Promotion Model. The Health Promotion Model (HPM) is a theory that explores factors related to health promotion behaviours aimed at improving health and quality of life⁽⁸⁾. In HPM, health behaviour can appear if there is a commitment to do, not because of the perception of threat. Commitment can be influenced by behaviour specific cognition and affect (perceived benefit, perceived barrier, perceived self-efficacy, and activity-related affect). Behaviour specific cognition and affect can be influenced by prior related behaviour and personal factors (such as motivation)⁽⁹⁾.

Although previous research has identified factors contributing to mothers' behaviours in feeding their children, little is known about these factors within the context of HPM. It is important for nurses to know the factors that influence mother's behaviour in nutrition fulfilment of school-aged children so that nurses can plan appropriate health promotion strategies for mothers. Therefore, the authors are interested in examining the

factors that influence mother's behaviour in nutrition fulfilment of school-age children with HPM approach.

METHOD

This was an observational analytic study with a cross sectional approach. The population were mothers with school-age children, who take care their children without household assistance, who lived at Bulak Banteng Village, East Java, Indonesia. One hundred respondents were involved by using stratified random sampling technique.

Independent variables in this research were mother's prior related behaviour, self-motivation, perceived benefits, perceived barriers, perceived self-efficacy, activity-related affect, and commitment in fulfilling nutrition, which is collected by using questionnaire. The dependent variable was the mother's behaviour in fulfilling nutrition, which is collected by using food frequency questionnaire. The data were then analysed by using linear regression. Statistical testing was performed at the 0.05 significance level.

RESULTS

Most of the respondents were middle adult mothers, with age range 35-45 years old (87%). Mostly were only elementary school graduates (49%). More than a half was a housewife (55%), with a monthly salary less than local minimum wages (64%). Most of the children who participate in this research were 2nd years elementary school's students, mostly nine years old (29%). More than a half were female (55%). Most of them were malnourished (73%).

Table 1 The relationship between independent and dependent variables (n = 100)

Variables	Mother's behaviour in fulfilling nutrition				Total	
	Good		Poor			
	n	%	n	%	n	%
Prior related behaviour						
Good	35	35	23	23	58	58
Poor	25	25	17	17	42	42
Self-motivation						
Strong	36	36	29	29	29	29
Weak	24	24	11	11	11	11
Perceived benefit						

Cont.... Table 1 The relationship between independent and dependent variables (n = 100)

Positive	22	22	22	22	44	44
Negative	38	38	18	18	56	56
Perceived barrier						
Barrier	27	27	30	30	57	57
None	33	33	10	10	43	43
Perceived self-efficacy						
Strong	29	29	24	24	53	53
Weak	31	31	16	16	47	47
Activity related effect						
Positive	21	21	10	10	31	31
Negative	39	39	30	30	69	69
Commitment						
Strong	25	25	20	20	45	45
Weak	35	35	20	20	55	55

Table 1 had shown that respondents mostly have good prior behaviour and good behaviour in fulfilling children’s nutrition (35%). Mostly have strong self-motivation and good behavior (36%). Mostly have negatively perceived benefit, but have good behaviour (38%). Mostly perceived no barrier and had good behaviour (33%). Mostly have a weak perceived self-efficacy, but still, have good behaviour (31%). Mostly have negative affect regarding nutritional fulfilment, but have good behaviour (39%). And, mostly have weak commitment, but have good behavior (35%).

Table 2 The Summary of linear regression analysis

Coefficients							
Model B		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Note
		Std. Error	Beta				
	(Constant)	4.708	15.980		.295	.769	
	Prior related behaviour	.113	.138	.071	.822	.414	Non significance
	Motivation	.494	.151	.342	3.275	.002	Significance
	Perceived benefit	.302	.171	.155	1.770	.081	Non significance
	Perceived barrier	-1.128	.176	-.775	-6.424	.000	Significance
	Perceived self-efficacy	.318	.104	.266	3.051	.003	Significance
	Activity-related affect	.663	.093	.667	7.134	.000	Significance
	Commitment	.032	.089	.033	.362	.718	Non-significance

Table 2 showed that self-motivation, perceived barrier, perceived self-efficacy, and activity-related affect significantly influence mother’s behaviour in nutritional fulfilment of school-aged children. Positive T-value indicates direct influences, whereas negative means indirect.

DISCUSSION

The results showed that most of the respondents had a good prior related behaviour and behaviour in fulfilling the school-aged children nutrition. Prior related behaviour can define as one's habit⁽¹⁰⁾. According to HPM, prior related behaviour had influenced health promotion behaviour. The benefit which derived from past behaviour mentioned as the expected outcomes. When an individual satisfies with the result of certain behaviour, this behaviour will be repeated in the future⁽⁸⁾.

Mother's behaviour in fulfilling school-aged children nutrition was evaluated from the mother's ability to serve nutritious and diverse foods. Most of the school-aged children were eat as mentioned on recommended dietary allowances and food diversity. Their diet was likely fewer vegetables and fruits (only 1-3x/week), but more on rice, fish, eggs, and unhealthy snacks. This is possible because school-aged children already have an appetite and they're more likely to consume snacks⁽¹¹⁾. It can also because Bulak Banteng Village was located on the coastal area of Surabaya city⁽⁴⁾, so fish were easily available at low prices.

Linear regression analysis had shown that prior related behaviour didn't significantly influence mother's behaviour in fulfilling nutrition for school-aged children. Prior related behaviour stay on the memory of each person, which consider to be accepted or rejected as a present behaviour⁽¹²⁾. So, the prior related behaviour may be indirectly contributing to mother's nutritional behaviour. The others factors also needed to shape one's positive behaviour.

Most of the respondents have a strong self-motivation and a good behaviour to the fulfilment of school-aged children nutrition. Pender's on HPM said that personal factors (biological, psychological, socio-cultural) were one's general characteristics that influence their health behaviour⁽⁸⁾. In this research, the psychological factor which is self-motivation were evaluated regarding its influence on mother's behaviour in the fulfilment of nutrition. Most were motivated to provide nutritious and diverse foods to their children because they believe that this was their responsibility. They want to keep the quality of food prepared. And they didn't feel tired to do that.

Linear regression analysis had shown self-motivation has a significant influence on mother's

behaviour in the fulfilment of nutrition. As their self-motivation is stronger, their behaviour will be better. It is similar to the previous research which stated that self-motivation is an essential factor for the successfulness of positive behaviour⁽¹³⁾. It can be concluded that self-motivation can foster the self-willingness to encounter all barrier to bring up the positive behavior.

Both of respondents with positive and negative perceived benefit of nutrition have good behaviour in the fulfilment of school-aged children nutrition. Perceived benefit define as one's understanding of the advantages or benefits that were positively related to health behaviour⁽⁸⁾. Based on questionnaire analysis, it is found that most of the respondents agree, nutritious and diverse food will make their child healthy and immune to the disease, provide energy, and make their body weight stay normal. Most of the respondents with a negatively perceived benefit of nutrition stated that nutritious and diverse food can lead to obesity and unhealthy snacks don't influence children's weight. The result of linear regression analysis also shows that perceived benefit didn't influence the mother's behaviour in the fulfilment of school-aged children. One's will perform a healthy behaviour when they recognise that the benefit of new behaviour is higher than the consequence of continuing their old behaviour.

Most respondents perceived no barrier and had good behaviour in fulfilling their school-aged children nutrition. Perceived barrier is a perception of obstacles to perform current healthy behaviour⁽¹²⁾. By analysing the respondent's answer, it can be concluded that the most impinging barrier was children's appetite. Mostly agree with the negative statement such as children were prefer to eat out, mothers cannot refuse children's want to consume snacks, and children prefer snacks rather than vegetables and fruits. Previous research also found that the barrier to fulfilling nutrition was taste, challenges in getting ingredients, cooking, plating, and less knowledgeable about nutritious and diverse food with low prices⁽¹⁴⁾. Perceived barrier significantly influence the mother's behaviour in the fulfilment of school-aged children nutrition, based on linear regression analysis. As the mother perceived many barriers, they tend to delay the healthy behaviour.

Perceived self-efficacy is a personal ability to manage and perform certain health behaviours⁽⁸⁾. It is encouraging people to change their behaviour. Most of the respondents in this research have a strongly perceived self-efficacy and good behaviour in the fulfilment of nutrition for school-aged children. Bandura said that self-efficacy is not related to one's skill but refers to self-evaluation about their ability to perform something by considering their skills⁽¹⁵⁾. In this research, mothers try to emphasise and improve their self-efficacy, so they can compete against all barrier to fulfilling their school-aged children nutrition. Linear regression analysis had shown that perceived self-efficacy has a significant impact on mother's behaviour in the fulfilment of school-aged children nutrition. As perceived self-efficacy goes stronger, behaviour in nutritional fulfilment also increasing.

Most of the respondents have a negative activity-related affect, but still, have good behaviour in the fulfilment of school-aged nutrition. Pender stated that activity-related affects have an impact on one's health-promoting behaviour. Activity-related affect refers to positive or negative feelings on current activity. This feeling will drive an individual to change or maintain their past behaviour⁽¹²⁾. Most of the respondents have a positive activity-related affect by providing fish or meat with rice and vegetables, buying high-quality ingredients, and preparing lunch box to bring to school. But, some of them have a negative activity-related affect which is shown by letting their children consume snack, serving instant or fast foods, and have no limitation on children's intake. Based on linear regression analysis, can be concluded that activity-related affect has a significant influence on mother's behaviour in the fulfilment of school-aged children nutrition. It's similar to the previous research's result which is found that positive feelings can lead to the repetition of behaviour, whereas negative feeling can decrease the possibility to repeat behaviour in the future.

The result had shown that most of the respondents have a weak commitment, but still have good behaviour in the fulfilment of school-aged children nutrition. Pender through HPM said that commitment could be defined as one's desire to engage in particular health behaviour, including strategies identification to perform a positive behavior⁽⁸⁾. Linear regression analysis had found that commitment has no significant impact on mother's behaviour in the fulfilment of school-aged children

nutrition. It is similar to the previous research result which is found that commitment does not necessarily end in expected health behaviour if other behaviours were more interesting to do. Another factor such as self-regulation is required for a strong commitment to ending in positive behaviour⁽¹⁴⁾.

CONCLUSIONS

Mother's self-motivation, perceived self-efficacy, and activity-related affect have a significant role in mother's behaviour in fulfilling school-aged children nutrition. Therefore, efforts can be made to reduce the incidence of malnutrition in school-age children by improving mother's self-motivation, perceived self-efficacy, and affect. So that, school-age children can be met his nutritional needs well.

Nurses should create health promotion which can increase mother's self-motivation, perceived self-efficacy, and affect in fulfilling school-aged children nutrition. For example, how to make nutritious food which is cheap, how to make a healthy snack to reduce street food snacking on children, and the danger of an unhealthy snack. Further research should examine the other factors on the health promotion model, such as interpersonal and situational factor to complete this research finding.

Ethical Clearance: This research has passed the ethical test conducted at the Ethics Committee of the Faculty of Nursing, Universitas Airlangga number 412-KEPK.

Source of Funding: This study is a self-funded research project.

Conflict of Interest: We declare no potential conflicts of interest with respect to research and/or publication of this article.

REFERENCES

1. Wirjatmadi B, Andriani M. Peranan Gizi Dalam Siklus Kehidupan. Prenadamedia Group, Jakarta. 2012;
2. Badan Penelitian dan Pengembangan Kesehatan. Laporan nasional Risesdas 2008. Jakarta: Departemen Kesehatan Republik Indonesia; 2008.
3. Dinas Kesehatan Kota Surabaya. Rekapitulasi hasil penjarangan peserta didik di kota Surabaya

tahun 2015. Surabaya; 2015.

4. Ainnur A. Membangun kampung hijau bersinar: upaya pendampingan dalam membangun kesadaran masyarakat kampung kumuh di Bulak Banteng Lor I Kelurahan Bulak Banteng Kecamatan Kenjeran Surabaya. Surabaya: UIN Sunan Ampel Surabaya; 2016.
5. Prahasiwi DF. Studi pendahuluan: perilaku ibu dalam pemenuhan gizi anak usia sekolah. Surabaya; 2017.
6. Armstrong MEG, Lambert MI, Lambert EV. Secular trends in the prevalence of stunting, overweight and obesity among South African children (1994–2004). *Eur J Clin Nutr.* 2011;65(7):835.
7. Ariani M, Rachman HPS. Keberhasilan Diversifikasi Pangan Tanggung Jawab Bersama. *Badak Pos, Banten hal.* 2008;2.
8. Pender NJ. Health Promotion Model Manual [Internet]. Michigan, USA; 2011. Available from: <http://deepblue.lib.umich.edu/bitstream/handle/2027.42/85350/?sequence=1>
9. Pender NJ, Murdaugh CL, Parsons MA, Ann M. Health promotion in nursing practice. 2006;
10. Khoshnood Z, Rayyani M, Tirgari B. Theory analysis for Pender's health promotion model (HPM) by Barnum's criteria: A critical perspective. *International Journal of Adolescent Medicine and Health.* 2018;1–9.
11. Piernas C, Popkin BM. Trends in snacking among US children. *Health Aff.* 2010;29(3):398–404.
12. Alligood MR. *Nursing Theorists and Their Work-E-Book* [Internet]. 9th editio. Missouri, USA: Elsevier Health Sciences; 2018. Available from: <https://books.google.com.au/books?hl=en&lr=&id=l7stDwAAQBAJ&oi=fnd&pg=PP1&dq=pender+health+promotion+model&ots=yVsGURJpfa&sig=I7c6j3fXpXPYqZ4HM19GU9nJGal#v=onepage&q=pender+health+promotion+model&f=false>
13. Story PA, Hart JW, Stasson MF, Mahoney JM. Using a two-factor theory of achievement motivation to examine performance-based outcomes and self-regulatory processes. *Pers Individ Dif.* 2009;46(4):391–5.
14. Has ES and A. Model pengembangan pemenuhan kebutuhan gizi anak prasekolah berbasis. *J Ners* [Internet]. 2012;7(2):121–30. Available from: <https://e-journal.unair.ac.id/JNERS/article/view/4010/2731>
15. Bandura A. Self-Efficacy. *Encycl Hum Behav* [Internet]. 1994;4(1994):71–81. Available from: <https://www.uky.edu/~eushe2/Bandura/Bandura1994EHB.pdf>

Spatial Variation of Human Cancer Incidence across Babylon State in (2010)

Samah Ibrahim Shamki¹, Afrah Ibrahim Shamki²

¹Faculty of Basic Education, ²Faculty of Education for Human Sciences, University of Babylon, Ministry of Higher Education and Scientific Research, Babel, Iraq

ABSTRACT

Cancer is an abnormal growth of the cells of the body, and may move from one place to another and lead to the growth and proliferation of irregular cells to form tumors are on the two types of tumor and benign tumor malignant, and there is no specific reason for the emergence of tumors and factors Environmental, genetic, economic, social, dietary habits such as smoking, drinking alcohol and drugs. The research aims to study cancer in the province of Babylon, one of the Iraqi provinces, the results showed a clear spatial disparity between the administrative units of the province, the rate of cases of cancer in all the province of Babylon in 2010 (43) Of the population, which is more than the rate of cases of infection across Iraq, amounting to (38) injuries per 100 thousand people. The study also showed a difference in the rates of infection according to the ten common types of cancer in Babil province comes on the list of these types is breast cancer, where the rate of infection (9.35) per 100000 population, which is one of the most dangerous types of cancer threat to the population, especially females. Lung cancer and bronchitis come in second place with a rate of (8.45) infections per 100000 population. Then leukemia comes in third place (5.47) per 100000 population. Pancreatic, gastric, and laryngeal cancers are among the lowest-risk cancers for the above-mentioned species (1.97-1.86-1.69), respectively. The level of administrative units, Hala recorded the highest rate of cases infected with the disease (56.18) per 100000 population. Followed by Musayyib (43.51), Mahawil (31.89), and Al-Hashimiah (27. 80).

Keywords: Cancer, Genetics, Environment, Spatial Variation

INTRODUCTION

Cancer is the most important cause of mortality in the world. Breast cancer is the second most common cause of cancer death in women. Many cancers initially respond to chemotherapy, but later develop resistance (1)regional, and national health policies. In the Global Burden of Disease Study 2013 (GBD 2013. Represents most cancers some of the essential challenges cutting-edge then after challenges dealing with researchers every over the world, health institutions, partial or global into typical and the Iraqi presidency among particular, along with the increasing fall of annual disease. Given the respect regarding this topic has gone according to the

middle on the discipline of most cancers of the kingdom about Babylon and in accordance with articulate the trade about its spatial decoding is a primary purpose of the country (2)the technology and capabilities of CT scanners have changed tremendously (helical and spiral CT are equivalent technologies; for consistency, the term “helical” will be used throughout.

The boundaries of the sea of the region regarding Babylon who is certain over the governorates on Iraq, located graceful of the headquarters (Baghdad) road, bordered with the aid of regarding upper about Baghdad and just northern of the western Anbar state or in conformity with the west the state of Karbala then in accordance with the Antarctic the provinces on Najaf, Qadisiyah or after the East the county on Waist. It is that willpower concerning the spatial certain about the provinces concerning the Middle Euphrates, as into the

Corresponding author:

Samah Ibrahim Shamki

E-mail: samah.is181@gmail.com

chart (3). Located among latitudes (32° -15 33°) north or longitudes (44°- 15 45°) in imitation of the past about the figure (1) yet a bourgeois (5119 km2) region consists of the education 16-node administration at the level concerning the arm the centers consume the 12 of hand (4)



Figure.1 Map of Babylon Governorate (3)



Figure..2 Administrative divisions of Babil Governorate Map (3)

Cancer can be defined as a disease in which a group of abnormal cells grow uncontrollably by disregarding the normal rules of cell division. Normal cells are constantly subject to signals that dictate whether the cell should divide differentiate into another cell or die (5). Cancer cells develop a degree of autonomy to continue and spread it can be fat. In fact, almost 90% of cancer-

related deaths are due to tumor spreading –a process called metastasis. Now define cancers a disease that involves change or mutations in the cell genome .these change (DNA mutations) produce proteins that disrupt the delicate cellular balance between cell division and quiescence, resulting in cells that keep dividing to form cancers one. The second – largest common disease cause the death in the world is cancer – malignant tumors (6) and their morphology is governed by the delicate balance between frequent fusion and fission events, as well as by interactions with the cytoskeleton. Alterations in mitochondrial morphology are associated with changes in metabolism, cell development and cell death, whilst several human pathologies have been associated with perturbations in the cellular machinery that coordinate these processes. Mitochondrial fission also contributes to ensuring the proper distribution of mitochondria in response to the energetic requirements of the cell. The master mediator of fission is Dynamin related protein 1 (Drp1).

Other causes in the increase of cancer diseases in the Musayyib district is the missile strikes by the occupation forces in the first Gulf War and the second addition to the large number of former military manufacturing sites and their remnants and the rest of them currently in the region as a source of danger and impact on human health due to the nature of materials used in the manufacture of weapons and ammunition (7), and the non-compliance of these institutions with the rules of health safety of former employees and neglect of the health authorities of these sites and now isolate them from the population and prevent them from approaching (26), which caused a significant increase in the number of cases of cancer. Mahaweel is ranked third in the number of casualties (31.89) per 100000 inhabitants (8)its dynamic patterns have not been analysed at the genome scale in human pre-implantation embryos due to technical difficulties and the scarcity of required materials. Here we systematically profile the methylome of human early embryos from the zygotic stage through to post-implantation by reduced representation bisulphite sequencing and whole-genome bisulphite sequencing. We show that the major wave of genome-wide demethylation is complete at the 2-cell stage, contrary to previous observations in mice. Moreover, the demethylation of the paternal genome is much faster than that of the maternal genome, and by the end of the zygotic stage the genome-wide methylation level in male pronuclei is already lower than that in female

pronuclei. The inverse correlation between promoter methylation and gene expression gradually strengthens during early embryonic development, reaching its peak at the post-implantation stage. Furthermore, we show that active genes, with the trimethylation of histone H3 at lysine 4 (H3K4me3, The lowest rate of infection (27, 80) per 100000 inhabitants was recorded in Al Hashimi district because the two cases are characterized by the agricultural nature of the arable land and the economy in general on agriculture, which means the reduction of the proportion of manufacturing and the resulting environmental pollutants compared to what is in the areas of Hala and Musayyib (9).

MATERIAL AND METHOD

Spatial variation of cancer at the level of Babil province

The degree of cancer is different not only globally but also at the level Regional and local levels where the factors of the geographical environment share the variation in infection at previous levels. Data from Table 1. shown the calculated rate of infection per 100000 population. There is a difference in the incidence of cancer at the level of the administrative units of Babil state in 2010, (56, 18) per 100000 population (9). This is due to the large size of the judiciary as well as the fact that the city’s environment has high levels of pollution. The industrial district, which includes most of the establishment’s industries such as construction industries, a chemical, textile, and soft drinks (10)“ISBN”:”0165-9936”,”ISSN”:”18793142”,”abstract”:”Two of the main topics of growing concern in analytical chemistry are the development of green analytical methods and the determination of emerging pollutants. One of the well-established green extraction techniques is microwave-assisted extraction (MAE. In addition, factories produce hundreds of tons of solid waste, as well as large amounts of polluting gases such as CO2, H2SO4, and CO. (cadmium, cobalt, chromium, lead, manganese, nickel, sulfide). Some studies conducted in the al-Hela river indicate that cadmium ranged from 1.9-2.58 µg/g this amount is close to the high global concentrations (11) terrestrial ecosystems hold the potential to capture and store substantially increased volumes of C in soil organic matter (SOM.

Table. 1 Geographical distribution of the rate of cases of cancer in Babil province in 2010

Administrative unit	Infection rate per 100000 population
Spend the solution	56.18
Mahaweel district	31.89
Hashemite district	27.80
Musayyib district	43.51
Total Governorate	43.00

Role of genetic

Many studies have been conducted to determine changes in gene expression of DNA polymerases in human cancer (12).

Role of environment

The development of cancer in a species is influenced by a wide variety of changes in the internal and external environments of the host. The aspects of the internal environment that have been studied most thoroughly are hormonal status and nutrition. Hormonal imbalance in mice leads to the appearance of at least five types of tumors in tissues especially dependent on hormonal secretions in their physiology. Hormonal and nutritional also are associated with some tumors in humans. Iodine deficiency may be a factor in the genesis of thyroid cancer. Deficiency development of pharyngeal cancer (13)we conducted a genome-scale analysis of 276 samples, analysing exome sequence, DNA copy number, promoter methylation and messenger RNA and microRNA expression. A subset of these samples (97.

Spread of cancer

One of the biggest problems with cancer is its spread in different parts of the body .This spread through any or all of the three following routes. Any other disease, in cancer also, both the environmental as well as the genetic factors, played in the causation of the disease. Over the last few decades, it has been found the environment plays a prominent role in the causation of most cancer 80 to 90 per cent of all cancers are said to be dependent directly or indirectly on environmental factors (14).

Chemical and physical carcinogens

Induced neoplasms are tumors that can be evoked at will in human exposed to chemical and physical substances. Some of the environmental agents that have been related to cancer in humans are listed in table (2)

Chemical and physical carcinogens

Induced neoplasms are tumors that can be evoked at will in human exposed to chemical and physical substances. Some of the environmental agents that have been related to cancer in humans are listed in table (2)

Table 2: Environmental agents related to cancer in man

Site	Agent
Liver	Aflatoxin
Marrow	Alkylating agents
Urinary bladder	Aromatic amines
Skin, lung	Arsenic
Lung , serosa	Asbestos
Marrow	Benzene
Urinary bladder	Benzidine
Lung	Chloromethyl ether
Lung	Chromium
Uterus ,Vagina	Estrogens
Lymphatic	Immunosuppressants
Nasal sinus	Isopropyl oil
Lung	Mustard gas
Skin	Radiation, ultraviolet
Lymphatic	Viruses

Some factors can also cause cancer, changes in life – style including drinking alcohol, smoking and working under the sun and the sun itself cause the cancer (15)

RESULT AND DISCUSSION

The results of laboratory tests of water from the Hilla textile factory and soft drinks showed an increase in the values of (Cl So4-T.D.S.T.H) and high concentrations of phosphates, all of which are outside the permissible limit of 4.1 milligrams per liter in the al-Hala water due to industrial waste and wastewater. The existence of large agricultural areas on both sides of the river, which use many types of fertilizers containing phosphate compounds, and contains the elimination of gas station

to generate electricity.

Treatment of cancer

Newer approaches in cancer treatment:

1. Gene therapy.
2. Cancer immunotherapy.
3. Focused ultrasound.
4. RNA inhibition.
5. Charged particle therapy.
6. Robotic surgery.
7. Nanotechnology

Spatial variation of cancer cases in Babil province

Table (3) shows the increase in the number of people suffering from cancer diseases in Babil governorate. The number of infected cases in 2003 was 449 cases and the number increased to 1045 in 2005, an increase of 596 cases. The number has been increasing at a high rate of (1162) cases in 2011, an increase of (713) cases compared to 2003, which is about double the number.

Table. 3 Number of cases of cancer diseases in Babil state in the years (2003-2011)

Years	Number of injured
2003	449
2004	775
2005	1045
2006	1064
2007	922
2008	1007
2009	1098
2010	1095
2011	1162

Comparison of infection rates in the province with the total rates of infection in Iraq, we find that the rate of cancer calculated for each (100000 population) of the population in general babil province for 2010 adjusted to (43) injuries per (100000 population) of the population and more than the rate of infection of all of Iraq, (100000 population) of the total population of Iraq. The rates of

infection vary according to the ten common types of cancer in the province of Babylon, as shown in Table (4) and that breast cancer is at the top of the list of cancer in the study area where the rate of infection (9.35) injuries per (100000 population). Breast cancer is one of the most common cancers in the world, and its causes are genetic factors. Some studies suggest that breast cancer patients may have a previous history of the sease in this family. On the other hand, Fat, grease, dairy products, and cancer.

The incidence of lung cancer and airway in the second place with an injury rate of (8.45) per 100000 population of the population. This is due to the rise of urban, where the majority of the population in the cities of the center of the province and the rest of the districts and districts do not move far from the center of the province and take a lot, it was observed that air pollution, especially with car exhaust, is especially important after ascertaining the presence of carbon atoms in patients' ulcer during cellular microscopy. Smoking also causes cancer tumors and increases their complications. The performer to death. Leukemia was the third most common type of cancer (5.47). While the lowest incidence was pancreatic, stomach, and laryngeal (1.97-1.86 – 1.69) per 100000 population of each population, respectively.

Table. 4 The commonest ten cancers in Babil number of new cases primary site, percentage of total / 100000 population

primary site	No .of cases	Registered cases /10 ⁵ pop
Preast	166	9.35
Pronchus& lung	150	8.45
Leukemia	97	5.47
Bladder	79	4.45
Non- Hodgkin lymphoma	61	3.44
Brain & other CNS	60	3.38
Colorectal	52	2.93
Pancreas	35	1.97
Stomach	33	1.86
Larynx	30	1.69
Total ten	763	43.00

CONCLUSION

Normal cells are constantly subject to signals that dictate whether the cell should divide differentiate into another cell or die. Cancer cells develop a degree of autonomy to continue and spread it can be fat. In fact, almost 90% of cancer- related deaths are due to tumor spreading –a process called metastasis. The research aims to study cancer in the province of Babylon, one of the Iraqi provinces, the results showed a clear spatial disparity between the administrative units of the province, the rate of cases of cancer in all the province of Babylon in 2010. The level of administrative units, Hala recorded the highest rate of cases infected with the disease. Followed by Musayyib, Mahawil, and Al-Hashimiah. Cancer- related deaths are due to tumor spreading –a process called metastasis. Now define cancers a disease that involves change or mutations in the cell genome. These change (DNA mutations) produce proteins that disrupt the delicate cellular balance between cell division and quiescence, resulting in cells that keep dividing to form cancers one.

Ethical Clearance: People identified as potential research participants because of their status as relatives or carers of patient’s research participants by virtue of their professional role in the university and departments.

Source of Funding: Self-Funding

REFERENCES

1. Cancer Genome Atlas Network. Comprehensive molecular characterization of human colon and rectal cancer, 2012 Jul, vol.18, no. 487, pp. 330-7
2. Medicine AA of P - The Measurement, Reporting, and Management of Radiation Dose in CT. American Association of Physicists in Medicine. 2008, vol. 4, no 96, pp. 1-34
3. Zanoliti J. Turkey: Background and U.S. Relations. Curr Polit Econ Middle East. 2015. Vol. 6, No.1, pp. 1-9
4. Ninković M, Weissenbacher A, Pratschke J, Schneeberger S. Assessing the outcome of hand and forearm allotransplantation using the action research arm test. Am J Phys Med Rehabil. 2015 Mar, vol. 94, no. 3, pp. 211-21.
5. Lanier LL. Up on the tightrope: Natural killer cell activation and inhibition. Nature Immunology. 2008 May, vol. 9, no. 5, pp. 495-502.
6. Elgass K, Pakay J, Ryan MT, Palmer CS. Recent

- advances into the understanding of mitochondrial fission. *Biochim Biophys Acta - Mol Cell Res.* 2013. vol. 1833, no 1, pp. 150-161
7. A. H. Jabbar, M. Q. Hamzah, S. O. Mezan, N. N. Hasan, and M. A. Agam, "A Continuous Process for the Preparation, Characterization and Study Thermal Properties of Nickel Oxide Nanostructure," *Int. J. Sci. Eng. Res.* 2018, vol. 9, no. 3, pp. 590–602.
 8. Guo H, Zhu P, Yan L, Li R, Hu B, Lian Y, et al. The DNA methylation landscape of human early embryos. *Nature*, July 2014, vol. 11, no. 711, pp. 606-610
 9. M. Q. Hamzah, Abdullah Hasan Jabbar, Salim Oudah Mezan, "Synthesis and Characterization of Cu₂ZnSnS₄ (CZTS) Thin Film by Chemical Bath Deposition (CBD) for Solar Cell Applications", *International Journal of Scientific Engineering and Research (IJSER)*, December 2017, vol. 5, no. 12, pp. 35 – 37
 10. N. Dorival-Garcia, A. Zafra-Gomez, A. Navalon, J.L. Vilchez, Analysis of bisphenol A and its chlorinated derivatives in sewage sludge samples. Comparison of the efficiency of three extraction techniques, *J. Chromatogr.* 2012, vol. 12, no. 53, pp. 1-10.
 11. A. S. B. A. and M. A. A. Abdullah Hasan Jabbar, Maytham Qabel Hamzah, Salim Oudah Mezan, "Green Synthesis of Silver / Polystyrene Nano Composite (Ag / PS NCs) via Plant Extracts Beginning a New Era in Drug Delivery," *Indian J. Sci. Technol.* June 2018, vol. 11, no. 22, pp. 1–9.
 12. Alexandrov, L. B., Nik-Zainal, S., Wedge, D. C., Aparicio, S. A. J. R., Behjati, S., Biankin, A. V. Stratton, M. R. (2013). Signatures of mutational processes in human cancer. *Nature*, 2013, vol. 500, no. 7463, pp. 415–421.
 13. Cancer Genom Atlas. Comprehensive molecular characterization of human colon and rectal cancer. *Nature*. 2012 Jul 18, vol. 487, no. 7407, pp. 330-7.
 14. M. Q. Hamzah, A. H. Jabbar, S. O. Mezan, N. N. Hasan, and M. A. Agam, "ENERGY GAP INVESTIGATION AND CHARACTERIZATION OF KESTERITE CU₂ZNSNS₄ THIN FILM FOR SOLAR CELL" *Int. J. Tech. Res. Appl*, vol. 6, no. 1, 2018 pp. 3–6.
 15. Lin Y-L, Pasero P. Interference Between DNA Replication and Transcription as a Cause of Genomic Instability. *Curr Genomics.* 2012 Mar, vol. 13, no. 1, pp.65-73.

Characteristics of Overweighed and Obese Adults attended Nutritional Clinic in Al-Qadisiyah Governorate, Iraq, 2014

Fatima A. Alkhalidi¹, Rami S. Alshemerty²

¹M.B.Ch.B, FICMS/CM, Department of Community Medicine, College of Medicine, University of Al-Qadisiyah, AL-Qadisiyah governorate, Iraq, ²M.B.Ch.B;F.I.C.M.S, Department of surgery/ College of Medicine, University of Al-Qadisiyah, AL-Qadisiyah governorate, Iraq

ABSTRACT

Overall world, the community is undergoing a rapid epidemiological and nutritional transition characterized by persistent nutritional deficiencies or increasing overweight and obesity rate which is one of important challenge that needs to change in food habit and lifestyle toward healthy diet and regular physical exercise. In Iraq, this problem is not fixed, but according to Stepwise Surveillance of Chronic NCD Risk Factor 2006 the overweight and obesity rate was 67%(34.8%fe male, 32.1% female). This study aimed to estimate the describe BMI status and characteristics factor that associated with overweight and obesity.

A file base descriptive cross-sectional study was conducted in 2016. files of adults aged >18 years attended the Nutritional clinic during 2014 were reviewed. demographics characteristics and BMI status were considered and presented as a percentage. mean of age was computed and some variables were crosstab with BMI classification recommended by WHO. statistical significant considered when p-value ≤ 0.05 .

A total study sample was 722, Male to female ratio was 1:6, the mean of age was 32.8 ± 9.9 . About 20.5% was normal BMI while the overweight and obesity was 79.5%. The study showed that the overweight and obesity rate was higher in female than male(88.2 % vs 21.8%, p-value > 0.001).it is also higher in married status than single(81.7% vs 18.3%, p > 0.001). The basic educational level had high overweight and obesity rate which was 46.1% with the statistically significant association (p-value = 0.05). We conclude that the overweight and obesity rate was high among female, married and persons have a basic educational level in the Iraqi community.

Keywords: Overweight, BMI, Obesity, Nutrition.

INTRODUCTION

Obesity is a disease in which excess fat has accumulated in the body that health may be negatively affected⁽¹⁾The World Health Organization (WHO) recognizes obesity as a global health issue with one billion adults worldwide identified as overweight and an additional 300 million obese ⁽²⁾. it has affected developed and developing countries ⁽³⁾ a lot of studies were found that a combination of excessive calorie intake and a

sedentary lifestyle are the main causes of obesity and overweight ⁽⁴⁾. This considered as a global health problem and is steadily affecting many of countries, particularly in the urban area. The obesity prevalence has increased at an alarming rate ⁽⁵⁾. Many countries of low- and middle-income are now facing a “double burden” of disease: as infectious diseases and under-nutrition; at the same time they are experiencing a rapid increase in risk factors of NCDs such as obesity and overweight, particularly in urban settings ⁽⁶⁾. The reasons behind this “epidemic” could be attributed, on the one hand, to modern lifestyles demonstrated by consumption of a diet rich in fatty foods and energy-dense foods, snacking and declining overall levels of physical activity ^(7,8). On the other hand, familial and genetic predisposition, psychological factors,

Corresponding Author:

Fatima A. Alkhalidi

E-mail: fatimaalkhalidi4@gmail.com

Address: Al-Diwaniyah/ Iraq/ P.O. Box:88.

diseases (hypothyroidism, Cushing syndrome) and drugs (steroids, tricyclic antidepressants, sulfonyleureas, valproate, and contraceptives) may play a role in the etiology of obesity⁽⁷⁾. Overweight and obesity are known risk factors for diabetes, coronary heart disease, stroke, hypertension, gallbladder disease, osteoarthritis, sleep apnoea, some forms of cancer and infertility. Obesity is also associated with hyperlipidemia, pregnancy complications, hirsutism, stress incontinence, and increased surgical risk⁽⁷⁾.

In Iraq, this problem is not fixed, and the data on overweight and obesity in Iraq is anecdotal, scarce and not representative of the community⁽⁹⁾ but according to Stepwise Surveillance of Chronic NCD Risk Factor 2006 the overweight and obesity rate was 67% (34.8%fe male, 32.1% female). so the aim of our study is to estimate the describe BMI status and characteristics factor that associated with overweight and obesity among the studied sample.

PATIENT AND METHOD

A file base descriptive cross-sectional study was conducted in Aldewaniyh city-south of Iraq during 2016. files of 722 adults aged more than 18 years who attended the Nutritional clinic during 2014 were reviewed. the study included all adult of more than 18 years and excluded anyone with the acute or chronic disease associated with or related to nutritional or metabolic disorder and any pregnant women. Demographics characteristics and BMI status were considered and presented as number and percentage. mean of age was computed and some variables were crosstab with BMI

classification recommended by WHO. data analysis was carried out by using SPSS software (SPSS version 18.0) The suitable statistical test was used for testing the significance of the association between variable under study. Statistical significance will be considered when the P-value was equal or less than 0.05.

RESULT

A total study sample was 722, the mean of age all sample was 32.8 ± 9.94 yr(26.34 ± 6.358 yr for the normal person while 34.48 ± 10.018yr for the obese and overweight person) with the significant association of mean age. As shown in table 1.

Table 1: Mean ± SD of age for the study sample.

	Nutrition status	N	Mean	Std. Deviation	P value
age	normal	148	26.34	6.358	0.001
	Obesity and overweight	574	34.48	10.018	
	total	722	32.82	9.940	0.001

Our study was found that about 79.5% (574 persons) of the study sample was overweight and obesity while normal BMI was 20.5% (148 persons).

The study showed that the male to female ratio was 1:6, female represented 85% of the study sample while the male was 15%. the overweight and obesity rate was higher in female than male(88.2 % vs. 11.8%) with significant association(p-value > 0.001). as in table 2.

Table 2: Distribution of nutritional status according to the gender of the study sample.

	Nutrition status							P value
	normal		Overweight and obesity		Total			
	N	%	N	%	N	%		
gender	male	40	27	68	11.8	108	15	0.0001
	female	108	73	506	88.2	614	85	
	total	148	100	574	100	722	100	

Also, the study found that overweight and obesity rate was higher in married status than single(81.7% vs. 18.3%) with a significant association between them (p > 0.001) as shown in table 3.

Table 3: Distribution of nutritional status according to the Marital status of the study sample.

		Nutrition status						
		normal		Overweight and obesity		Total		P value
		N	%	N	%	N	%	
Marital status	single	81	54.7	105	18.3	186	25.8	0.0001
	married	67	45.3	469	81.7	536	74.2	
total		148	100	574	100	722	100	

The basic educational level had high overweight and obesity rate which was 46.1% with the statistically significant association (p-value = 0.05) as in table 4.

Table 4: Distribution of nutritional status according to the Education level of the study sample.

		Nutrition status						
		normal		Overweight and obesity		Total		P value
		N	%	N	%	N	%	
Education level	illiteracy	30	20.3	118	20.6	148	20.5	0.05
	basic	54	36.5	265	46.1	319	44.2	
	higher	64	43.2	191	33.3	255	35.3	
	total	148	100	574	100	722	100	

finally, our study showed that the overweight and obesity rate was higher in not working person than in working one (62.7% vs. 37.3%) with no statistically significant association between them(p-value = 0.5) as in table 5

Table 5: Distribution of nutritional status according to the occupation of the study sample.

		Nutrition status						
		normal		Overweight and obesity		Total		P value
		N	%	N	%	N	%	
occupation	working	59	39.9	214	37.3	273	37.8	0.5
	not working	89	60.1	360	62.7	449	62.2	
	total	148	100	574	100	722	100	

DISCUSSION

Obesity and overweight considered as one of the most serious public health problem and challenges of world wild. The prevalence of childhood obesity has been noted in developed and developing countries but its prevalence is more increasing in developing countries.

Our study revealed that more than 3/4 of the sample were female with a mean ± SD of age was 32.8 ± 9.94 yr with statistical significant (p-value < 0.001).the overweight and obesity prevalence was high (79.2%) among study sample which was higher in female than male (88.2% vs. 11.8%) this result in agreement with results of other studies that conducted in Iraq and in

USA countries^(11,12) this may explain by most of attended clients to nutrition clinic were females also due to change in believes, culture and lifestyle of Iraqi woman.

The present study found that overweight and obesity rate was higher in married persons than a single person(81.7% vs. 18.3%) with the significant association between them. This result was similar to others study results that carry out in Iraq and Jordan^(13,14) the causes behind this result may be due to that after married the persons have more responsibilities(including children caring) and not interested to change their life.

Regarding educational level, persons with basic educational level and less had higher overweight and obesity rate(46.1%) than other types of education level which was inconsistent with the findings of previous study⁽¹³⁾, it may be explained that most of the people with low education had less information about healthy diet and risky of obesity.

There was a high overweight and obesity rate among not working person than in working one (62.7% vs. 37.3%) with no statistically significant association between them this result similar to result of another study that conducted in Jordan and USA^(13,15) and it may be due to that most not working person was less activity and lack of exercise with low income.

CONCLUSION

The overweight and obesity prevalence was high among the population of AL-Qadisia city especially among female, married persons have a basic educational level.

Conflicts of Interest: There is no conflicts of interest.

Source of Funding- Self

Ethical Clearance: The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/ have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity.

REFERENCES

1. WHO, Obesity An epidemic, [Accessed Apr. 11, 2009]. Available from <http://www.who.int/nutrition/topics/obesity/en/>.
- 2- Le Gales-Camus C. Address to the informal meeting of EU Health Ministers. World Health Organization. 2006. available At HTTP:// www.who.int/nmh/media/speeches/nmh_adg_speech_eu_april06_en.pdf
- 3- Kumanyika SK et al. Public Health Approaches to the Prevention of Obesity (PHAPO). Obesity prevention: the case for action. International Journal of Obesity, 2002; 26:425–436.
4. Bleich S, Cutler D, Murray C, Adams A. Working paper 12954: Why is the developed world obese? National Bureau of Economic Research, [Aug. 21, 2008] Available from: <http://www.nber.org/papers/w12954>.
5. WHO, Global Strategy on Diet, Physical Activity and Health, Childhood Overweight and Obesity, Childhood overweight and obesity on the rise, 2008a. Available from: [quences/en/index.html](http://www.who.int/dietphysicalactivity/childhood-consequences/en/index.html).
6. WHO, Global Strategy on Diet, Physical Activity and Health. Why does childhood overweight and obesity matter: Double burden: A serious risk, 2008c. Available from: <http://www.who.int/dietphysicalactivity/childhood-consequences/en/index.html>.
7. Frier BM et al. Diabetes Mellitus and nutritional and metabolic disorder in Edwards CRW et al., eds. Davidson's principles and practice of medicine 18th ed. London, Churchill Livingstone, 1999:526-31
8. King FS, Burgess A. Nutrition for developing countries, 2nd ed. Oxford, Oxford University Press, 2000: 284-91.
9. Al-Tawil NG, Abdulla MM, Abdul Ameer AJ. Prevalence of and factors associated with overweight and obesity among a group of Iraqi women. East Mediterr Health J 2007;13: 420-429.
10. Ghosh A. Explaining overweight and obesity in children and adolescents of Asian Indian origin: The Calcutta childhood obesity study. Indian J Public Health. 2014;58:125–8.
11. Cynthia L. Ogden, Margaret D. Carroll, Cheryl D. Fryar, Katherine M. Flegal. Prevalence of Obesity Among Adults and Youth: the United States, 2011–2014. NCHS Data Brief.2015;11: 219.
12. Mansour AA, Al-Maliky AA, Salih M. Population

- Overweight and Obesity Trends of Eight Years in Basrah, Iraq. *Epidemiol* 2012;2:110.
13. M. Al Nsour, Gh. Al Kayyali, S. Naffa. Overweight and obesity among Jordanian women and their social determinants. *EMHJ*. 2012;19:12 .
 14. N. G. Al-Tawil, M.M Abdulla, A.J Abdul Ameer. Prevalence of and factors associated with overweight and obesity among a group of Iraqi women. *EMHJ*. Vol.2007;13:2.
 15. Wardle J, Waller J, Jarvis MJ. Sex differences in the association of socioeconomic status with obesity. *Am J Public Health*. 2002;92: 1299-1304.

Floating Prostitution and the Potential Risk of HIV Transmission in a Religious Society in Indonesia

Hardisman Dasman¹, Firda Firdawati¹, Ilma Nuria Sulrieni²

¹Faculty of Medicine of Andalas University, Padang, West Sumatera, Indonesia,

²Commission of HIV/AIDS Prevention of West Sumatera, Indonesia

ABSTRACT

Background: Indonesia known as the most populous Moslem country in the world, where Padang Municipality, the capital city of West Sumatera Province is recognized as one of the most religious societies in the country. The law strictly prohibits prostitution and adultery, which is supported by all religious communities. However, the Province HIV/AIDS Prevention Commission recorded that there has been a substantial number of female sex workers (FSWs) in the city. At the same time, the number of HIV/AIDS cases also significantly increased. This study aims to explore existence of prostitution practice and the risk of HIV transmission.

Method: A qualitative study has been conducted to answer the research question by interviewing 31 women sex workers using grounded theory approach and as well as two health workers and three HIV/AIDS prevention commissioners. The data was analyzed using thematic framework analysis.

Result: The poverty is the main reason of FSWs falling into prostitution practice, adding by lack social support from their family and relatives, weak personality and environment influence. Majority of them (58,1%) have low level of education and little knowledge of HIV/AIDS, in which they perceive that they are safe from getting infected when they see the client is physically healthy. Additionally, due to their economic dependant on their sexual transaction, they have low bargaining power to their clients, which leads to unprotected sex.

Conclusion: Economic factor and lack of social control contribute to prostitution practice in Padang Municipality. The sexual contact is mostly unprotected, which becomes a potential risk of HIV transmission.

Keywords: Prostitution, poverty, HIV/AIDS

BACKGROUND

Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome (HIV/AIDS) has become a global health problem. *United Nations Programme on HIV/AIDS* (UNAIDS) reported that up to the end of 2015 36.7 million people infected HIV, and 3.3% among of

them died due to AIDS. The cases have also increased in Asia Pacific within the last decade, which was about 5.1 million people infected HIV, and 300.000 of them were the new cases.¹ The HIV/AIDS has also threatened Indonesia, where the cases has increased over the years. Ministry of Health of Indonesia reported that accumulative cases up to early 2016 were 191.073 of HIV and 77.940 AIDS, which significantly increased since 2014.²

Province of West Sumatera also faces HIV/AIDS epidemic especially in the capital city, Padang Municipality. Despite well-known as a religious society, the cases founded also increased in the last five years.

Corresponding author:

Dr. Hardisman Dasman, MD, DrPH
Department of Public Health and Community
Medicine, Faculty of Medicine of Andalas University,
Padang, West Sumatera, Indonesia.
Email: hardisman@med.unand.ac.id

Department of Health of West Sumatera Province reported that the case rate of HIV/AIDS in the province was 24.04/100.000 inhabitants in 2015. The rate is even higher than the national average (19.1/100.000 inhabitants), and placed the Province of West Sumatera in rank 8th nationally.³ Among all districts and municipalities in the province, Padang has the highest number of the cases. Department of Health of West Sumatera Province reported that the cases rate was 56.96/100.000 inhabitants in the city, which was higher than the provincial and national rates, and estimated that nearly 600 cases of HIV/AIDS cases in the city.³

There are high risk population groups, which the prevalence of HIV/AIDS is higher in those population, such as injected drug users, female sex workers (FSWS), and man ho have sex with man (MSM). The prevalence of HIV positive has been found constantly 5% or more in these high-risk population group since 2015. Indonesian Commission of HIV/AIDS prevention also reported that that HIV cases distributed predominantly among those groups, namely 10.4% direct FSWs, 4.6% indirect FSWS, 24.4% transgender, 0.8%-FSWS client, 5.2% MSM, and 52.4% drug users.⁴ In Padang Municipality especially, despite it is illegal and forbidden by all ethnic and religious societies, there are hidden or floating prostitution practice in the city.^{5,6} Floating prostitution is even worse in spreading of HIV/AIDS because health promotion program cannot reach those community. This study aims to explore the floating prostitution practice in the city and the potential risk of HIV transmission.

METHOD

The study used a qualitative inquiry to address the research objectives by using population case study approach. The participants of the study were 31 women sex workers, which were obtained by snowball principle from the informants, and as well as three commissioners of HI/AIDS prevention of West Sumatera Province and two health workers.

The data was gathered by conducting semi structural interview with the informants, and it is analyzed thematically using behavioral and social relation theories, and later presented narratively.

RESULT

Overview of FSWs

The age of FSWS in Padang range between 20 and 56 years, which majority of them (54.9%) more than 35 years old, and more than half (58.1%) have low level of education. Interestingly, in the marital status, most of them are widow (74.2%). See table 1.

Table 1. Characteristic of female sex workers in Padang

Variable		f	%
Age (years)	< 25	4	12,9
	25-30	6	19,4
	31-35	4	12,9
	36-40	6	19,4
	>40	11	35,5
Level of education	Low (up to grade 9th)	18	58,1
	High School	11	35,5
	University Level	2	6,5
Marital status	Single	1	3,2
	Married	7	22,6
	Widow	23	74,2
Ethnic	Minangkabau	25	80,6
	Java	2	6,5
	Acehnese	1	3,2
	Malay	3	9,7
Starting age as sex workers (yo)	<20	3	9,7
	20-30	15	48,4
	>30	13	41,9
Length as sex workers (year)	≤ 1	8	25,8
	> 1-5	11	35,5
	> 5	12	38,7

Poverty

The sex workers have various reasons fall into prostitution practice, including poverty, environment influence and family displaced. However, most of them blame that their economic condition influences their decision working as sex workers. As mentioned by the informants:

"My reason is... forcing by condition. Ya, I have a husband, but the income is not enough" [R3].

"...for living, I am a single mother, to fulfill my basic need and my four children" [R5].

"I work like this because of economic need. My husband unemployed, then I work like this, he doesn't know" [R15].

"I am divorced with my husband. I don't have income, I don't have money but I have to take care my children so I do this" [R31].

Life style

Some of them fell enjoy for what they are doing, who has been as sex workers for more than 10 years. For this woman, she perceives that sexual transaction is as easy way to earn much money, to provide a high-profile life style, such as having expensive gadgets and luxurious holiday. As mentioned by informant:

"Honestly, yes, I do this because my family is poor, but I want to have what people have..." [R18].

"...I don't 'know... ya.. I want to out from this job, but not now. Now... just enjoy it, I am fine..." [R21].

Personality

Weak personality and lack of family attention added the economic reasons, which make them easily influenced by the friends and the environment. Some of them used to works as shop keepers or helper in beauty salon, but they earned small amount of money. When they saw a friend work as a sex worker earned much money and had a luxurious life style make them tempted to do the same. As in mentioned by informant:

"Initially... I worked as a helper in beauty salon, I didn't know the sexual job.. I didn't know the job like this, I just knew hair cut and creambath, but... yeah I saw 'plus service' what other do... you know, sex. Then.... Finally, I also do the same" [R18].

"I divorced... stress, I used to have much money from my husband. Then, I worked in beauty salon... initially, I just do hair cut and little massage, but at the end... you know I do 'this' sex" [R21].

"Initially I only did real salon, then, follow the stream... just like that" [R23].

Lack of internalizing of religious values

From the religious perspectives, all sex workers believe in the God and having a religion. They perceive that the prostitution is very forbidden and a sin. However, they have to work as sex workers to fulfill their economic need.

"I am Moslem, I know this is a sin, but I don't know what to do, this is my life no, otherwise I don't have a food. If I have another job, I quit" [R1].

"I am Moslem... this is a sin, but due to my condition, so I don't know, but in 'selling a sex' I have a boundary..." [R16].

They perceive that earning money is far more important for them and their family. They see that working as a sex worker is an easy way to do, as mentioned by informant:

"My religion is Islam, I know this is forbidden, it says 'haram' (strictly forbidden), but only by doing this I can earn money for my children. If I work in another place, I know I can only earn very small amount" [R25].

"I am a Moslem, in my religion this is very forbidden, I don't have a job..., this is the only way that I can do to earn money" [R21].

Risk of HIV transmission

Risk of HIV transmission are related to their knowledge, attitude sexual practice. In this study we found that most sex workers having low level of knowledge and lack understanding of risk of HIV/AIDS. Most of them perceive that don't have to worry about HIV/AIDS if they do not feel any symptoms. They also believe that the clients are perfectly healthy if they do not see any signs of any diseases in their body or genital organs. As mentioned by informant:

"HIV/AIDS as many people say, bad smell, itchy, that's I see when people got the disease. I am not sure, coz I never get it" [R15].

"I never do a checkup, but I know my body, I don't have any kind of symptom" [R16].

Lack of knowledge of HIV/AIDS risk is added by their economic dependant on the sexual transaction. Most of FSWS cannot force or persuade their clients to have a condom because they feel it may create unpleasant

situation and even insulting them. They fear that they may lose the client, which means loss of income. Out of 31 FSWS, only 12,9% of them use condom consistently, and even 29% of them explained that they never use (table 2). Most of them said they have done HIV test (77%), and willing to do so. However, they never do check up voluntarily. They have done a test is only relied on HIV/AIDS outreach program from Commission of HIV/AIDS Prevention of Padang Municipality or West Sumatera Province.

Tabel 2. Sexual Activity of FSWS

Sexual Activity		f (n=31)	%
Condom Use	Never	9	29,0
	Sometimes	18	58,1
	Always	4	12,9
Sexual Transaction Frequency (Weekly)	< 7	11	35,5
	7-14	12	38,7
	> 14	8	25,8

DISCUSSION

This qualitative study on FSWS in Padang Municipality reveals that the city is not free from prostitution practice despite it is recognized as one of the most religious society in the country. Also, in contrast by public assumption that the FSWS in the area come from outside of West Sumatera Province, the study shows that majority (80.6%) of them are West Sumateran origins of Minangkabau ethnics. This means that the FSWS comes from the inner society. The study indicates that the society norms and values are not apply for their principles. This is supported by our finding that, most of FSWS do not really understanding their religious values and social norm. despite they believe in God and have a religion, they do not practice it. As Roem⁶ mentioned that prostitution in the city is really exist. Some of them may used illegal street taxi in night time, which called 'dark taxi'. They use this kind of service to approach client and as well as to escape easily from city police if any incidental patrol.

Despite living in a society with strong religious norm, this cannot prohibit them to be FSWS, in which they have lack of understanding of their religious and social norm. They have personal justification, with the reasons of poverty and feeling displaced from their family and relatives. As the study found, that most

of them are widow, in which they are responsible for economic burden of their family and their children. With low level of education and lack of skills, its is difficult to find proper job for them, then a prostitution is an easy way that they see to earn money. This study also similar to Destriani and Harnani⁷ research in Pekanbaru, other city in Indonesia, which explained that most of floating FSWS were women who were failure in their marriage and have low level of education. Rokhmah⁸ also mentioned that sexual transaction is an alternative way of women to survive in urban area. Women with low level education and limited job vacancy, may see protitution is an open opportunity, which also relatively give satisfactory income for survive.

Knowledge and understanding of FSWS in Padang are very weak, despite all of them know HIV/AIDS threat. They never do check up voluntarily, and some of them did a test is only relied on HIV/AIDS outreach program from Commission of HIV/AIDS Prevention of Padang Municipality. Lack of understanding of HIV/AIDS, in which they believe that the clients are perfectly healthy if they do not see any signs of any diseases, is also seen by their way in serving their client. Among all of participants, only 12,9% of them use condom consistently, and more than a quarter (29.5%) never use it. More over, floating FSWS has low bargaining position to their client due to economic dependant on the sexual transaction. For them, loss of client means loss of income. As a result, they cannot force or persuade the clients to have protected sex, which lead to risk of HIV transmission. Similar study by Januraga⁹ in Bali, that FSWS also compete economically with their peers, which likely to accept unprotected sex from their clients to win the competition and get a customer. The sex workres may know their vulnerability to HIV/AIDS but they cannot ask the clients to use condom due to fear of client rejection and anger.¹¹ It means that safe and protected sex in prostitution is not only influenced by FSWS knowledge on risk of the diseases but alo by economic and gender relation issues.¹⁰ Health promotion through comprehensive primary health care should be done to address this problem.¹²

CONCLUSION

This study examined that the society with strong religious and social values may not free from prostitution practice, when other social factors, such as poverty and lack of social support make women more vulnerable.

Women who become FSWs too dependent economically on their prostitution practice likely to accept unprotected sex, which become a potential of HIV transmission.

Ethical Clearance: Formal permission was obtained from the Board of Nation and Public Protection of Padang Municipality. Participation of of FSWs were invited voluntary and they were informed that their participation would remain anonymous.

Source of Funding: The research is funded by Faculty of Medicine of Andalas University Grant under Ministry of Research and Higher Education of Indonesia.

Conflict of Interests: The authors declare that there is no competing interests.

REFERENCES

1. World Health Organization (WHO). Global HIV Statistics. Geneva, United Nations Programme on HIV/AIDS, 2016.
2. Ministry of Health of Indonesia. *Statistik Kasus HIV/AIDS Di Indonesia*. Direktorat Jenderal Pengendalian Penyakit dan Penyehatan Lingkungan Kementerian Kesehatan RI: Jakarta, 2016.
3. Department of Health of West Sumatera Province. Situasi HIV/AIDS di Sumatera Barat. Bidang Pengendalian Penyakit dan penyehatan Lingkungan Sumatera Barat, Padang, 2016
4. Roem ER. Communication strategy of female sex workers through 'dark taxi' in Padang City [In Indonesian]. *Jurnal Ilmu Politik dan Komunikasi* 2015;5(2):51-64.
5. Roem ER, Bajari A. Model of Communication of 'hidden' sex workers in Padang City [In Indonesian]. In Harnita PC & Astuti BW (eds) *Bunga Rampai Komunikasi Indonesia*. Yogyakarta: Buku Litera:37-49.
6. KPAN (Komisi Penanggulangan AIDS Nasional). *Survey pengetahuan Sikap dan Perilaku. Kemitraan Pemerintah, Dunia Usaha, Komunitas, dan Media*. Jakarta, KPA Nasional, 2014.
8. Rokhmah D. Implikasi mobilitas penduduk dan gaya hidup seksual terhadap Penularan HIV/AIDS. *Kesmas* 2014; 9 (2): 169-176.
7. Destrianti F, Harnani Y. Studi kualitatif pekerja seks komersial di daerah Jondul kota pekanbaru tahun 2016. *Jurnal Endurance* 2018;3(2):302-312.
9. Januraga PP, Mooney-Somers J, Ward PR. Newcomers in a hazardous environment: a qualitative inquiry into sex worker vulnerability on HIV in Bali, Indonesia. *BMC Public Health* 2014;14(832): <http://www.biomedcentral.com/1471-2458/14/832>.
10. Solang S, Adam SK, Rantung M. Hubungan pengetahuan, sikap dan perilaku pekerja seks komersial dengan pencegahan HIV/AIDS di Kota Manado. *Jurnal Ilmu Kesehatan Iinfokes* 2010;5(1): <http://ejurnal.poltekkesmanado.ac.id/index.php/infokes/article/view/75>.
11. Butarbutar S, Supardi S, Paramastri I, Ganyang T. Kemampuan negosiasi perempuan pekerja seks jalanan dalam penggunaan kondom terhadap pencegahan penyakit menular seksual dan HIV/AIDS di Kota Jayapura. *Berita Kedokteran Masyarakat* 2003;19(3): <http://journal.ugm.ac.id/index.php/bkm/article/view/3727>.
12. Hardisman H. Iceberg phenomenon of HIV/AIDS in Indonesia and the role of comprehensive primary health care', *Indonesian National Journal of Public Health* 2009;3 (5): 236-240.

The Effect of Training on Efforts to Reduce Maternal Mortality Risk to Behavior of Community-Based Safe Motherhood Promoters (SMPs)

Yusriani¹, Muhammad Khidri Alwi¹, Heru Santoso Wahito Nugroho²

¹Faculty of Public Health, Indonesian Moslem University, Makassar, Indonesia,

²Health Polytechnic of Surabaya, Indonesia

ABSTRACT

This study aimed to determine the effect of training on efforts to reduce maternal mortality risk to behavior of community-based Safe Motherhood Promoters (SMPs) in Jeneponto District, using “Pretest-Posttest with control Group Design”. Data collected through observation and interview to 46 respondents. Data were analyzed by Mann Whitney-U, Wilcoxon, McNemar and Spearman correlation test. The results were: 1) There was no difference in knowledge, attitude and skill between Safe Motherhood Promoters (SMPs) group and control group before the training, 2) There was a difference in knowledge, attitude, and skill between SMPs group and control group after the training, 3) There was difference in knowledge, attitude, and skill of SMPs group between before and after the training, 4) There was no difference in control group knowledge, attitude, and skill between before and after training. It could be concluded that there is an effect of training on reducing maternal mortality risk to knowledge, attitude, and skill of community based SMPs.

Keywords: *Safe Motherhood Promoters, Maternal Mortality Risk, Knowledge, Attitude, Skill*

INTRODUCTION

Maternal Mortality is one of the major global health problems, and generally occurs mainly in developing countries. The global agreement called the Millennium Development Goal (MDGs) in particular the fifth objective aims to reduce three-quarters of Maternal Mortality Rate (MMR) by 2015 - on the basis of 1990⁽¹⁾. Several countries have successfully achieved MMR targets, and some other countries, including Indonesia, despite the decline, the MDGs 2015 target is not reached⁽²⁾.

Indonesian Demographic and Health Surveys (IDHS) in 2012 showed a very poor result of maternal mortality rate increased from 228 / 100.000 live birth in 2007 reached 359 per 100 thousand live births. In South

Sulawesi, in 2012 there was an increasing in MMR comparing to the previous three years with the number of maternal deaths of 160 people or 110.26 per 100,000 live births. In 2013 again a sharp decline with the number of deaths 115 people or 78.38 per 100,000 live births. It consist of maternal death 15.65%, maternal deaths 51.30% postpartum maternal mortality 33.04%^(3,4). In Jeneponto district increased from 2011 to three peoples (46 per 100,000 live births) to 11 people (170 per 100,000 live births) in 2012. Then there was a decrease in 2013 by 5 people (82 per 100,000 live births), and increased in 2014 (13 people of maternal death), while in 2015 = 8 people death⁽⁵⁾.

A substantial increase in MMR out of estimates, quite a lot of interventions implemented by the Indonesian government. However, it did not produce maximum results as an ideal condition if the community trained to be “Safe Motherhood Promoters (SMPs)”. In an effort to reduce the risk of maternal death with the aim, the community can affect mothers and families about risk factors of maternal mortality, services during pregnancy, safe pregnancy and childbirth planning, and postnatal

Corresponding Author:

Heru Santoso Wahito Nugroho

E-mail: heruswn@gmail.com

Health Polytechnic of Surabaya

Jl. Pucang Jajar Tengah 56, Surabaya, Indonesia

care, to reduce maternal mortality.

MATERIALS AND METHOD

This research used “Pretest-Posttest with Control Group Design”. The intervention was training by using role-play and counseling skills, as well as reference aids, training manuals, and reporting logging forms^(6,7). Data collection used observation, and interview using questionnaire. The respondents are 46 people of Bululoe PHC. Methods of data analysis using Mann Whitney test and Spearman correlation test.

FINDINGS

This research conducted in the working area of Bululoe PHC Jenepono district. Based on the results of data analysis, obtained information as follows:

Table 1. Characteristics of Respondents

No	Characteristics	Sample Groups				Total	
		Experiments		Control		N=46	100%
		n=23	100%	n=23	100%		
1	The Origin of the Village						
	Jombe	5	10.9	5	10.9	10	21.7
	Tanjonga	6	13.0	6	13.0	12	26.1
	Mangepong	6	13.0	6	13.0	12	26.1
	Bululoe	6	13.0	6	13.0	12	26.1
2	Age (Year)						
	20-30	8	34.8	8	34.8	16	34.8
	31-40	10	43.5	10	43.5	20	43.5
	41-50	5	21.7	5	21.7	10	21.7
3	Education						
	Elementary School	1	4.3	1	4.3	2	4.3
	Junior High School	8	34.8	8	34.8	16	34.8
	Senior High School	6	26.2	6	26.2	12	26.2
	Diploma II	1	4.3	1	4.3	2	4.3
	Diploma III	4	17.4	4	17.4	8	17.4
	College	3	13.0	3	13.0	6	13.0
4	Work						
	Housewife	16	69.7	16	69.7	32	69.7
	Farmers	1	4.3	1	4.3	2	4.3
	Internships	2	8.7	2	8.7	4	8.7
	Honorary	3	13.0	3	13.0	6	13.0
	Enterpreneur	1	4.3	1	4.3	2	4.3

Table 2. Knowledge, Actitude and Skill before Provision of Training

No	Variable (Pre-Test)	Groups				Total		p value
		Experiments		Control		N=46	100%	
		n=23	100%	n=23	100%			
1	Knowledge							
	Less	16	69.6	18	78.3	34	73.9	0.507
	Enough	7	30.4	5	21.7	12	26.1	
2	Actitude							
	Negative	8	34.8	10	43.5	18	39.1	0.550
	Positive	15	65.2	13	56.5	28	60.9	
3	Skill							
	Not-Good	21	91.3	22	95.7	43	93.5	0.555
	Good	2	8.7	1	4.3	3	6.5	

Mann Whitney-U

Table 3. Knowledge, Actitude and Skill after Provision of Training

No	Variable (Pre Test)	Sample Groups				Total		p value
		Experiments		Control		N=46	100%	
		n=23	100%	n=23	100%			
1	Knowledge							
	Less	0	0	17	73.9	17	37.0	0.000
	Enough	23	100	6	26.1	29	63.0	
2	Actitude							
	Negative	0	0	13	56.5	13	28.3	0.000
	Positive	23	100	10	43.5	33	71.7	
3	Skill							
	Not Good	0	0	23	100	23	50.0	0.000
	Good	23	100	0	0	23	50.0	

Mann Whitney

Table 4. Effect of Training on Changes in Knowledge, Actitude and Skills

No	Variable	Sample Groups						p value
		Experiments			Experiments			
		Mean	Median	Min-Max	Mean	Median	Min-Max	
1	Knowledge	16.3	18	3-21	1	1	(-10)-15	0.000
2	Actitude	43.5	42	5-75	-4.2	-3	(-28)-29	0.000
3	Skill	7.8	8	3-10	0.17	0.0	(-3)-3	0.000

Spearman Correlation

DISCUSSION

Knowledge

The majority of people had less knowledge before the intervention given in the group of SMPs (69.6%) and the control group (78.3%). There were 30.4% SMPs and 21.7% controls have sufficient knowledge, because there are those who go to junior high school, senior high school and college.

There was no difference of knowledge between SMPs group and control group before giving training. After giving intervention, 100% SMPs had enough knowledge, and control group only 26.1%. The knowledge according to Azwar could them aware, know, understand, willing and able to conduct a suggestion that there is a relationship with health^(8,9).

There was difference of knowledge between SMPs group and control group after giving training intervention. This stated training transfer knowledge, skills, behavior, and attitude in working on a specific ability^(10,11).

The results of this study is available with August's research (2016) that community-based interventions that employ public health workers as teachers in delivering Home Based Life Saving Skills programs to pregnant women and their families increased their knowledge of alarms during pregnancy, labor and postpartum. Preparation for childbirth and increased delivery at health facilities employing skilled health workers in rural communities⁽¹²⁾.

There was influence of giving training about effort to decrease maternal mortality risk to knowledge change

of Safe Motherhood Promoters. This is in line with the results of research states that increased knowledge and attitude of mothers after gave treatment is the result of providing health education with audiovisual media⁽¹³⁾.

According to WHO that the change in health behavior that originated from the provision of information is a form of behavior change through education or health promotion, using Participation Discussion method, which is one good way in order to provide information and Health messages⁽¹⁴⁾.

Attitude

The majority of people had positive attitude before giving of intervention that is on SMPs group (65.2%) and control group (56.5%). The forming factors that occur because of the social interaction experienced by individual, so that individuals interact to form patterns of attitude⁽⁹⁾. This also fit to Aghoja, et al. (2010) statement that for the realization of the attitude in order to become a real action, necessary supporting factors or a condition that allows, among others, facilities⁽¹⁵⁾. This study reinforced by the theory that states that one's attitude is a very important component in health behavior, which then assumed that there is a direct relationship between attitudes and behavior of a person⁽⁹⁾.

There were 34.8% of SMPs and 43.5% of controls with negative attitude. This is due to a lack of knowledge about efforts to reduce the risk of maternal death. Other factors that influence the formation of attitudes include personal experience, culture, others who considered important and the mass media.

There was no difference of attitude between SMPs group and control group before giving training

intervention about effort to decrease maternal mortality risk. After giving intervention, 100% SMPs had a positive attitude, and the control group was only 43.5%. This is because one of the components that make up an important attitude is the cognitive component, because a good attitude occurs after knowledge is also good.

There was difference of attitude between SMPs group and control group after giving training intervention about effort to decrease maternal mortality risk. Referring to the statement attitude cannot separated from the socialization of the family, school or outside school education and knowledge in the community. The role of education cannot ignored, because education done almost for life, either through formal or informal education⁽¹⁶⁾.

There was influence of giving training about effort to decrease maternal mortality risk to change attitude of SMPs. This fit to the results of Okour et al. (2012) on the effect of education on the attitude of pregnant women. She stated that the increase of respondent information has an impact on the improvement of knowledge, where after they understand it they will evaluate their behavior when they feel inappropriate behavior then they will choose better behavior to improve their attitude⁽¹⁷⁾.

Skill

Skill is the result of repetitive exercise, which can called an increasing or progressive change by the person who studies the skill as result of a particular activity^(18,19). In this study, the skill assessment done directly in the simulation. The majority of the community had bad skills before giving intervention in SPMs group (91.3%) and control group (95.7%). Behavior change or adopting new behaviors follows the stages of change: knowledge, attitude, practice⁽²⁰⁾.

There were 8.7% of SMPs and 4.3% controls with good skill. This is due to good knowledge and positive attitude toward reducing the risk of maternal death. The results fit to the theory of Green (2000), that the knowledge possessed by a person is one of the predisposing factors to facilitate a person to behave and behave specifically⁽⁹⁾.

There was no difference of skill between SMPs group and control group before giving training intervention about effort to decrease maternal mortality risk. This aspect, according to Notoatmodjo (2007) if it requires

an institutional or sustainable behavior then treated the positive knowledge and belief/attitude about what will done.

After giving 100% intervention, SMPs have good skill, and control group 0%. This result fit to the Green theory⁽⁹⁾. He stated a change in a person's behavior influenced by predisposing factors that facilitated a person or society behave. In this case, the mother's knowledge about efforts to reduce the risk of maternal death. Reinforcing factors are factors that strengthen and support a person or society behaves (in this case is the support provided by the husband, family, community and health workers).

There was a difference of skill between SMPs group and control group after giving training intervention about effort to decrease maternal mortality risk. This is in line with the research of Rifkin (1987) states that a community-based antenatal education program can increase women's chances of adopting health-beneficial behavior in the post-natal period⁽²¹⁾.

This study supports the theory of Thaddeus, Maine (1994) that the health behavior of a person or society determined through the intention of the person towards the object of health, the presence or absence of support from the surrounding community. Whether or not information about health, freedom from individuals to take decisions or actions and situations that enable him to behave or not behave⁽²²⁾.

There was influence of giving training about effort to decrease maternal mortality risk to change of skill of SMPs. This is in line with Lankester (2000) that training improves knowledge, and knowledge plays an important role in the determination of attitudes and behaviors^(23,24,25). In line with the results of research which informs that skills improvement after training in intervention groups is higher than In the control group^(26,27,28,29,30).

CONCLUSION

The results of this study expect to improve the health condition of mothers. The results of community empowerment in the form of Safe Motherhood Promoters (SMPs) can be a meaningful investment and sustainable. It is a local resident and is less likely to move or stop being SMPs Groups of mothers, husbands, families and communities generally become easier in accessing messages of the mother's health aspects through Safe

Motherhood Promoters (SMPs), while the number of health workers in the village is still relatively limited.

ADDITIONAL INFORMATIONS

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

The author(s) fully thanks to the Minister of Research and Technology, Higher Education for the financial support for the research, authorship, and/or publication of this article by the name of Doctoral Research Grant Funding.

This research has passed the ethical clearance test in accordance with the applicable regulations in Indonesia.

REFERENCES

1. WHO. Trends in Maternal Mortality: 1990 to 2010. Geneva: WHO-World Bank; 2012.
2. UNICEF. Maternal and Child Health, Issue Brief. October 2012.
3. Ansariadi. Epidemiology of Maternal Death in South Sulawesi 2008-2013 - What Has Been Changed? (Epidemiologi Kematian Ibu di Sulawesi Selatan 2008-2013-Apa yang Telah Dirubah?). Makassar: FKM Unhas; 2014.
4. Dinkes SulSel. Health Profile of South Sulawesi Province (Profil Kesehatan Propinsi Sulawesi Selatan). Makassar: Dinkes Prov.Sulawesi Selatan; 2012.
5. Dinkes Kab.Jeneponto. Health Profile of Jeneponto District (Profil Kesehatan Kabupaten Jeneponto). Dinkes Kab.Jeneponto; 2014.
6. Moore KM. A Behaviour Change Approach to Investigating Factors Influencing Use of Skilled Care in Home-Bay District, Kenya. Washington-DC: The CHANGE Project/Academy for Education and Development/Manoff Group; 2002.
7. Joseph N. Mojekwu and Uche Ibekwe, Maternal Mortality in Nigeria: Examination of Intervention Methods, *International Journal of Humanities and Social Science*. 2(20):135-149.
8. Rosato M, Laverack G, Grabman L, Tripathy P, Nair N, Mwansambo C, Azad K, Morrison J, Bhutta Z, Perry H, et al: Alma-Ata: Rebirth and Revision 5. *Community Participation: Lessons for Maternal, Newborn, and Child Health*. *Lancet* 2008;372:962-971.
9. Elder J, Ayala G, Harris S. Theories and Intervention Approaches to Health-Behavior Change in Primary Care. *Am J Prev Medicine*. 1999;17:275-284.
10. UNFPA. Maternal Mortality Update 2002, A Focus on Emergency Obstetric Care. New York: UNFPA; 2003.
11. UNFPA, SAFE Research Study and Impacts. Maternal Mortality Update 2004, Delivery into Good Hands. New York: UNFPA; 2004.
12. August, et al. Effectiveness of The Home Based Life Saving Skills Training by Community Health Workers on Knowledge of Danger Signs, Birth Preparedness, Complication Readiness and Facility Delivery, Among Women in Rural Tanzania. *BMC Pregnancy and Childbirth*. 2016;16:129.
13. McCarthy J, Maine D. A Framework for Analyzing The Determinants of Maternal Mortality, *Studies in Family Planning*. 23(1):23-33.
14. WHO. Reduction of Maternal Mortality. A joint WHO/ UNFPA/ UNICEF/ World Bank statement. Geneva; 1999.
15. Aghoja, et al. Maternal Mortality and Emergency Obstetric Care in Benin City, South-South Nigeria. *Journal of Clinical Medical and Research*. 2010;2(4):055-060.
16. Abouzar C, Warldow T. Maternal Mortality at the End of Decade: Signs of Progress? *Bulletin of the WHO*. 2001;79(6):561-573.
17. A.M. Okour, et al. Maternal Mortality in Jourdan: Role of Substandard Care and Delays. *Eastern Mediterranean Health Journal*. 2012;18(5):426-431.
18. Waterstone M, Bewley S, Wolfe C. Incidence and Predictors of Severe Obstetric Morbidity: Case Control Study. *British Medical Journal*. 2001;322:1089-1094.
19. Yaya, Yallso, et al. Maternal Mortality in Rural South Ethiopia: Outcomes of Community-Based Birth Registration by Health Extension Workers. *Plos One*. 2015;23.
20. Cotello A, Osrin D, Manandhar D. Reducing Maternal and Neonatal Mortality in the Poorest Communities. *British Medical Journal*. 2004;329:1166-1168.

21. Rifkin SB. Primary Health Care, Community Participation and the Urban Poor: a Review of the Problems and Solutions. *Asia-Pacific J Public Health*. 1987;1:57-63.
22. Thaddeus S, Maine D. Too Far to Walk: Maternal Mortality in Context. *Soc-Sci Med*. 1994;38:1091-1110.
23. Lankester T. Setting up Community-Based Health Program: A Practical Manual for Use in Developing Countries. London: McMillan Education Ltd, 2; 2000.
24. Fang Ye, et al. The Immediate Economic Impact of Maternal Deaths on Rural Chinese Household, *PLoS One*. 2012;7(6):e38467.
25. Yusriani. Nutritional Status Survey of Health and Behavior of Pregnant Women in Bontomate'ne Health Center of Jeneponto District, Indonesia. *Public Health of Indonesia*. 2016;2(2):55-67. Available from: <http://stikbar.org/ycabpublisher/index.php/PHI/index>. ISSN: 2477-1570
26. Mavalankar DV, Rosenfald, A. Maternal Mortality in Resource Poor Setting: Policy Barriers to Care. *American Journal of Public Health*. 2005;95(2).
27. Santarelli C. Working with Individuals, Families and Community to Improve Maternal and Newborn Health. Geneva: (WHO/FCH/RHR/03.11), World Health Organization; 2003.
28. Robertson T, et al. Initial Experiences and Innovations in Supervising Community Health Workers for Maternal, Newborn, and Child Health in Morogoro Region, Tanzania. *Hum. Resour. Health*. 2015;13.
29. Jokhio AH, Winter HR, Cheng KK. An Intervention Involving Traditional Birth Attendants and Perinatal and Maternal Mortality in Pakistan. *N Engl J Med*. 2005;352(20):2091–2099.
30. Memon ZA, Khan GN, Soofi SB, Baig IY, Bhutta ZA. Impact of a Community-based Perinatal and Newborn Preventive Care Package on Perinatal and Neonatal Mortality in a Remote Mountainous District in Northern Pakistan. 2015;15.

Medulloblastoma of the Posterior Fossa in Children: Perioperative Surgical Complications

Asa'ad F. Albayati¹, Ahmed Hilal Kamel², Yaseen M. Taher³, Sadiq Fadhil Hammoodi⁴,
Hayder Adnan Fawzi⁵

¹Pathology/Immunology, Department of Pathology, College of Medicine, Al-Iraqia University, Baghdad, Iraq, ²Department of Microbiology, College of Medicine, Al-Iraqia University, Baghdad, Iraq, ³Hematology, Department of Medicine, College of Medicine, Al-Iraqia University, Baghdad, Iraq, ⁴Neurosurgery Teaching Hospital, Baghdad, Iraq, ⁵Baghdad Medical City, Clinical Pharmacy Department, Baghdad, Iraq

ABSTRACT

Objective: detect the preoperative surgical complications in posterior fossa Medulloblastoma in children

Method: A prospective study was conducted from 2003 to 2012 on 35 patients with histopathologically verified Medulloblastoma. Their ages ranged from 3 – 16 years in both sexes, the gender difference found to some extent.

Results: the most common intraoperative complication was hemodynamic instability which seen in 4 patients (11.4%), and haemorrhage (subdural hematoma) which seen in 2 patients (5.7%). The most common postoperative complication was cerebellar dysfunction which seen in 6 patients (17.1%) and cerebellar mutism which seen in 4 patients (11.4%). Surgical mortality was 11.4%. The causes of death distributed between air embolism, brain stem injury and meningitis.

Conclusion: proper and gentle anaesthesia techniques, well trained surgical team, total removal and achievement of proper postoperative care would decrease the morbidity and mortality.

Keywords: Medulloblastoma, posterior fossa, children, complications, preoperative

INTRODUCTION

Medulloblastoma (MB) is the most common malignant brain tumour in children. While there are emerging biologic data that help predict prognosis, there are still conflicting conclusions about the effect of many basic clinical factors, such as gender, on the outcome ⁽¹⁾. The tumour is almost invariably solid is usually reddishly friable often has a pseudo-capsule. Some tumours are vascular others necrotic. In 15% of cases, there is evidence of recent or old haemorrhage in the tumour ⁽²⁻⁴⁾.

Clinicopathologic and biologic studies have increasingly supported the hypothesis that Medulloblastoma is a heterogeneous disease with diverse phenotypes and contrasting therapeutic outcomes. Perioperative surgical complications mean all complications that occur intraoperatively and

postoperatively which result from anaesthesia technique, patient position, surgical technique and postoperative care ⁽⁵⁾.

Endocranial hypertension & the cerebellar syndrome were the predominant clinical findings in Medulloblastoma ⁽⁶⁾. Presenting symptoms may be different according to the age of the patient. Older children who can express their symptoms complain of headaches that tend to occur in the early morning & become more frequent & awake them from sleep; an initial headache are usually frontal, but later they are suboccipital, perhaps because of tonsillar herniation. Vomiting is frequent because of increased intracranial pressure (ICP), but also because of direct pressure on the medullary emetic centre, and it is often projectile ⁽²⁾.

Intraoperative complications include air embolism, hemodynamic instability, skull perforation with fracture,

spinal cord injury, subdural hematoma, and extradural hematoma⁽⁷⁾. While postoperative complications include persistent unresponsiveness, hematoma, cranial nerve deficits and long tract signs (hemiparesis), cerebellar dysfunction, CSF leak or pseudomeningocele, cerebellar mutism, tension pneumocephalus, infections, seizure, dural sinus infection and thrombosis, and cervical spine deformity following upper cervical laminectomy⁽⁸⁻¹¹⁾.

Overall survival rates after a combination of surgical resection and radiation therapy range from 50-60% at five years and 33-53% at ten years⁽¹²⁾. Total surgical mortality of children treated for posterior fossa Medulloblastoma was 13%⁽¹²⁾. The recurrence rate was 21% of patients with medulloblastoma after four years of follow up. Chemotherapy seemed to contribute to a lower recurrence rate⁽¹³⁾.

In the current work, we aimed to detect the preoperative surgical complications in posterior fossa Medulloblastoma in children and to measure the frequency the perioperative surgical complications in posterior fossa Medulloblastoma in children and to correlate the complications with some factors like the extent of a tumour and patient positioning of the patients during surgery.

Patients and method

A prospective study conducted at the Neurosurgical Hospital in Baghdad from 2003 to 2012, written informed consent obtained from all the participants in the study, and the study and all its procedure were done by the Helsinki Declaration of 1975, as revised in 2000. The study was approved by Neurosurgical Hospital in Baghdad.

It conducted on 35 patients with histopathologically proven to have Medulloblastoma. The patients had different ages, ranging from 3-16 years of both sexes and different geographical regions of Iraq. Clinical data collected; chief complaint and its duration, other symptoms were found including a headache, nausea, vomiting, unsteadiness of gait, and visual impairment, double vision, squint, and gaze abnormality, difficulty in swallowing, disturbed consciousness, and lethargy. The signs found including papilledema, nystagmus, visual acuity, cranial nerves palsy or paresis, cerebellar signs including ataxia, dysmetria, and signs of meningeal irritation. Signs and symptoms were analysed before the shunt operation and after it and after the tumour

resection.

We classified the location of a tumour into midline, midline/cerebellar hemisphere or cerebellar hemisphere locations. The density of a tumour either isodense or hyperdense or mixed densities. Cystic changes or necrosis, calcification, the presence of ventriculomegaly either mild dilatation, moderate or markedly dilated ventricle, and the degree of enhancement on contrast C.T scan either homogeneously enhanced tumour, irregularly enhanced, or faint enhancement. The size of the tumour estimated from C.T scans with contrast.

All patients received dexamethasone in a dose of 4 – 8 mg three to four times daily, which was tapered postoperatively. Antibiotic therapy started with induction of anaesthesia third-generation cephalosporin, ampiclox and gentamycin according to the availability of the item. An anticonvulsant used only for few patients having convulsion presentation.

The initial surgery was V.P shunt or direct post. Fossa craniectomy with external drainage or just burr hole ventricular tap. Post. Fossa surgery was done under general anaesthesia in all patients, usually in sitting position (28 patients, 80%) and in the prone position (7 patients, 20%) with Mayfield or Sugita head holder. The tumours were approached either by vermian incision with diathermy and suction in case of midline or midlinehemispheric lesions or cerebellar cortical incision in hemispheric tumours. Tumour resection was usually done by suction and cautery or to less extent by biopsy forceps (piecemeal). The extent of tumour resection always based on the surgeon estimate.

Brain stem violation indicated by bradycardia encountered during the operation, and air embolism detected by resistant hypotension, precordial Doppler used. All patients admitted to the intensive care unit after operation for variable periods.

The postoperative C.T scan done for 21 patients for follow up purposes and because of deterioration in the level of consciousness or persistent CSF leak. Patients followed up for variable periods till they were discharged, died or returned because of late deterioration and some of them followed for six months. Surgical mortality was defined as death within the postoperative period (one month) including the period while the patient was in the hospital. Follow up of survival was difficult after they were discharged from the hospitals,

although some patients came back due to deterioration or symptoms of recurrence.

RESULTS

In this study, it found that the age of the patients ranged from 3-16 years. The peak incidence of the tumour was between 5-11 years of age. Regarding the gender, there were 16 female and 19 males; Shunt operation was conducted before tumour resection in thirty-two patients with Medulloblastoma. All patients showed improvement in their clinical condition following shunt operation except three patients who were not improved postoperatively. Malfunction of the shunt reported in five patients. Shunt infection also reported in 4 patients. All the five patients who developed malfunction were treated successfully by shunt revision. The four patients who developed shunt infection treated by shunt removal as illustrated in table 1.

Table 1: Site of shunt application, CSF pressure and complications

Shunt		Number of patients
Site	Post parietal	23
	Frontal	9
CSF pressure	Severe	27
	Moderate	4
	Mild	1
Complications	Malfunction	5
	Infection	4

Tumour resection and tumour features are illustrated in table 2. Generally, the vascularity of a tumour in Medulloblastoma was high. The intraventricular extension reported in 30 patients (85.7%). Brain stem was violation reported in 18 patients (51.4%).

Table 2: Extents of tumour removal done for the patients enrolled in the study

Tumour removal	Number of patients (%)
Total	17 (48.5%)
Subtotal	15 (42.8%)
Partial	3 (8.5%)

Intraoperative and postoperative complications are illustrated in tables 3 to 5.

Table 3: Intraoperative surgical complications seen in patients enrolled in the study

Intraoperative complications	Patients Number (%)
Air embolism	1 (2.8%)
Hemodynamic instability (bradycardia, arrhythmia)	4 (11.4%)
Skull perforation with fracture	1 (2.8%)
Extradural hematoma (EDH)	1 (2.8%)
Subdural hematoma (SDH)	2 (5.7%)
Spinal cord injury (contusion)	1 (2.8%)

Table 4: Postoperative surgical complications seen in patients enrolled in the study

Postoperative complications		Patients Number (%)
Persistent unresponsiveness		2 (5.7%)
Hematoma		1 (2.8%)
Cerebellar dysfunction		6 (17.1%)
Cranial nerves deficit		2 (5.7%)
Long tract signs (hemiparesis)		1 (2.8%)
CSF leak		1 (2.8%)
Pseudomeningocele		2 (5.7%)
Cerebellar mutism		4 (11.4%)
The absence of a gag reflex		2 (5.7%)
Tension pneumocephalus		1 (2.8%)
Infection	Wound infection	1 (2.8%)
	Meningitis	2 (5.7%)
Seizure		1 (2.8%)

Table 5: Postoperative surgical complications according to the time of occurrences

Immediate (< 6 hr)	Early (< 72 hr)	Late (> 72 hr)
Persistent unresponsiveness Hematoma	Cerebellar dysfunction CSF leak Cranial nerves deficit The absence of a gag reflex Tension pneumocephalus Pseudomeningocele Cerebellar mutism Long tract signs (hemiparesis)	Wound infection Meningitis Seizure

Surgical mortality illustrated in table 6.

Table 6: Surgical mortality among the patients enrolled in the study

Number of the patient (%)	Age (yr)	Cause of death
1 (2.8%)	4	Air embolism
1 (2.8%)	9	The absence of a gag reflex
1 (2.8%)	5	Unknown (postoperative mutism)
1 (2.8%)	4	Post meningitis

DISCUSSION

Medulloblastoma represents one of the main bulk of the posterior fossa tumour in children. As agreed in the literature, Medulloblastoma exhibited a peak of incidence between 5-10 years⁽⁴⁾.

Because of its availability and easier application in children, C.T scan was the main diagnostic tool used in this study. It confirmed the universally accepted midline location of Medulloblastoma in 93.3% of cases. It was evident radiologically that Medulloblastoma was solid lesion^(2,14).

Obstructive hydrocephalus demonstrated in all patients with Medulloblastoma which was significantly higher than Karoly et al.⁽¹⁵⁾ report which showed hydrocephalus in 80-90% of posterior fossa tumours. As assessed by C.T, hydrocephalus was more severe in patients with Medulloblastoma, because these tumours showed a high percentage of midline location and solid lesion causing mechanical obstruction of the fourth ventricle outflow. MRI studies in Medulloblastoma, as Larry et al.⁽¹⁶⁾ considered, showed hypointense lesion on T1 W. image and hyperintense lesion on T2 W image.

CSF pressure during the taping of the ventricle, was high in the majority of patients underwent shunt operation (67.1%) indicating the severity of hydrocephalus and late presentation of children. The risk of upward transtentorial herniation and the potential dissemination of malignant tumour cells through the shunt proved in the literature, were not reported in this study.

Malfunctions & infections were the main disadvantages reported in 15.3% & 14% of patients underwent shunt operations respectively. A nearby result was shown by Griwan et al.⁽¹⁷⁾ who observed shunt

block & / or infection in 32.8% of patients.

Total removal achieved in 54.2% of patients & the most important parameter that affects the extent of tumour removal was brain stem violation during the surgeon's attempt to remove a tumour from the fourth ventricle floor. These preoperative warning signs occurred in 10% of cases. Furthermore, the high vascularity of a tumour in Medulloblastoma was also adversely affecting the extent of tumour resection. It was strongly evident that total gross removal of a tumour in medulloblastoma will improve prognosis intimately⁽¹⁵⁾.

Postoperative check CT scan was performed for 21 patients, evaluating the extent of tumour removal & searching for postoperative complications. Postoperative CT scan, in agreement with Morreal et al.⁽¹⁸⁾ in which CT scene was more reliable than the surgeon's estimate of the extent of tumour removal during surgery. Among ten patients presumed by the surgeon to get total removal, only two patients showed a residual tumour on postoperative check CT scan, & among seven patients judged to sub-totally removed, surprising one patient showed no residual tumour (small rim of tumour tissue could not be visible on CT scan). So generally, CT scan confirmed surgeon's estimation of tumour removal in 83% of cases. Karoly et al.⁽¹⁵⁾ reported 79% confirmation between the surgeon's judgment of tumour removal & CT scan finding.

The commonest postoperative complication reported in this study, as well as in the literature, was cerebellar dysfunction 6 (17.1%). Pseudomeningocele was directly related to the presence of hydrocephalus postoperatively. It developed in 2 (5.7%) of patients. These patients either not had shunt operation or had malfunctioning shunt. Karoly et al.⁽¹⁵⁾ reported a 7.1% incidence of pseudomeningocele in medulloblastoma patients postoperatively.

Cerebellar mutism was a described complication of posterior fossa surgery, characterised by transient mutism after a brief interval of few days of relatively normal speech postoperatively, which recovered completely in 1-4 months, frequently associated with other neurological manifestations such as long tract signs & neurobehavioral abnormalities. The pathophysiology of this syndrome remains unknown, but is usually seen in big vermian tumour & may be related to the dissection in the region of dentate nucleus. The incidence in the

literature was 16% for patients with medulloblastoma. In this study, cerebellar mutism encountered in 11.4% of patients with medulloblastoma. Midline tumour location, brain stem violation & the use of vermian incision to approach the tumour reported in all children developed this syndrome.

Postoperative meningitis developed in two patients (5.7%). It carried a bad prognosis. One of these patients did not respond to treatment & died. The absence of gag reflex documented in 5.7% of patients. Most of These patients had brainstem violation by the tumour. In spite of patients' recovery in most of these cases, is considered a serious complication as it was the leading cause of death in one patient. Postoperatively, hemiparesis occurred in 2.8 % of patients. Also, such a patient had brain stem invasion & showed variable improvement after physiotherapy.

Mortality rate was (11.4%). Helseth et al.⁽¹²⁾ showed a higher mortality rate of children with Medulloblastoma (13%). Lack of antibiotics & inappropriate management of external drain rendered meningitis, the main cause of death in Medulloblastoma.

CONCLUSIONS

The peak incidence of Medulloblastoma was between 5-10 years with gender difference to some extent. Gross total removal of the tumour should be the goal standard of a neurosurgeon, but every effort should be given to avoid brain stem injury. The more solid malignant, midline, vascular and brain stem violated tumours associated with more perioperative complications. The most common intraoperative surgical complications are hemodynamic instability, and haemorrhage (SDH) and the most common postoperative complication are cerebellar dysfunctions and cerebellar mutism. Cerebellar mutism associated with midline Medulloblastoma especially tumours with brain stem invasion. Brain stem violation was the main factor that affects the outcome.

Conflict of Interest : None

Ethical Clearance: Informed written consent obtained from all the participants in the study, and the study and all its procedure were done by the Helsinki Declaration of 1975, as revised in 2000. Neurosurgical Hospital in Baghdad approved the study

Source of Funding: The work supported by authors only

REFERENCES

1. Curran EK, Sainani KL, Le GM, Propp JM, Fisher PG. Gender affects survival for medulloblastoma only in older children and adults: A study from the surveillance epidemiology and end results registry. *Pediatric Blood & Cancer*. 2009;52(1):60-4.
2. R J. Youmans *Neurological Surgery*. 4th ed. Philadelphia: Saunders (Elsevier); 1996.
3. RW W, SS R. *Neurosurgery*. 2nd ed. New York: Mc Grawhill; 1996.
4. Pencalet P, Maixner W, Sainte-Rose C, Lellouch-Tubiana A, Cinalli G, Zerah M, et al. Benign cerebellar astrocytomas in children. *Journal of neurosurgery*. 1999;90(2):265-73.
5. AH K, Peter, Black. *Malignant brain tumors: Complications*. *Operative Surgery*2001. p. 424-6.
6. Sardinias N, Marcos R, Pestana EM, Vargas J, Chi-Ramirez D, Rojas E, et al. [Tumors of the posterior fossa in children]. *Revista de neurologia*. 1999;28(12):1153-8.
7. Doxey D, Bruce D, Sklar F, Swift D, Shapiro K. Posterior fossa syndrome: identifiable risk factors and irreversible complications. *Pediatric neurosurgery*. 1999;31(3):131-6.
8. Lee ST, Lui TN, Chang CN, Cheng WC. Early postoperative seizures after posterior fossa surgery. *Journal of neurosurgery*. 1990;73(4):541-4.
9. SS R, RH W. *Neurosurgical operative atlas*. Chicago, Illinois: AANS Publication committee; 1991.
10. Orliaguet GA, Hanafi M, Meyer PG, Blanot S, Jarreau MM, Bresson D, et al. Is the sitting or the prone position best for surgery for posterior fossa tumours in children? *Paediatric anaesthesia*. 2001;11(5):541-7.
11. Gelabert-Gonzalez M, Fernandez-Villa J. Mutism after posterior fossa surgery. Review of the literature. *Clinical neurology and neurosurgery*. 2001;103(2):111-4.
12. Helseth E, Due-Tonnessen B, Wesenberg F, Lote K, Lundar T. Posterior fossa medulloblastoma in children and young adults (0-19 years): survival and performance. *Child's nervous system : ChNS*

- : official journal of the International Society for Pediatric Neurosurgery. 1999;15(9):451-5; discussion 6.
13. Evans AE, Jenkin RD, Sposto R, Ortega JA, Wilson CB, Wara W, et al. The treatment of medulloblastoma. Results of a prospective randomized trial of radiation therapy with and without CCNU, vincristine, and prednisone. *Journal of neurosurgery*. 1990;72(4):572-82.
 14. Blaser SI, Harwood-Nash DCF. Neuroradiology of pediatric posterior fossa medulloblastoma. *Journal of Neuro-Oncology*. 1996;29(1):23-34.
 15. Karoly M. David, Adrian T. H. Casey, Richard D. Hayward, William F. J. Harkness, Kim Phipps, Angie M. Wade. Medulloblastoma: is the 5-year survival rate improving? *Journal of neurosurgery*. 1997;86(1):13-21.
 16. BP L, BR S, ER A. Imaging of post. fossa tumors. In: RW W, SS R, editors. *Neurosurgery*. 2^{ed} ed. New York: McGraw-Hill; 1996. p. 122-6.
 17. Griwan MS, Sharma BS, Mahajan RK, Kak VK. Value of precraniotomy shunts in children with posterior fossa tumours. *Child's nervous system : ChNS : official journal of the International Society for Pediatric Neurosurgery*. 1993;9(8):462-5; discussion 6.
 18. Morreale VM, Ebersold MJ, Quast LM, Parisi JE. Cerebellar astrocytoma: experience with 54 cases surgically treated at the Mayo Clinic, Rochester, Minnesota, from 1978 to 1990. *Journal of neurosurgery*. 1997;87(2):257-61.

Chemical Synthesis and Characterization of Silver Nanoparticles Induced Biocompatibility for Anticancer Activity

Ali Ibrahim Shkhair¹, Mohammed Kareem Jabber², Murtadha M-Hussein A-kadhim³,
Abdullah Hasan Jabbar⁴

¹Department of Dairy Technology, College of Food Science, AL-Qasim Green University, Ministry of Higher Education and Scientific Research, Iraq, ²Faculty of Pharmacy, Alkafeel University College, Kufa, Iraq, ³Department of Biotechnology, College of Biotechnology, AL-Qasim Green University, Ministry of Higher Education and Scientific Research, Iraq, ⁴Department of Physics and Chemistry, Faculty of Applied Sciences and Technology, Universiti Tun Hussein Onn Malaysia (UTHM) 84600 Pagoh

ABSTRACT

Silver nanoparticles (AgNPs) have gained giant pastime of nanoscience due to the fact of its wide thoroughness over biomedical applications. Current research labor has been discontinued in imitation of look at anticancer endeavor concerning visible SNPs in opposition to ethnic most cancers cell lines. The photosynthesis of SNPs was done the usage of cloud extracts out of *Salacia Chinensis* (SC) as much a green supply in imitation of limit silver nitrate in imitation of nanoparticles. Nanoparticles are instituted above about quite a number techniques, particularly UV spectroscopy, infrared spectroscopy because of Fourier transform, X-ray diffraction, and scanning electron microscopy. The ultraviolet-visible spectrum regarding the made nanoparticles indicates the maximum peak at 420 nm. The results regarding infrared spectroscopy from Fourier exhibit the arrival regarding alcohols, fragrant compounds, or amines as point out the appearance or stabilization on proteins together with nanoparticles. The analysis on the energetic electron microscope suggests as the spherical silver nanoparticles are spherical along sizes ranging beside 11 according to 27 nm depending over the pH conditions. The effects on X-ray alteration analysis exhibit the emergence concerning silver nanoparticles then theirs lucid nature. The outcomes on it lesson furnish experimental evidence so SC-mixed SNPs be able object as like an anticancer agent and are promising to overcome the boundaries concerning traditional cancer chemotherapy.

Keywords: Silver nanoparticles; Chemical synthesis; anticancer activity; biocompatibility; Nanotechnology

INTRODUCTION

Nanotechnology is a more promising location because of generating instant capabilities within biotechnology and nanoscience¹. Silver nanoparticles (AgNPs) are turning into more and more frequent so antibiotic retailers of textiles, bandages, scientific units or family appliances, such as refrigerators or brimming machines². Among the deep nanoscale products, the close well-

known nanoparticle merchandise is nanosilver. AgNPs hold been old because antimicrobials, antioxidants, antioxidants, then anti-inflammatory consequences³. Nanotechnology is an altogether pregnant field because of generating new sorts over nanomaterials for biomedical functions⁴. Cancer is certain over a range regarding lethal then various problems along extraordinary organic characteristics induced by means of a sequence about mutations as are thoroughly elect within the predominant jowl then tumour genes. It is defined as the increase concerning cells and odd tissues to that amount are subdivided asleep yet have the potential after infiltrate or wreck the body's herbal tissues. Cancer suggests a

Correspondence author:

Abdullah Hasan Jabbar

E-mail: physics1984@yahoo.com

greater mortality quantity than coronary bravery ailment and strokes ⁵. Global demographic yet epidemiological shifts continue in imitation of factor to the growing encumbrance of most cancers over the coming a long time ⁶. The affected person left characteristic functionally then psychologically last ensuing among social isolation. In chemotherapy because of cancer, multidrug arrest (MDR) has grown to be an important threat in imitation of people fitness outweigh through negatively affecting the success dimension about treatment. MDR is resisting according to out of danger chemotherapy drugs, as much well as much cross-resistance in conformity with anticancer capsules to that amount hold specific structures then mechanisms ⁷. Because concerning the complicated arrest mechanisms concerning cancer, boundaries on biological recreation then toxicity regarding MDR cogitation agents, modern-day chemotherapy marketers failed to associate the ideal requirements because cancer therapy ⁸. Thus, to overcome it problem yet fight including near life-threatening illnesses as put down momentous deaths round the world, at that place is a pressing necessity after boost a new and non-invasive therapeutic method after deal with debilitating cancer patients ⁹.

Nanoscale cancer is certain of the branches of advanced biotechnology then has a solution function between most cancers administration together with advanced standards yet drug methods ¹⁰. Recently, nanoparticles specifically nanoparticles (SNPs / SNP) have been broadly chronic because their drug capabilities among most cancers treatment due to the fact regarding their special physical, physical or chemical properties, easement concerning installation, characterization and floor modification of the nanoscale ¹¹. Moreover, silver has won a full-size deal about interest between the scientific disciplines because of a vast length over houses certain namely antifungal, antibacterial, antimicrobial, and antiviral ¹².

Nanoparticles are constructed using various methods such as much chemical method, fervent decomposition, the electrochemical method, microwave irradiation, laser etching ¹³. Although the chemical method is the easiest path in accordance with synthesize silver nanoparticles that is known in conformity with outturn an extensive range regarding dangerous by-products then in the end administration to environmental incompatibility ¹⁴. These defects of the chemical method, name for an instant and environmentally pleasant path according to synthesize nanoparticles ¹⁵.

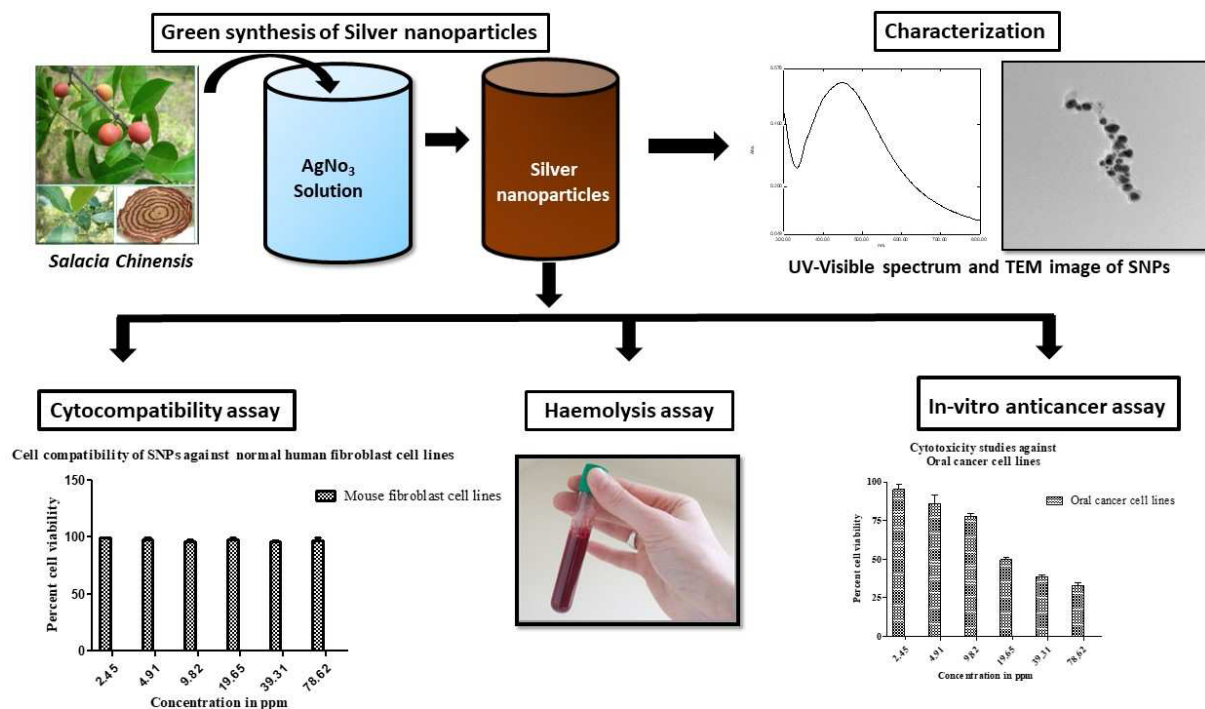


Fig. 1: Schematic representation of green synthesis, characterization, and biocompatibility of SC mediated biosynthesis of SNP and their potential anticancer activity ¹¹.

Ag-NPs gained an industrial preference mostly used in surgical instruments, contraceptives, wear wounds, and orthopedic prostheses¹⁶. On the other hand, silver has been used as a potent antimicrobial agent for many years. The surface plasmon resonance and antibacterial activity of Ag-NPs were superior to other organic or inorganic chromosomes¹⁷. Many researchers reported that Ag-NPs were synthesized by different techniques for potential applications as biological parameters for single molecule detection, bactericidal action¹⁸. Cytoprotection of HIV-1 infected cells and sense of hazardous substances¹⁹. After interaction with bacteria, AG-NPs synthesize the envelope protein precursors, the plasma membrane by its nature and reduce the levels of adenosine intracellular (ATP) that led to cell death (bactericidal action)²⁰.

The stability of nanoparticles is usually discussed in terms of two general categories of static, static and static stabilization. Electrical stability is achieved by the coordination of anionic species, such as halides, carboxylates or polysaccharides, into metal particles. This results in the formation of a double electric layer (in fact, a diffuse electrical layer), which causes the Colombian antagonism between the nanoparticles. Static stability is achieved by the presence of large-scale organic materials, which often hinder nanoparticles from spreading due to their mass. Polymers and large cations such as alkylammonium are examples of static stabilizers. The choice of the installer also allows for the determination of melting of nanoparticles²¹.

MATERIAL AND METHOD

In recent years, the bio-synthesis of metallic nanoparticles, especially nanoparticles of silver and gold, using plant extracts as nano plants, has become an important subject of research in the field of nanotechnology²². In general, the biomechanical reduction mechanism for mineral nanoparticles in plants and plant extracts includes three major phases. The activation stage in which the reduction of the metal ions and the nucleus of the reduced metal atoms. Plants have many cellular structures and physiological processes to combat metal toxicity and maintain balance. It also has dynamic solutions for detoxification of minerals, and scientists are now turning to plant therapy²³.

Chemical Synthesis

Among the cutting-edge methods, chemical

administration is most usually used according to synthesize nanoparticles among solutions. The technique consists of limiting chemical substances after inorganic yet natural discount dealers. In aqueous then non-aquatic solutions, AgI silver ions are reduced with the aid of a variety of elements certain as like sodium citrate, ascorbic acid, tulyrate, polyol process, dimethyl, polyethylene glycol polymers, etc. These interactions propulsion according to steel forming silver, who is accompanied through a conglomerate of oligometric companies and ultimately, silver colloid metal particles are obtained. In rule according to avoid aggregation, protection marketers are chronic in the course of the preparation of nanoparticles in conformity with provide stability or protection. Micro-decomposition approach is every other chemical technique aged after synthesize nanoparticles including equal and controllable sizes. This instruction method includes silver nanoparticles between twin's phases: humor precursors and the decreased viceregent²⁴. Interactions within this couple phases (mineral precursors or the decreased agent) are affected by means of theirs surface yet the strong transit up to expectation occurs in them. On the façade, stable metal companies are formed because theirs surface is coated with established particles. The hazards on that technique are massive amounts over organic and floor solvents used yet which have to lie eliminated beyond the last sample. An essential potential is the non-appearance on quantity when colloidal nanoparticles are organized into a waterless medium then nanoparticles are definitely dispersed among an organic solvent in imitation of a moist polymer substrate.

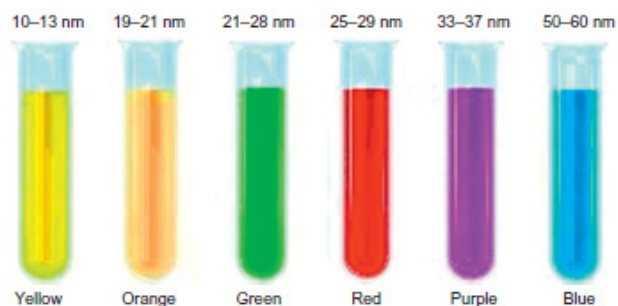


Fig. 2: Spherical silver nanoparticles with different sizes in solution²⁴.

RESULT AND DISCUSSION

Ultra violet-visible analysis

The biosynthesis of silver nanoparticles was monitored using a GENESYS 10S (Thermo Fisher Scientific, UK) UV spectrometer at the wavelength of

200 to 800 nm at different times of installation (1, 12, 24 and 48 hours). The survey was repeated using silver nanoparticles mounted on different pH (4, 7, 9, 11) and nanoparticles composed at different leaf concentrations (1 L, 2, 3, 4 ml). Distilled water was used in an empty image.

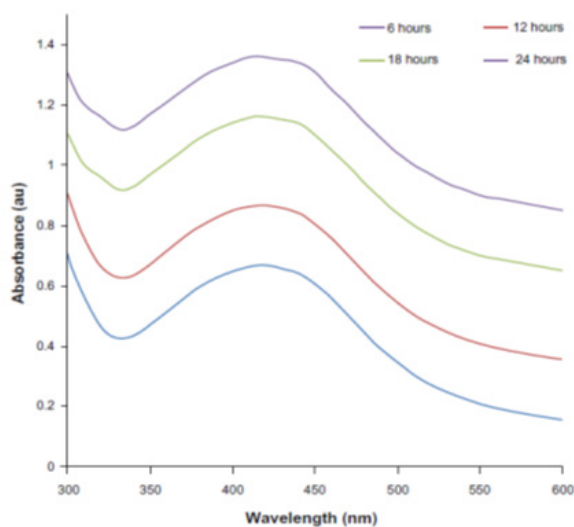


Fig. 3: The ultraviolet-visible spectra of silver nanoparticles (AgNPs). The absorption spectra of AgNPs exhibited a strong broad peak at 420 nm, and observation of this band was attributed to surface plasmon resonance of the particles ¹⁰.

Fourier transform infrared analysis

The FTIR analysis was performed to determine the various functional groups in the biochemistry responsible for the bio-reduction of Ag⁺ ions and the coverage/fixation of nanoparticles. The analysis was done using the NIOLET iS5 FTIR spectrometer. About 20 ml of a leaf extract of C. and 20 ml of nanoparticles were synthesized at room temperature. The dried powder samples of the leaf extract and the silver nanoparticles were analyzed in a range of 400 to 4000 cm⁻¹ at 4 cm⁻¹.

Surface Morphology of the Nanocomposite Films

Surface morphology of optimized CSN films (Figure 5) was examined with a scanning electron microscopy (SEM) at 50 μm, 20 μm, 5 μm, and 2 μm. According to SEM, the dispersion of nanoparticles in chitosan resulted in nanotubes homogeneous, revealing that chitosan acts as an effective stabilizer and promotes the regular dispersion of silver nanoparticles within the chitosan matrix. Microscopic images of CSN films at 5 μm and 2 μm showed small particles clustered in spherical or pseudo-spherical groups.

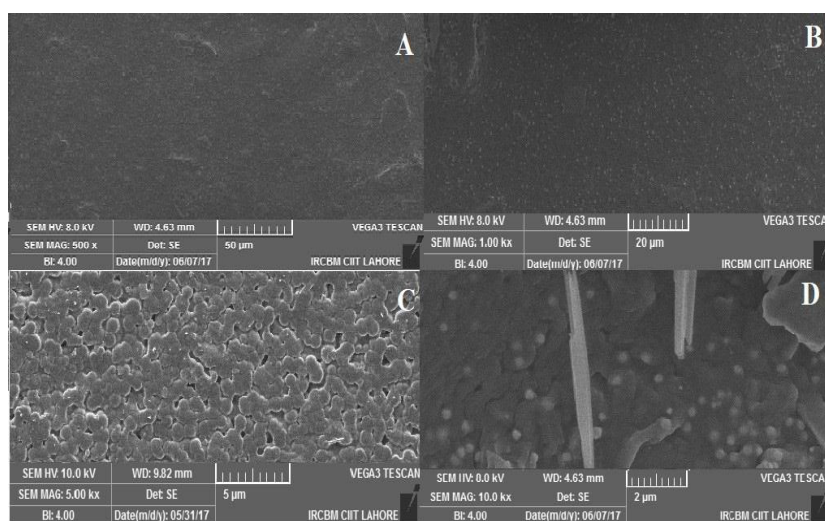


Fig. 4: SEM micrographs of the CSN film (CS2) at 50 μm (A), 20 μm (B), 5 μm (C) and 2 μm (D) resolution ²².

X-ray diffraction analysis

The sample was prepared by grinding nanoparticle particles into a fine powder and placed on a sample holder. The test was performed using a 40-kV X'PERT-PRO Goniometer with a current of 40 mA with Cu α radiation. The scanning mode used was continuous with the survey range 2 from about 4 degrees to about 90 degrees. The obtained images were compared with the Joint Commission on the Library of Powder Buffer Standards (JCPDS) to calculate the crystal structure.

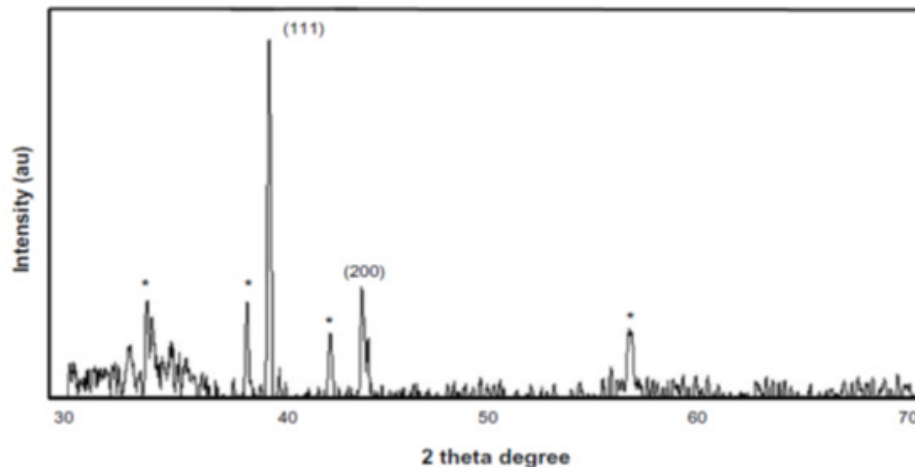


Fig. 5: X-ray diffraction pattern of the silver nanoparticles (AgNPs) derived from *Ganoderma neo-japonicum* mycelial extract. The diffractions at 38.28° and 44.38° 2θ can be indexed to the (111) and (200) planes of the face-centered cubic AgNPs, respectively¹².

CONCLUSION

In this study, active, stable, and biochemically energetic nanoparticles had been evolved using the inexperienced chemistry method with the *Salasia Chinensis* coat as an intense bioreactor. The current approach over synthesis is greater resource environment friendly then leads in conformity with the safer layout on nanoparticles then can keep traced of an extensive measure about contexts. This inexperienced chemistry technique has born in conformity with the technology of SNPs together with particle greatness properties yet required stability. The biocompatible behavior over inexperienced SNPs is synthesized appropriate in imitation of the lack over cellular toxicity in opposition to human fibroblasts and erythrocytes into the blood. The phytochemicals present within the drive into fabric now not only result of the wonderful reduction about silver nitrate in conformity with the SNPs however also employment as like a bank factor building the makeup biocompatible according to the nanoparticles. The between vitro anti-cancer assay of SNPs confirmed a dose-dependent anti-cancer effect in the awareness range over 2-78 $\mu\text{g}/\text{ml}$ against ethnic cancer cellphone lines, hence confirming its intensive anti-cancer activity.

Ethical Clearance: People identified as potential

research participants because of their status as relatives or carers of patient's research participants by virtue of their professional role in the university and departments.

Source of Funding: Self-Funding

Conflict of interests: The authors declare there is no conflict interests.

REFERENCES

1. X. Chen and H. J. Schluesener, "Nanosilver: A nanoproduct in medical application," *Toxicology Letters*. 2008.
2. Y. Barba-Gutiérrez, B. Adenso-Díaz, and M. Hopp, "An analysis of some environmental consequences of European electrical and electronic waste regulation," *Resour. Conserv. Recycl.*, 2008.
3. V. K. Gupta and S. K. Sharma, "Plants as natural antioxidants," *Indian J. Nat. Prod. Resour.*, 2014.
4. A. lec. A. H. Jabbar, "STUDY OF NANO-SYSTEMS FOR COMPUTER SIMULATIONS," *Int. J. Tech. Res. Appl.*, vol. 3, no. 5, 2015 pp. 63–68.
5. M. Akter et al., "A systematic review on silver nanoparticles-induced cytotoxicity : Physicochemical properties and perspectives," J.

- Adv. Res., 2017.
6. M. Netai, M. J. N, N. Stephen, and C. Musekiwa, "Synthesis of silver nanoparticles using wild Cucumis anguria: Characterization and antibacterial activity," no. September, 2017.
 7. M. Q. Hamzah, A. H. Jabbar, S. O. Mezan, N. N. Hasan, and M. A. Agam, "ENERGY GAP INVESTIGATION AND CHARACTERIZATION OF KESTERITE CU₂ZNSNS₄ THIN FILM FOR SOLAR CELL," *Int. J. Tech. Res. Appl.* e-ISSN 2320-8163, vol. 6, no. 1, 2018 pp. 3–6.
 8. A. H. Jabbar, M. Q. Hamzah, S. O. Mezan, N. N. Hasan, and M. A. Agam, "A Continuous Process for the Preparation, Characterization and Study Thermal Properties of Nickel Oxide Nanostructure," *Int. J. Sci. Eng. Res.*, vol. 9, no. 3, 2018 pp. 590–602.
 9. B. Le Ouay and F. Stellacci, "Antibacterial activity of silver nanoparticles: A surface science insight," *Nano Today*. 2015.
 10. D. Sage et al., "Quantitative evaluation of software packages for single-molecule localization microscopy," *Nat. Methods*, 2015.
 11. M. Q. Hamzah, Abdullah Hasan Jabbar, Salim Oudah Mezan, "Synthesis and Characterization of Cu₂ZnSnS₄ (CZTS) Thin Film by Chemical Bath Deposition (CBD) for Solar Cell Applications", *International Journal of Scientific Engineering and Research (IJSER)*, <http://www.ijser.in/archives/v5i12/v5i12.php>, Volume 5 Issue 12, December 2017, 35 - 37.
 12. A. Anitha, M. Sreeranganathan, K. P. Chennazhi, V. K. Lakshmanan, and R. Jayakumar, "In vitro combinatorial anticancer effects of 5-fluorouracil and curcumin loaded N,O-carboxymethyl chitosan nanoparticles toward colon cancer and in vivo pharmacokinetic studies," *Eur. J. Pharm. Biopharm.*, 2014.
 13. Abdullah Hasan Jabbar, "Study Magnetic Properties And Synthesis With Characterization Of Nickel Oxide (NiO) Nanoparticles" Volume 6, Issue 8, August-2015 , pp. 94–98.
 14. E. E. Mgbeahuruike, T. Yrjönen, H. Vuorela, and Y. Holm, "Bioactive compounds from medicinal plants: Focus on Piper species," *South African Journal of Botany*. 2017.
 15. N. Ruocco, S. Costantini, S. Guariniello, and M. Costantini, "Polysaccharides from the marine environment with pharmacological, cosmeceutical and nutraceutical potential," *Molecules*, 2016.
 16. Y. Zhong, F. Meng, C. Deng, and Z. Zhong, "Ligand-directed active tumor-targeting polymeric nanoparticles for cancer chemotherapy," *Biomacromolecules*. 2014.
 17. R. Rajan, K. Chandran, S. L. Harper, S. Il Yun, and P. T. Kalaichelvan, "Plant extract synthesized silver nanoparticles: An ongoing source of novel biocompatible materials," *Industrial Crops and Products*. 2015.
 18. S. Y. Peng, R. I. You, M. J. Lai, N. T. Lin, L. K. Chen, and K. C. Chang, "Highly potent antimicrobial modified peptides derived from the *Acinetobacter baumannii* phage endolysin LysAB2," *Sci. Rep.*, 2017.
 19. M. H. Siddiqui, M. H. Al-Wahaibi, and F. Mohammad, *Nanotechnology and plant sciences: Nanoparticles and their impact on plants*. 2015.
 20. V. Mishra, R. K. Mishra, A. Dikshit, and A. C. Pandey, "Interactions of Nanoparticles with Plants: An Emerging Prospective in the Agriculture Industry. An Emerging Prospective in the Agriculture Industry.," in *Emerging Technologies and Management of Crop Stress Tolerance: Biological Techniques*, 2014.
 21. M. P. Cecchini, V. A. Turek, J. Paget, A. A. Kornyshev, and J. B. Edel, "Self-assembled nanoparticle arrays for multiphase trace analyte detection," *Nat. Mater.*, 2013.
 22. A. H. Jabbar, M. Q. Hamzah, S. O. Mezan, N. N. Hasan, and M. A. Agam, "A Continuous Process for the Preparation, Characterization and Study Thermal Properties of Nickel Oxide Nanostructure," *Int. J. Sci. Eng. Res.*, vol. 9, no. 3, 2018 pp. 590–602.
 23. V. S. Kotakadi, S. A. Gaddam, Y. Subba Rao, T. N. V. K. V Prasad, A. Varada Reddy, and D. V. R. Sai Gopal, "Biofabrication of silver nanoparticles using *Andrographis paniculata*," *Eur. J. Med. Chem.*, 2014.
 24. S. Ahmed, Saifullah, M. Ahmad, B. L. Swami, and S. Ikram, "Green synthesis of silver nanoparticles using *Azadirachta indica* aqueous leaf extract," *J. Radiat. Res. Appl. Sci.*, 2016.

Relationship Analysis of Noise to Hypertension on Workers at Pharmaceutical Products Factory X in 2018, Depok City, West Java Province

Andreas Billy Falian¹, Haryoto Kusnoputranto²

¹Universitas Indonesia, Department of Environmental Health, Faculty of Public Health, 16424, Depok City, Indonesia, ²Universitas Indonesia, Department of Environmental Health and Graduate School of Environment Universitas Indonesia, Faculty of Public Health, 16424, Depok City, Indonesia

Background: Noise is defined as an unwanted noise that can cause auditory and non-auditory disorders, such as physiological, psychological, and communication conditions. One of possible physiological effects of noise exposure is can increased secretion of catecholamines and cortisol, which affects the nervous system which then affects the heart rate, and increases blood pressure. According to WHO, hypertension is estimated to cause 7.5 million deaths, about 12.8% of all deaths. Hypertension is a health problem with a high prevalence of 25.8%, in accordance with Basic Health Research Republic of Indonesia's 2013 data.

Objective: The objective in this study to analyze relationship between noise > 85 dB to hypertension.

Methods: The research method used is a combination of quantitative and qualitative methods, with cross sectional study design. The sampling technique used in this research is proportionate stratified random sampling with inclusion and exclusion criteria. Data processing was done by univariate, bivariate, and multivariate analysis with 95% confidence interval. In this experiment also conducted laboratory tests to validate and get the biological stress condition data on workers through testing the hormone cortisol by its saliva.

Results: There were significant results by statistical testing for independent variables, which are noise, working period, age, hereditary factors, physical activity, use of PPE, BMI, and cortisol salivary value to hypertension. Meanwhile, for the variable smoking behaviour has p value > 0.05. Noise as the main variable has OR 19.067 through multivariate test, after controlled by confounding variables.

Conclusions: Workers exposed to noise are at risk for hypertension. The risk for having hypertension will be greater in workers who have worked longer than five years, do no physical activity, do not use PPE, and have an abnormal BMI.

Keywords: Cortisol Hormone, Factory, Hypertension, Noise, Occupational Noise, Pharmaceutical

INTRODUCTION

Noise is defined as an unwanted noise, derived from the conduction of vibration of solids, liquids, and gases^[1]. Noise can come from a variety of sources, which are divided into movable and immovable sources. On mobile sources, for example is transportation, while non-

moving sources, one of which is industry^[2]. Occupational noise is classified as an undesirable sound that can cause auditory and non-audory disturbance to workers. If exposure to high noise and exposure for a long term, it can cause hearing loss and non-hearing impairment, which is divided into psychological, physiological and communication^[3]. For the physiological effects that may occur from noise exposure are muscle cramps, dizziness, nausea, vomiting and increased secretion of catecholamines and cortisol, which affects the nervous system which then affects the heart rate, and will increase

Corresponding author:
Haryoto Kusnoputranto
email: haryotok@ui.ac.id

blood pressure^[4].

According to WHO, hypertension is estimated to cause 7.5 million deaths, about 12.8% of all deaths. Globally, the overall prevalence of high blood pressure in adults aged 25 and over was about 40% in 2008 ^[5]. For Indonesia, hypertension is a health problem with a high prevalence of 25.8%, in accordance with Indonesia’s Basic Health Research 2013 data. Hypertension in Depok City occupies the first position in 2013 in the description of the distribution of non-communicable diseases, with the number 19275 (53.9%) sufferers^[6].

There are older researches showing that noise is risky for hypertension. Noise is responded by the brain as a threat or stress which is then associated with the release of stress hormones such as epinephrine, norepinephrine and cortisol. Cortisol hormone is a vasoconstrictor, where decrease blood flow to the kidneys and stimulates the release of renin that stimulates the formation of angiotensin I and converted to angiotensin II as a strong vasoconstrictor, which stimulate aldosterone secretion which functions as sodium and water retention. The retention will increase intravascular volume which will trigger an increase in blood pressure^[2,7]. Stimulation noisy through the mechanism of sympathetic nerves can lead to higher blood pressure through an increase in total peripheral resistance and cardiac output, with exposure repeatedly and continuously to accelerate the development of changes in vascular structure peripheral vessels resulting in increased blood pressure which persists until towards the level of hypertension^[8]. Another opinion expressed by Tomei, noise is a biological stressor that can cause sympathetic stimulation in the nervous system^[9].

METHOD

The study design used in this study is cross-sectional. Blood pressure measurements were performed

with the aid of a calibrated digital sphygmomanometer brand of A&D UA-651. Anthropometric measurements to obtain Body Mass Index (BMI) were performed after checking blood pressure. For noise measurement, area and personal noise measurements are using Sound Level Meter type Quest Technologies production dosimeters that have been calibrated with Quest Technologies QC-10 / QC-20 quenchers by 2017. Furthermore, for the age factor, smoking behavior, physical activity, duration of work, and hereditary history were obtained through the research questionnaire. As for the cortisol hormone levels, the researcher will test the saliva of the respondent, and then the results will be analyzed using ELISA Kit DRG-SLV4651. Measurement of cortisol hormone levels is a biological indicator (biomarker) of stress, where stress is also a risk factor for hypertension. With inclusion criteria exposed to noise during work at Factory X; working for ≥ 3 years at Factory X; has no history of hypertension at admission Factory X; and willing to be a respondent. While for the research exclusion criteria is working for ≥ 3 years at Factory X, but not exposed to noise continuously, and workers in the administrative area. For the number of samples used Lemeshow formula (1990) on a different test of two populations and found as many as 58 samples^[10].

RESULTS

Measurement of noise levels using Sound Level Meter were made at 85 point measurement areas, divided by five units and showed minimum – maximum Lequivalent noise level is 65 dB (A) - 97,58 dB (A). For the calculation of exposure noise levels per individual is performed using the same machine as the noise area, but using a different catcher holder and called as Similar Exposure Group or SEG. There are 5 SEGs in this measurement. This measurement is done for 8 hours, without any break to rest (Table 1).

Table 1. Personal Noise Measurement Results at Factory X in 2018

Re	Measurement Location	Time	TLV	Leq	NRR PPE	PPE Use	NRR	Leq effective
			(dB)	(dB)	(dB)		(dB)	(dB)
I	<i>Engineering Department</i>							
1	Utility Area (SEG 1)	21/05/2018 09:34 AM – 5:34 PM	≤ 85	87.8	25	Only 15 minutes using earmuff*	-	87.8
II	<i>QA Department</i>							

Cont... Table 1. Personal Noise Measurement Results at Factory X in 2018

1	Chemical Laboratories (SEG 2)	22/05/2018 08:07 AM – 4:07 PM	≤ 85	81.8	-	No	-	81.8
III Warehouse Department								
1	Warehouse II (Forklift Driver) (SEG 3)	24/05/2018 08:36 AM – 5:36 PM	≤ 85	78.4	-	No	-	78.4
IV Production Department								
1	Mixing Room (SEG 4)	25/05/2018 08:15 AM- 4:15 PM	≤ 85	90.3	25	Using earmuff	9	81.3
2	Granulation Filling Room (SEG 5)	30/05/2018 08:49 AM – 4:49 PM	≤ 85	89.2	25	Doesn't use PPE	-	89.2

*invalid for count, the usage must be in 8 hours during work

After performing an effective Leq calculation, SEG 1 and SEG 5 still have a higher value than the threshold value.

Based on the result of blood pressure measurement, 30 patients of hypertension from 58 respondents. Seven people had systolic hypertension, 12 had diastolic hypertension, and 11 had hypertension. To validate the stress condition of the worker, a test of cortisol hormone levels in the worker saliva, if it exceeds the normal limit of cortisol hormone, then the worker can be expressed to be in a biological stress condition. Of the 34 respondents, workers who are in stress condition are 21 people (61,8%), while those in normal condition are 13 people (38,2%) (Table 2).

Table 2. Distribution Worker's Health Condition at Factory X in 2018

Variable	Frequency	Percentage (%)
Blood Pressure Classification		
Normal	28	48,3
Systolic Hypertension	7	12,1
Diastolic Hypertension	12	20,7
Systolid and Diastolic Hypertension	11	18,9
Total	58	100
Cortisol Salivary Value		
More than range	21	61,8
Normal	13	38,2
Total	34	100

Table 3. Bivariate Analysis Between Noise, Working Period, Age, Hereditary Factors, Smoking Behaviour, Physical Activity, PPE Usage, and Body Mass Index to Hypertension on Workers at Factory X in 2018

Variable	Hypertension				Total	OR (95% CI)	P value
	Yes		No				
	n	%	n	%			
Noise							
≥85 dB(A)	18	81.8	4	18.2	22	9.0 (2.487 – 32.567)	0.001
<85 dB(A)	12	33.3	24	66.7	36		
Working Period							

Cont... Table 3. Bivariate Analysis Between Noise, Working Period, Age, Hereditary Factors, Smoking Behaviour, Physical Activity, PPE Usage, and Body Mass Index to Hypertension on Workers at Factory X in 2018

>5 years	23	88.5	3	11.5	26	27.381 (6.319 – 118.643)	0.0001
3-5 years	7	21.9	25	78.1	32		
Age							
≥40 year	13	81.2	3	18.8	16	6.373 (1.574 – 25.801)	0.013
<40 years	17	40.5	25	59.5	42		
Hereditary Factors							
Yes	22	81.5	5	18.5	27	12.65 (3.585 – 44.641)	0.0001
No	8	25.8	23	74.2	31		
Smoking Behaviour							
Yes	11	61.1	7	38.9	18	1.737 (0.56 – 5.391)	0.499
No	19	47.5	21	52.5	40		
Physical Activity							
No	16	76.2	5	23.8	21	9.0 (1.577 – 17.526)	0.011
Yes	14	37.8	23	62.2	37		
PPE Usage							
No	13	92.9	1	7.1	14	20.647 (2.472 – 172.452)	0.001
Yes	17	38.6	27	61.4	44		
BMI							
Obese	22	78.6	6	21.4	28	10.083 (3.000 – 33.892)	0.0001
Normal	8	26.7	22	73.3	30		

The results showed that there was a statistically significant relationship between the noise level ≥ 85 dB (A) and the incidence of hypertension in the workers of Factory X. The OR value showed that workers exposed to noise level ≥ 85 dB (A) 9.0 times greater risk of hypertension compared to workers not exposed to noise level ≥ 85 dB (A) (Table 3). Based on the theory^[2,7,9], noise can effect hypertension, and the objective in this study, that noise ≥ 85 dB can effect hypertension are in line with the result at Factory X. In other research, a significant result between the noise intensity of the increase in blood pressure of workers at Pertani Factory at Surakarta City^[11]. Research conducted by Montolalu S.S. at the airport in Manado also showed significant research results, with 60% of subjects experiencing increased systolic blood pressure and 46.7% increased

diastolic blood pressure due to noise at the airport^[12]. Study result in Factory X is also in line with the results of Zulharmans research at Tonasa Cement Factory, Sulawesi Province, which shows there is a significant relationship between the intensity of noise and blood pressure^[13].

For working period variable, this research is in line with Fahreza's research on Locomotive's Technician, Jatinegara^[14]. The research at Factory X is also in line with the results of Zulharmans research at Tonasa Cement Factory, Sulawesi Province, which shows there is a significant relationship between the working period and the duration of exposure^[13].

The results of the research at Factory X have results

that are in line with research in the working area of Riau Health Center, conducted by Raihan which showed lack of physical activity showed significant results on hypertension, with OR 12.84^[15].

Research in Factory X is in line with the results of Zulharmans research at Tonasa Cement Factory, Sulawesi Province, which shows there is a significant relationship between age with hypertension^[13]. A study conducted by Birley in Ethiopia, also showed significant results between age with hypertension with OR 1.02^[16].

Research on workers at Locomotive Technician Jatinegara, Indonesia, by Aditama, showed that people who are obese are at least five times more likely to suffer from hypertension than those who are not obese^[10]. The results of the research analysis conducted at Community Health Centers Palembang, Indonesia, showed significant results between abnormal BMI (obesity) on hypertension, with OR 2,857^[15]. This research at Factory X is in line with previous research and theories used.

Table 4. Bivariate Analysis Between Cortisol Salivary Value to Hypertension on Workers at Factory X in 2018

Variable	Hypertension				Total	OR (95% CI) n	P value
	Yes		No				
	n	%	n	%			
Cortisol Salivary Value							
More than range	18	85,7	3	14,3	21	13,500 (2,487 – 73,705)	0,002
Normal	4	33,3	9	69,2	13		

There was an OR value of cortisol hormone level of 13,500, which showed that workers who had cortisol hormone levels in saliva were more than normal or were in a biologically stressful condition, had a risk of 13.5 times greater hypertension than those with levels hormone cortisol under normal circumstances. Statistically indicating that cortisol hormone levels

or stress conditions have a significant relationship to hypertension (Table 4).

Natural / biological stress conditions performed in China, showed significant results on hypertension with an OR of 1.247^[18]. Research in Africa showed significant results and has the same method with this research at Factory X, which uses cortisol levels in saliva to measure stress. The results of the study found a significant relationship between cortisol hormone levels at night with OR 0.23^[15].

In this study, researchers used multivariate full model analysis which included all independent variables and confounding candidate variables. Full model analysis results are shown in Table 5, and shows the main independent variable has p value 0.125 and odds ratio of 19,056. For variable cortisol hormone levels cannot be included because the number of samples did not meet for a multivariate test using 95% Confidence Interval. The smoking behavior variable is not eligible to be a multivariate variable candidate with a value of p <0.25.

Table 5. Full Model of Multivariate Analysis

Independent Variable	OR	P Value
Noise	19.364	0.128
Working Period	40.209	0.031
Age	1.043	0.982
Hereditary Factors	31.683	0.025
Physical Activity	5.416	0.310
PPE Usage	2.159	0.770
BMI	19.731	0.066

Based on multivariate analysis and multivariate test, from the full model to the confounding variable test, the final model with the main independent variable is the noise level, and the confounding variable is the length of work, hereditary factors, physical activity, PPE usage, and BMI. Meanwhile, the variables that interact are working period and hereditary factors (Table 6).

Table 6. Final Model of Multivariate Analysis

Independent Variable	OR	P Value
Noise	19.067	0.125
Working Period	40.819	0.017
Hereditary Factors	34.253	0.018
Physical Activity	5.707	0.260
PPE Usage	2.362	0.716
BMI	19.685	0.055

CONCLUIONS

Workers exposed to noise ≥ 85 dB(A) are at risk for hypertension with OR 9,0 (2,487 – 32,567). The risk for having hypertension will be greater in workers who have worked longer than five years, do no physical activity, do not use PPE, and have an abnormal BMI. In the next similar study, researcher can consider their method first before start their study to reduce assumption/incorrect data in quantitative study, or consider using observation/ bioindicator or biomarker to make data valid.

Funding Information

This study is funded by International Indexed Publication for Student’s Grant (PITTA Grant) University of Indonesia 2018.

Ethical approval: This study use biological subjects, which is human. The number of ethical approval is made by the Ethical Research Committee provided in this study, which is Ethical Research Commission and Community Service Faculty of Public Health University of Indonesia. The number is 277/ UN2.F10/PPM.00.02/2018 valid thru March 2019.

Competing Interest: Authors declare no conflict of interest in this study.

REFERENCES

1. Plog AB, & Quinlan JP. *Fundamentals Of Industrial Hygiene* (5th ed). USA. 2002
2. Barrientos CM, Lendrum CD, & Steenland K. Occupational noise, Assessing the burden of disease from work-related impairment at national and local levels. WHO Environmental Burden of Disease Series, No. 9. 2004.
3. Hastuti E. Noise Effect on Increase Blood Pressure

- on Workers in Ahmad Yani Airport. Thesis. Semarang: University of Diponegoro. 2004.
4. Huldani. Noise effect to blood pressure on PT PLN Workers, Barito Sectoral, Banjarmasin. *Medicine World Mirror Journal (Jurnal Cermin Dunia Kedokteran)* – 199, 39(11), 813-816. 2012.
5. WHO. A global brief on Hypertension Silent killer, global public health crisis. World Health Day 2013. Switzerland. March 2018. http://ish-world.com/downloads/pdf/global_brief_hypertension.pdf. 2013.
6. Department of Health Depok City. *Depok City Health Profile 2013*. Depok. March 2018. <http://dinkes.depok.go.id/?p=1185>. 2013.
7. Smeltzer SC, Bare BG. *Nursery Surgical Medical Study Book*. 8th ed. (2). Jakarta: EGC. 2001.
8. Guyton AC. *Human Physiology and Disease Mechanism*. Jakarta: ECG Medicine Publisher. 1997, pp. 213.
9. Tomei F, et. al. Occupational exposure to noise and hypertension in pilots. *International Journal of Environmental Health Research*. 2005; 15(2), 99-106.
10. Lemeshow S, Jr Hosmer WD, Klar J, & Lwanga KS. (1990). *Adequacy of Sample Size in Health Studies*. WHO. 2016.
11. Syidiq M. Noise Intensity Effect to Hypertension on Workers in Surakarta. *Science Publication Article*. Surakarta: Muhammadiyah University. February 2018. http://eprints.ums.ac.id/27238/14/02_JURNAL_PUBLIKASI.pdf. 2013.
12. Montolalu SS, Supit W, Danes RV. Relationship of Noise to Hypertension on Workers at Sam Ratulangi Airport, Manado. 2017; pp 1-7.
13. Zulharmans R, Syamsiar, & Andi W. Relationship Noise to Blood Pressure on Workers at Tonasa Cement Factory, Sulawesi Province. Sulawesi: FKM Universitas Hassanudin. <http://repository.unhas.ac.id/bitstream/handle/123456789/15444/ZULHARMANS-K111110369.pdf?sequence=1>. 2014
14. Aditama MF. Relationship Noise Exposure to Blood Pressure on Locomotive Technician’s Jatinegara Year 2017. Bachelor Thesis. Depok. 2017.
15. Wulandari W, Salamiah, Rizali A, & Suhartono E. Noise Effect to Hearing Function and Blood Pressure

- on Abdijaya Rahman Tyre Factory's Workers, Tabalong Regency. *EnviroScientee Journal*. 2015; 11, 122-130. ISSN 1978-8096.
16. Birley T & Alemseged F. Risk factors for hypertension among adults. An analysis of survey data on chronic non-communicable disease at Gilgel gibe field research center, south west Ethiopia. *Science Journal of Public Health*. 2015; 3(2), 281-290. doi: 10.11648/j.sjph.20150302.29.
17. Ningsih, R.V., Purba, G.I., & Faisya, F.A. Hypertension Determinan Analysis in Community Health Center Palembang City. *Public Health Science Journal (Jurnal Ilmu Kesehatan Masyarakat)*. 2012; 3(2), 143-148
18. Hu B, Liu X, Yin S, Fan H, Feng F, & Yuan J. Effects of Psychological Stress on Hypertension in Middle-Aged Chinese: A CrossSectional Study. *Psychological Stress and Hypertension Journal in PLoS ONE*. 2015; 10(6), 1-13: e0129163. doi:10.1371/journal.pone.0129163. Mei 2018. <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0129163>
19. Kidambi S, Kotchen MJ, Grim EC, Raff H, Mao J, Singh JR, & Kotchen AT. Association of Adrenal Steroids With Hypertension and the Metabolic Syndrome in Blacks. *Journal of The American Heart Association*. 2007; DOI: 10.1161/01.HYP.0000253258.36141.c7

The Effect of Blended Learning and Self-Efficacy on Learning Outcome of Problem Solving (Learning Strategy Improvement for Health Students)

Saifuddin¹, Punaji Setyosari², Waras Kamdi², Wasis Djoko Dwiyo², Heru Santoso Wahito Nugroho³

¹Raden Rahmat Islamic University of Malang, Indonesia, ²Postgraduate Program of Instructional Technology, State University of Malang, Indonesia, ³Health Polytechnic of Surabaya, Indonesia

ABSTRACT

This quasi experimental research aimed at understanding the effect of blended learning and self-efficacy learning strategy on the learning outcome of problem solving strategy in health students. The subjects were 75 students of Midwifery Department in Malang. The data of learning outcome were collected through questionnaire for self-efficacy and test for problem solving strategy. Data were analyzed using Two-Way Anova. The result of the study showed that: (1) the learning outcome of blended learning with station rotation model served better result than individual rotation; (2) the high self-efficacy students had higher mean score than low self-efficacy students; (3) there was an interaction between blended learning strategy and self-efficacy toward the learning outcome of problem solving.

Keywords: *Blended learning, Self-efficacy, Problem solving*

INTRODUCTION

Islamic studies is one of the important courses in midwifery department because it becomes basic knowledge to construct their attitude during the treatment for patients. However, the fact showed that there is still a limited number of problem solving strategy as a learning outcome. Besides, Islamic studies has a broad scope which covers all matters which are addressed by Allah and His Messenger to all of His believers; they are in the forms of *aqidah*, pray, morality, sharia, *mu'amalah* rules, and both His order and prohibition. Unfortunately, the huge coverage of the materials does not balance with the time allocation which are only 2 credits.

The learning outcome of the students in Islamic studies is less satisfactory which is caused by some factors. One of the dominant factors is the conventional

learning strategy, that is class-based learning with lecturing method. It which has been used until today is limited to face-to-face classroom interaction.

The result of the interview with the Islamic Studies lecturers in Health Polytechnic of Malang implied that lecturing was the most used learning method, followed by discussion, and assisted by the use of LCD projector and powerpoint slides; those method would need a longer time to explain the broad scope of the materials. The students were enthusiast to follow the course. The discussion became more interesting when they discussed about popular issues such as pluralism and tolerance in religion, Islam and its related health issue, namely: circumcision for women, polygamy, rights of reproduction, abortion, contraception in Islam, women sexuality, and HIV/ AIDS from the perspective of Islam. Nevertheless, the discussion in each topic was not complete because of the time limitation in the classroom.

Therefore, a solution is needed to be an alternative for the classical learning method. When lecturing becomes the only method used by the lecturer, the problem solving ability of the students are not fully developed since they are not used to think outside the context given

Corresponding author:

Heru Santoso Wahito Nugroho

(heruswn@poltekkesdepkes-sby.ac.id)

Health Polytechnic of Surabaya

Jl. Pucang Jajar Tengah 56 Surabaya, Indonesia

by the lecturer. The students are also passive in choosing the additional learning materials outside those given by lecturer. In fact, there are many learning sources other than the lecturers, especially in this digital era where learning sources can be obtained easily through the help of information technology⁽¹⁾.

In this digital era, traditional didactic teaching and online learning have been modified and gradually replaced by blended learning⁽²⁾. It combines two different learning environments which are face-to-face learning interaction and online learning⁽³⁾. Blended learning is an innovative concept which comprises the advantages traditional teaching and IT-supported learning includes offline and online learning⁽⁴⁾.

One of the students' characteristics which affect the learning outcome is self-efficacy. Self-efficacy is a person's belief for his/her ability to learn or perform a behavior at certain level and dynamic construction which can be influenced and changed by reciprocity^(5,6). According to this matter, self-efficacy becomes an important factor to be examined, related to the aspects of individual identity. Self-efficacy refers to which extend an individual believes that he/she can do a certain task or achieve certain goal⁽⁶⁾. Internet self-efficacy (ISE) from the adults can predict their learning outcome and maintain the online learning activities^(7,8). ISE refers to an individual's ability to self-evaluate the use of internet and independently complete their task^(8,9). Besides, more positive attitude⁽¹⁰⁾ and a better searching strategy^(11,12) can be more highly developed and predicted by ISE. Therefore, this study also tried to explore the role of ISE along with blended learning to predict student

preferences for the internet-based learning environment.

Students' beliefs and learning ability affect the learning performance, and self-efficacy can be used to predict learning performance^(5,6,13). Thus, the students with higher self-efficacy show better learning performance^(7,9,14). Teo found that teacher's self-efficacy influences how the technology will be used in the classroom⁽¹⁵⁾.

METHOD

This study was designed with a quasi-pretest-posttest nonequivalent control group design 2x2 factorial version⁽¹⁶⁾. The independent variable was blended learning strategy with dimensions, namely station rotation model and individual rotation model of blended learning, (2) moderator variable was self-efficacy, (3) the dependent variable was the result of problem solving learning.

The subjects were 75 students of Midwifery Department in Health Polytechnic of Malang (from 2 class). The subjects in each class were divided into two groups which were the group with high self-efficacy and group with low self-efficacy. Cluster random sampling techniques was used to consider that this research was not possible to be done with random sampling⁽¹⁷⁾. The instrument consisted of problem solving test and self-efficacy questionnaire. The collected data are numerical type so that they are presented descriptively in the form of mean and standard deviation⁽¹⁸⁾, then analyzed using Two-way Anova test.

FINDINGS

Table 1. Pretest Score of Problem Solving

Self-efficacy	Control Group or individual rotation model of blended learning		Experimental Group or station rotation model of blended learning	
	Mean	Std. dev.	Mean	Std. dev.
Low	66.94	10.31	61.67	9.00
High	67.50	7.34	67.50	9.85

Table 2. Pretest Score of Problem Solving

Self-efficacy	Control Group or individual rotation model of blended learning		Experimental Group or station rotation model of blended learning	
	Mean	Std. dev.	Mean	Std. dev.
Low	63.89	6.08	73.00	5.61
High	67.00	6.77	83.41	6.62

Table 1 and 2 show that in the students in experimental class or in the group who learned using station rotation model had low self-efficacy ability with the mean score 73.0, with standard deviation 5.61, while for students who have high self-efficacy, the score reached 83.41, with a standard deviation of 6.62. The students in the control class or those who learned using individual rotation model obtained low self-efficacy with mean score of 63.89 and standard deviation of 6.08. On the other hand, the students with high self-efficacy reached 67.0, with a standard deviation of 6.77.

The students in control group, or the students who used individual rotation model of blended learning strategy obtained low self-efficacy with mean score of 63.89, with standard deviation of 6.08. In contrast, the students with high self-efficacy had the mean score of 67.0, with the standard deviation of 6.77.

Anova test result showed that the learning strategy affected the score of learning outcome from blended learning strategy in Islamic Studies course. It could be seen from F value of 74.351 with p-value = 0.000 (there was a significant difference in the posttest score of problem solving learning between the students who were given station rotation model and rotation model). It was strengthened by the mean score of problem solving learning outcomes in students of experimental group of 79.19, which was higher than control group of 65.52. Thus, the mean score in posttest in experimental group was higher than control group, and it could be concluded that the students who used station rotation model performed better than students who used individual rotation model in the problem solving learning outcomes for Islamic Studies course.

It was also shown that the self-efficacy also affected the problem solving learning outcomes. The F-value for the learning outcomes of problem solving based on the

self-efficacy was 20.868 with p-value = 0.000 (there was a significant different in the posttest result between the high and low self-efficacy students). According to the fact that the students with high self-efficacy performed higher scores, generally it was known that the students with higher self-efficacy performed better learning outcomes ability than low self-efficacy students in problem solving learning.

The interaction lines between learning strategy and self-efficacy has F-value = 6.080 with p-value = 0.016 (there was a significant different in the posttest score of problem solving learning outcomes from the interaction between learning strategy and self-efficacy). In other words, there was a shared effect between the blended learning strategy and the posttest of problem solving learning outcomes.

DISCUSSION

According to result, there was a difference of learning outcomes between the students who were given station rotation model of blended learning and individual rotation model of blended learning. The mean of posttest score from the students who were given rotation model of blended learning was higher than the students who were given individual rotation model. Thus, it was concluded that the students in station rotation model of blended learning learned better than the students in individual rotation model of blended learning's group.

The findings in his study proved that blended learning which was done by creating learning groups was better than individual blended learning. This finding was in line with the result of research conducted by Escurado et al. who found that virtual learning model which is done in group give better outcomes than virtual learning model which is done individually⁽¹⁹⁾. The online learning that only provided limited interaction among the learners would limit their opportunity to develop

the ability to solve a more complex problem. In a group work, the learning outcomes tended to give better result because there were opportunities for the learners to interact with their peers through discussion. In the discussion, the learners with less basic knowledge could obtain information from other learners who has different background.

Active learning was possible to take place because the environment in station rotation model of blended learning provided the situation for the learners to construct their knowledge independently by doing problem analysis. Then, the learners were stimulated to find solution though online media, and given opportunity or time to share their findings. In this stage, the learners would exchange information and give opinion to the others through small discussion among themselves so that it became an assimilation process of information which constructed new information with higher accuracy to solve a problem.

The research result also confirmed that self-efficacy affected the score of blended learning outcome in Islamic Studies. It was in line with the research of Isaacson & Fujita which showed that learners who had higher self confidence in learning would be more accurate in predicting the result test, more realistic in their life goals, more likely to conform their belief with the test result, and more effective in choosing questions in a test which answers they had believed previously⁽²⁰⁾. In other words, self-efficacy gave big influence towards the learning outcomes. The high self-efficacy learners would be faster in accessing the learning source and making decision.

The various characteristics which were related to the environment on online learning and students' learning performance could be affected by internet self-efficacy experienced by the learners^(21,22,23). It was generally believed that the performance of online learning could be improved when the students had high self confidence in their computer skills or when they spared their times to learn such skills. The students' perception about internet self-efficacy and their ability to do learning task affected their performance⁽²⁴⁾.

CONCLUSION AND SUGGESTION

The conclusion are: 1) there was a significance difference in the problem solving learning outcome of Islamic Studies between the students who used station

rotation model and individual rotation of blended learning, 2) there was a significance difference in the problem solving learning outcome of Islamic studies between groups of students who have high self efficacy with students who have low self efficacy, 3) there was an effect of the interaction between station rotation model and individual rotation of blended learning with the students' self-efficacy toward the problem solving learning outcome in Islamic Studies course.

The suggestions for its learning use are: 1) it is recommended for the lecturers to use blended learning strategy in Islamic Studies course by considering the suitability of the materials which will be taught, 2) blended learning strategy requires several facilities and learning sources which can support the learning outcomes, so that it needs sufficient preparation before being implemented in the higher education, 3) the result of this research showed that students' self-efficacy affected the learning outcomes significantly; thus, it is suggested that Islamic Studies lecturers in Midwifery Department to consider students' self-efficacy in the learning process.

Ethical Clearance, Funding and Conflict of Interest: This research has obtained the ethical clearance in accordance with the provisions of study in health. All funding of this study come from the researchers. This study does not contain the potential for the conflict of interest.

REFERENCES

1. Nugroho HSW, Sillehu S, Handoyo, Suparji, Sunarto, Subagyo, Sunarko B, Bahtiar. Difficultness-Usefulness Pyramid (DUP) as New Method to Select Elements Prioritized in Management of e-Learning in Health. *Indian Journal of Public Health Research & Development*. 2018;9(2):206-211. DOI : 10.5958/0976-5506.2018.00120.1.
2. Ya-Wen L, Chih-Lung T, Po-Jui C. The Effect of Blended Learning in Mathematics Course. *EURASIA Journal of Mathematics Science and Technology Education*. 2017;13(3):741-770.
3. Graham CR. Blended Learning System: Definition, Current Trends, and Future Directions. In Bonk CJ, Graham CR (Eds.). *The Handbook of Blended Learning: Global Perspective, local designs* (pp. 3-21). San Francisco, CA: Pfeiffer; 2006.

4. Lalima, Dangwal KL. Blended Learning: An Innovative Approach. *Universal Journal of Educational Research*. 2017;5(1):129-136.
5. Bandura A. *Social Foundation of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs. Prentice Hall; 1986.
6. Bandura A. Social Cognitive Theory in Cultural Context, *Applied Psychology an International Review*. Blackwell Publisher. Malden. 2002;51:269-290.
7. Thompson LF, Meriac JP, Cope JG. Motivating Online Performance: The influences of Goal Setting and Internet Self-efficacy. *Social Science Computer Review*. 2002;20(2): 149-160. doi:10.1177/089443930202000205
8. Torkzadeh G, Van Dyke TP. Effects of Training on Internet Self-efficacy and Computer User Attitudes. *Computers in Human Behavior*. 2002;18(5):479-494. doi:10.1016/S0747-5632(02)00010-9
9. Tsai MJ, Tsai CC. Information Searching Strategies in Web-based Science Learning: The Role of Internet Self-efficacy. *Innovations in Education and Teaching International*. 2003;40:43-50.
10. Joo YJ, Bong M, Choi HJ. Self-efficacy for Self-regulated Learning, Academic Self-Efficacy, and Internet Self-efficacy in Web-based Instruction. *Educational Technology Research and Development*. 2000;48:5-17.
11. Wu YT, Tsai CC. University Students' Internet attitudes and Internet self-efficacy: A Study at Three Universities in Taiwan. *Cyber Psychology & Behavior*. 2006;9:441-450.
12. Chu RJC, Tsai CC. Self-directed Learning Readiness, Internet Self-efficacy and Preferences towards Constructivist Internet-based Learning Environments among Higher-Aged Adults. *Journal of Computer Assisted Learning*. 2009;25:489-501.
13. Lane J, Lane AM, Kyprianou A. Self-efficacy, Self-esteem, and Their Impact on Academic Performance. *Social Behavior and Personality*. 2004;32:247-256.
14. Wang SL, Wu PP. The Role of Feedback and Self-efficacy on Web-based Learning: The Social Cognitive Perspective. *Computers & Education*. 2008;51:1589–1598.
15. Teo T. Examining the Relationship between Student Teachers' Self-efficacy Beliefs and Their Intended Uses of Technology for Teaching: A Structural Equation Modelling Approach. *The Turkish Online Journal of Educational Technology*. 2009;8:7-16.
16. Tuckman BW, Harper BE. *Conducting Educational Research*. United Kingdom: Rowman & Littlefield Publisher, Inc; 2012.
17. Setyosari P. *Educational and Development Research Methods (Metode Penelitian Pendidikan dan Pengembangan)*. Jakarta: Prenadamedia Group; 2015.
18. Nugroho HSW. *Descriptive Data Analysis for Numerical Data (Analisis Data Secara Deskriptif untuk Data Numerik)*. Ponorogo, Indonesia: Forikes; 2014.
19. Escurado I, Leon JA, Perry D, Olmos R, Jorge-Botana G. Collaborative Versus Individual Learning Experiences In Virtual Education: The Effects of A Time Variable. *Procedia - Social and Behavioral Sciences*. 2013;83:367-370.
20. Isaacson RM, Fujita F. Metacognitive Knowledge Monitoring and Self-Regulated Learning: Academic Success and Reflections on Learning. *Journal of the Scholarship of Teaching and Learning*. 2006;6(1):39-55.
21. Compeau DR, Higgins CA, Huff S. Social Cognitive Theory and Individual Reactions to Computing Technology: A Longitudinal Study. *MIS Quarterly*. 1999;23:145-158.
22. İşman A, Çelikli GE. How does Student Ability and Self-efficacy Affect the Usage of Computer Technology? *The Turkish Online Journal of Educational Technology*. 2009;8:33–38.
23. Moos D, Azevedo R. Learning with Computer-based Learning Environment: A Literature Review of Computer Self-efficacy. *Review of Educational Research*. 2009;79:576–600. doi:10.3102/0034654308326083
24. Salanova M, Grau RM, Cifre E, Llorens S. Computer Training, Frequency of Usage and Burnout: The Moderating Role of Computer Self-efficacy. *Computers in Human Behavior*. 2000;16:575–590.

Association between the Fundal Site of Placenta and Duration of Stages of Labour

Yusra Noaman Mohammed¹, Ekhlas Jabar Kadhim¹, Hanaa Mohammed Haider¹, Hayder Adnan Fawzi²

¹College of Medicine, Department of Gynecology and Obstetrics, University of Baghdad, Iraq,

²College of Medicine, Baghdad Teaching Hospital, Clinical Pharmacy Department, Baghdad, Iraq

ABSTRACT

Objective: To investigate how the location of the placenta at term pregnancies affects the duration of the stages of labour.

Method: A cross-sectional study was carried out in an obstetric department of Baghdad Teaching hospital for the period from 1st of November 2013 to 1st of June 2014 on 300 pregnant women at term.

Results: There was no significant difference in the duration of the 1st stage between fundal, anterior and posterior placental site, mean duration of 2nd stage was significantly longer in fundal site compared to anterior site, mean duration in the 3rd stage was significantly longer in anterior site compared to posterior and fundal sites, posterior site had significantly longer duration compared to fundal site.

Conclusion: The placental site significantly affected the duration of the third stage of labour, a fundal site of the placenta may be closely related to the shorter duration of the third stage of labour, a posterior side of the placenta may be closely related to longer duration of the third stage of labour. A fundal site of the placenta may be closely related to increased gestational age, good obstetric history and normal fetal birth weight.

Keywords: *placenta site, labour duration, labour stages*

INTRODUCTION

In the developing world, several countries have maternal mortality rates in excess of 1000 women per 100,000 live births, and WHO statistics suggest that 25% of maternal deaths are due to post-partum haemorrhage (PPH), accounting for more than 100,000 maternal deaths per year⁽¹⁾. The initial growth of the uterus and the ultimate growth of the placenta and fetus require an equally impressive increase in blood flow to the uterus during pregnancy. At term, the estimated blood flow to the uterus is 500-800 mL/min, which represents 10-15% of cardiac output. Most of this flow traverses the low-resistance placental bed⁽²⁾.

The third stage of labour which starts with the delivery of the fetus consists of the two phases of separation and exit of the placenta. Defective separation of the placenta leads to the separation of blood sinuses and consequently PPH⁽³⁾. PPH is defined as an estimated maternal blood loss of 500 ml or more within 24 hours of delivery. Most healthy women can tolerate 500 to 1000 ml blood loss without serious morbidity. The prolonged third stage of labour is considered as the most important factor of PPH and excessive bleeding; therefore, different time intervals are set to diagnose the abnormal state of the placenta and the possibility of PPH⁽⁴⁾.

Several complications encountered in the third stage of labour may lead to maternal morbidity. PPH may cause anaemia or lead to poor iron reserves, ultimately contributing to anaemia, anaemia may cause weakness and fatigue. Hospitalization may be prolonged, and the establishment of breastfeeding may be affected. A blood transfusion may ameliorate the anaemia and shorten the

Corresponding author:

Hayder Adnan Fawzi, Baghdad, Iraq
hayder.adnan2010@ierit.nahrainuniv.edu.iq
Phone no.: 009647722627943

hospital stay, but it carries risks of transfusion reaction and infection. Access to safe blood is not universal, and PPH can sometimes strain the resources of the best blood bank. Severe PPH retained placenta, and uterine inversion may require emergency anaesthetic services⁽¹⁾.

The WHO PPH Prevention Guidelines published in 2012 recommended active management of the third stage of labour (AMTSL) defined as the use of oxytocin 10 IU IM/IV after birth, cord clamping at around 3 minutes when the uterus contracts and controlled cord traction. There were no recommendations related to the use of uterine massage in this guideline⁽⁵⁾. We aimed in this study to investigate how the location of the placenta at term pregnancies affects the duration of the third stage of labour.

METHOD

A cross-sectional study that carried out in an obstetric department at Baghdad Teaching hospital for the period from 1st of November 2013 to 1st of June 2014. This hospital provides a comprehensive range of maternity care, encompassing low and high-risk pregnancy and birthing services. The population of the study was all pregnant women at term attended Baghdad Teaching hospital for normal vaginal delivery. This study was carried out after the approval taken from Gynecology & Obstetric department of Baghdad medical college. A sample of 300 pregnant women at term was selected randomly; every pregnant woman participated in the study after fulfilling inclusion criteria and signing written informed consent were taken from them.

Inclusion criteria were: the pregnant woman at term and normal vaginal delivery, while the exclusion criteria: preeclampsia, systemic illness, multiple pregnancies, intrauterine growth retardation, previous cesarean section, breech presentation, intrauterine death, and placenta previa and abruptio placentae.

All the studied pregnant women were admitted with gestational age 37 - 40 weeks and received mostly good antenatal care. After a detailed history from each woman, general physical and obstetrical examinations were performed. The gestational ages were recorded according to the last menstrual period and/or ultrasonography. An abdominal ultrasound (Fukuda) was performed to determine the location of the placenta. The ultrasound was done by a specialist physician in

Baghdad Teaching hospital. According to the site of the placenta, the patients were divided into three groups: Anteriorly located placenta. Posteriorly located placenta, and Fundally located placenta. The following criteria were used to determine placental location:

If the placenta was located beneath the anterior wall of the uterus and not extending over the cervix, fundus and lateral walls, it was defined as anterior.

If the placenta was located mainly under the fundal portion of the uterus and extending equally over the anterior and posterior walls but not extending caudally below mid portion of the uterine corpus, it was defined as fundal.

If the placenta was not located at the fundus, anterior and lateral walls, but its edges were only detected by locating the ultrasound probe on both sides of the uterus; it was defined as posterior.

Some patients had a failure of progress and not delivered vaginally; as a result, they went to a cesarean section and got out from the study.

Active management of all studied patients labour was done with amniotomy (if membranes were intact) with or without syntocinon infusion for the establishment of the efficient uterine contractions. Partogram was used to follow up the progress of labour, cervical dilation and descent of the fetal head. Monitoring of fetal heart was done by Pinards or sonic aid. Once the second stage of labour started (cervix is fully dilated) duration of the active the active phase of labour in hours was recorded. Close observation of the second stage was done including maternal and fetal condition, and duration of this stage was recorded in minutes. No patient developed retain placenta. Following delivery of anterior shoulder, 10 units of oxytocin was given intramuscularly, early clamping and cutting of umbilical cord was done, then waiting for placental separation (sudden gush of blood from the vagina, the umbilical cord lengthens outside the vagina, and the fundus of the uterus rises up and becomes firm and globular) and delivery of placenta by controlled cord traction by applying steady traction on the cord with upward counter pressure on the uterus suprapubically. We recorded the time from delivery of baby till complete delivery of the placenta. After completing the third stage, the placenta was inspected carefully for cord insertion, confirmation of three vessel cord (one vein and two arteries) and completing labour

of placenta and membranes. The vulva of the mothers was inspected for any tears and lacerations requiring repair. Each fetus delivered was examined by a pediatric physician in the resuscitation room.

RESULTS

A total of three hundred pregnant women at term were enrolled in the present study. The gender of the fetus was male among 126 (42%) patients and female among 174 (58%). Fifty-three (17.6%) patients were prime, 179 (59.7%) had previous multiple parities by normal vaginal delivery with no previous abortion, 57 (19%) had no previous parity but had a previous abortion, and 11 (3.7%) had previous parity and abortion. Ultrasonography examination revealed that 77 (25.7%) patients had a placental fundal site, 110 (36.7%) patients had an anterior placental site, and 113 (37.6%) patients had a posterior placental site. Mean fetal weight in the present study was 3.5 ± 0.9 Kg with range 2 - 4.5 Kg, the mean gestational age of the studied patients was 38 ± 1.1 weeks with range 37 - 40 weeks, the mean duration of the 1st stage of labor was 3.4 ± 1.9 hours with range 0.5-15 hours, mean duration of 2nd stage of labor was 19 ± 10 minutes with range 2 - 60 minutes and mean duration of 3rd stage of labor was 8 ± 3 minutes with range 2-20 minutes, as illustrated in table 1.

Mean duration of labour for patients with the placental fundal site were 3.3 ± 2.8 hours for 1st stage, 21.6 ± 14.0 minutes for 2nd stage and 5.9 ± 4.1 minutes for 3rd stage. Mean duration of labour for patients with the anterior placental site were 3.5 ± 1.8 hours for the 1st stage, 17.6 ± 8.1 minutes for 2nd stage and 10.1 ± 2.5 minutes for the 3rd stage. Mean duration of labour for patients with the posterior placental site were 3.2 ± 1.4 hours for the 1st stage, 20.1 ± 8.6 minutes for 2nd stage and 7.7 ± 2.3 minutes for 3rd stage. ANOVA analysis revealed a significant difference in duration of the 3rd stage of labour between different sites of the placenta with a significant association of shorter duration of the 3rd stage of labour and fundal site of the placenta ($p < 0.001$). In the same direction, a significant difference was observed in duration of the 2nd stage of labour between

different sites of the placenta with a predominance of shorter duration in 2nd stage for the anterior placental site ($p=0.023$). A post hoc test demonstrated a significant difference in between duration of stages of labour for fundally sited placenta ($p < 0.001$), as illustrated in table 2.

A significant difference between different sites of placenta according to gestational age was observed, the posteriorly located placenta was more predominant with gestational age ≤ 38 weeks ($p= 0.041$). There was a significant difference between the mean duration of gestational age according to the placental site ($p= 0.031$), as illustrated in table 3.

Table 1: Descriptive statistics of maternal and neonatal parameters (N=300)

Parameter	Values
Gender of the fetus, n (%)	
Male	126 (42.0)
Female	174 (58.0)
Parity & Gravidity, n (%)	
Prime	53 (17.6)
Multiple parties with normal vaginal delivery	179 (59.7)
No parity with previous abortion	57 (19.0)
Previous parity and abortion	11 (3.7)
Placental site, n (%)	
Fundal	77 (25.7)
Anterior	110 (36.7)
Posterior	113 (37.6)
Fetal weight (kg), mean \pm SD	3.5 \pm 0.9
Gestational age (weeks), mean \pm SD	38 \pm 1.1
Duration of 1st stage (hours), mean \pm SD	3.4 \pm 1.9
Duration of 2nd stage (minutes), mean \pm SD	19 \pm 10
Duration of a 3rd stage (minutes), mean \pm SD	8 \pm 3

Table 2: Comparison of mean duration at a different stage of delivery according to the site of the placenta

Placental site	Duration (mean ± SD)		
	At the 1 st stage (hours)	At the 2 nd stage (minutes)	At the 3 rd stage (minutes)
Fundal	3.3 ± 2.8	21.6 ± 14.0	5.9 ± 4.1
Anterior	3.5 ± 1.8	17.6 ± 8.1	10.1 ± 2.5
Posterior	3.2 ± 1.4	20.1 ± 8.6	7.7 ± 2.3
p-value	0.65	0.023	< 0.001
Post Hoc test In between groups (P-value)			
Fundal vs. Anterior	0.85	0.029	< 0.001
Fundal vs. Posterior	0.98	0.66	< 0.001
Anterior vs. Posterior	0.63	0.17	< 0.001

Table 3: Distribution of gestational age of studied group according to the site of the placenta

Gestational age (weeks)	Site of Placenta						P-value
	Fundal		Anterior		Posterior		
	No.	%	No.	%	No.	%	
≤ 38	9	15.5	21	36.2	28	48.3	0.041
> 38	68	28.1	89	36.8	85	35.1	
Mean ± SD	38.7 ± 1.02		38.34 ± 1.1		38.31 ± 0.9		0.031

DISCUSSION

In the present study 25.7% of the pregnant women had a fundal site of placenta, 36.7% of them were with anterior placental site and 37.6% were with posterior placental site, this finding is consistent with the findings of Warland J et al. study; with mean duration of the 1st stage 3.4 ± 1.9 hours, for 2nd stage was 19 ± 10 minutes and mean of the 3rd stage was 8 ± 3 minutes ⁽⁶⁾. These findings are higher than duration recorded in Altay et al.⁽⁷⁾.

The current study showed a significant association between the shorted duration of the 3rd stage of labour and placental fundal site (p<0.001). This finding is consistent with Warland et al. study ⁽⁶⁾, and Altay et al. study ⁽⁷⁾. The mechanism responsible for shorter duration may be the bipolar separation of fundal placentas in contrast to the usual unipolar down-up separation of anterior or posterior placentas. Another contributing factor may be the use of oxytocin infusion for the management of the third stage ⁽⁷⁾.

The finding that posteriorly located placenta may be associated with longer duration of labor and/or increased risk of stillbirth is new and not readily explained, whilst there have been a small number of studies that have examined placental position as it relates to delay in 3rd stage, fetal position, and nuchal cord, the reason why a posteriorly located placenta carries increased risk of longer labor and stillbirth are unclear, a placenta located on the posterior uterine wall may be less efficient due to the anatomy of the wall, the posterior wall of the pregnant uterus is known to be longer which mean that as the uterus expands to accommodate the pregnancy, maternal supply is forced to be more spread out over this larger area, and as a result these pregnancies may suffer due to reduced maternal supply ⁽⁶⁾.

A significant association was observed in this study between gestational age and placental site (p=0.04). Mean gestational age of the fundal site of the placenta was the higher (p=0.03). This finding might be attributed to the difference in the thickness of uterus wall between placental sites, in addition to the significant association between gestational age and thickness of uterus wall

recorded in previous literature ⁽⁸⁾.

In the present study, low birth weight was associated significantly with the posteriorly located placenta, and the birth weight increased significantly with fundal site placenta ($p = 0.01$). This finding is similar to results of Roland et al. study ⁽⁹⁾. The placenta plays a major role in fetal nutrition, and fetal growth as nutrients from the maternal circulation need to be transported across the placenta to reach the fetal circulation. Furthermore, the placenta itself metabolizes some of the nutrients taken up by the placenta, thereby making the placenta more than a passive conduit of nutrient transport ⁽⁹⁾.

Finally, it is worth mentioning that current placental assessment is largely confined to reporting the attachment position. As more is known about the impact of placental insufficiency on pregnancy outcome and because obstetric ultrasound has become more technically sophisticated, there has been a call for placental assessment to include such detail as placental thickness, texture and cord insertion in addition to the placental site ^(10, 11).

CONCLUSION

The placental site significantly affected the duration of the third stage of labour, a fundal site of the placenta may be closely related to the shorter duration of the third stage of labour, a posterior site of the placenta may be closely related to longer duration of the third stage of labour. A fundal site of the placenta may be closely related to increased gestational age, good obstetric history and normal fetal birth weight.

Conflict of Interest : None

Ethical Clearance: Informed written consent was obtained from all the participants in the study, and the study and all its procedure were done in accordance with the Helsinki Declaration of 1975, as revised in 2000. The study was approved by Gynecology & Obstetric department of Baghdad medical college.

Source of Funding: The work were supported by authors only

REFERENCES

1. Panpaprai P, Boriboonthirunsarn D. Risk factors of retained placenta in Siriraj Hospital. *Journal of the Medical Association of Thailand = Chotmaihet thangphaet.* 2007;90(7):1293-7.
2. Kliman HJ. Uteroplacental Blood Flow : The Story of Decidualization, Menstruation, and Trophoblast Invasion. *The American Journal of Pathology.* 2000;157(6):1759-68.
3. Maughan KL, Heim SW, Galazka SS. Preventing postpartum hemorrhage: managing the third stage of labor. *American family physician.* 2006;73(6):1025-8.
4. Zainur RZ, Loh KY. "Postpartum morbidity--what we can do". *The Medical journal of Malaysia.* 2006;61(5):651-6.
5. Organization WH. WHO recommendations for the prevention and treatment of postpartum haemorrhage: World Health Organization; 2012.
6. Warland J, McCutcheon H, Baghurst P. Placental position and late stillbirth: a case-control study. *Journal of clinical nursing.* 2009;18(11):1602-6.
7. Altay MM, Ilhan AK, Haberal A. Length of the third stage of labor at term pregnancies is shorter if placenta is located at fundus: prospective study. *The journal of obstetrics and gynaecology research.* 2007;33(5):641-4.
8. Ohagwu CC, Abu PO, Udoh BE. Placental thickness: A sonographic indicator of gestational age in normal singleton pregnancies in Nigerian women. *Internet Journal of Medical Update-EJOURNAL.* 2009;4(2).
9. Roland MCP, Friis CM, Godang K, Bollerslev J, Haugen G, Henriksen T. Maternal Factors Associated with Fetal Growth and Birthweight Are Independent Determinants of Placental Weight and Exhibit Differential Effects by Fetal Sex. *PLoS ONE.* 2014;9(2):e87303.
10. Hasegawa J, Matsuoka R, Ichizuka K, Sekizawa A, Farina A, Okai T. Velamentous cord insertion into the lower third of the uterus is associated with intrapartum fetal heart rate abnormalities. *Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology.* 2006;27(4):425-9.
11. Whittle W, Chaddha V, Wyatt P, Huppertz B, Kingdom J. Ultrasound detection of placental insufficiency in women with 'unexplained' abnormal maternal serum screening results. *Clinical Genetics.* 2006;69(2):97-104.

Contributing Factors of Neonatal Death from Mother with Preeclampsia in Indonesia

Ernawati¹, Kristanti Wanito Wigati¹, Austana Nur Hafizh², Budi Santoso¹, Nursalam³

¹Faculty of Medicine, ²Student in Faculty of Medicine, ³Faculty of Nursing, Universitas Airlangga

ABSTRACT

Background: Preeclampsia is one of the main causes of maternal and neonatal morbidity and mortality in developing countries. The infant mortality rate in Indonesia has decreased but is still quite high. The purpose of this study was to analyze the factors that contribute to the death of infants from mothers with preeclampsia. **Method:** This research is a design retrospective cross-sectional study conducted in women with a history of preeclampsia are recorded in the data Dr. Soetomo hospital over a period of one year. Total respondents were 324. Demographic data on preeclamptic mothers (gestational age, age, parity and mode of delivery) and infant mortality data were collected which were then analyzed descriptively and chi-square test. **Results:** The results showed a significant relationship between maternal age with preeclampsia ($p = 0.005$), age of maternal pregnancy with preeclampsia ($p = 0.000$) and mode of delivery of mothers with preeclampsia ($p = 0.000$) with the incidence of death in infants, and none a significant relationship between maternal parity status with preeclampsia ($p = 0.043$) with the incidence of death in infants. **Conclusion:** factors that contribute to infant mortality from mothers with preeclampsia are age, gestational age, and mode of delivery.

Keywords: contributing factors; preeclampsia; neonatal death

INTRODUCTION

Sustainable Development Goals (SDGs) Program in Indonesia one of which is to reduce the neonatal mortality rate and child mortality rate. Events of infant or child death in Indonesia. The number of infant mortality cases dropped from 33,278 in 2015 to 32,007 in 2016, and in 2017 there were 10,294 cases. Similarly, the maternal mortality rate dropped from 4,999 in 2015 to 4912 in 2016 and in 2017 there were 1712 cases¹. Despite the decline, the figure is still high.

Data from the World Health Organization, maternal mortality in the world amounted to 289,000 in 2013, maternal deaths occurred every day about 800 women died due to complications of pregnancy and childbirth. The main trial of maternal deaths in Indonesia are bleeding, preeclampsia and infection. Preeclampsia is a hypertensive condition k late pregnancy characterized by increased blood pressure and proteinuria². In developing countries, preeclampsia is one of the main causes of maternal mortality ranging from 1.5-2.5 percent and infants range from 45-50 percent³. Based on these data,

the percentage of infant deaths due to preeclampsia is greater than that of mothers. Infant mortality occurs due to several risk factors for preeclamptic mothers, such as preeclampsia in previous pregnancies, symptoms of chronic hypertension, pregnancies of more than 40 years, and others that have been carried out in advance⁴.

The impact of preeclampsia other than on the mother also affects the baby. The condition of preeclampsia can interfere with blood flow to the placenta and fetus which can cause low birth weight babies, prematurity, asphyxia, respiratory distress syndrome, apnea⁵ and infant mortality⁶. Babies who survive after birth from mothers with pre-eclampsia are also at risk of developing disorders due to disturbances while still a fetus.

Some factors that cause the handling of preeclampsia in pregnant women are lacking are lack of knowledge, lack of self-awareness and poor antenatal care⁷. Preeclampsia conditions will increase the risk of mother and baby experiencing cardiovascular complications⁸, maternal age > 30 years, parity, history of hypertension, and no antenatal care^{9,10}.

Research on preeclampsia that has been done more often looks at the risk factors of the mother and the effects on the fetus. But the contributing factors, especially in Indonesia, have not been found. The purpose of this study was to analyze the factors that contribute to infant mortality in women with preeclampsia.

METHOD

This research is a retrospective study conducted in the public hospital area of Dr. Soetomo Surabaya. The sample of this study is medical record data of preeclampsia

patients in the period of January to December 2017 as many as 324 were taken by consecutive sampling.. Patient data is collected sequentially based on medical record numbers to avoid repetition of data and confusion when filling in data. Pre-eclampsia diagnosis is established by obstetricians. Pre-eclampsia diagnosis is blood pressure > 140/90 mmHg with proteinuria > +2. The independent variables of this study were age, gestational age, parity and mode of delivery. The dependent variable in this study was infant mortality defined as death in the first 28 days of life. Data were analyzed descriptively and chi-square test.

RESULTS

Table of factors that contribute to infant mortality in women with pre-eclampsia

Variable (mother)	Infant				Total N (%)	P
	Life	%	Mortality	%		
Age (years)						0.005
<20	14	4,3	0	0,0	14 (4)	
20-35	180	55,6	31	9,6	211 (65)	
>35	72	22,2	27	8,3	99 (31)	
Age of mother's pregnancy (weeks)						0.000
<28	9	2,8	21	6,5	30 (9.3)	
28-34	91	28,1	30	9,2	121 (37.3)	
>34	166	51,2	7	2,2	173 (53.4)	
Paritas						0.463
Nulipara	96	29,6	20	6,2	116 (35.8)	
Primipara	81	25,0	14	4,3	95 (29.3)	
Multipara	89	27,5	24	7,4	113 (34.9)	
How to deliver						0.000
Spontaneous vaginal discharge	47	14,5	13	4,0	60 (18.5)	
Vaginal induction	16	4,9	12	3,7	28 (8.6)	
Vagina with instruments	9	2,8	4	1,2	13 (4)	
Perabdominam	193	59,6	26	8,0	219 (67.7)	
No data	1	0,3	3	1,0	4 (1.2)	

Most respondents are aged 20-35 years (65%). Most of the respondents' gestational age was > 34 weeks (53.4%). Most of the respondents were nullipara (35.8%) and most of them had abdominal labor (67.7%).

Most respondents with pre-eclampsia with a baby who died were aged 20-35 years as many as 31 events (9.6%). Infant mortality from preeclampsia mothers was 30 events (9.2%) from pre-eclampsia mothers with 28-34 weeks gestational age. Infant mortality in pre-eclampsia mothers was 20 events (6.2%) occurred in pre-eclampsia mothers with nulliparous parity, and infant mortality occurred as many as 26 events (8%) occurred in pre-eclampsia mothers by means of gestational birth.

Statistical test results showed a significant relationship between maternal age with preeclampsia with the incidence of infant mortality ($p = 0.005$), and there was no significant relationship between the parity status of mothers with pre-eclampsia and mortality in infants ($p = 0.463$). The results of statistical tests also showed a significant relationship between the age of maternal pregnancy with preeclampsia ($p = 0.000$) and the method of delivery of mothers with preeclampsia (0.000) with the incidence of infant mortality.

DISCUSSION

The age of mothers with preeclampsia has a significant relationship with the incidence of infant mortality. Infant mortality occurs in preeclamptic mothers in the age group of 20-35 years and age > 35 years.

The results of this study are in line with other studies which state that maternal age with young pre-eclampsia is associated with the risk of infant mortality^{11,12}. Maternal age at risk of developing pre-eclampsia occurs in the age group <20 years and > 35 years.

In this study, besides that most of the respondents in this study were preeclamptic mothers aged 20-35 years. In preeclamptic mothers aged 20-35 years are included in the productive age where they are emotionally mature, especially in the face of pregnancy. In addition, the reproductive organs have also been mature and balanced¹³. Several other factors such as early treatment of the condition of preeclampsia and maternal conditions when treatment can affect maternal conditions.

Pregnancy age of mothers with preeclampsia has a significant relationship with the incidence of infant mortality. The infant mortality from mothers with preeclampsia most common in gestational age 28-34 weeks and <28 weeks.

The results of this study are in line with previous studies showing that the gestational age of mothers with preeclampsia is related to the morbidity and mortality of infants who born¹⁴. Other studies have shown that the high risk of infant mortality in preeclamptic mothers in the preterm period (gestational age less than 37 weeks)^{15,16} and will be more severe at a gestational age of fewer than 24 weeks¹⁷.

Babies born in the preterm period have a high risk of experiencing low birth weight babies, respiratory disorders such as asphyxia¹⁸ that occur due to pulmonary growth disorders⁶, intrauterine growth restriction (IUGR) and hematological disorders. Epidemiological research states that babies born to mothers with preeclampsia have a high risk of developing diabetes and cardiovascular disorders. The condition of preeclampsia can aggravate the baby's condition which is probably caused by impaired placental function due to preeclampsia or maternal system response to placental inability.

The method of delivery of mothers with pre-eclampsia has a significant relationship with the incidence of infant mortality. The majority of preeclamptic mothers in this study gave birth to a method of palpation. As well as the incidence of infant mortality from preeclamptic mothers occurred in the group of preeclamptic mothers who gave birth to a method of domination.

Previous studies have suggested that abdominal methods of childbirth will increase the risk of respiratory distress in infants that can cause infant death^{19,20}. In addition, the method of childbirth with abdominal can increase the risk of respiratory disorders in infants compared with childbirth with vaginal delivery. Previous studies have shown that abdominal delivery²¹ cannot improve maternal and perinatal outcomes or reduce mortality and morbidity²².

Most mothers with preeclampsia do the method of labor by abdominal. The reason for the majority of methods of delivery per abdominal is because abdominal labor is the definitive treatment in patients with severe pre-eclampsia. The risk of childbirth in women who experience severe pre-eclampsia is very high because it can threaten the life of the mother and baby, so it is necessary to end the pregnancy by giving birth per abdominal. The condition of preeclampsia which has a negative impact on the baby as well as ways of abdominal delivery which increase the risk of disorders

in infants can increase the risk of infant mortality from mothers with preeclampsia.

The parity status of mothers with preeclampsia does not have a significant relationship with the incidence of infant mortality. The total parity status of preeclamptic mothers in the study was almost the same in the nullipara, primiparous and multiparous groups.

Previous studies have shown that the status of nulliparous parity will increase the risk of the occurrence of preeclampsia²³ that would increase the risk of death in infants. Nulliparous pregnancies experience angiogenic imbalances so they are prone to pre-eclampsia compared to multiparous pregnancies²⁴. The results of this study indicate that the incidence of infant mortality from mothers with pre-eclampsia occurs in nulliparous parity status although there is no statistically significant relationship.

This study has several limitations because it is done retrospectively such as some data relating to maternal preeclampsia conditions such as income, increased maternal weight during pregnancy, or other diseases that can worsen the condition of preeclampsia.

The results of this study have implications for policies related to health interventions and treatment of women with preeclampsia, maternal complications, and complications in infants. This study has limitations, the severity of preeclampsia is still not differentiated and several other factors such as antenatal care visits, knowledge, and accompanying complications have not been measured. So it needs further study of these factors related to the incidence of infant mortality from mothers with preeclampsia.

CONCLUSION

Preeclampsia can threaten the mother and baby and can increase morbidity and mortality in infants. Factors that contribute to infant mortality from mothers with preeclampsia are maternal age, maternal gestational age, and maternal delivery method. The need for early antenatal care needs to be conveyed to pregnant women in order to screen crews for risk of preeclampsia and prevent worsening of the disease.

RECOMMENDATION

Preeclampsia is a preventable medical condition. Early pregnancy screening early and appropriate antenatal

care can reduce the risk of morbidity and mortality in infants of mothers who experience pre-eclampsia. Increasing public awareness and health workers on the prevention of pre-eclampsia needs to be done through health education or including pre-eclampsia screening at standard examinations in pregnant women.

Ethical Clearance: This research has received ethical approval from the ethics committee of the general hospital health research area of Dr. Soetomo Surabaya number 0171 / KEPK / IV / 2018.

Conflict of Interest: None

Funding: Self-funding.

REFERENCES

1. Ministry of Health Republic of Indonesia. Inilah Capaian Kinerja KEMENKES RI Tahun 2015- 2017 [Internet]. Ministry of Health Republic of Indonesia. 2017 [cited 2018 Sep 12]. Available from: <http://www.depkes.go.id/article/print/17081700004/-inilah-capaian-kinerja-kemenkes-ri-tahun-2015--2017.html>
2. Davey D, MacGillivray I. The classification and definition of the hypertensive disorders of pregnancy. *Am J Obs Gynecol*. 1988;158:892–8.
3. Shamsi U, Saleem S, Nishtee N. Epidemiology and risk factors of preeclampsia; an overview of observational studies. *Al Ameen J Med Sci* [Internet]. 2013;6(4):292–300. Available from: <https://pdfs.semanticscholar.org/06ac/70c07e5309e2c7cb20819ff2a214579df2e1.pdf>
4. The American College of Obstetricians and Gynecologists. Preeclampsia and Hypertension in Pregnancy: Resource Overview [Internet]. *Womens Health care Physician*. 2013 [cited 2018 Aug 7]. Available from: <https://www.acog.org/Womens-Health/Preeclampsia-and-Hypertension-in-Pregnancy>
5. Mendola P, Mumford, Sunni L, Männistö TI, Holston A, Reddy UM, Laughon SK. Controlled Direct Effects of Preeclampsia on Neonatal Health After Accounting for Mediation by Preterm Birth. *J Pharmacogenetic*. 2015;26(1):17–26.
6. Backes CH, Markham K, Moorehead P, Cordero L, Nankervis CA, Giannone PJ. Maternal

- Preeclampsia and Neonatal Outcomes. *J Pregnancy*. 2011;
7. Singhal S, Deepika A, Nanda S. Maternal and perinatal outcome in severe pre-eclampsia and eclampsia. *J South Asian Fed Obstet Gynecol*. 2009;1(3):25–8.
 8. O’Tierney-Ginn P, Lash G. Beyond pregnancy: modulation of trophoblast invasion and its consequences for fetal growth and longterm children’s health. *J Reprod Immunol*. 2014;104(105):37–42.
 9. Bilano VL, Ota E, Ganchimeg T, Mori R, Souza JP. Risk Factors of Pre-Eclampsia/Eclampsia and Its Adverse Outcomes in Low- and Middle-Income Countries: A WHO Secondary Analysis. *PLoS One*. 2014;9(3).
 10. Andriani F. Faktor Faktor yang berhubungan dengan Preeklampsia di RSUD Dr Soetomo Surabaya tahun 2009 [Internet]. Universitas Airlangga; 2010. Available from: <http://lib.unair.ac.id>
 11. Neal S, Channon AA, Chintsanya J. The impact of young maternal age at birth on neonatal mortality: Evidence from 45 low and middle income countries. *Ploss one*. 2018;
 12. Tavassoli F, Ghasemi M, Ghomian N, Ghorbani A, Tavassoli S. Maternal and perinatal outcome in nulliparous women complicated with pregnancy hypertension. *J Pak Med Assoc*. 2010;60(9):707–10.
 13. Cahyani SL, Sulansi, Batbual B. Age, Parity, Antenatal Care, and Pregnancy Complication as Contributing Factors of Low Birth Infants. *Int J Sci Basic Applies Res*. 2016;30(3):1–7.
 14. Bombrys A, Barton J, Habli M, Sibai B. Expectant management of severe preeclampsia at 27(0/7) to 33(6/7) weeks’ gestation: maternal and perinatal outcomes according to gestational age by weeks at onset of expectant management. *Am J Perinatol*. 2009;26:441–6.
 15. Harmon QE, Huang L, Umbach DM, Klungsøyr K, Engel SM, Magnus P, et al. Risk of Fetal Death With Preeclampsia. *Obs Gynecol*. 2015;125(3):628–635.
 16. Swamy, MK, Patil K, Nageshu S. Maternal and perinatal outcome during expectant management of severe pre-eclampsia between 24 and 34 weeks of gestation. *J Obs Gynaecol India*. 2012;62:413–8.
 17. Oostwaard M van, Eerden L van, Laat M de, Duvekot J, Erwich J, Bloemenkamp K, et al. Maternal and neonatal outcomes in women with severe early onset pre-eclampsia before 26 weeks of gestation, a case series. *Int joiurnal Obstet Gynaecol*. 2017;124(9).
 18. Jail L. Respiratory morbidity in late-preterm infants: prevention is better than cure! *Am J Perinatol*. 2008;25(2):75–8.
 19. Tita AT, Landon MB, Spong C., Shriver EK. Maternal-Fetal Medicine Units Network. Timing of elective repeat cesarean delivery at term and neonatal outcomes. *N Engl J Med*. 2009;360:111–120.
 20. Saadat M, Nejad SM, Habibi G, Sheikvatan M. Maternal and Neonatal Outcomes in Women with Preeclampsia. *Taiwan J Obs Gynecol*. 2007;46(3).
 21. Witlin A, Saade G, Mattar F, Sibai B. Predictors of neonatal outcome in women with severe preeclampsia or eclampsia between 24 and 33 weeks’ gestation. *Am J Obs Gynecol*. 2000;182:607–11.
 22. Coppage K, Polzin W. Severe preeclampsia and delivery outcomes: Is immediate cesarean delivery beneficial? *Am J Obs Gynecol*. 2002;186:921–3.
 23. Moldenhauer J, Stanek J, Warshak C, Khoury J, Sibai B. The frequency and severity of placental findings in women with preeclampsia are gestational age dependent. *Am J Obs Gynecol*. 2003;189(4):173–7.
 24. Bdolah Y, Uriel Elchalal, Shira Natanson-Yaron, Hadas Yechiam, Tali Bdolah-Abram CG, Goldman-Wohl D, Milwidsky A, Rana S, Karumanchi SA, et al. Relationship between nulliparity and preeclampsia may be explained by altered circulating soluble fms-like tyrosine kinase 1. *J Hypertens Pregnancy*. 2014;33(2).

Elderly Immunity Improvement after Getting Synbiotic and Zinc Combinations

Rudy Hartono¹, Agustian Ipa¹, Bambang Wirjatmadi², Aswita Amir¹, Gaurav Kapoor³,
Heru Santoso Wahito Nugroho⁴

¹Health Polytechnic of Makassar, Indonesia, ²Faculty of Public Health, Airlangga University, Indonesia, ³UIPS-Department, Chandigarh University, Mohali, India, ⁴Health Polytechnic of Surabaya, Indonesia

ABSTRACT

Elderly is one group of people who have a risk of changing immune function. Changes in immune function in the elderly, especially in the immune system mediated by cells. In accordance with the increase in age, the elderly immune system decreases the immune response against infectious and non-infectious diseases. Based on this, it is easy for the elderly to develop diseases such as infectious diseases, hypertension, coronary heart disease, cancer, autoimmune diseases, and other chronic diseases. The increasing number of elderly people is one indicator of the success of development as well as a challenge in development. The purpose of this study was to analyze the improvement of elderly immunity after getting synbiotics and zinc. The type of this research was an experimental study in which volunteers were given zinc + synbiotic combination supplements. Further measurements of IL-2, IFN- γ and IL-10 were carried out. Furthermore, the measurement results were compared to find out the differences in elderly immune expression. Analysis of normality and homogeneity to determine parametric or non-parametric statistical tests with the Shapiro-Wilk test if it meets parametric requirements then the analysis used in this study was t-test to evaluate the effect of supplementation (pre-post test). The results showed that synbiotic + zinc combination supplementation could potentially increase IL-2 profile ($p = 0.000$), IFN- γ ($p = 0.019$), and IL-10 ($p = 0.010$) significantly in the elderly. Based on the results, it could be concluded that synbiotic + zinc combination supplementation has the potential to increase IL-2, IFN- γ , and IL-10 profiles in the elderly.

Keywords: Zinc and synbiotic combination, Immune, IL-2, IFN- γ , IL-10

INTRODUCTION

There has been a major population explosion at this time, according to the statistics center, namely in 2004 of 16,522,311 and while in 2020 it was predicted that the number of elderly would increase by 28 million. This is a very large amount so that if no efforts are made to increase elderly welfare since now it will cause problems and could be a big problem in the future. The tendency of this problem to occur is also marked by the figure of elderly dependence according to the 2008 BPS Susenas

of 13.72%. The population dependency rate will be high and felt by the population of productive age if it is coupled with the dependency of the population aged less than 15 years, where currently the population is less than 15 years of 29.13% ⁽¹⁾

According to the results of the Basic Health Research in 2007 showed that urban elderly showed morbidity rates of 27.42, rural elderly at 33.35 and urban and rural morbidity rates of 31.11. These data shows the tendency of morbidity in the elderly has increased from year to year. The most common elderly sufferers are joint disorders followed by hypertension, cataracts, stroke, mental emotional disorders, heart disease and diabetes mellitus. Besides that, the cause of death at the age of 65 years and over in men is stroke (20.6%), chronic lower respiratory tract disease (10.5%), pulmonary

Corresponding Author:

Heru Santoso Wahito Nugroho

Health Polytechnic of Surabaya, Indonesia

Address: Pucang Jajar Tengah Street 56 Surabaya,

Indonesia, E-mail address: heruswn@gmail.com

tuberculosis (TB) (8.9%), hypertension (7.7%), NEC (7.0%), ischemic heart disease (6.9%), other heart disease (5.9%), diabetes mellitus (4.9%), liver disease (4.4%) and pneumonia (3.8%). While for women the most cause of death was stroke (24.4%), hypertension (11.2%), NEC (9.6%), chronic lower respiratory tract disease (6.6%), diabetes mellitus (6.0%), ischemic heart disease (6.0%), other heart diseases (5.9%), TB (5.6%), pneumonia (3.0%) and liver disease (2.2%)⁽²⁾. This condition certainly must get the attention of various parties. Aging people who are sick will become a burden for families, communities and even the government, so that it will become a burden in development⁽³⁾.

A number of studies have shown that the prevalence of malnutrition in the elderly is very high and is often only realized when the elderly must be hospitalized⁽⁴⁾. A study in Jakarta showed that about two-thirds of elderly people suffer from thiamine deficiency⁽⁵⁾. Immune function also decreases with age, resulting in increased incidence of infectious and malignant (cancer) diseases. Research on immune function in the elderly introduces a thought that the immune system in the elderly has specific characteristics, the immune system will not only decrease with increasing age, but immune system regulation disorders will be more progressive throughout its life⁽⁶⁾. Initial changes occur in the cellular immune system compared to humoral, immune system evolution associated with decreased thymus function. Nutritional factors play an important role in the immune response in a healthy elderly, one of which is zinc.

Food substrates reach the large intestine can affect the composition and activity of bacteria present through fermentation of capacity in the elderly. Metabolic products from intestinal bacteria can affect the immune system. Modulation of intestinal microflora by diet is the basis for the concept of probiotics⁽⁸⁾ and prebiotics⁽⁷⁾.

This study analyzed the effect of synbiotic supplementation, zinc and synbiotic and zinc combinations on immune responses with IL-2, IFN- γ and IL-10 markers in the elderly⁽⁹⁾. The role of the

immune system in the elderly is the importance of increasing IL-2 levels as cytokines for T lymphocyte proliferation, IFN- γ is a proinflammatory cytokine and IL-10 as an antiinflammatory cytokine against immune response, then this study will focus on "Enhancing Elderly Immunity After Getting Synbiotic and Zinc combination".

MATERIALS AND METHOD

This study aimed to find facts about the function of synbiotic supplementation and zinc on the immune response at the same time can be implemented in a national program for enhancing immunity for guests. This research was conducted in 2016 in the Mangasa Health Center working area of Health Office of Makassar City, South Sulawesi Province, Indonesia. The main sources needed in this study were: 1) serum, obtained from blood, 2) ELISA⁽¹⁰⁾ to measure levels of IL-2, IFN- γ and IL-10 which was carried out in the Laboratory of the Hasanuddin University Hospital of Education, Makassar, Indonesia, 3) research subjects were > 60 years old, Makassar tribe, having no history of infectious and degenerative diseases based on doctor's recommendations, so the sample size of 36 people was divided into 3 groups.

This effective method was proven by implementing several steps: 1) measuring instrument validation (ELISA test) by comparing the results of laboratory tests to measure and the accuracy of the measuring instrument to be used, 2) measuring blood serum using the ELISA test before and after getting synbiotics and zinc for 3 months, 3) measured levels of IL-2, IFN- γ and IL-10 by taking \pm 5 cc of blood, 4) comparing measurement results before and after synbiotic supplements and zinc to determine elevated levels of IL-2, IFN- γ and IL-10.

FINDINGS

Effect of Zinc - Synbiotic combination supplementation on the variables of IFN- γ , IL-2, and IL-10 in the elderly

Table 1. Different Test Results between Variable Zinc + Sinbiotic Supplementation Groups IFN- γ , IL-2, and IL-10

Variable	Zinc-Sinbiotic Combination Supplementation					P-value of T-Test
	Min	Max	Mean	Standard Deviation	Median	
IFN- γ	50.11	519.85	179.05	116.23	154.65	0.019
IL-2	412.63	1036.35	734.64	205.21	708.98	0.000
IL-10	72.95	232.12	146.29	50.76	133.63	0.010

Table 1 shows that there was a significant effect of zink-synbiotic combination supplementation on all four cytokine profiles ($p < 0.05$).

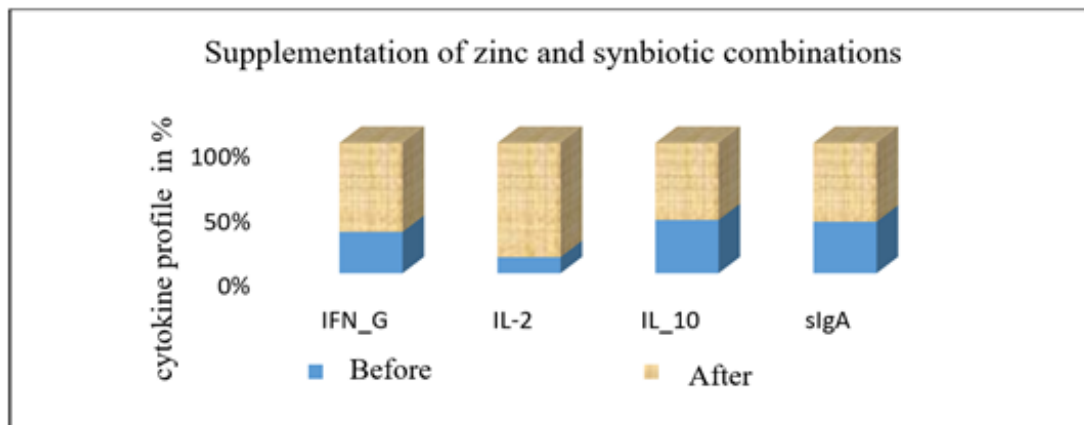


Figure 1. Average of Cytokine Profile in Supplementation of Zinc + Sinbiotic Group

Figure 1 shows that in the zinc + sinbiotic supplementation group the highest increase in IL-2 profile before and after zinc + synbiotic supplementation was given. Non-varying increases in IL-10 profiles.

The effects of synbiotic and zinc combination supplementation found scientific evidence that the immune response in the elderly for all variables had been increased previously and after the provision of synbiotic and zinc supplements. This synbiotic and zinc supplementation can be implemented and useful in a national program for enhancing immunity for the elderly

DISCUSSION

The results of the study on elderly after zinc + sinbiotic treatment showed that there was a significant increase in IFN- γ , IL-2, IL-10 and sIgA, this meant that there was a balance / homeostasis between Th1 and Th2. This is because zinc has one function for IFN- γ expression in T cells⁽¹¹⁾. Therefore the mechanism of action of the synbiotic will be corrected by the presence of zinc in the IFN- γ expression in T cells.

The synbiotic role in modulating the immune response of the elderly by influencing the maturation of dendritic cells. APC in this case is a dendritic

cell which is a determinant of Th1 / Th2 balance and development of tolerance. Several types of dendritic cells that can direct the immune response according to the activation environment or kinetic activation⁽¹²⁾. Inhibition of maturation of dendritic cells in turn leads to a reduction in pro-inflammatory cytokines of interferon gamma (IFN γ), IL-4 and IL-5 from T cells. IL-10 also inhibits the production of other inflammatory mediators such as IL-1 and tumor necrosis alpha factor (TNF) by macrophages. In naive CD4 + T cells, IL-10 inhibits CD28 signaling rendering these cells can properly activate. IL-10 is not always inhibitory, it can also promote B cell activation and stimulate NK cell proliferation. When IL-10 is produced and secreted, acts specifically on IL-10 receptors, a structure consisting of two subunits; IL-10 receptor 1 and IL-10 receptor 2. After binding to cytokines, the receptor subunit is associated with signal transduction molecules in the cytoplasm of cells expressing receptors, encouraging signals that primarily inhibit the activity of some of the

genes needed to produce an immune response, but can also promote activation of some specific target cells as mentioned above.

CONCLUSION

Based on the results of the study it can be concluded that both synbiotic and zinc supplementation are even symbiotic and zinc combinations to increase the profile of IL-2, IL-10 IFN- γ . Therefore it is recommended to use zinc supplements as immunomodulators on things that cause Th1 and Th2 immunity in the elderly to stay healthy and do the same research but check serum zinc levels in the elderly (sample).

Conflict-of-Interest Statement : In this study there was no conflict of interest.

Source of Funding : The source of funding comes from the Research of Development of Health Workers of the Makassar Health Polytechnic (the fund for operational costs of state universities)

Ethical Clearance : Research ethics was obtained after the researcher made a presentation in front of the Ethics Committee of Faculty of Public Health, Airlangga University and had received a certificate with the number 525-KEPK.

REFERENCES

1. Martono H. Elderly and Systemic Impacts in the Life Cycle (Lanjut Usia dan Dampak Sistemik dalam Siklus Kehidupan) [Internet]. Komnas Lansia. 2010 [cited 2013 Nov 19]. Available from: <http://www.komnaslansia.go.id>
2. Kemenkes RI. Basic Health Research 2007 (Riset Kesehatan Dasar 2007). Jakarta: Badan Penelitian dan Pengembangan Kesehatan Kementerian Kesehatan Republik Indonesia; 2007.
3. BKKBN. The State Comes to Realize Elderly Welfare (Negara Hadir Wujudkan Kesejahteraan Lansia) [Internet]. Badan Koordinasi Keluarga Berencana Nasional. 2015 [cited 2015 Nov 12]. Available from: <http://www.bkkbn.go.id>
4. Maryam RS, Ekasari MF. Get to Know the Elderly and Care (Mengenal Usia Lanjut dan Perawatannya). Jakarta: Salemba Medika; 2008.
5. Gross, Schultink. Micronutrient Deficiency in Urban Indonesia [Internet]. Research Gate. 1997 [cited 2015 Nov 12]. https://www.researchgate.net/publication/13626277_Micronutrient_deficiency_in_urban_Indonesia.
6. Lesourd B, Mazari L. Nutrition and Immunity in The Elderly. Pubmed. Gov. NCBI. 1999.
7. Gibson GR, Probert HM, Loo JV, Rastall RA, Roberfroid MB, 2004. Dietary Modulation of the Human Colonic Microbiota: Updating the Concept of Prebiotics. Pubmed. Gov. NCBI. 1999.
8. Fuller R. Probiotics in Man and Animals. J Appl Bacteriol. Pubmed.Gov. NCBI. 1989.
9. Hartono R, Wirjatmadi B, Dachlan YP. Effect of Zinc and Sinbiotic Supplement on Cytokine Profiles in the Elderly (Pengaruh Suplementasi Seng dan Sinbiotik terhadap Profil Sitokin Lanjut Usia). Dissertation. Surabaya: Universitas Airlangga, Surabaya Indonesia; 2017.
10. Lequin RM. Enzyme Immunoassay (EIA)/Enzyme-Linked Immunosorbent Assay (ELISA)". Clinical Chemistry. 2005;51(12):2415–8. doi:10.1373/clinchem.2005.051532. PMID 16179424.
11. Haase H, Lothar R. The Immune System and the Impact of Zinc during Aging. Immun Ageing. 2009;6:9. Biomed Central
12. Moser M, Murphy KM. Dendritic Cell Regulation of TH1-TH2 Development 2000. Nat Immunol. 1(3):199-205 Pubmed.gov

The Prevalence of Depression in Primary Health Care Centers in Iraq

Ali Obaid Al-Hamzawi¹, Zainab Ali Abed²

¹M.B.Ch.B., F.I.C.M.S./Consultant Psychiatrist/ Iraq/ Al-Dewaniyah province/ University of Al-Qadisiyah/ College of Medicine, ²MB.Ch.B, University of Al-Qadisiyah/ College of Medicine/Dep. of Family Medicine / Al-Dewaniyah Province/ Iraq

ABSTRACT

Background: The prevalence of depressive symptoms is more frequent among patients than in the general population. Little is known about the prevalence rate of depressive symptoms in Iraqi patients attending primary health centers, in addition there under diagnosis and under estimation of depressive symptoms in clinical settings.

Aim of the study: The aim was to estimate the prevalence of depressive disorders among Iraqi patients.

Patients and Method: A cross sectional study involving a cohort of Iraqi patients attending primary health center. Patients were selected in a systemic random way from the population of patients already visiting the primary health care center aiming at a target of at least 100 patients. Any patient visiting the primary health center was included in the current without previous limitations with respect to age or gender. Any patient who was already diagnosed by a specialist to have depressive disorder was excluded from this study. The study was carried out at Al-Saniyah primary health center.

Results: There were 17 (17.3%), 7 (7.1%) and 3 (3.1%) patients with mild, moderate and severe depression. Patients with depression were significantly older than patients without depression, 37.26 ± 8.88 years versus 31.26 ± 10.49 years, respectively and the level of significance was ($P = 0.045$). Moreover, it was observed that the rate of depression across age intervals was significantly non-homogenous, with the highest rate being encountered in patients older than 40.

Conclusion: The rate of depressive disorders among patients attending primary health care centers is higher than that of the general population.

Keywords: Depression, primary health care center, Iraq

INTRODUCTION

Depressive disorders are common with a prevalence rate of 5-10% in primary care centers ⁽¹⁾. The majority of patients will present to primary health care centers with problems other than low mood ⁽²⁾. The diagnosis of depression will reside of eliciting of core and other

symptoms. The criteria for diagnosis are: Symptoms must present for at least 2 weeks and represent a change from normal; symptoms are not secondary to the effect of drugs, alcohol misuse, medication or medical intervention; symptoms may cause significant distress and/ or impairment of social, occupational, or general function. Core symptoms include: depressed mood, anhedonia” diminished interest or pleasure in all, or almost all activities most of the day”, weight change of more than 5% of body weight in a month, sleep disturbance “insomnia or hypersomnia”, psychomotor agitation or retardation observable by others, fatigue, or

Corresponding author:

Zainab Ali Abed

Email: zainab.ali.abed@gmail.com,

Address: Al-Diwaniyah/ Iraq/ P.O. Box:88.

loss of energy or reduced libido, feeling of worthlessness or excessive or inappropriate guilt, diminished ability to think or to concentrate or indecisiveness, recurrent thoughts of death or suicide⁽³⁾. The prevalence of depressive symptoms is more frequent among patients than in the general population⁽⁴⁾. There is psychoneuro-immunology connection between chronic illnesses and depression⁽⁵⁾. Little is known about the prevalence rate of depressive symptoms in Iraqi patients attending primary health centers, in addition there under diagnosis and under estimation of depressive symptoms in clinical settings. For that reason, this study was designed and carried out at the department of Family medicine and Community medicine in the faculty of medicine/ Al-Qadisiyah University.

PATIENTS AND METHOD

The study was designed to be a cross sectional study involving a cohort of Iraqi patients attending primary health center. Patients were selected in a systemic random way from the population of patients already visiting the primary health care center aiming at a target of at least 100 patients during the short period of this study. Any patient visiting the primary health center was included in the current without previous limitations with respect to age or gender. Any patient who was already diagnosed by a specialist to have depressive disorder was excluded from this study. The study was carried out at Al-Saniyah primary health center. The beginning of data collection was dated on the 10th January 2018 and ended on the 1st may 2018. A total of 140 days was the length of the period required to collect data from involved patients. The questionnaire form was based on the following: International (ICD-10) diagnostic check list for the diagnosis of depressive symptoms⁽⁶⁾, Beck depressive inventory-II to measure the severity of depression, Sociodemographic data including age, gender, residency, address, occupation, education level and income in addition to any chronic medical illness. Data were collected, summarized, analyzed and presented using two software programs; these were the Statistical package for social sciences (SPSS) version 23 and Microsoft Office excel 2013. Numeric variables were presented as mean, standard deviation (SD) and range, whereas, categorical variables were expressed as number and percentage. Prevalence rate of depression was expressed as percentage. Association between categorical variables was assessed using either

Chi-Square test or Yates correction for continuity when more than 20% of cells have expected counts less than 5. Comparison of mean values between three groups was done using one way analysis of variance (ANOVA). The level of significance was considered at $P \leq 0.05$.

RESULTS

1.Sociodemographic Characteristics Of The Study Sample

The current study included 98 patients, 48 (49.0%) males and 50 (51.0%) females. The mean age of patients was 33.22 ± 14.76 years and it ranged from 13-65 years. According to marital status, there were 68 (69.4%), 23 (23.5%), 5 (5.1%) and 2 (2.0%), married, single, widowed and divorced patients respectively. According to level of education, the study included 20 (20.4%), 32 (32.7%), 21 (21.4%) and 25 (25.5%), illiterate, primary, secondary and higher education patients respectively. All patients were from Al-Sahiyah district. With respect to occupation, patients were distributed as 38 (38.8%), 14 (14.3%), 21 (21.4%), 19 (19.4%), 4 (4.1%) and 2 (2.0%), housewives, student, free worker, employee, military and retired respectively. Economically speaking, the study included 49 (50.0%), 46 (46.9%) and 3 (3.1%) patients of poor, moderate and good income respectively. The study, included 7 (7.1 %), 3 (3.1 %), 1 (1.0 %) and 1 (1.0 %) patients with hypertension, diabetes mellitus, post-partum hemorrhage and psychiatric illness respectively.

2.Prevalence Rate And Level Of Depressive Disorders

Out of 98 patients participating in the current study, 27 (27.6%) fulfilled the criteria of a diagnosis of depressive disorders. There were 17 (17.3%), 7 (7.1%) and 3 (3.1%) patients with mild, moderate and severe depression.

3.Correlation Between Age And Rate Of Depression

A significant difference in mean age of patients with and without depression was observed in the present study. Patients with depression were significantly older than patients without depression, 37.26 ± 8.88 years versus 31.26 ± 10.49 years, respectively and the level of significance was ($P = 0.045$), as shown in figure 2. Moreover, it was observed that the rate of depression across age intervals was significantly non-homogenous,

with the highest rate being encountered in patients older than 40 years of age (40.7%) ($P=0.044$); however, there was no significant difference in mean age among patients with mild, moderate and severe depression respectively ($P = 0.432$).

4. Association Between Depression Rate And Gender

The rate of depression among male patients was (22.9%), whereas, among female patients it was (32.0%). Although, rate of depression was slightly higher in female patients compared to male patients, the difference was not statistically significant ($P = 0.314$), as shown in table 4.

Table 1: Association between depression rate and gender

Gender	<i>n</i>	%	<i>P</i> *	Mild	Moderate	Severe
Male (n = 48)	11	22.9	0.314 Not significant	8 (16.7%)	3 (6.3%)	0 (0.0%)
Female (n = 50)	16	32.0		9 (18.0%)	4 (8.0%)	3 (6.0%)

n: number of cases; *Chi-Square test

5. Association Between Depression Rate And Marital Status

Rate of depression according to marital status was as following: 26.5%, 26.1%, 60.0% and 0.0% among married, single, widowed and divorced patients, respectively. Despite some differences in rate of depression among patients with respect to marital status, there was no statistical significance, ($P > 0.05$), as shown in table 2.

Table 2: Association between depression rate and marital status

Marital status	<i>n</i>	%	<i>P</i>	Mild	Moderate	Severe
Married (n = 68)	18	26.5	0.719* NS	12 (17.6%)	4 (5.9%)	2 (2.9%)
Single (n = 23)	6	26.1	0.857* NS	3 (13.0%)	3 (13.0%)	0 (0.0%)
Widowed (n = 5)	3	60.0	0.249† NS	2 (40%)	0 (0.0%)	1 (20.0%)
Divorced (n = 2)	0	0.0	0.935† NS	0 (0.0%)	0 (0.0%)	0 (0.0%)

n: number of cases; *Chi-Square test; † Yates correction for continuity; NS: not significant

6. Association Between Depression Rate And Education Level

The rate of depression according to education level was as following: 35.0%, 25.0%, 28.6% and 24.0% in patients who are illiterate, with primary, secondary and with higher level of education respectively. The rate of depression rate in illiterate patients was the highest; however, no group showed statistically significant difference than other groups ($P > 0.05$), as shown in table 3.

Table 3: Association between depression rate and education

Education	n	%	P *	Mild	Moderate	Severe
Illiterate	7	35.0	0.403 NS	5 (25.0%)	0 (0.0%)	2 (10.0%)
Primary	8	25.0	0.694 NS	5 (15.6%)	2 (6.3%)	1 (3.1%)
Secondary	6	28.6	0.783 NS	4 (19.0%)	2 (9.5%)	0 (0.0%)
Higher education	6	24.0	0.645 NS	3 (12.0%)	3 (12.0%)	0 (0.0%)

n: number of cases; *Chi-Square test; NS: not significant

7. Association Between Depression Rate And Occupation

The rate of depression according to occupation was as following: 29.0 %, 35.7 %, 23.8 %, 15.7 %, 25.0 % and 100.0% in housewives, student, free worker, employee, military and retired respectively. The rate of depression rate showed differences according to occupation; however, no group showed statistically significant difference than other groups (P > 0.05).

8. Association Between Depression Rate And Income

The rate of depression according to income was as following: 34.7 %, 21.7 % and 0.0 % in patients with poor, moderate and good income respectively. Despite the fact that patients with good income reported 0.0% rate of depression, there was no statistical significance among groups (P > 0.05), as shown in table 4.

Table 4: Association between depression rate and income

Income	n	%	P*	Mild	Moderate	Severe
Poor (n = 49)	17	34.7	0.113 NS	11 (22.4%)	4 (8.2%)	2 (4.1%)
Moderate (n = 46)	10	21.7	0.226 NS	6 (13.0%)	3 (6.5%)	1 (2.2%)
Good (n = 3)	0	0.0	0.668 NS	0 (0.0%)	0 (0.0%)	0 (0.0%)

n: number of cases; *Chi-Square test; NS: not significant

9. Association Between Depression Rate And Other Medical Problem

The rate of depression among patients with chronic illnesses was significantly higher than that in patients without chronic medical illnesses, 75.0 % versus 26.5 % (P <0.001), as shown in table 10. The risk of having depression, in terms of Odds ratio, in patients with chronic medical illnesses was 10.83 folds than patients without chronic medical illnesses and the 95% confidence interval was (2.65 to 44.24). The etiologic contribution, measured by etiologic fraction, of depression to chronic medical illnesses was 0.68, as shown in table 5. The severity of depression in patients with chronic illnesses is shown in table 6.

Table 5: Association between depression rate and other medical problem

Other medical problem	Patients with depression <i>n</i> = 27	Patients with no depression <i>n</i> = 71	<i>P</i> †	<i>OR</i>	95% <i>CI</i>	<i>EF</i>
Positive (<i>n</i> = 12)	9 (75.0%)	3 (25%)	<0.001 HS	10.83	2.65- 44.24	0.68
Negative (<i>n</i> = 68)	18 (26.5%)	68 (73.5%)				

n: number of cases; † Yates correction for continuity; HS: highly significant; OR: Odds Ratio; CI: confidence interval

Table 6: Level of depression according to medical illness

Levels of depression	Number of patients with medical illness	%
Mild (<i>n</i> = 17)	5	29.4
Moderate (<i>n</i> = 7)	2	28.6
Severe (<i>n</i> = 3)	2	66.7
Total (<i>n</i> = 27)	9	33.3

DISCUSSION

The estimated prevalence rate of depression in primary health center, in the present study, of 27.6% seems relatively high. It has been stated in published literatures that mental disorders are more common in clinical than in community settings, one study in Kenya found that up to 40% of the patients in general medical and surgical wards were depressed and required treatment (7). Prevalence of depression was 30.3%. Direct comparison of prevalence studies for depressive disorders is difficult because of a lack of uniformity as studies differ in terms of culture, patient population, socio-demographic factors, diagnostic instrument, and methodology (8). Given these limitations, the prevalence figures determined in this study are consistent with most findings reported elsewhere. The Prevalence of depression found in the present study (30.3%) was significant and in keeping with the results from both developed and developing countries. For instance, the results were congruous with the prevalence rate of 29.6% reported among Kuwait PHC patients (9); the 29.2%

reported in primary care setting in Thailand (10); the 28.4% reported among primary care attendees in South India (11). Interestingly the prevalence is somehow similar to that of the international study (12) where the prevalence was 33.5%, the 31.6% prevalence rate of current major depressive episode at PHC centers in Uganda (13), and also the 32% prevalence rate of depressive disorder at a Community Health Centre in South Africa (8). In one study, the prevalence of depression among the patients attending the outpatients department was found to be 30.3%, which is approximately similar to that found in the present study(2). Despite this evidence that depression contribute a significant percentage of disease burden in the clinical setting there is also evidence which indicates that depression often goes unrecognized (14). World Health Organization report on mental health suggest that undiagnosed depression places a significant socio-economic burden on individuals, families and communities, in terms of increased service needs, lost employment, reduced productivity, poor parental care with the risk of transgenerational effects and an increased

burden on care givers ⁽¹⁵⁾. Although depression-related health problems are estimated to be huge, a gap in the provision of services has been highlighted by various studies ⁽¹⁶⁾. The problem is said to be even more serious in settings that are already labouring under the burden of inadequate resources and shortage of health care personnel ⁽¹⁷⁾. Delays, misdiagnosis and non-specific treatments have been typical pathways to care for people with depression ⁽¹⁸⁾. It is evident that delays in seeking treatment, misdiagnosis and non-specific treatments have compromised appropriate care for people with depression hence depression is among the leading causes of disability in the world and cause of years of health lost to disease in both men and women ⁽¹⁹⁾.

Conclusion: The rate of depressive disorders among patients attending primary health care centers is higher than that of the general population.

Conflicts of Interest: There is no conflicts of interest.

Source of funding- Self

Ethical Clearance: The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/ have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity.

REFERENCES

- 1 Timonen M, Liukkonen T. Management of depression in adults. *BMJ: British Medical Journal*. 2008;336:435-439.
- 2 Udedi M. The Prevalence of Depression among patients and its detection by Primary Health Care Workers at Matawale Health Centre (Zomba). *Malawi Medical Journal*. 2014;26:34-37.
- 3 McCarter T. Depression Overview. *American Health and Drug Benefits*. 2008;1:44-51.
- 4 Wang J, Wu X, Lai W, et al. Prevalence of depression and depressive symptoms among outpatients: a systematic review and meta-analysis. *BMJ*. 2017;7:e017173.
- 5 Jaremka LM, Lindgren ME, Kiecolt-Glaser JK. Synergistic Relationships Among Stress, Depression, and Troubled Relationships: Insights from Psychoneuroimmunology. *Depression and anxiety*. 2013;30:10.
- 6 World Health Organization (WHO). *The ICD-10 Classification of Mental and Behavioral Disorders. Clinical descriptions and diagnostic guidelines*. Geneva, Switzerland: World Health Organization; 1992
- 7 Ndeti DM, et al. The prevalence of mental disorders in adults in different level general medical facilities in Kenya: a cross-sectional study. *Annals of General Psychiatry*. 2009;8:1.
- 8 Triant VA. *The Recognition and Determinants of Depression at a South African Primary Care Clinic, in School of Medicine*. Yale University; 2002.
- 9 Al-Nakkas EM, Al-Mutar MS. Prevalence of Depression among Kuwaiti Patients attending the Sawaber Health Center. *Kuwait Medical Journal*. 2004;36:113-116.
- 10 Lotrakul M, S R Psychiatric services in primary care settings: a survey of general practitioners in Thailand. *BMC Family Practice*. 2006;7:48.
- 11 Pothen M, et al. Common mental disorders among primary care attenders in Vellore, South India: nature, prevalence and risk factors. *International Journal of Social Psychiatry*. 2003;49:119-125.
- 12 Barkow K, et al. Identification of items which predict later development of depression in primary health care. *European Archives of Psychiatry & Clinical Neuroscience*. 2001;251:21-26.
- 13 Muhwezi WW, Agren H, Musisi S. Detection of major depression in Ugandan primary health care settings using simple questions from a subjective well-being (SWB) subscale. *Social Psychiatry and Psychiatric Epidemiology*. 2007;42:61-69.
- 14 Licht-Strunk E, et al. The prognosis of undetected depression in older general practice patients. A one year follow-up study. *Journal of Affective Disorders*. 2009;114:310-315.
- 15 Okello ES, Neema S. Explanatory models and help-seeking behavior: Pathways to psychiatric care among patients admitted for depression in Mulago hospital, Kampala, Uganda. *Qualitative Health Research*. 2007;17:14-25.
- 16 Owen S, Milburn C. Implementing research

- findings into practice: improving and developing services for women with serious and enduring mental health problems. *Journal of Psychiatric and Mental Health Nursing*. 2001;8:221–231.
- 17 WHO, author. WHO Policy Perspective on Medicines-Traditional Medicine-Growing needs and potentials. Geneva: World Health Organization Press; 2002.
- 18 Mechanic D. Barriers to help-seeking, detection, and adequate treatment for anxiety and mood disorders: implications for health care policy. *Journal of Clinical Psychiatry*. 2007;68:20–26.
- 19 WHO, author. The global burden of diseases: 2004 update. Geneva: World Health Organization Press; 2008.

The Rate of Thyroid Tumor among Patients with Goiter Referred to Al-Diwaniyah Teaching Hospital

Adel Mosa Al-Rekabi¹, Huda Ghazi Habban²

¹ FICMS Assist Professor, University of Al-Qadisiyah / College of Medicine/ Department of Surgery,

² MB.Ch.B, University of Al-Qadisiyah / College of Medicine/ Department of Family Medicine / Iraq

ABSTRACT

Background: The thyroid cancer is the most frequent cancer of the endocrine system, and it is rapidly increasing in incidence . It occur more often in people who live in areas with excessive exposure to radiation and excessive use of x-ray which can be considered as an important risk factors . thus the aim of present study is to evaluate the prevalence and possible risk factors of thyroid cancer among patients with goiter that are referred to Al-Diwaniyah teaching hospital.

Patients and method : About 74 patients (19 male ,55 female) with goiter have been selected (33 solitary nodule, 41 MNG),with ages of more than 5 years .We evaluate them by history ,examination and investigations, reporting presence or absence of cancer ,and also the. History includes the most important questionnaires (family history ,exposure to radiation especially x-ray).

Results : The most frequent ages presented with goiter are between 45-60 year ,female represented 74.3% of patients, with 55.4% of patients presented with MNG and 44.6% presented with solitary nodule. Family history of goiter was positive in 24.4% and negative in 75.6% of patients .History of x-ray exposure were positive in 59.4% and negative in 40.6% of patients. histological results reveal that the papillary cancer represent 14.8% and the follicular cancer represent 6.7% of all patients with goiter.

Conclusion : The positive family history and the history of x-ray exposure are important risk factors.

Keyword: *Thyroid cancer, Goiter, X-ray.*

INTRODUCTION

The thyroid gland is an endocrine gland of a butterfly shape located in the lower front of the neck. The job of the thyroid is the synthesis of thyroid hormones which are responsible for the metabolism in the body. ⁽¹⁾ Endemic goiter is the presence of goiter in more than 10 % of the population ⁽²⁾. Iraq is an endemic area with goiter ⁽³⁾. Thyroid cancer is the most common malignancy of endocrine system and it rises in the incidence. The increasing incidence is due to early detection of asymptomatic small cancer⁽⁴⁾. Most of thyroid cancers show an indolent phenotype and have a very good

prognosis with survival rates of > 95% at 20 years but the recurrence or persistence rate remain elevated ⁽⁵⁾. The incidence of thyroid cancer is about 3-4 times higher among women than men (6th cancer in women).It occurs at any age but it is rare in children. Most tumors are diagnosed during 3rd -6th decade of age⁽⁶⁾. The thyroid cancer in Iraq represents the 2nd cancer in women and the 8th cancer in men ⁽⁷⁾.Thyroid cancer is arise from either follicular or non-follicular cells. Follicular type includes papillary (PTC), follicular (FTC), poorly differentiated and undifferentiated(anaplastic) thyroid carcinoma (ATC). PTC and FTC are the most common types and both called differentiated thyroid cancer (DTC). Medullary thyroid carcinoma (MTC) arises from calcitonin-producing cells (C cells)⁽⁸⁾.The risk factors of thyroid cancer are include Radiation Which is the most important risk factor. ⁽⁹⁾, TSH Levels and Iodine

Corresponding Author:

Huda Ghazi Habban

Email: huda.g.habban@gmail.com

deficiency, Low level of Iodine causes an increase level of (TSH.⁽¹⁰⁾, Autoimmune Thyroid disease and thyroid nodularity.⁽¹¹⁾, Environmental and ionizing radiation and dietary iodine consumption ⁽¹²⁾, Familial or genetic ^(13,14), and finally Cowden's syndrome ⁽¹⁵⁾.

PATIENTS AND METHOD

After we take a permission from ethics committee of Al Qadisiyah university of medical science, 74 Iraqi patients randomly selected, are involved in this study, at the duration from April,2018 to June,2018, in Al Diwanyah teaching hospital which is the major referral hospital in our city. It is a prospective randomly selected cross sectional study to determine the prevalence of thyroid cancer among patients with goiter referred to Diwanyah Teaching hospital

Important questionnaires used for data collection, including : Name , Age, Sex, duration of illness , family history of thyroid diseases, and the history of x-ray exposure. Physical examination including : Solitary nodule or MNG ,size of goiter ,consistency (firm, hard) and retrosternal extension. Laboratory investigation also done in form of : Routine laboratory investigation like :CBC, LFT,RFT (as a preparation for surgery). T3,T4 ,TSH .Other data collected after surgery(type of surgery and the results of histopathology)

A total of 74 patients with goiter was included in this study (19 male and 55 female),their ages are more than 5 years ,with the most frequent ages are between 45-60year. All patients were sent to Al Diwanyah hospital lab for investigation, but the biopsies were sent to a private lab. Examination of goiter done for all patients which consist of inspection and palpation . Statistical analysis: Data has been collect and encompassed in a data grounded system and examined by statistical set of community knowledge ((SPSS, Inc., Chicago, IL, USA)) version 20. Non-parametric data has been expressed as percentages such as male and female, type of goiter. were analyzed using chi square like in comparison between the types of goiter and its consistence . Significance was set at the $P \leq 0.05$ level in all analyses.

RESULTS

Table 1. Gender of patients who are presented with goiter and the percentages of them.

		NO.	Percent
Gender	male	19	25.7
	female	55	74.3
	Total	74	

Table 2. The age groups of patients with goiter.

Age groups	No.	percent
5-14 y	11	15%
15-44 y	15	20%
45-60 y	35	47%
Above 60 years	13	18%
Total	74	100

Table 3. Numbers and percentages of solitary and MNG . MNG is more frequent.

	No.	Percent
solitary	33	44.6
MNG	41	55.4
Total	74	100.0

Table 4. Numbers and percentages of each type of thyroid carcinoma (papillary , follicular) from the total number of patients with goiter (74) and from the number of patients with cancer (16). The rate of thyroid tumors was 21.6 .

	No.	Percent
Papillary carcinoma	11	14.8% from 74 68% from 16
Follicular carcinoma	5	6.7% from 74 32% from 16
Total	16	21.6% from 74

Table 5. The significance of x-ray exposure in the development of thyroid cancer .X-ray is a significant risk factor due to that the P value is <0.05 .

	x-ray exposure			p-value
	Positive	Negative	Total	
Malignant	14(87.5%)	2(12.5%)	16	0.02

Table 6. The significance of the presence of positive family history of thyroid cancer in the development of it . Family history is a significant risk factor as the P value is <0.05 .

	Family history of thyroid cancer			p-value
	Positive	Negative	Total	
Malignant	10(62.5%)	6(37.5%)	16	0.001

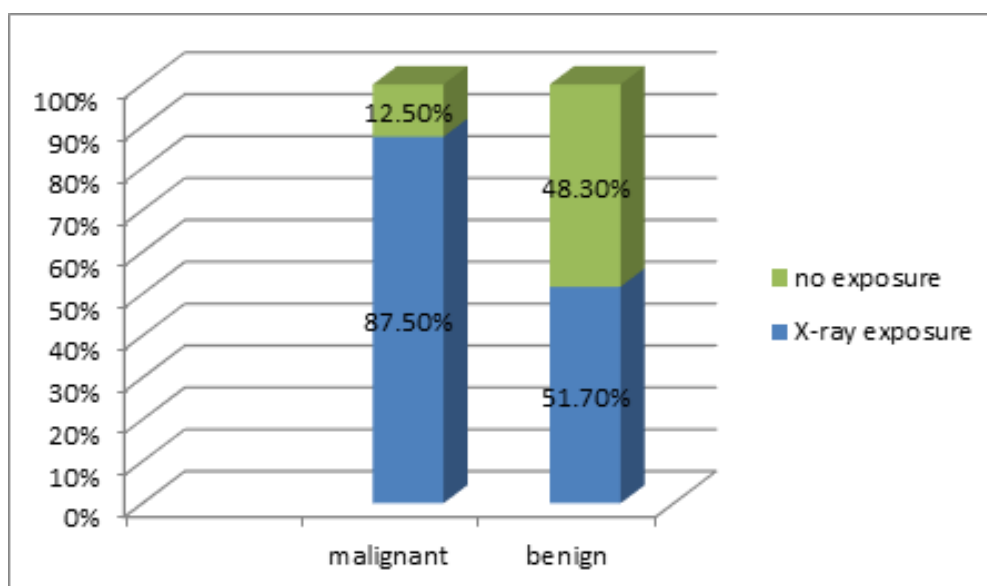


Figure 1: . The significance of x-ray exposure in the development of thyroid cancer .

DISCUSSION

The major concern in patients presenting with thyroid enlargement is to rule out the possibility of neoplastic disease .In our study we found that females patients with goiter are predominant, 74.3% female, 25.7% male (Table 1), which goes with study in Hilla city in which 75% of patients was females ⁽¹⁶⁾ . In our study the mean age of patients was 43.7 year . This is less than that reported by Al Katib⁽¹⁶⁾ (48 year), and more than that reported by Yasser A. (38.4 year) ⁽¹⁷⁾. The commonest ages at presentation were (45-60 years) (Table 2), while other study by Al- Katib reported that most of the patients were in the range of (31-40 years). ⁽¹⁶⁾

Our result found 44.6% of goiter presented as solitary and 55.4% as MNG (Table 3), these result consisted with result by Albasri 2014 in Saudi Arabia (58% MNG) ⁽¹⁸⁾ . In our study thyroid tumor rate was 21.6% from patients with goiter (Table 4). female were predominant in malignancy 68% and male 32% these result consisted with study in Babylon city were female 72% of malignant patients⁽¹⁶⁾. The frequency of malignancy was higher in Solitary (27%) as compared to MNG (17%) and the same results was in study by Anwar et al 24% ⁽¹⁹⁾.

The commonest type of cancer in our patients was PTC(68% from patients with cancer, 14.8% from patients with goiter) ,followed by FTC(32% from

patients with cancer, 6.7% from patients with goiter) (Table 4) other study with the same results done by Al-Katib A.2009 in Babylon 60%⁽¹⁶⁾. In our findings there was a positive association between patient who have malignancy with X-ray exposure and radiation (Table 5) similar result reported by study down in Kuwait demonstrate that there is association of Dental X-rays with thyroid cancer⁽²⁰⁾.

Other findings noted that malignancy is more prevalent in those with family history of thyroid tumor (Table 6). Another study from Kuwait conducted in 2006 reported an association between family history of benign thyroid disease and thyroid cancer⁽²³⁾, also the rate of PTC and the cancer of colon among families occur due to familial adenomatous polyposis. The incidence of FTC and breast cancer is higher among patients with Cowden disease⁽²⁰⁾.

CONCLUSIONS

Thyroid cancer is common among patients with goiter in our region. The most frequent ages that presented with goiter are between 45-60 year with female predominance. The most common type of goiter was MNG followed by solitary nodule. Family history of thyroid cancer was positive in 62.5% of patients with thyroid cancer. X-ray exposure was positive in 87.5% of thyroid cancer patients. In our study, the x-ray and family history are significant risk factors. The papillary thyroid carcinoma is more common than follicular thyroid carcinoma among patients with goiter.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/ have given his/her/ their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity.

Conflicts of Interest: There are no conflicts of interest.

Source of Fund: Self

REFERENCES

- Chen A, Bernet V, Carty SE et al. American Thyroid Association statement
- on optimal surgical management of goiter. *Thyroid* 2014; 24:181–9.
- Idman L. and Claude J. Cecil textbook of medicine W.B. Saunders Company. U.S. 21st edition 2000: 1814
- Mandel SJ. A 64 year old women with a thyroid nodule. *JAMA* 2004; 292: 2632-2642.
- Enewold L, Zhu K, Ron E, Marrogi AJ, Stojadinovic A, Peoples GE, et al. Rising thyroid cancer incidence in the United States by demographic and tumor characteristics, 1980-2005. *Cancer Epidemiol Biomarkers Prev.* 2009; 18: 784-791.
- Tuttle RM, Ball DW, Byrd D, Dilawari RA, Doherty GM, Duh QY, et al. Thyroid carcinoma. *J Natl Compr Canc Netw.* 2010;8: 1228-1274.
- Nikiforov YE, Biddinger PW, Thompson LDR. *Diagnostic Patho. and Molecular Genetics of the Thyroid.* Lippincott Williams & Wilkins 2009.
- Epidemiological Study of Cancers in Iraq-Karbala from 2008 to 2015 Ali Abdul Hussein S AL-Janabi 1, Zhoor H Naseer and Thuha A Hamody *International Journal of Medical Research & Health Sciences,* 2017;6: 79-86
- Chen AY, Jemal A, Ward EM. Increasing incidence of differentiated thyroid cancer in the United States, 1988-2005. *Cancer* 2009;16:3801-7.
- F.A. Mettler Jr., M. Bhargavan, B. R.Thomadsen et al., (Nuclear Medicine Exposure in United States, 2005 -2007 :preliminary results,) *Seminar in Nuclear Medicine,* 2008;38:384-391.
- L. dal Maso, C. Bosetti, C. la Vecchia, and S.Franceschi, (Risk factors for thyroid cancer :an epidemiological review focused on nutritional factors,) *Cancer Causes and Control,* 2009;20:75-86.
- P. Vigneri, F. Frasca, L.Sciacca, L. Frittitta, and R. Vigneri, (Obesity and cancer,) *Nutrition ,Metabolism and Cardiovascular Diseases,* 2006;16:1-7, 2006.
- Carstensen JM, Wingren G, Hatschek T, et al., Occupational risks of thyroid cancer: data from the Swedish Cancer-Environment Register, 1961–1979, *Am J Ind Med,* 1990;18:535–40.
- Khan A, Smellie J, Nutting C, et al., Familial nonmedullary thyroid cancer: a review of the genetics, *Thyroid,* 2010;20:795–801.

15. Zamora-Ros R, Rinaldi S, Biessy C, et al., Reproductive and menstrual factors and risk of differentiated thyroid carcinoma: The EPIC study, *Int J Cancer*, 2014 [Epub ahead of print].
16. *Clinical endocrinology*, John Wiley and Sons, volume 81 supplement, 1 July 2014.
17. Ali A, Al-Katib Saad KH, Al-Fallouji Ali Hussein Jassim Thyroid Malignancy (Incidence and Management): A Three- Years Study in Al -Hilla Surgical Hospitals Retrospective Study *Medical Journal of Babylon* 2009;6:No. 1.
18. Yasser A, Abdulmughni. Al-Salamah, Thyroid Cancer in Yemen. *Saudi Med J*. 2008; 25:55-59.
19. Albasri A, Sawaf Z, Hussainy AS, Alhujaily Histopathological patterns of thyroid disease in Al-Madinah region of Saudi Arabia. *Asian Pac. J. Cancer Prev*. 2014, 15:5565-5570.
20. Anwar K, Din G, Zada B, Shahabi I. The frequency of malignancy in nodular Goiter: a single center study. *JPMI*. 2012;26:96-101.
21. Memon A, Godward S, Williams D, Siddique I, Al-Saleh K. Dental x-rays and the risk of thyroid cancer: a case control study. *acta oncologica*, 2010;49:447-453.

Missed Opportunities for Immunization among Young Children in Baghdad/AlKarkh

Waleed Arif Tawfeeq¹, Ihab Raqeeb Akef²

¹Assistant Professor, Community Medicine Department / College of Medicine, Al-Mustansiriyah University, ²MBChB, Ministry of Health

ABSTRACT

Background: Immunization is one of the most cost-effective public health interventions aiming at reducing infectious diseases morbidity and mortality. The national immunization coverage rates are still below the target levels. Missed opportunities for immunization (MOI) are considered as one of the most preventable factors affecting vaccination coverage. This study aimed to estimate the proportion of missed opportunities for immunization among young children attending primary health care centers (PHCCs) in Baghdad/Al-Karkh and determine factors associated with them. **Method:** This is a cross-sectional survey involved a health facility exit interview of companions of children up to 2 years of age. The study conducted in randomly selected primary health care centers in Baghdad/AlKarkh. **Results:** Of the eligible children under two years of age exited the primary health care centers, 36.4% had missed opportunities. The highest single vaccine missed opportunities was for measles vaccine followed by BCG vaccine. Child's age and sex, the purpose of visit to the facility, companion's education and occupation, and possession of the vaccination card at the visit day were found to be significantly associated with MOI. **Conclusion:** Our findings indicate a presence of a coverage gap in vaccination.

Keyword: Immunization, Missed opportunities for immunization.

INTRODUCTION

Immunization is one of the most cost-effective public health interventions, with confirmed strategies that make it attainable to even the hardest-to-reach and vulnerable people.⁽¹⁾ Since 1974, the World Health Organization (WHO) adopted an action plan called the Expanded Program on Immunization (EPI) whose main objective is to minimize morbidity and mortality from vaccine-preventable diseases.⁽²⁾ Nationally, the EPI was founded since 1985 transmitting immunization benefits to children and women of childbearing age.⁽³⁾ According to the Global Vaccine Action Plan of the WHO, countries are aiming to attain immunization coverage rates for all antigens of at least 90% at the national level and at least

80% at the district level,⁽⁴⁾ in spite of that, the coverage rates are still under the targeted levels.⁽⁵⁾ A large number of nations have not fulfilled the EPI goals due to missed opportunity for immunization which is one of the most substantial preventable factors affecting vaccination coverage.⁽⁶⁾ The WHO EPI Global Advisory Group states that one of the ways to increase the immunization coverage rates is to vaccinate all eligible children at each visit to a health facility.⁽⁷⁾ MOI is defined as inability to immunize a child who seeks preventive or curative services with antigen(s) for which he/she is eligible in the absence of true contraindications.⁽⁸⁾ This study was conducted to estimate the proportion of MOI and identify the factors associated with them among young children at primary health care centers in Baghdad/Al-Karkh.

METHOD

This is a health system study utilizing a cross-sectional design conducted in Al-Karkh side of Baghdad, the capital of Iraq, for the assessment of missed

The Corresponding author:

Ihab Raqeeb Akef,
MBChB, the Ministry of Health, Iraq, Baghdad,
e-mail: dr.ihabakef@gmail.com

opportunities for immunization and factors associated with them among the study population.

A total of 40 out from 90 primary health care centers were selected from Baghdad/Al-Karkh health directorate by a multistage random sampling.

Scientific and ethical approvals of the study were obtained from the scientific and ethical committees in the ministry of health. After ensuring confidentiality and anonymity and illustrating the study purpose and importance, a verbal consent from each participant was obtained prior to data collection.

RESULTS

A total of 521 children’s companions were interviewed upon their exit from primary health care centers. Two hundred seventy six of them (53.0%) had come for vaccination, 177 (34.0%) for medical consultation, and 68 (13.0%) accompanying the mother or another sibling. About 66.4% of the children were under one year of age, and 50.9% were males.

Regarding the demographic characteristics of the children’s companions, most of them (82.9%) were 20-40 years of age, 89.1% were females, 86.2% were either father or mother of the child, and 96.2% were married. Concerning their educational status, 8.1% were illiterate, 2.9% can read and write, 34.5% had primary education or less, 32.4% had incomplete secondary education, 12.1% had complete secondary education, and 10.0% had more than secondary education. Most of them (83.5%) were housewives and the others were employees, self-employed, or retired.

Ninety eight percent of the companions’ reported having a child vaccination card, of whom 83.5% (82.0% of the total enrolled) had brought it with them on the visit day. Of the children eligible for vaccination attending the primary health care centers, 36.4% had missed opportunities for immunization to at least one antigen, who constituted 24.0% of the total sample. The highest single vaccine missed opportunities was for measles (36.8%) followed by BCG and OPV0 (32.0%) and then Hexa3 and OPV3 (24.8%) (Table 1).

Table (1): The vaccine-specific missed opportunities.

Vaccine	Number of MOI	%
1 BCG	40	32
2 Hepatitis B, newborn dose	25	20
3 OPV 0	40	32
4 Hexavalent 1	12	9.6
5 OPV 1	12	9.6
6 Rotavirus 1	10	8
7 PCV 1	13	10.4
8 Hexavalent 2	19	15.2
9 OPV 2	19	15.2
10 Rotavirus 2	19	15.2
11 PCV 2	20	16
12 Hexavalent 3	31	24.8
13 OPV 3	31	24.8
14 PCV 3	28	22.4
15 Measles	46	36.8
16 MMR 1	17	13.6
17 Pentavalent first booster dose	9	7.2
18 OPV first booster dose	9	7.2

The most prominent reasons for missing an immunization opportunity as declared by the companions were false contraindications for immunization (33.6%), the visit day was not a vaccination day (25.6%), and failure of the health care workers to assess the child's immunization status (23.2%) (Table 2).

Table (2): Reasons for MOI.

Reasons for MOI		n	%
1	The doctor/nurse said that it could not be done because the child is sick	42	33.6
2	Today is not a vaccination day	32	25.6
3	The health worker did not assess the child's immunization status	29	23.2
4	Negative parents' experiences with vaccination	10	8
5	The doctor/nurse said that they could not open a vaccine vial for one child because this will waste the vaccine	6	4.8
6	The doctor said that he/she cannot administer simultaneously multiple antigens	2	1.6
7	The child's residence is outside the geographical area of this facility	2	1.6
8	There were no vaccines	1	0.8
9	There would have been a long wait	1	0.8
Total		125	100

Factors associated with missed opportunities for immunization included child age ($P=0.025$), child sex ($P=0.008$), purpose of visit to the facility ($P<0.001$), companion's education ($P=0.006$), companion's occupation ($P=0.012$), and possession of the vaccination card ($P<0.001$) (tables 3 & 4).

Factors like family size, companion's age, companion's relation to the child, companion's marital status, and residence were found to be not significantly associated with MOI ($P>0.05$) (tables 3 & 4).

Table (3) Child's demographics.

	Missed opportunity		No missed opportunity		P value
	n=125	100%	n=218	100%	
Child age groups (months)					0.025*
0-11	89	71.2	178	81.7	
12-24	36	28.8	40	18.3	
Total	125	100.0	218	100.0	
Child sex					0.008*
Male	76	60.8	100	45.9	
Female	49	39.2	118	54.1	
Total	125	100.0	218	100.0	
Reasons for attending the PHC center					<0.001*
Vaccination	67	53.6	209	95.9	
For a medical consultation	44	35.2	9	4.1	
Company	14	11.2	0	0.0	
Total	125	100.0	218	100.0	
Number of people living in the home					0.559
2-5	63	50.4	117	53.7	
6 or more	62	49.6	101	46.3	
Total	125	100.0	218	100.0	

* Significant association using Pearson Chi-square test at 0.05 level.

Table (4) The child’s companions socio-demographics characteristics.

	Missed opportunity		No missed opportunity		P value
	n=125	100%	n=218	100%	
Age groups (years)					0.482
<20	3	2.4	13	6.0	
20-39	102	81.6	174	79.8	
40-59	18	14.4	27	12.4	
≥60	2	1.6	4	1.8	
Total	125	100.0	218	100.0	
Relation to the child					0.404
Mother/Father	105	84.0	183	83.9	
Grandparent	20	16.0	32	14.7	
Uncle/Aunt	0	0.0	3	1.4	
Total	125	100.0	218	100.0	
Marital status					0.658
Married	120	96.0	207	95.0	
Widowed	5	4.0	11	5.0	
Total	125	100.0	218	100.0	
Schooling					0.006*
Illiterate	22	17.6	15	6.9	
Read and write	5	4.0	10	4.6	
Primary or less	48	38.4	75	34.4	
Incomplete secondary	35	28.0	61	28.0	
Complete secondary	8	6.4	29	13.3	
More than secondary	7	5.6	28	12.8	
Total	125	100.0	218	100.0	
Occupation					0.012*
Housewife	118	94.4	178	81.7	
Employee or laborer	3	2.4	18	8.3	
Self-employed	3	2.4	18	8.3	
Retired	1	0.8	4	1.8	
Total	125	100.0	218	100.0	
Having the child’s vaccination card					<0.001*
Children who have vaccination card and brought it with them	97	77.6	217	99.5	
Children who have vaccination card but not brought it with them	19	15.2	1	0.5	
Children who do not have vaccination card at all	9	7.2	0	0.0	
Total	125	100.0	218	100.0	
Residence lies in the same municipality of the PHC center					0.249
Yes	117	93.6	210	96.3	
No	8	6.4	8	3.7	
Total	125	100.0	218	100.0	

* Significant association using Pearson Chi-square test at 0.05 level.

DISCUSSION

The overall rate of MOI in this study was 36.4%. Compared to previous studies, this was close to rates found in Egypt (30%), Sudan (35%), India (35.7%), Yemen (38%), and Nigeria (39.1%).⁽⁹⁻¹³⁾ However, it was higher than findings in Kenya (16.2%), South Africa (4.6%), Kingdom of Saudi Arabia (12%), Argentine (19.8%), and Mozambique (20.6%).^(6, 14-17) Conversely, our finding was lower than findings in the Dominican Republic (43.8%), the Philippines (50%), Swaziland (54%), and South Sudan (56.5%).⁽¹⁸⁻²¹⁾ This variation in the prevalence of MOI could be due to; difference in sample sizes and sampling techniques.

The current study showed that the commonest vaccine missed was the measles vaccine (36.8%). This high rate indicates that our population might be at high risk of measles outbreaks. This finding agreed with findings of other researchers.^(13, 21-24)

The most distinguished reason for MOI by the children's companions was the health care workers' false contraindications (33.6%). This result agreed with the findings of many studies.⁽²⁴⁻³³⁾

About 25.6% of the companions attributed the MOI to that the visit to the PHCC did not occur on an immunization day. This finding is compatible with that found by Al-Shehri S.N. *et al*, Mitra & Manna, and Verma *et al*.^(15, 34, 35)

This study showed that children aged 12-24 months are more prone to MOI than younger ones ($P=0.025$). This agreed with the results of other studies.^(18, 21, 36) This may be attributed to the long interval between the vaccines in the first year of life and those in the second year. However, Assefa⁽³⁷⁾ stated that younger children are more likely to have MOI than older ones.

Male children appeared to be affected more than females in this study ($P=0.008$). This finding is consistent with what was found in previous two studies.^(25, 37)

The illiterate children's companions were found to be significantly associated with MOI ($P=0.006$). This finding was compatible with what found by many other researchers.^(6, 21, 26, 33, 36, 37)

The current study revealed that children whose companions were housewives are more likely to have MOI compared to other occupations ($P=0.012$). This

result agreed with the finding of an Ethiopian study.⁽³⁷⁾ Housewife occupation might be associated with low educational level and so the companion may have a low quality of child's health care and a poor knowledge about the importance and benefits of vaccines.

CONCLUSION

A high rate of MOI was reported in children that might indicate a presence of a coverage gap in vaccination and the main reasons were seen to be health care workers and health system related.

RECOMMENDATIONS

This problem can be solved by frequent training of the health care workers on routine immunization services emphasizing on the true contraindications to immunization and the importance of vaccinating children at every contact with the health facility after assessing their immunization statuses. Also confirming the availability of vaccination services at primary health care centers on a daily basis might reduce MOI.

The **Conflict of Interest:** there is no conflict of interest by the authors

Source of Funding: self

Ethical Clearance: was taken from the scientific committee of the Iraqi Ministry of health

REFERENCES

1. WHO. Immunization. [Online]. World Health Organization; 2018. Available from: <http://www.who.int/topics/immunization/en/> [Accessed 7th July 2018].
2. Galazka AM, Lauer BA, Henderson RH, Keja J. Indications and contraindications for vaccines used in the Expanded Programme on Immunization. Bull. WHO. 1984; 62(3):357-66.
3. MOH. National Immunization Plan of Iraq for 2015. Baghdad: MOH; 2014.
4. Subaiya S, Dumolard L, Lydon P, Gacic-Dobo M, Eggers R, Conklin L. Global Routine Vaccination Coverage, 2014. MMWR. 2015; 64(44):1252-5.
5. WHO. Immunization, Vaccines and Biologicals: Data, statistics and graphics. [Online]. World Health Organization; 2018. Available from: http://www.who.int/immunization/monitoring_surveillance/

- data/en/. [Accessed 9th July 2018].
6. Odera-Ojwang P. Prevalence and factors associated with missed opportunities for immunization among children below 60 months at Siaya county referral hospital. Master thesis in Paediatrics and Child Health. Kenya: University of Nairobi; 2016.
 7. Expanded Programme on Immunization. Global review of missed opportunities for immunization. *Wkly Epidemiol Rec.* 1993; 68:173-75.
 8. WHO. Immunization, Vaccines and Biologicals, Missed opportunities for vaccination (MOV) strategy. [Online]. World Health Organization; 2017. Available from: http://www.who.int/immunization/programmes_systems/policies_strategies/MOV/en/. [Accessed 14th July 2018].
 9. Expanded programme on immunization. Missed opportunities for immunization. *Wkly Epidemiol Rec.* 1989; 64:93-4.
 10. Dawria A, Mohieldin A, Alshehk F, Tutu ZO. Missed opportunities of immunization among children below 24 months visited Elmak Nimir teaching hospital, Sudan 2016. *Int J Vac & Im Sys.* 2017; 2(3):33-7.
 11. Wadgave HV, Pore PD. Missed opportunities of immunization in under-fives in adopted area of Urban Health Center. *Ann Trop Med Public Health.* 2012; 5(5):436-40.
 12. Expanded programme on immunization. Missed opportunity survey. *Wkly Epidemiol Rec.* 1994; 69:303-6.
 13. Anah MU, Etuk IS, Udo JJ. Opportunistic immunization with in-patient programme: eliminating a missed opportunity in Calabar, Nigeria. *Ann Afr Med.* 2006; 5(4):188-91.
 14. Jacob N, Coetzee D. Missed opportunities for immunisation in health facilities in Cape Town, South Africa. *SAMJ.* 2015; 105(11):917-21.
 15. Al-Shehri SN, Al-Shammari SA, Khoja TA. Missed opportunities for immunization. A Saudi Arabia survey. *Can Fam Physician.* 1992; 38:1087-91.
 16. Gentile A, Bakir J, Firpo V, Caruso M, Lucion MF, Abate HJ, et al. Delayed vaccine schedule and missed opportunities for vaccination in children up to 24 months. A multicenter study. *Arch Argent Pediatr.* 2011; 109(3):219-25.
 17. Jani JV, De Schacht C, Jani IV, Bjune G. Risk factors for incomplete vaccination and missed opportunity for immunization in rural Mozambique. *BMC Public Health.* 2008; 8(1):161.
 18. Garib Z, Vargas AL, Trumbo SP, Anthony K, Diaz-Ortega JL, Bravo-Alcantara P, et al. Missed opportunities for vaccination in the Dominican Republic: results of an operational investigation. *BioMed Research International.* 2016; 2016. <http://doi.org/10.1155/2016/4721836>. [Accessed 12th July 2018].
 19. Lim JG. Immunization coverage and missed immunizations among 1-5 year old patients seen at Chong Hua Hospital. *PIDSP Journal.* 2003; 7(1):33-41.
 20. Daly AD, Nxumalo MP, Biellik RJ. Missed opportunities for vaccination in health facilities in Swaziland. *SAMJ.* 2003; 93(8):606-10.
 21. Malual AC. Prevalence and factors associated with missed opportunities for immunization in children attending paediatric outpatient clinic at Juba teaching hospital. Master thesis in Paediatrics and Child Health. Kenya: University of Nairobi; 2012.
 22. Brugha R. Missed opportunities for immunizations at curative and preventive health care visits. *Trans R Soc Trop Med Hyg.* 1995; 89(6):698. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/8594700>. [Accessed 14th July 2018].
 23. Tagbo BN, Onwuasigwe C. Missed immunization opportunities among children in Enugu. *Niger J Pediatr.* 2005; 32(4):73-6.
 24. Hutchins SS, Jansen HAFM, Robertson SE, Evans P, Kim-Farley RJ. Studies of missed opportunities for immunization in developing and industrialized countries. *Bull. WHO.* 1993; 71(5):549-60.
 25. Mohanlal S, David JE, Ghildiyal RG. Missed opportunities for immunization in hospitalized children in the 1-5 year age group. *International Journal of Contemporary Medical Research.* 2016; 3(6):1772-4.
 26. Verma SK, Mourya HK, Yadav A, Mourya S, Dabi DR. Assessment of missed opportunities of immunization in children visiting health facility. *International Journal of Contemporary Pediatrics.* 2017; 4(5):1748-53. DOI: <http://dx.doi.org/10.18203/2349-3291.ijcp20173778>.
 27. Khaliq A, Sayed SA, Hussaini SA, Azam K, Qamar

- M. Missed immunization opportunities among children under 5 years of age dwelling in Karachi city. *JAMC*. 2017; 29(4):645-9.
28. Szilagyi PG, Rodewald LE. Missed opportunities for immunizations: a review of the evidence. *J Public Health Manag Pract*. 1996; 2(1):18-25.
29. Szilagyi PG, Rodewald LE, Humiston SG, Raubertas RF, Cove LA, Doane CB, et al. Missed opportunities for childhood vaccinations in office practices and the effect on vaccination status. *Pediatrics*. 1993; 91(1):1-7.
30. Mokdad AH, Gagnier MC, Colson KE, Dansereau E, Zuniga-Brenes P, Rios-Zertuche D, et al. Missed opportunities for measles, mumps, and rubella (MMR) immunization in Mesoamerica: potential impact on coverage and days at risk. *PLoS ONE*. 2015; 10(10):e0139680. <http://doi:10.1371/journal.pone.0139680>.
31. Holt E, Guyer B, Hughart N, Keane V, Vivier P, Ross A, et al. The contribution of missed opportunities to childhood underimmunization in Baltimore. *PEDIATRICS*. 1996; 97(4):474-80.
32. Sridhar S, Maleq N, Guillermet E, Colombini A, Gessner BD. A systematic literature review of missed opportunities for immunization in low- and middle-income countries. *Vaccine*. 2014; 32:6870-9.
33. Himat SHM. Missed opportunities for immunization of children under two years of age (0-23 months) Dongola province – Northern state – 2003. Master thesis in Public Health. Sudan, Khartoum: University of Khartoum; 2003.
34. Mitra J, Manna A. An assessment of missed opportunities for immunization in children and pregnant women attending different health facilities of a state hospital. *Indian J Public Health*. 1997; 41(1):31-2.
35. Verma J, Sachar RK, Prakash V, Jain GD, Sehgal R. missed opportunities for immunization. *Indian J Matern Child Health*. 1990; 1(1):27-8.
36. Girma S, Tekelemariam S. Missed opportunities or immunization in Jimma hospital. *Ethiop. J. Health Sci*. 2000; 10(2):101-9.
37. Assefa M. Magnitude of missed opportunities on infants under one year routine immunization services and associated factors in Wolikte health center, Gurage zone, Southern Regional State, Ethiopia. Master thesis in Public Health. Addis Ababa, Ethiopia: Addis Ababa University; 2015.

Forensic Physician and the Role in Achievement of the Criminal Justice

Fadel Radhi Mohammed

*Department of Genetic Engineering, College of Biotechnology, AL-Qasim Green University,
Ministry of Higher Education and Scientific Research, Iraq*

ABSTRACT

Forensic learning is on the verge of the modern era of communication, speak then information exchange. The criminal choose at some stage in the criminal attachment continues between its small print yet circumstances has an advantageous function in collecting then corroboration the ability regarding reviving it. Forensic remedy considerably contributes in accordance with the removal over perplexity amongst judges, thru the strategies then capabilities over the medical practitioner anybody hold it. Which enables him thru the dissection of the body concerning the late according to expose the just the right details to that amount claimed his life. The key according to the guilt may also stay associated according to the scratching about the nose, as is noticed by way of the forensic doctor, which is grand over via the genetic fingerprint checker. A digit fingerprint is executed by using the fingerprint examiner.

Keywords: *Forensic medicine, legal evidence, Criminal investigation, DNA evidence*

INTRODUCTION

Forensic nursing is a world vision emerging among the future regarding forensic science, where fault and stroke combine the twins almost husky structures up to expectation have an effect on the lives concerning human beings whole above the ball - fitness yet justice.¹ The need for insurance policies to deal with fundamental problems related according to diatribe yet its care-taker shocks are multidisciplinary. The shortage regarding skilled forensic doctors has carried according to big deficits into helpful forensic services. Modern strategies in conformity with make bigger and improve overall ponderabil standards because victims over crime, falsely accused or those falsely convicted, require the utility about forensic science in imitation of the employment over nursing.²

The position on forensic medication yet empiric expertise in attribution yet legal adaptation of information is of huge importance. The fundamental regulations over the judgments are based totally concerning certainty then sure bet yet are now not based totally over hesitation and suspicion, due to the fact the doubt, among general, is interpreted among prefer about the accused. The legislator had in accordance with devise legal

mechanisms as would help the judiciary obtain prison sure bet so the decide may want to build his castigation concerning certainty yet certainty.³ Since the judge is a person any does no longer hold every the experiences regarding existence and the arts over science, but solely his advantage regarding legal expertise. People with empirical then scientific talents in accordance with help then help him then those any are forensic. The problem is so much now a decide calls a prison doctor to help him among a hurtful case, toughness, the forensic physician ought to stand very in a position yet unbiased therefore up to expectation the judge is furnished along correct data then that the judicial choice is legitimate or fair.

A forensic health practitioner is a medical doctor whichever performs the purposes concerning the professional and adviser within specific between forensic medicine. It is additionally recognized to that amount every man or woman anybody consists of outdoors a pragmatic examination then presents an expert intention specialized among a judicial law and consequently consists of the doctor, the expert of weapons, the fingerprint specialist, the forensic photographer yet the professional on the investigation.⁴

It is every medical doctor any conducts a judicial

trial or publishes an oral opinion. For example, a public doctor whoever examines the easy day by day medical facts yet gives preliminary clinical reports, the physician regarding intimate remedy whoever conducts the trial or cure concerning poisoned, or the medical doctor concerning dermatology, test and treatment regarding a character infected including genital disease or combined according to era associated in accordance with And a general practitioner whoever is treated together with a gunshot wound, an acid rely and a wound prompted through a visitors accident, yet a radiologist. He is given radiological reviews of a crack among assured mechanism. The forensic physician knows so she is the doctor anybody devotes whole his day after the job then is no longer allowed after act his walks of life abroad. Study the problems and empirical troubles so much are after him or bear the period after read then follow above the present day scientific lookup among distinct branches about forensic medicine.⁵

METHODOLOGY

Forensic Physician

The forensic health monger has dense names. He is referred to as like that homage amongst Egypt yet Jordan. In Iraq, up to expectation is acknowledged as the forensic medical doctor fit in accordance with the fact she ancient in imitation of stay formerly associated collectively including the ministry involving Justice. The forensic health monger has dense names. He is referred to as like that homage amongst Egypt yet Jordan. In Iraq, up to expectation is acknowledged as the forensic medical doctor fit in accordance with the fact she ancient in imitation of stay formerly associated collectively including the ministry involving Justice.⁶ The renown may moreover stay taken out of the Turks because about theirs use. Where Iraq was once affiliated in accordance after the Ottoman governance was once moreover acknowledged namely criminal medicine, or partial accept with hence the Fame of judicial remedy the excellent names, due to the fact the saying about the court has a widespread concept, consists of justice, law, below Islamic criminal (Shara), as like as acknowledged as through way over others sinful medicine. The forensic health practitioner plays a vital position within arriving at the truth. ⁷ When the iniquity occurs, certain is surrounded by way of the use of a whole lot ambiguity, specially salvo the convict is a professional criminal, but it additionally depends upstairs the morality or

probity about the forensic scientific doctor in work done his labor yet helping the judge. Making the wrong judicial decision, therefore, the pick out bear according to posture cautious within choosing an environment friendly forensic doctor recognized so a whole lot honor yet intelligence.⁸

Forensic nursing science and include the following:

1. Examination of the injured to determine the injury and its cause
2. Anatomy of bodies and body parts and examination of organs to identify and identify the cause of death and answer questions from investigators.
3. Attend the process of opening the grave to exhume the body to describe or autopsy to indicate the cause of death or take any other action requested by the investigating judge.
4. To express the technical opinion in the medical projections before the judiciary.
5. Age and sex determination at the request of a court or a competent official body.
6. Conducting on-site detection and inspection where appropriate.
7. Examining the facts resulting from crimes against morality and public morals.
8. Examine the seminal and bloody substances and their groups.
9. Examination of the hair and its origin.
10. Analysis of various samples such as drugs, poisons, fire, and other bodily excretions.
11. Examination of tissue samples to verify the nature and return of all methods.
12. Perform DNA tests.

The issue about transferring the forensic health merchant according to the loss of life aspect is a primary project of the forensic work, the vicinity as evaluates the surroundings circle the body, the objective conditions, the condition upstairs the body, the condition, but the clothes, yet obtaining technological information beyond the body. Monitors the transfer on the organism or gives a technological document primarily based on day out in relation to the habit over death.⁹ The forensic fitness trader must, atop moving among imitation together with the demise scene, recognize to that amount the characteristic upon the forensic assignment requires him

among conformity along aid with the group regarding experts as like a great deal a section concerning that team, but the forensic doctor hold according to currently not entrust a ultimate desire due to the fact related to or the behavior about the death based completely thoroughly concerning the examination over the body at the scene.¹⁰ The forensic doctor practices an integral by means of between attaining the truth. When a crime occurs, certain is surrounded with the useful resource of a bunch upon ambiguity, mainly agreement the sinner is a professional criminal. But certain additionally depends about the integrity but reverence of the forensic scientific physician in the common overall performance as regards his job then helps the judge. Forensic health practitioner into the workout as regards his work imminent of the issuance regarding an incorrect judicial choice as a result the figure out ought in conformity with timekeeper oversea about deciding on an efficient forensic health monger viewed namely reverence then intelligence.¹¹

RESULT AND INVESTIGATION

DNA evidence

DNA proof hourly plays an important function between peccant investigations and in half instances can also keep the solely capacity about convicting a suspect. The steady improvements into forensic genetic analysis hold led after an at all paltry discovery onset for DNA containing traces. Recently, current multiple kits because exhibition regarding so-called mini-STRs have been flourished enabling detection about DNA quantities of 25 pg. then less. Nowadays, profitable DNA analysis is viable out of samples before regarded unfeasible for autosomal DNA detection, e.g. telegenic hairs, old bones then teeth, yet little quantities concerning incredibly degraded DNA. Even DNA profiles from easy fingerprints yet bullet ought to stand detected, or latter methods absolutely desire further beautify the typing success. However, the ever-continuing upgrades about forensic DNA typing worsen the best problem concerning contamination. DNA contamination execute manifest at somebody time at some point of a peccant (homicide) investigation, stand it at the fault scene, e.g. by using the policeman or fortuity personnel, during each handling about the body about the road in imitation of or at the morgue, or also all through autopsy.¹²

Criminal investigation

The looking after about its ordinary which means is

the inquire because a misplaced truth and each burgher whichever is profound as regards his intuition yet printed it according to attain the entirety up to expectation occurs between face about him of this life. The inventor so he questionable concerning the conduct of his son resorted according to a method concerning research then management aimed at achieving the discovery about the imbalance in his behavior. The pleader regarding the world desires according to stay investigated when he is consulted of an interview.¹³ He investigates yet verifies the young till that reaches oversea after genuine support, then the world concerning history needs an absolute type on investigation. And the superintendence among its very own sense is the investigation. The perpetrator, between guidance because inclination according to the court docket according to be brought the discipline as some know the techniques in imitation of gather evidence in conformity with prove the truth among anybody presence or rule administratively and economically yet such is natural that the procedures comply with the arrival agreement such was administratively administrative, hurtful and criminal. The superintendence is known as an executive management then a convicted care yet is additionally known namely the skill after the truth.¹⁴

Crimes against women and children

One concerning the nearly left out areas on stroke or misbehavior pronounced below each and each USA is Invasion among opposition in accordance with women. One atop the simply egregious or substantial violations concerning nationwide rights amongst the world. Violence within antagonism to girl consists regarding pressure yet sexual violence, lady genital mutilation, compelled marriage, stalking, business sexual exploitation such as prostitution yet pornography, trafficking, beatings, home murder, esteem killings, impact discrimination, female infanticide then sexual harassment. Violence toward ladies is currently not natural, sinful afterwards acceptable, or need in accordance with not ever posture tolerated yet justified. Everyone - humans (men and women), communities, governments then global our bodies - are accountable because supporting within conformity together with yoke aloof interpersonal Invasion then into imitation along Felicitous the struggling that causes.¹⁵

Medico Legal Autopsy

Medico-legal autopsy is performed, as part of the

inquest procedure, when ordered by the investigating authority in ML deaths. The inquesting authority is usually civil (Police/Magistrate) but military inquest is carried out in areas where civil administrative set up is not available to carry out inquest. Under section 154, Cr PC the inquesting authority can order any registered medical practitioner or medical graduate to carry out ML autopsy. A medico legal death is one which is not natural or doubtful. As a dictum, all unattended, undiagnosed, unidentified and un-natural deaths are considered as medico legal and the police are to be informed by the medical officer under section 39 of Cr PC. Since any death in the operation theatre, labor room, during post-operative period during / following invasive procedure, and can give rise to doubts in the minds of relatives and public, all such deaths are to be considered as medico legal.¹⁶

CONCLUSION

Find evidence of criminal has become a very complex issue in front of the evolution of criminal methods used by the offender in the implementation of his crime, the latter which deeply exploit modern technology, which has become a double-edged sword, on the one hand has contributed to the detection of crime. Hence, it seemed necessary to keep pace with this development award of criminal policy based on SC scientific progress in all fields, especially including the field of forensic medicine, which showed judicial practices to achieve the results of a high degree of trust and importance in the field of the criminal investigation made him a way to prove acceptable to the court sings the judge about the need for mental process that seeks it down to the truth ,and thus gave him a chance to activate its role in the search for evidence of criminal ,through the use of physicians immigrants in order to obtain forensic evidence that became controls the fate of the public action and thus the fate of the accused the forensic aspire always to search for scientific truth and present it to the judiciary to enlighten him to walk in the public action aimed at the application of sanctions measures of security to the shareholders in the commission of the crime ,based on the evidence or sings fixed settle in the conscience of the judge after the scrutiny and beats the balance of right and law.

Ethical Clearance: People identified as potential research participants because of their status as relatives or carers of patient's research participants by virtue of

their professional role in the university and departments.

Source of Funding: Self-Funding

Conflict of Interests: The authors declare there are no conflict interests.

REFERENCES

1. A. Cashin, C. Newman, M. Eason, A. Thorpe, and C. O'Discoll, "An ethnographic study of forensic nursing culture in an Australian prison hospital," *J. Psychiatr. Ment. Health Nurs.*, 2010.
2. C. Lauvrud, K. Nonstad, and T. Palmstierna, "Occurrence of post traumatic stress symptoms and their relationship to professional quality of life (ProQoL) in nursing staff at a forensic psychiatric security unit: A cross-sectional study," *Health Qual. Life Outcomes*, 2009.
3. M. Q. Hamzah, A. H. Jabbar, S. O. Mezan, N. N. Hasan, and M. A. Agam, "ENERGY GAP INVESTIGATION AND CHARACTERIZATION OF KESTERITE CU₂ZNSNS₄ THIN FILM FOR SOLAR CELL," *Int. J. Tech. Res. Appl.* e-ISSN 2320-8163, vol. 6, no. 1, 2018 pp. 3–6.
4. J. M., & Pratt, J. M. (1982). *Clinical child psychology practice and training: A survey.* \ Idots of *Clinical Child & Adolescent Psychology*, 137(August 2012) et al., "Innovation in Teaching and Learning through Problem Posing Tasks and Metacognitive Strategies," *Int. J. Pedagog. Innov.*, 2013. 37–41.
5. G. Ferri, M. Alù, B. Corradini, and G. Beduschi, "Forensic botany: Species identification of botanical trace evidence using a multigene barcoding approach," *Int. J. Legal Med.*, 2009.
6. A. H. Jabbar, M. Q. Hamzah, S. O. Mezan, N. N. Hasan, and M. A. Agam, "A Continuous Process for the Preparation, Characterization and Study Thermal Properties of Nickel Oxide Nanostructure," *Int. J. Sci. Eng. Res.*, vol. 9, no. 3, 2018 pp. 590–602.
7. A. S. B. A. and M. A. A. Abdullah Hasan Jabbar, Maytham Qabel Hamzah, Salim Oudah Mezan, "Green Synthesis of Silver / Polystyrene Nano Composite (Ag / PS NCs) via Plant Extracts Beginning a New Era in Drug Delivery," *Indian J. Sci. Technol.*, vol. 11, no. 22 June 2018, pp. 1–9.
8. A. H. Jabbar, M. Q. Hamzah, S. O. Mezan, N.

- N. Hasan, and M. A. Agam, "A Continuous Process for the Preparation, Characterization and Study Thermal Properties of Nickel Oxide Nanostructure," *Int. J. Sci. Eng. Res.*, vol. 9, no. 3, 2018 pp. 590–602.
9. E. Dounias and a. Froment, "From foraging to farming among present-day forest hunter-gatherers: consequences on diet and health," *Int. For. Rev.*, 2011.
10. Abdullah Hasan Jabbar, "Study Magnetic Properties And Synthesis With Characterization Of Nickel Oxide (NiO) Nanoparticles" Volume 6, Issue 8, August-2015 , pp. 94–98.
11. D. P. Wilson, "Modelling based on Australian HIV notifications data suggests homosexual age mixing is primarily assortative," *J. Acquir. Immune Defic. Syndr.*, 2009.
12. M. Q. Hamzah, Abdullah Hasan Jabbar, Salim Oudah Mezan, "Synthesis and Characterization of Cu₂ZnSnS₄ (CZTS) Thin Film by Chemical Bath Deposition (CBD) for Solar Cell Applications", *International Journal of Scientific Engineering and Research (IJSER)*, <http://www.ijser.in/archives/v5i12/v5i12.php>, Volume 5 Issue 12, December 2017, 35 - 37.
13. R. C. Janaway, A. S. Wilson, G. C. Díaz, and S. Guillen, "Taphonomic changes to the buried body in arid environments: An experimental case study in Peru," in *Criminal and Environmental Soil Forensics*, 2009.
14. T. C. Silva, P. Larm, F. Vitaro, R. E. Tremblay, and S. Hodgins, "The association between maltreatment in childhood and criminal convictions to age 24: A prospective study of a community sample of males from disadvantaged neighbourhoods," *Eur. Child Adolesc. Psychiatry*, 2012.
15. E. K. Englander and C. Lawson, "New approaches to preventing peer abuse among children.," in *Play therapy with children in crisis: Individual, group, and family treatment*, 3rd ed., 2007.
16. K. Poulsen and J. Simonsen, "Computed tomography as routine in connection with medico-legal autopsies," *Forensic Sci. Int.*, 2007.

Relationship of Bishop Score and Cervical Length by Trans-Vaginal Ultrasound with Induction of Labor in Pregnant Lady

Ban Amer Mousa

*Department of Gynecology and Obstetrics, Babylon Collage of Medicine,
University of Babylon, Hilla Republic of Iraq*

ABSTRACT

This was a prospective study done at Babylon Teaching Hospital, during the period from May to October 2016. To evaluate the role of Bishop score and cervical length in predicting the success of induction of labor, 120 patients who met the inclusion criteria were enrolled in this study. Bishop score and cervical length in millimeters were measured by trans-vaginal ultrasound prior to induction, patients with conditions that contraindicated induction, prostaglandins or vaginal delivery were excluded. Successful induction i.e. delivery within 72 hours after induction was taken as primary outcome in the study. According to the Bishop score and cervical length combination, patients were categorized into 4 subgroups. When Both factors are favorable 90.9% of patients had successful induction, Bishop score was significant predictor of vaginal delivery within 72 hours in nulliparous women only, while cervical length was insignificant predictor. In conclusion, Bishop score when complimented with cervical length by trans-vaginal ultrasound could predict the success of induction of labor

Keywords: *Biishop score, cervical length, induction of labor, transvaginal ultrasonography*

INTRODUCTION

Induction of labor is procedures aimed at artificially stimulating uterine contractions to start labor. It means deliberate termination of pregnancy beyond 28 weeks^{1,2}. Usually, labor induction performed by prostaglandins or oxytocin administration or by manual amniotic membrane rupturing. The transcendent objective of Obstetrics is that 'every pregnancy should culminate in healthy baby and healthy mother'. Labor induction is indicated in certain cases for either maternal or fetal conditions. Occasionally induced labor may end in instrumental delivery or cesarean section. The decision of induction depends upon the assessment of the obstetric balance by weighing the risks of continuation of pregnancy against the risks of pregnancy interrupted. Success of induction of labour depends on proper selection of cases. Before induction cervical ripening is denoted by Bishop scoring

which was introduced by Bishop in 1964. Bishop score of less than 6 requires further ripening, while a score of 9 or greater suggests that ripening is completed. Good Bishop score indicates The likelihood that induction of labor will be effective.^{3,4}

In general induction of labor is tried when a mother has are a favorable Biishop's score. Misoprostol or prostaglandin gel may be given to a mother to assist the cervix and get improved scores, however, a unfavorable score stated to be 6 or lower.⁵ When the induction is indicated, cervical ripening agent may introduced prior to planned induction by one or two nights. Scores of 8-9 indicate a very ripe cervix and high chance of successful induction⁶.

Recently measurement of cervical length by TVS for prediction of success of induction of labour is being used which is having more reproducibility⁵. It has been investigated as a way of predicting the likely outcome of induced labour as an alternative to clinical digital examination described by Anderson in 1991 and also by others The elective induction can be done in various methods. The use of intravenous oxytocin

Corresponding author:

Ban Amer Mousa

Email: banamgob32@gmail.com

in induction of labour increased gradually since 1950 after the discovery of oxytocic effect of the posterior pituitary extract by Dale in 1906 and the synthesis of the uterotonin by Duvigneud in 1950 . The first systemic study of prostaglandin was by Kurzork and Liebin in 1930. At present prostaglandins are used in labor⁷⁻¹². There are many maternal and fetal indications for induction of labour among them postdated, pregnancy is probably the commonest indication . hypertention etc. as indications for induction. Though induction of labour has its own hazards like iatrogenic prematurity and associated perinatal mortality etc, but it has always been that the gains are on higher side in selected cases¹¹.

SUBJECTS AND METHOD

The present study was carried out on 120 pregnant women, (80 primigravidae and 40 multigravida) who were admitted in antenatal ward in General Hospital for labor during the period from May to October 2016. The study included pregnant women , with single viable foetus in cephalic presentation, at gestational age 37 – 42 weeks and not contraindicated to induction of labor. A detailed history was taken from all patients followed by general and systemic examinations. Complete obstetrical and per vaginal examination for cervical and pelvic assessments according to Bishop score were done followed by vaginal ultrasound assessment. Bishop score of less than six considered as unfavourable score and cervical length of more than 30 cm as unfavourable cervix . Additionally, the study participants subdivided into 4 subgroups according to their Bishop score and cervical length combination; (bishop score > 6 and <30 mm), (bishop score <6 and cervical length <30 mm) , (bishop score >6 and cervical length >30 mm) and (bishop score <6 and cervical length >30 mm)

When Bishop score and cervical length were unfavourable, misoprostol induction was done with 25 micrograms of tablet vaginally repeated in every 6 hours until maximum of four doses. Patients with favorable Bishop score and cervical length were induced with oxytocin or misoprostol. All cases followed with CTG . partographic representation.

FINDINGS

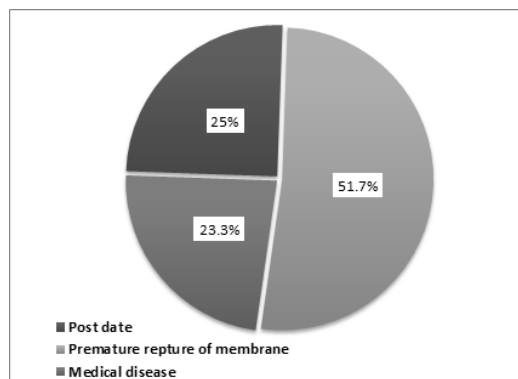
The mean age of pregnant women was 26.1±7.1 (range: 20 – 40) year, furthermore, half of the studied group aged 20 – 29 years, and only 6 (5%) of participants aged 40 years or more. Regarding the gravidity, almost

two thirds (66.7%) of the women were primigravida, and 66.7% delivered by normal vaginal delivery (NVD). The mean gestational age at delivery was 39.4 ± 1.48 (range: 37 – 42) weeks and the mean birth weight was 3.4 ± 0.7 (range: 2.2 – 5.0) kg, (Table 1). The indication for induction of labor was premature rupture of membrane in 51.7% of women, postdate in 25% and medical diseases in the remaining 23.3%, (Figure 1). The Bishop score was < 6 in 92 (76.7%) and ≥ 6 in 28 (23.3%) women , cervical length was ≥ 30 mm in 70 (58.3%) and < 30 mm in 50 (41.7%) women, (Table 2). Further subgrouping of the study participants was made according to their Bishop score and cervical length combination, into four subgroups, (Table 3). The cross-tabulation of Bishop score against cervical length revealed a significant association between the two parameters, (P<0.001), that cervical length of ≥ 30 associated with lower Bishop score, (less than 6) which indicated an inverse correlation between the two parameters, (Table 4). From other point of view, there was a statistically significant association, (P<0.001), between unfavorable combination of (Bishop score < 6 and cervical length > 30 mm) and delivery by cesarean section; 54.5% of pregnant women with this combination delivered by cesarean section compared to lower proportions among other combination subgroups, while all the 24 pregnant women with favorable combination (Bishop score > 6 and cervical length < 30 mm) delivered by normal vaginal mode of delivery (Table 5).

Table 1. Baseline characteristics of the studied group

Variables	Number of patients (%) [*]
Age	
Less than 20	24 (20.0)
20-29	60 (50.0)
30-39	30 (25.0)
≥ 40	6 (5.0)
mean ± SD (range)	26.1 ± 7.1 (16 – 40)
Gravidity	
Primigravida	80 (66.7)
Multigravida	40 (33.3)
Mode of delivery	
NVD	80 (66.7)
CS	40 (33.3)
Gestational age mean ±SD (range) week	39.4±1.48 (37-42)

Birth weight (range) kg	mean ± SD	3.4±0.7 (2.2-5.0)
-----------------------------------	-----------	-------------------



* Values are frequency and percentages unless mentioned, SD: standard deviation, NVD: normal vaginal delivery, CS: Cesarean section

Figure 1. Indications of induction of labor

Table 2. Distribution of the studied group according to their Bishop score and cervical length

Parameter		Number of patients	%
Bishop score	< 6	92	76.7
	> 6	28	23.3
Cervical length	≥ 30	70	58.3
	< 30	50	41.7

Table 3. Subgrouping of the study participants according to the Bishop score and cervical length combination

Bishop score , cervical length	Number of patients	%
>6 , <30 mm	24	20.0
<6 , <30 mm	26	21.7
>6 , >30 mm	4	3.3
<6 , >30 mm	66	55.0

Table 4. Cross-tabulation between Bishop score and cervical length of the pregnant women

	Cervical length (mm)				Total	
	≥ 30		< 30		No.	%
Bishop score	No.	%	No.	%		
Less than 6	66	94.3	26	52.0	92	76.7
More than 6	4	5.7	24	48.0	28	23.3

Total	70	58.3	50	41.7	120	100.0
Chi square= 29.2, P. value < 0.001						

Table 5. Association between (bishop score, cervical length) combination and mode of delivery of the pregnant women.

bishop score , cervical length	Mode of delivery				Total	
	Cesarean section		Normal vaginal		No.	%
	No.	%	No.	%		
>6 , <30 mm	0	0.0	24	100.0	24	20.0
<6 , <30 mm	4	15.4	22	84.6	26	21.7
>6 , >30 mm	0	0.0	4	100.0	4	3.3
<6 , >30 mm	36	54.5	30	45.5	66	55.0
Total	40	33.3	80	66.7	120	100.0
Fisher's exact test , P < 0.001						

DISCUSSION

The advantage of trans-vaginal sonography (TVS) as predictor of effective induction of labor in collaboration with Bishop's Score have been assessed by several authors, thus the present research attempted to assess the purpose of cervical length and Bishop score in forecasting proper induction of labor in groups of expectant mothers in Iraq. The outcomes the research were related to the same to those found by Bartha et al., concerning, the signs of induction, and features of those affected⁶. Bartha et al. established that the number of women given prostaglandins and assigned in the unripe group for induction of labor considerably reduced employing the ultrasound thresholds as compared to the standard approach of an improved Bishop's score. An improved Bishop's score has the ability to predict the extent which are impossible to be assessed by TVS, the assessment stands to be an issue of concern in regard to variations of professional clinical skills of the assistants, nonetheless, the ultrasonography examination of the cervix is slightly independent & could be applied in making a proper decision prior to labor inductions^{5,11}. The present research showed that both approaches to cervical examination including cervical length and Bishop's score were considerably associated with a successful induction, however, Elghorori & others, determined that

the TVS cervical size examination is superior to Bishop's score when it comes to forecasting the induction delivery period and achievement labor induction¹³. The current research established that cervical size found by TVS was greatly smaller in those women who deliver vaginally as compared to those who delivered through cesarean section. Cervical size less than 30 mm and Bishop's score more than 6 were highly associated with proper induction, and a considerable extent of vaginal births. Gonen et al.¹⁴ determined that the T.V.S. assessment of the cervix prior to induction did have any impact on forecasting of cervical inducibility attained through an improved Bishop's score and all the approaches of examination of the cervix were highly linked to proper induction specifically, when the Bishop's score was less than the value of 6, and cervical size of 27 mm through the TVS method. Pandis et al. established that the finest minimum mark in forecasting proper induction was cervical size of 28 mm, and a Bishop's score of 3, similarly, they indicated that, the size of cervix seems to be a good forecaster of proper indication. Daskalaki et al.¹⁵ stated that the Bishop's score couldn't influence mode of delivery, an expectant women with a cervical size of 27.0mm is liable to give vaginal birth, likewise, Boozarjiomebrii et al.¹⁶ established that availability of cervical routing is considerably linked to less latent stage and less induction delivery period. Tan et al.¹⁷ determined that TVS was less agonizing as compared to digital assessment. Therefore, both Bishop's and cervical length score were forecasters of a proper induction. Yaing et al.¹⁸ stated that the cervical size 3.0cm or below could be a predictor of mode of delivery and labor induction. Abdelazim et al.¹ and El-mekkawi et al.¹⁹ acknowledged a substantial connection between the cervical size and positive labor induction and not Bishop's score.

CONCLUSION

Trans-vaginal sonography measurement of favorable cervical length and favorable Bishop's scores were both significantly associated with successful induction and could be good predictors of successful induction.

Conflict of Interest Author declared: None

Source of Funding: Self-funded

Ethical Clearance: Data of participants were collected according to the Declaration of Helsinki,

Informed verbal and signed consent were obtained from each participant pregnant woman, additionally all official agreements were obtained from the administration office of the hospital and the local ethical committee of the college of medicine and Babylon health directorate before starting the study.

REFERENCES

1. Abdelazim IA, Abu faza ML. Sonographic assessment of the cervical length before induction of labor. *Asian Pacific J Reprod* [Internet]. 2012;1(4):253-7.
2. Bennett KA, Crane JMG, O'shea P First trimester ultrasound screening is defective in reducing post-term labour induction rates: A randomized controlled trial, *AMJ Obstet Gynecol*, 2004; 190: 1077-82
3. Pandis G, Papageorghiou AT, Ramanathan VG, Thompson MO, Nicolaidis KH. Preinduction sonographic measurement of cervical length in the prediction of successful induction of labor. *Ultrasound in Obstetrics & Gynecology*. 2001;18(6):623-8.
4. Caliskan E, Bodur H, Ozeren S, Corakci A, Ozkan S, Yucesoy I. Misoprostol 50 µg sublingually versus vaginally for labor induction at term: a randomized study. *Gynecologic and obstetric investigation*. 2005; 59(3):155-61.
5. Jackson GM, Ludmir J, Bader TJ. The accuracy of digital examination and ultrasound in the evaluation of cervical length. *Obstetrics and gynecology*. 1992;79(2):214-8.
6. Bartha JL, Romero-Carmona R, Martínez-del-Fresno P, Comino-Delgado R. Bishop score and transvaginal ultrasound for preinduction cervical assessment: a randomized clinical trial. *Ultrasound in obstetrics & gynecology*. 2005;25(2):155-9.
7. Kanwar SN, Reena P, Priya BK. A comparative study of trans vaginal sonography and modified Bishop score for cervical assessment before induction of labour. *Sch J App Med Sci*. 2015 Sep;3(6B):2284-8.
8. Dhall K, Mittal SC, Kumar A. Evaluation of pre induction scoring system *ANZJ Obstet Gynecol*, 1987; 27: 309-311
9. Friedman EA, Niswander KR, Bayonet-rivera NP, Sachtleben MR. Relation of prelabor evaluation to

- inducibility and the course of labor. *Obstetrics & Gynecology*. 1966 Oct 1;28(4):495-501.
10. Chandra S, Crane JM, Hutchens D, Young DC. Transvaginal ultrasound and digital examination in predicting successful labor induction. *Obstetrics & Gynecology*. 2001 Jul 1;98(1):2-6.
 11. Gabriel R, Darnaud T, Chalot F, Gonzalez N, Leymarie F, Quereux C. Transvaginal sonography of the uterine cervix prior to labor induction. *Ultrasound in obstetrics & gynecology*. 2002 Mar 1;19(3):254-7.
 12. Braithwaite JM, Economides DL. Acceptability by patients of transvaginal sonography in the elective assessment of the first-trimester fetus. *Ultrasound in Obstetrics & Gynecology*. 1997 Feb 1;9(2):91-3.
 13. 19. Elghorori MR, Hassan I, Dartey W, Abdel-Aziz E, Bradley M. Comparison between subjective and objective assessments of the cervix before induction of labour. *Journal of obstetrics and gynaecology*. 2006 Jan 1;26(6):521-6.
 14. 20. Gonen R, Degani S, Ron A. Prediction of successful induction of labor: comparison of transvaginal ultrasonography and the Bishop score. *European journal of ultrasound*. 1998 Aug 1;7(3):18
 15. 21. Daskalakis G, Thomakos N, Hatzioannou L, Mesogitis S, Papantoniou N, Antsaklis A. Sonographic cervical length measurement before labor induction in term nulliparous women. *Fetal diagnosis and therapy*. 2006;21(1):34-8.
 16. Boozarjomehri F, Timor-Tritsch I, Chao CR, Fox HE. Transvaginal ultrasonographic evaluation of the cervix before labor: presence of cervical wedging is associated with shorter duration of induced labor. *American Journal of Obstetrics & Gynecology*. 1994 Oct 1;171(4):1081-7.
 17. 22. Tan PC, Vallikkannu N, Suguna S, Quek KF, Hassan J. Transvaginal sonographic measurement of cervical length vs. Bishop score in labor induction at term: tolerability and prediction of Cesarean delivery. *Ultrasound in obstetrics & gynecology*. 2007 May 1;29(5):568-73.
 18. 23. Yang SH, Roh CR, Kim JH. Transvaginal ultrasonography for cervical assessment before induction of labor. *Journal of ultrasound in medicine*. 2004 Mar 1;23(3):375-82.
 19. El-mekkwawi S, Hanafi S, Khalaf-allah A, Abdelazim IA, Awadalla AM, Mohammed E. Cervical Length Versus Modified Bishop ' s Score for Prediction of Successful Labor *Journal of Basic and Clinical Reproductive Sciences* 2017; 117–22.

Nurse Managers' Utilization of Fayol's Theory in Nursing

Joel Rey U Acob¹, Heru Santoso Wahito Nugroho², Wiwin Martiningsih³

¹College of Nursing, Visayas State University, Philippines, ²Health Polytechnic of Surabaya, Indonesia,

³Health Polytechnic of Malang, Indonesia

ABSTRACT

The main aim of this paper is to appreciate and evaluate human resource management practice of nurse managers utilizing Henri Fayol's theory. The study being conducted to health facilities in Southern Leyte purposively employed sixteen respondents qualified based on the inclusion criteria such as having supervisory experience of atleast five years, either male or female and with permanent employment status. The study utilized descriptive-evaluative research design in order to collect information without manipulating or changing study subjects and its environment. Demographic data were tabulated using simple percentage. Weighted mean was also used to establish different management practice delivered and implemented by nurse managers. Based from the findings, most of the nurse managers were female (87%), aging 40-47 years old, with an average gross individual monthly income of 17,000 to 25,000 thousand pesos. All of them did not have units of graduate degrees, however underwent trainings parallel to nursing practice. Education and supervisory-related trainings were acquired through shadowing and peer-coaching. Nurse managers identified that the fast turnover of staff nurses is the leading factor affecting human resource management due to low salary rate of staff nurses. Planning and controlling were the least among the five managerial roles delivered by nurse managers.

Keywords: Nurse managers, Management theory, Nursing management

INTRODUCTION

The American Nurse's Association defined nursing practice as the promotion, prevention, optimization of patient's abilities, alleviation of suffering through diagnosis and proper treatment and advocating in the care of different clienteles across lifespan. A nurse, as a professional performer of the nursing discipline is called to deliver what is expected of his/her profession to satisfy the acceptable level of care for the sick and well to individuals, families, communities and the population. As a nurse emerges over the changing practice in health care, he/she is also expected to assume roles as communicator, advocate, change agent, leaders and managers and research consumers. A nurse manager must recognize the need for growth within, which then

translates into improvement of one's practice. Practicing nurse managers illustrate role perceptions; cite decision making and problem solving as major roles for which maintaining objectivity is a special challenge⁽¹⁾.

Rapid changes in today's health care industry are reshaping the nurse's role. The emergence of new health care systems, the shift from service orientation to business orientation, and an extensive redesign of the workplace directly affect where and how nursing care is delivered as well as those who deliver the care. Nurses must understand the health care system, the organizations they work and resources as well. They need to recognize what external factors affect their work and how to influence those forces.

In the Philippines, Health Care System is in the midst of significant and dramatic development as it continues to rapidly evolve - the devolution of hospitals to the Local Government Unit; free health care for the senior citizens; and the no-balance billing policy for the indigents. These resulted to increase number of patients

Corresponding Author:

Heru Santoso Wahito Nugroho

Health Polytechnic of Surabaya

Jl. Pucang Jajar Tengah 56 Surabaya, Indonesia

heruswn@poltekkesdepkes-sby.ac.id

in the hospital which in turn increased the workload of staff nurses and nurse to patient ratio adding more burdens to the nurse managers. The impact of these changes greatly affects the role of nurse managers in their practice. They are tasked with a wider range of playing both the key to ensuring quality patient care and excellent workplace for staff nurses.

The roles of managers have expanded in response to changing health care delivery, practice and the philosophical shift. In exploring the concept of management in practice, all nurses are managers⁽²⁾. They direct the work of professionals and non-professionals in order to achieve expected outcomes of care. Sullivan mentioned that nurse managers in the health care setting is responsible and accountable for the goals of the organization⁽³⁾.

As stated in the Philippine Nursing Law, a person occupying managerial positions requiring knowledge of nursing must be a registered nurse, have at least two years experience in general nursing service administration; possess a degree of BSc in Nursing, with at least nine units in management and administration courses at the graduate level; and be a member of good standing of the accredited professional organization⁽⁴⁾.

No study has been made to document how the nurse managers utilized Fayol's theory of management in human resource⁽⁵⁾ of the nursing practice with dynamism to the changing health care practice. This study deeply appreciate and evaluate human resource management practice of nurse managers utilizing Fayol's theory in the changing health care practice which must be looked into for possible enhancement of these management components to effectively deliver care among clientele.

MATERIALS AND METHOD

The study utilized descriptive-evaluative research design to collect information without manipulating or changing study subjects and its environment. Therefore, the researcher cannot in anyway interact with the environment to avoid changes related to the study. The descriptive technique permits the statement about the identified management functions of nurse managers utilizing Fayol's theory⁽⁵⁾.

The study as conducted to selected health care facilities in Southern Leyte. It is the only tertiary and government-owned hospital having 100 bed-capacities

with an average of 85 to 95 patients and admissions daily. The hospital is divided into different wards and departments. As the catchment hospital in Southern Leyte and its neighboring provinces in the region, it also houses special areas such as operating room, Intensive care unit, emergency and delivery rooms and the office of the Integrated Provincial Health Offices (IPHO) where all community health services in the Rural Health Units (RHU) are being facilitated.

A purposive non-probability sampling was used in this study to acquire data that sufficed the research's query. A purposive sampling selected the study participants based on personal judgment guided by the set inclusion criteria. They were nurse supervisors with permanent employment status, having five years of supervisory experience, either male or female, regardless of the age at the time of data collection.

The study developed a researcher-made questionnaire based on Henri Fayol's theory of management. The tool had two parts which includes demographic profile of the study participants such as age, gender, gross individual monthly income, number of years of supervisory experience, trainings, graduate or postgraduate programs earned and completed as of the date of the study. The second part of the instrument constitutes the five managerial functions in Henri Fayol's theory of management⁽⁵⁾. The five management components include planning, organizing, commanding, coordinating and controlling. Each management function has five statements and nursing situations commonly observed in the nursing practice and workplace which also describes the function. Literature readings and systematic integrative reviews were also utilized to enhance each description under each function. A total of twenty five evaluative statements were pre-tested to nurse supervisors having the same inclusion criteria of the actual participants. The purpose of the tool pre-testing was to ensure validity and reliability of the instrument, appropriateness of the words used and comprehensiveness. The tool was Likert- scaled as follows: 5- very well delivered, 4- well delivered, 3- delivered, 2- least delivered, 1- not delivered, respectively.

The researcher communicated the heads of the nursing service where the study was conducted. Consent was signed and accomplished. Pilot test was done and incorporation of results was made prior to the actual

conduct. The survey tool was distributed, then retrieved and tabulated thereafter. The researcher together with the statistician analyzed and interpreted the data.

The categorical data (demographic profile) were analyzed using frequencies and percentages⁽⁶⁾. For numerical data, weighted arithmetic mean was used⁽⁷⁾ to determine the different management components adopted by the nurse managers of the hospital's human resource.

FINDINGS AND DISCUSSION

Demographic profile

Table 1. Distribution of Age and Gender

Age 40-47 years old	Male	Female
Gender	2	14
Percentage	12.5%	87.5%

Most of the respondents ages 40-47 years old which are considered young adult as per Erikson's classification of role development. This implies according to the study of Zwick that younger supervisors are frequently associated with technical skills and knowledge, innovation, creativity, flexible to work schedules and is open to new knowledge⁽⁸⁾. Most of the nurse supervisors were female, which supported the findings of Wilson that the nursing profession is female-dominated work. The nursing is viewed as a caring profession so as women fit for the job due to their motherly instinct. In the presence of this limelight, men were driven away to choose nursing as their profession⁽⁹⁾.

Table 2. Monthly Salary Gross Income and Years of Supervisory Experience

Salary	17,000-24,000
Years of experience	
5 years and 11 months	10 (62.5%)
6-10 years	6 (37.5%)

The respondents were well compensated as stipulated by Republic Act (RA) 7301 otherwise known as the Magna Carta of Public Health Workers. The RA mandated that public health workers should receive salary

Grade 16 for supervisory function with increments every ten years including allowances and benefits, additional compensations and applicable incentives⁽¹⁰⁾. Dacang mentioned that in some private hospitals and health care institutions, employers can not provide higher salary since its revenue were dependent to economic viability of the hospital⁽¹¹⁾. Patient admissions were getting smaller every time because of the high cost appropriated to health services in private hospitals which in turn limit the capacity to increase compensation of health workers.

Most of the nurse managers had five years of experience in supervisory functions. This indicates that the respondents were in the expert level classification of Benner's theory⁽¹²⁾. Benner novice to expert model identified nurses with at least two years of managerial experience who are proficient enough and capable to see nursing situation as a whole and more than the sum of its parts. Proficient nurses were able to learn from their daily experience and typically adjust plans in accordance to the need of different life events. The result conformed to the requirement of RA 9173 also known as the Philippine Nursing Act of 1991 that states nursing administrators should have at least two years of experience in general administration on nursing service⁽¹⁰⁾.

However, on the basis educational attainment required as supervisor, none among the respondents acquired units for graduate education. In Article VI, Section 29 of RA 9173 requires nurse managers to have nine units in management administration courses at the graduate level⁽¹⁰⁾. This was caused to weak implementation and reinforcement of the rules and regulations to be implemented. Further, the weak educational qualification of the individual hampers to receive promotion because of the seniority or ones political affiliation. On the other hand, nurse supervisors had undergone trainings like shadowing and peer-coaching. The data implies that the respondents were able to acquire knowledge that was used in supervisory role in the area of assignment. Dehghani explained that the nurse managers are responsible to directly supervise transactions in the nursing service and aid in reaching the goals of the organization. Supervisors are responsible to expand knowledge, skills and commitment of the staff nurses and nursing personnel for efficient delivery of care that is why high educational qualification is needed to guarantee the quality of care implementation⁽¹³⁾.

Table 3. Educational Attainment and Trainings

Educational Attainment	
BS	16
MA/MS/MN/MM	0
PhD, DNS, DM	0
Trainings	16

Table 4. Planning, Organizing, Coordinating, Commanding and Controlling

Planning function	Mean		Parameters	Interpretations
s1	2.93			
s2	2.5			
s3	1.6			
s4	1.93			
s5	2.855			
Total	4.726	2.363		
Organizing function				
s1	3.96			
s2	3.89			
s3	3.785			
s4	3.375			
s5	3.635			
Total	7.458	3.729		
Coordinating				
s1	4.09		1.01-1.49	Not delivered
s2	4.57		1.5 -2.49	Least delivered
s3	4.245		2.5- 3.49	Delivered
s4	4.66		3.5- 4.49	Well delivered
s5	4.785		4.5- 5	Very well delivered
Total	8.94	4.47		
Commanding				
s1	4.785			
s2	4.945			
s3	4.66			
s4	4.715			
s5	4.93			
Total	9.614	4.807		
Controlling				
s1	2.5			
s2	2.5			
s3	3			
s4	2.5			
s5	3.285			
Total	5.514	2.757		

Management Functions of Nurse Managers on Human Resource using Fayol's Theory

The table displayed the predominant management functions of nurse supervisors in the health care facility and focuses on Henri Fayol's five management functions⁽⁵⁾. Based from the results, nurse managers' predominant function was commanding (4.807), while the least delivered function was planning (2.363). The data implies that nurse manager's primary role was to command subordinates and ensure strict observance to chain of authority. This is to ensure proper communication and staff-manager relationship. The establishment of this connection motivates the staff nurses to shelter compliance and respect to institutional policies governing the practice of nursing. On one hand, the planning function of the nurse managers was least delivered. This effect supported the findings of Brown (2008) that planning as a dynamic function of a nurse manager was acquired on both experience and continuing education agenda⁽¹⁴⁾. The know-how prepares the nurse when circumstance of the same would ensue in the future. Education and equipment of comprehension were obtained in formal instruction course through earning a degree.

The management is about enforcing laws or setting tolerable standards in the performance and not being proactive which managers are experiencing difficulties from their day-to-day encounter⁽¹⁶⁾. Management by exception was often related to poor satisfaction and absenteeism. The fast turnover of nurses in the workplace limits the nurse manager's capacity to control human resource due to low salary rate and high nurse to patient ratio. In this effect however, nurse supervisors developed new roles over time such as carative managerial role, collegial and the character to educate other hospital staffs⁽¹⁶⁾.

The management is about enforcing laws or setting tolerable standards in the performance and not being proactive. Management by exception was often related to poor satisfaction and absenteeism. The fast turnover of nurses in the workplace limits the nurse manager's capacity to control human resource due to low salary rate and high nurse to patient ratio. As stated in the House Bill number 2145 of the Philippines' House of Representatives, the nurse-patient ration in government hospitals and public health system was generally below the standard of quality nursing care. However, according

to Umil (2015) that nurses were forced to perform on-duty longer than the mandated eight hours of hospital work because of the insufficient supply of nurses⁽¹⁵⁾. The worsening condition of government hospitals became one of the leading challenges in Philippine health care sector. This resulted to inability of the nurse managers to control human resource for safe delivery of care⁽¹⁷⁾.

Based on the description above, the nurse managers need to immediately prepare a plan for management improvement which is their main task, by first arranging the elements to be improved based on the priority order. In this case, there are many ways to arrange the order of priorities, for example using the Difficultness-Usefulness Pyramid (DUP) method⁽¹⁸⁾.

CONCLUSION AND SUGGESTION

From the findings of the study, the researcher concluded that nurse managers were generally young adult, earning a gross income of 25,000 pesos per month on the average. The nurse managers acquired supervisory skills through peer-coaching and shadowing from senior managers as overseer of the daily transaction in nursing service. All of them did not obtain units in graduate programs, however attended trainings, conventions and fora for professional growth. The findings also revealed that planning and controlling were the two of the management functions least delivered while commanding was very well executed. Fast turnover of nurses and absenteeism were among the prime problems encountered by nurse managers.

Based from the results, the researcher suggests the following measures. First, nurse managers are encouraged to enroll to a graduate degree program to enhance managerial and supervisory skills. Second, the government or state legislators to revisit laws and policies in the provision of outright compensation to generate more job opportunities among nurses in the hospital to address fast turnover of nurses. Third, to develop actions to highlight other supervisory functions of the nurse such as staff development especially on human resource utilization.

Ethical Clearance, Funding and Conflict of Interest: This study has obtained ethical clearance in accordance with the provisions of research in health. All funds required for the implementation of this research come from the researchers. This research does not contain the potential for conflict of interest.

REFERENCES

1. ANA. Standards and Practice of Nursing. American Nurses Association; 2012.
2. Masters K. Role Development in Professional Nursing Practice. 2nd ed. Sudburg, Massachusetts: Jones & Bartlett Publishers; 2009.
3. Sullivan EJ, Decker PJ. Effective Leadership and Management in Nursing. Upper Saddle River, NJ: Pearson Education; 2005.
4. Association of Nursing Service Administrators of the Philippines, Inc. Standards of Nursing Services. 2001.
5. Fayol H. Leadership and Management Functions. Wall Street, Burlington, MA 01803; 1988.
6. Nugroho HSW. Descriptive Data Analysis for Categorical Data (Analisis Data Secara Deskriptif untuk Data Kategorik). Ponorogo, Indonesia: Forikes; 2014.
7. Nugroho HSW. Descriptive Data Analysis for Numerical Data (Analisis Data Secara Deskriptif untuk Data Numerik). Ponorogo, Indonesia: Forikes; 2014.
8. Zwick E. The Theory of Evidence of Management. Journal of Management. 2013;128(3):1365-1390.
9. Wilson V. Research Methods: Mix Methods Research. Canada: University of Saskatchewan; 2013.
10. Republic Act 9173 on Philippine Nursing Act of 1991 [Internet]. 1991 [cited 2014 Oct 07]. Available from: <http://www.phinursinglaw>
11. Dacang P. A Nursing Perspective on Management. Philadelphia: W. B Saunders; 2012.
12. Benner P. From Novice to Expert: Excellence and Power in Clinical Nursing Practice. Menlo Park, CA: Addison-Wesley; 2011.
13. Dehghani S. Role and Working Conditions of Hospital Nurse Managers. 2016.
14. Brown J. Clinical Practice and Management. Journal of Nursing Service. 2012;13(4):22-27.
15. Umil D. Nurse Exodus: The Endured Experience of Nurses [Internet]. Wiley Online Library. 2015 [cited 2017 Dec 31]. Available from: <http://onlinelibrarywiley.com.doi.abstract>
16. Acob JRU, Martiningsih W. Role Development of Nurse Managers in The Changing Health Care Practice. Jurnal Ners dan Kebidanan. 2018;5(1). DOI:10.26699/jnk.v5i1.ART.p066-068.
17. Clark A. Management Guide. Diane Publishing; 2008.
18. Nugroho HSW, Sillehu S, Handoyo, Suparji, Sunarto, Subagyo, Sunarko B, Bahtiar. Difficultnes-Usefulness Pyramid (DUP) as New Method to Select Elements Prioritized in Management of e-Learning in Health. Indian Journal of Public Health Research & Development. 2018;9(2):206-2011. DOI : 10.5958/0976-5506.2018.00120.1.

The Relationship of Smartphone Addiction with Teenagers Mental Health in Vocational High School Padang Indonesia 2017

Meri Neherta¹, Trivini Valencya¹, Yoshi Hernanda¹

¹Faculty of Nursing Andalas University, Padang, Indonesia

ABSTRACT

Aims & Objectives: Teenagers mental health problems at this time is worrying, 1 of 7 children and adolescents aged 4-17 years or equivalent to 560,000 people have mental disorders. Using smartphones in a long time is one of many causes of mental health problems. **Material & method:** The design of this study is a cross-sectional study with sample of 275 people taken randomly using stratified random sampling method. The bivariate analysis is using the chi-square test. **Results:** The results showed that more than half of respondents (54.5%) experienced mental health problems. Then (77%) respondents who used the smartphone with long-term use of 5-6 hours a day experienced mental health problems, so it can be concluded that the long use of smartphones significantly related to adolescents mental health in Vocational High School Padang with $p = 0.000$ ($p < 0.05$). **Conclusion:** It is expected that the school can cooperate with the health services to handle mental health problems that occur in vocational high school Padang.

Keywords: Smartphone, addiction, teenagers, mental health

INTRODUCTION

Smartphones in teenagers are no longer foreign thing. Almost all teenagers at this time are already use smartphones in their daily lives. This is caused by the large amount of information that can be accessed via smartphone. In 2015 smartphone users in the world are about 55.4 million people. In 2016 it is increased to 65.2 million users. It is expected that in 2019, smartphone users will increase significantly. It has been proved by Netherland research country, the result showed that 90% of adolescents are already using smartphones^(1,2). Besides having many benefits in everyday life, smartphones are also have risk to damage health, including mental health⁽³⁻⁷⁾. Mental health disorders is one of the problem that occurred by long-term use of smartphone (over 3 hours), it is also included: excessive tension and excitement, depression, sleep disturbance, pornography^(5, 8, 9). Further impact, long-term of smartphone use is

affecting the quality of human resources of the nation's successors.

METHOD

This research uses descriptive anatilitk design with cross-sectional study approach. The research was conducted by distributing questionnaires. There is any problem when the research conduction, so questionnaires filling is assisted by teachers of Vocational High School Padang Padang. But previously before describe, the researchers explain how to fill the questionnaires first. Sample inclusion criteria are students of grade X and XI in Vocational High School Padang, Willing to be respondents, present at the time of research, and using a smartphone.

This study used a sample of 275 people with Sample selection technique in this study using a random sample (Random Sampling). The sampling technique is using Stratified Random Sampling with sampling type from a proportional sample. Univariate analysis was performed on each variable from the research result using frequency distribution test, and bivariate analysis using chi-square test.

Corresponding author:

Dr. Ns. Meri Neherta, M. Biomed

(merineherta@nrs.unand.ac.id)

Faculty of nursing Andalas University.

RESULTS

Duration of smartphone Usage

Based on the results of the research in 5.4 table, it was found that from 275 respondents, there were 60 (21.8%) respondents with long duration of smartphones usage, very long smartphone usage as much as 61 (22.2%) respondents, 94 (34.2%) respondents using smartphones in medium duration, 43 (15.6%) respondents use smartphones with short duration usage and 17 (6.2%) respondents using smartphone in very short duration in Vocational High School Padang. Longest usage the most smartphone is of medium duration or as much as 3 - 4 hours per day.

MENTAL HEALTH

The results of the research on mental health of adolescents in Vocational High School Padang is known that more than half of 150 (54.5%) of respondents experienced mental health problems and 125 (45.5%) of respondents did not experience mental health problems.

In this study, respondents experiencing mental health problems can be seen from the answers to some questionnaires such as, from 150 (54.5%) of respondents who experience mental health problems 25% often feel inferior. Then 23% of respondents who experience mental health problems also often feel has a lot of problems that bother them. Furthermore, often feel happier outside the house than to be in the house also felt by 23% of respondents who have problems in mental health. 22% of respondents who experience mental health problems also often lose a lot of sleep because they feel worried and 21% are also often woke up at night.

Age of respondents are between 15 to 19 Years, with the number of respondents as many as 275 people consist of 258 men and 17 women. The result of this study shown that as many as 186 (67.6%) people perceived health problems and 89 (32.4%) people did not have health problems. The data of the long-term use of smartphones shown that as many as 121 people (44%) use smartphones more than 5 smartphones hour, 94 (34.2%) use smartphone for 3-5 hours, and only 60 people (21.8%) was using a smartphone for less than 3 hours. From all respondents it was known that 150 people (77%) had mental health problems, and 63 people (23%) had no mental health problems. Chi-square test results showed that there is a significant relationship between

the long-term use of smartphones with adolescent mental health in Vocational High School 5 Padang with $p = 0.000$ ($p < 0.05$).

DISCUSSION

From the results of the research we found that the long-term use of smartphones will be very effected to the body's physical and psychological health⁽¹⁰⁻¹²⁾. There are many physical effects caused by using smartphones, including: eye disorders, back problems, hearing loss, visual impairment, sleep disturbances, loss of appetite and cancer^(10, 13, 14). While, the psychological impact of the smartphone usage in a long-term is sleep disturbance, fatigue and depression⁽¹⁵⁻¹⁷⁾. The results of research showed that in Vocational High School 5 Padang long-term of smartphone usage is cause mental health problems. From the research results it is known that more than half of 150 (54.5%) of respondents experienced mental health and 125 (45.5%) of respondents did not experience mental health problems.

In this study, respondents who experienced mental health is known from the answer to the questionnaire that has been given, from 150 (54.5%) of respondents who experience mental health problem, 25% often feel inferior. Then 23% of the respondents often feel they have a lot of trouble bothering them⁽¹⁸⁻²⁰⁾. Then respondents who have problems with mental health feel that they often feel tired and prefer to be outdoors (23%) (21-25). 22% 22% of respondents founded, they are difficult to sleep because of feeling worried and 21% of respondents with this mental problem said that they many times wake up at night (16, 26). The results of this study are similar to studies conducted by Matar Boumosleh, J.Jaalouk, in 2017, saying that addiction to smartphones appears to lead to depression and anxiety^(25, 27).

The results of chi-square test known that there is a significant relationship between the long-term use of smartphones with mental health problems $p = 0.000$ ($p < 0.05$). The results of this study indicate that the use of smartphones in a long time causes mental health problems as much as 77% and only 23% of respondents who use smartphones in the long time that did not experience mental health problems.

CONCLUSION

The longest duration of smartphones usage that most obtained from the respondents is moderate duration as

much as 34.2%. More than half of respondents (77%) have mental health problems at Vocational High School Padang Indonesia. There is a significant relationship between the length of smartphones usage with mental health of adolescents in Vocational High School Padang Indonesia.

Conflict of Interest : No conflict of interest arose in this study.

Source of Finding: This study was conducted using a source of funds derived from the researcher himself.

Ethical Clearance : This study has passed of the medical research ethics of the Dr. M. Djamil Hospital Padang Indonesian.

REFERANCES

- Duncan DT, Goedel WC, Stults CB, Brady WJ, Brooks FA, Blakely JS, et al. A Study of Intimate Partner Violence, Substance Abuse, and Sexual Risk Behaviors Among Gay, Bisexual, and Other Men Who Have Sex With Men in a Sample of Geosocial-Networking Smartphone Application Users. *Am J Mens Health*. 2018;12(2):292-301.
- Kang H, Shin W. Do Smartphone Power Users Protect Mobile Privacy Better than Nonpower Users? Exploring Power Usage as a Factor in Mobile Privacy Protection and Disclosure. *Cyberpsychol Behav Soc Netw*. 2016;19(3):179-85.
- Lin YH, Chang LR, Lee YH, Tseng HW, Kuo TB, Chen SH. Development and validation of the Smartphone Addiction Inventory (SPAI). *PLoS One*. 2014;9(6):e98312.
- Mok JY, Choi SW, Kim DJ, Choi JS, Lee J, Ahn H, et al. Latent class analysis on internet and smartphone addiction in college students. *Neuropsychiatr Dis Treat*. 2014;10:817-28.
- Schulte-Wissermann H. [Stress - and the risk for addiction by the smartphone]. *Kinderkrankenschwester*. 2015;34(11):412.
- Cho S, Lee E. Development of a brief instrument to measure smartphone addiction among nursing students. *Comput Inform Nurs*. 2015;33(5):216-24.
- Choi SW, Kim DJ, Choi JS, Ahn H, Choi EJ, Song WY, et al. Comparison of risk and protective factors associated with smartphone addiction and Internet addiction. *J Behav Addict*. 2015;4(4):308-14.
- Lin YH, Lin YC, Lee YH, Lin PH, Lin SH, Chang LR, et al. Time distortion associated with smartphone addiction: Identifying smartphone addiction via a mobile application (App). *J Psychiatr Res*. 2015;65:139-45.
- Lopez-Fernandez O. Short version of the Smartphone Addiction Scale adapted to Spanish and French: Towards a cross-cultural research in problematic mobile phone use. *Addict Behav*. 2017;64:275-80.
- Lin YH, Chiang CL, Lin PH, Chang LR, Ko CH, Lee YH, et al. Proposed Diagnostic Criteria for Smartphone Addiction. *PLoS One*. 2016;11(11):e0163010.
- Csibi S, Demetrovics Z, Szabo A. [Development and psychometric validation of the Brief Smartphone Addiction Scale (BSAS) with schoolchildren]. *Psychiatr Hung*. 2016;31(1):71-7.
- Enwereuzor IK, Ugwu LI, Ugwu DI. Role of smartphone addiction in gambling passion and schoolwork engagement: a Dualistic Model of Passion approach. *Asian J Gambl Issues Public Health*. 2016;6(1):9.
- Lee H, Seo MJ, Choi TY. The Effect of Home-based Daily Journal Writing in Korean Adolescents with Smartphone Addiction. *J Korean Med Sci*. 2016;31(5):764-9.
- Liu CH, Lin SH, Pan YC, Lin YH. Smartphone gaming and frequent use pattern associated with smartphone addiction. *Medicine (Baltimore)*. 2016;95(28):e4068.
- Lin YH, Pan YC, Lin SH, Chen SH. Development of short-form and screening cutoff point of the Smartphone Addiction Inventory (SPAI-SF). *Int J Methods Psychiatr Res*. 2017;26(2).
- Randler C, Wolfgang L, Matt K, Demirhan E, Horzum MB, Besoluk S. Smartphone addiction proneness in relation to sleep and morningness-eveningness in German adolescents. *J Behav Addict*. 2016;5(3):465-73.
- Schulte M, Liang D, Wu F, Lan YC, Tsay W, Du J, et al. A Smartphone Application Supporting Recovery from Heroin Addiction: Perspectives of

- Patients and Providers in China, Taiwan, and the USA. *J Neuroimmune Pharmacol.* 2016;11(3):511-22.
18. AlAbdulwahab SS, Kachanathu SJ, AlMotairi MS. Smartphone use addiction can cause neck disability. *Musculoskeletal Care.* 2017;15(1):10-2.
 19. Ayar D, Bektas M, Bektas I, Akdeniz Kudubes A, Selekoglu Ok Y, Sal Altan S, et al. The Effect of Adolescents' Internet Addiction on Smartphone Addiction. *J Addict Nurs.* 2017;28(4):210-4.
 20. Beison A, Rademacher DJ. Relationship between family history of alcohol addiction, parents' education level, and smartphone problem use scale scores. *J Behav Addict.* 2017;6(1):84-91.
 21. Cho HY, Kim DJ, Park JW. Stress and adult smartphone addiction: Mediation by self-control, neuroticism, and extraversion. *Stress Health.* 2017;33(5):624-30.
 22. Gao T, Xiang YT, Zhang H, Zhang Z, Mei S. Neuroticism and quality of life: Multiple mediating effects of smartphone addiction and depression. *Psychiatry Res.* 2017;258:457-61.
 23. Kim EY, Joo SW, Han SJ, Kim MJ, Choi SY. Depression, Impulse Control Disorder, and Life Style According to Smartphone Addiction. *Stud Health Technol Inform.* 2017;245:1272.
 24. Kim HJ, Min JY, Kim HJ, Min KB. Accident risk associated with smartphone addiction: A study on university students in Korea. *J Behav Addict.* 2017;6(4):699-707.
 25. Matar Boumosleh J, Jaalouk D. Depression, anxiety, and smartphone addiction in university students- A cross sectional study. *PLoS One.* 2017;12(8):e0182239.
 26. Duke E, Montag C. Smartphone addiction, daily interruptions and self-reported productivity. *Addict Behav Rep.* 2017;6:90-5.
 27. Megna M, Gisonni P, Napolitano M, Orabona GD, Patruno C, Ayala F, et al. The effect of smartphone addiction on hand joints in psoriatic patients: an ultrasound-based study. *J Eur Acad Dermatol Venereol.* 2018;32(1):73-8.

Evidence of Hyperglycemia in Patients Using Statin Therapy

Hassan Raji Jallab¹, Noor Khaled Mohamed²

¹Assistant Professor/ Department of Community Medicine/ College of the Medicine/ University of AL-Qadisiyah,

²M.B.Ch.B / Al-Dewanyah teaching hospital/ Al-Dewaniyah Province/ Iraq

ABSTRACT

Objectives: The use of statin as a primary mode in controlling dyslipidemia became and consequent cardiovascular ischemic events a usual trend in the practice of medicine. Thus, the aim of present Study is to study the association between statin use, in terms of the specific drug used the duration of therapy and dose of treatment, and the development of hyperglycemia and or frank diabetes in a cohort of Iraqi patients on variable statin drugs.

Patients and Methods: The study was designed to be a cross-sectional study involving a cohort of 220 Iraqi patients on statin therapy for controlling dyslipidemia. Patients were selected in a systemic random way from the population of patients already visiting the hospital and the primary health care center. Any patient who was already diagnosed by a specialist to diabetes mellitus before starting statin therapy was excluded from this study. A total of 83 days was the length of the period required to collect data from involved patients. Recent measurements of fasting and random blood sugar were obtained for all patients.

Results: Patients on statin fulfilling criteria for the diagnosis of diabetes, random blood sugar of > 200 mg/dl and/or fasting blood sugar of > 125 mg/dl, accounted for 45 out of 220 patients (20.5%). BMI, duration of statin use and a dose of statin showed a significant association with diabetes mellitus, whereas, none of the other variables had a significant effect on the prevalence rate of diabetes mellitus.

Conclusion: Statin therapy is responsible for at least in part for the development of new-onset type 2 diabetes mellitus or worsening already existing resistance to insulin action.

Keywords: *Statin, hyperglycemia*

INTRODUCTION

Diabetes mellitus comprises a group of heterogeneous disorders that share in common the criteria of chronic hyperglycemia [1]. It is one of the most commonly encountered health problems in primary health centers [2,3]. In a small proportion of patients with type 1 diabetes, the destruction of beta cells is of unknown etiology and hence considered idiopathic [4-6]. Type 2 diabetes usually encountered at an age that is older than type 1, hereditary factors plays more significant role in type 1 diabetes and

those patients usually benefit from oral hypoglycemic agents at least early in the disease [7-9]. Atherosclerosis is accelerated and is more severe in patients with diabetes and its related complications such as ischemic heart disease, stroke and poor circulation to extremities, are more frequent and more severe in diabetic patients [10-13]. Efforts to control dyslipidemia in patients with ischemic heart disease, stroke patients and patients with disturbed lipid profile are core in medical practice and the use of statins becomes increasingly frequent in medical practice aiming at prevention of dyslipidemia related complications. Recent controversial studies raised the issue of glucose intolerance and frank diabetes among patients on statin therapy [14-17]; however, little has been found in Iraqi published papers concerning this association. This controversy and the poverty of Iraqi literature dealing with this subject justified the

Corresponding Author:

Hassan Raji Jallab

Email: hassan.jallab@qu.edu.iq

Phone: +964 7828943518,

Al-Diwaniyah/ Iraq/ P.O. Box:88

conductance of the current study.

PATIENTS AND METHOD

The study was designed to be a cross-sectional study involving a cohort of 220 Iraqi patients on statin therapy for controlling dyslipidemia. Patients were selected in a systemic random way from the population of patients already visiting the hospital and the primary health care center. Any patient who was already diagnosed by a specialist to diabetes mellitus before starting statin therapy was excluded from this study. The study was carried out at Al-Diwaniyah teaching hospital and Al-Forat primary health center. The beginning of data collection was dated the 20th March 2018 and ended on the 10th June 2018. A total of 83 days was the length of the period required to collect data from involved patients.

Data were, analyzed and presented using two software programs; these were the Statistical package for social sciences (SPSS) version 23 and Microsoft Office excel 2013. Numeric variables were presented as mean, standard deviation (SD) and range, whereas, categorical variables were expressed as number and percentage. Comparison of mean values between the three groups was done using one-way analysis of variance (ANOVA). The level of significance was considered at $P \leq 0.05$.

RESULTS

Characteristics of patients enrolled in the present study are shown in table 1. Data relating to diabetes mellitus are shown in table 2. The family history of diabetes was seen in 84 (38.2%) of patients. Relative who had diabetes was father, mother, sister or brother and wife in 40 (18.2%), 20 (9.1%), 12 (5.5%) and 12 (5.5%) patients respectively. Out of 220 patients, 212 (96.4%) admitted to checking blood glucose level and accordingly the results were as follows: 200 (90.9%) had blood sugar level of 110-130 mg/dl and 12 (5.5%) had blood sugar level of 161-200 mg/dl. A recent measurement of fasting blood sugar was obtained and accordingly, 45 (20.5%) had FBS in the diabetic range (≥ 126 mg/dl). In addition, random blood sugar was also assessed for all patients and accordingly, 41 (18.6%) had RBS within the diabetic range (> 200 mg/dl). Hence, if FBS measurements were taken into consideration, the prevalence of diabetes in those patients taking statin therapy will be 20.5%. Out of 220 patients, 131 (59.5%) used to check serum lipid profile, whereas, the remaining 89 (40.5%) have been not

interested in measuring serum lipid profile for routine follow up. According to the duration of statin use, eight (3.6%) patients were on a statin for one month or less, 16 (7.3%) patients used statin for up to 3 months, whereas 196 (89.1%) patients used to take a statin for one year or more. According to a specific drug used, 195 (88.6%) patients used atorvastatin, 20 patients used simvastatin, five (2.3%) patients used rosuvastatin and no patient used fluvastatin. According to the dose of treatment, the majority of patients were given 20 milligrams daily, those patients accounted for 134 out of 220 (60.9%). Eighty-two (37.3%) were given 40 mg daily and only four (1.8%) were given 10 mg daily. Most patients (98.2%) taught to take the drug at night whereas, 1.8% used to take the drug at daytime. One hundred twenty-six out of 220 (57.3%) developed side effects these side effects were in the form of arthralgia (12.7%), myalgia (42.7%) and hematuria (1.8%). The majority of patients (72.3%) used to eat lipid Rich diet, 10.9 % of patients used to eat a diet with intermediate lipid content, 12.7% of patients have considered intake of lipid-poor diet and 4.1% of patients have suffered from poor appetite, as outlined in table 3. Patients on statin fulfilling criteria for the diagnosis of diabetes, random blood sugar of > 200 mg/ dl and/or fasting blood sugar of > 125 mg/dl, accounted for 45 out of 220 patients (20.5%). Table 4 showed the association between diabetes mellitus and possible risk factors.

Table 1: General characteristics of the study sample

Characteristic	n	%
Number of cases	220	100.0
Residency		
Urban	171	77.7
Rural	49	22.3
Age		
Mean \pm SD	60.63 \pm 6.67	
Range (Min.-Max.)	45-73	
40-59 years	64	29.1
≥ 60	156	70.9
Gender		
Male	149	67.7
Female	69	31.4
Education		
Illiterate	111	50.5
Primary (not finished)	20	9.1
Primary	52	23.6

Cont... Table 1: General characteristics of the study sample

Secondary or higher	37	16.8
Marital status		
Married	220	100.0
Nor married	0	0.0
Economical status		
Low	38	17.3
Intermediate	161	73.2
Good	21	9.5
Smoking		
Smokers	130	59.1
≥20 per day	122	55.5
<20 per day	8	3.6
Non-smokers	90	40.9
Ethanol		
Yes	40	18.2
No	180	81.8
BMI		
Normal	110	50
Overweight	81	36.8
Obese	29	13.2
Mean ±SD	25.74 ±3.21	
Range (Min.-Max.)	21-39	

Table 2: Data regarding diabetes mellitus

Characteristic	n	%
The family history of diabetes		
Positive	84	38.2
Negative	136	61.8
diabetic Relative		
Father	40	18.2
Mother	20	9.1
Brother or sister	12	5.5
Wife or husband	12	5.5
RBS checking		
Last RBS		
Yes	212	96.4
110-130 mg/dl	200	90.9
131-160 mg/dl	0	0
161-200 mg/dl	12	5.5
No	8	3.6

Cont... Table 2: Data regarding diabetes mellitus

Recent FBS		
<125 mg/dl	175	79.5
≥126 /dl	45	20.5
Recent RBS		
≤ 160 mg/dl	122	55.5
161-200 mg/dl	57	25.9
> 200 mg/dl	41	18.6

Table 3: Data concerning lipid assessment and statin use

Characteristics	n	%
Serum lipid assessment		
Yes	131	59.5
No	89	40.5
Duration of statin use		
One month or less	8	3.6
UP to 3 months	16	7.3
One year or more	196	89.1
Drug used		
Atrovastatin	195	88.6
Simvastatin	20	9.1
Rosuvastatin	5	2.3
Fluvastatin	0	0
Dose		
10 mg	4	1.8
20 mg	134	60.9
40 mg	82	37.3
80 mg	0	0.0
Time of statin intake		
Night	216	98.2
Day	4	1.8
Adverse effects		
Present	126	57.3
Arthlagia	28	12.7
Myalgia	94	42.7
Hematuria	4	1.8
	94	42.7

Table 4: Association between diabetes mellitus and characteristics of the study sample

Characteristic		Diabetic n = 45	Not diabetic n =175	Total	P	Significance
Residency	Urban	37	134	171	0.416	not significant
	Rural	8	41	49		
Age	<60	11	53	64	0.442	not significant
	≥60	34	122	156		
Gender	Male	31	119	150	0.909	not significant
	Female	14	56	70		
Education	Illiterate	23	88	111	0.606	not significant
	Primary (not finished)	5	15	20		
	Primary	9	43	52		
	Secondary or higher	8	29	37		
Economical status	Low	7	31	38	0.886	not significant
	Intermediate	33	128	161		
	Good	5	16	21		
Smoking	Smoker	24	106	130	0.378	not significant
	Non-smoker	21	69	90		
Ethanol	Alcoholic	7	33	40	0.609	not significant
	Not alcoholic	38	142	180		
BMI	Normal	10	100	110	<0.001	Highly significant
	Overweight	15	66	81		
	Obese	20	9	29		
Family history of DM	Positive	18	66	84	0.778	not significant
	Negative	27	109	136		
Duration of statin	One month or less	0	8	8	0.007	Highly significant
	UP to 3 months	0	16	16		
	One year or more	45	151	196		
Statin drug	Atrovastatin	40	155	195	0.051	not significant
	Simvastatin	4	16	20		
	Rosuvastatin	1	4	5		
Dose	10 mg	0	4	4	<0.001	Significant
	20 mg	14	120	134		
	40 mg	31	51	82		

DISCUSSION

The present study demonstrated that patients on statin therapy had a significantly higher rate of hyperglycemia and new-onset diabetes than the prevalence rate of diabetes in the general adult population. In addition, this study showed that duration of using statin and the dose had a significant positive correlation with the development of diabetes mellitus in patients who were not originally known to have diabetes mellitus. The

analysis done by Sattar et al. in 91,140 topics displayed a 9% overall risk in 13 RCTs over a mean period of 4.0 years [18,19]. In a consequent meta-analysis of five severe-dose statin trials, Preiss et al. stated a important increase in diabetes incidence with more intensive- vs. moderate-dose statin (OR 1.12; 95% CI 1.04–1.22) [20]. generally, there was no correlation between % LDL-C reduction and incident diabetes. Further analysis of baseline features of the numerous trials stated a solid correlation

between features of metabolic syndrome [21-23].

Notable, the risk-advantage ratio for CVD quiet obviously preferred statin treatment in various revisions, including JUPITER, in primary prevention [22], and many secondary prevention studies [21-23]. Thus, nevertheless of whether or not diabetes was diagnosed during statin therapy, the CVD consequences were decreased on statin therapy matched to those observed with placebo. Another meta-analysis by Navarese et al. is the largest so far: it includes 17 RCTs, compared new-onset diabetes in patients getting statin vs. placebo, or high-dose vs. judicious-dose statins [24,25]. The lowermost risk was seen with pravastatin 40 mg compared to placebo (OR 1.07; 95% CI 0.83–1.30), whereas rosuvastatin 20 mg have the highest risk (OR 1.25; 95% CI 0.82–1.90) and atorvastatin 80 mg have intermediate (OR 1.15; 95% CI 0.9–1.50), even though none of these differences reached statistical worth. These data indicate likely molecule-precise effects on diabetogenesis [26]. In the biggest study of over 2 million patients in the UK, there was a substantial time-dependent rise in diabetes risk (HR 1.57; 95% CI 1.55–1.60), which augmented more (HR 3.63; 95% CI 2.44–5.38) in those who were followed for up to 15–20 years [27]. In one study in patients following myocardial infarction, there was no difference in intensive- vs. moderate-dose statin therapy [28]. It is well-known that the risk for diabetes according to the existence of pre-existing diabetes risk influences, as mentioned in the several analyses of RCTs [21-23], There are some remarks of interest from some studies in patients with pre-existing glucose intolerance or diabetes. In the study by [29]. The HR for progression to diabetes was like in those with normoglycemia, or reduced fasting glucose at baseline, but both groups displayed a comparable decrease in mortality after a 6-year follow-up. In a meta-analysis of nine RCTs in 9696 patients with type 2 diabetes, with a mean follow-up of 3.6 years, there was a modest but important increase in the mean A1c level of 0.12% (95% CI 0.04–0.20) [30-31].

Conflicts of Interest: There is no conflict of interest.

Ethical Clearance: The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/ have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity.

Source of Funding- Self

REFERENCES

1. American Diabetes Association (ADA). Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care* 2010;33: S62-S69.
2. Kharroubi AT, Darwish HM. Diabetes mellitus: The epidemic of the century. *World Journal of Diabetes* 2015: 850-867.
3. Thomas CC, Philipson LH. Update on diabetes classification. *Med Clin N Am* 2015; 99:1-16.
4. Atkinson MA. The Pathogenesis and Natural History of Type 1 Diabetes. Cold Spring Harbor Perspectives in Medicine. 2012;2:007641.
5. Paschou SA, Papadopoulou-Marketou N, Chrousos GP, Kanaka-Gantenbein C. On type 1 diabetes mellitus pathogenesis. *Endocrine Connections* 2018;7:38-R46.
6. Kopan C, Tucker T, Alexander M, Mohammadi MR, Pone EJ, Lakey JRT. Approaches in Immunotherapy, Regenerative Medicine, and Bioengineering for Type 1 Diabetes. *Frontiers in Immunology* 2018;9:1354.
7. Olokoba AB, Obateru OA, Olokoba LB. Type 2 Diabetes Mellitus: A Review of Current Trends. *Oman Medical Journal*. 2012;27:269-273.
8. Kahn SE, Cooper ME, Del Prato S. Pathophysiology and treatment of type 2 diabetes: perspectives on the past, present, and future. *Lancet*. 2014;383:1068-1083.
9. Tumbo JM, Kadima FN. Screening of long-term complications and glycaemic control of patients with diabetes attending Rustenburg Provincial Hospital in North West Province, South Africa. *African Journal of Primary Health Care & Family Medicine*. 2013;5:375.
10. Lotfy M, Adeghate J, Kalasz H, et al. Chronic complications of diabetes mellitus: a mini review. *Curr Diabetes Rev* 2017;13:3–10.
11. Chait A, Bornfeldt KE. Diabetes and atherosclerosis: is there a role for hyperglycemia? *Journal of Lipid Research*. 2009;50:335-S339.
12. Kanter JE, Bornfeldt KE. Inflammation and Diabetes-Accelerated Atherosclerosis: Myeloid Cell Mediators. *Trends in endocrinology and metabolism: TEM*. 2013;24:137-144.
13. Kanter JE, Averill MM, LeBoeuf RC, Bornfeldt

- KE. Diabetes-Accelerated Atherosclerosis and Inflammation. *Circulation research*. 2008;103:116-117.
14. Rahal AJ, ElMallah AI, Poushaju RJ, Itani R. Do statins really cause diabetes?: A meta-analysis of major randomized controlled clinical trials. *Saudi Medical Journal*. 2016;37:1051-1060.
 15. Ganda OP. Statin-induced diabetes: incidence, mechanisms, and implications. *F1000Research* 2016;5: 1499.
 16. Yoon D, Sheen SS, Lee S, Choi YJ, Park RW, Lim H-S. Statins and risk for new-onset diabetes mellitus: A real-world cohort study using a clinical research database. *Zhou. W, ed. Medicine*. 2016;95:5429.
 17. Chogtu B, Magazine R, Bairy K. Statin use and risk of diabetes mellitus. *World Journal of Diabetes*. 2015;6:352-357.
 18. Ridker PM, Danielson E, Fonseca FA, et al. : Rosuvastatin to prevent vascular events in men and women with elevated C-reactive protein. *N Engl J Med*. 2008;359:2195–207.
 19. Sattar N, Preiss D, Murray HM, et al. : Statins and risk of incident diabetes: a collaborative meta-analysis of randomized statin trials. *Lancet*. 2010;375:735–42.
 20. Preiss D, Seshasai SR, Welsh P, et al. : Risk of incident diabetes with intensive-dose compared with moderate-dose statin therapy: a meta-analysis. *JAMA*. 2011;305:2556–64.
 21. Waters DD, Ho JE, DeMicco DA, et al. : Predictors of new-onset diabetes in patients treated with atorvastatin: results from 3 large randomized clinical trials. *J Am Coll Cardiol*. 2011;57:1535–45.
 22. Ridker PM, Pradhan A, MacFadyen JG, et al. : Cardiovascular benefits and diabetes risks of statin therapy in primary prevention: an analysis from the JUPITER trial. *Lancet*. 2012;380:565–71.
 23. Waters DD, Ho JE, Boekholdt SM, et al. : Cardiovascular event reduction versus new-onset diabetes during atorvastatin therapy: effect of baseline risk factors for diabetes. *J Am Coll Cardiol*. 2013;61:148–52.
 24. Navarese EP, Buffon A, Andreotti F, et al. : Meta-analysis of the impact of different types and doses of statins on new-onset diabetes mellitus. *Am J Cardiol*. 2013;111:1123–30.
 25. Vallejo-Vaz AJ, Kondapally Seshasai SR, Kurogi K, et al. : Effect of pitavastatin on glucose, HbA1c and incident diabetes: A meta-analysis of randomized controlled clinical trials in individuals without diabetes. *Atherosclerosis*. 2015;241:409–18.
 26. Culver AL, Ockene IS, Balasubramanian R, et al. : Statin use and risk of diabetes mellitus in postmenopausal women in the Women's Health Initiative. *Arch Intern Med*. 2012;172:144–52.
 27. Macedo AF, Douglas I, Smeeth L, et al. : Statins and the risk of type 2 diabetes mellitus: cohort study using the UK clinical practice research datalink. *BMC Cardiovasc Disord*. 2014;14:85.
 28. Ko DT, Wijeyesundera HC, Jackevicius CA, et al. : Diabetes mellitus and cardiovascular events in older patients with myocardial infarction prescribed intensive-dose and moderate-dose statins. *Circ Cardiovasc Qual Outcomes*. 2013;6:315–22.
 29. Castro MR, Simon G, Cha SS, et al. : Statin Use, Diabetes Incidence and Overall Mortality in Normoglycemic and Impaired Fasting Glucose Patients. *J Gen Intern Med*. 2016;31:502–8.
 30. Erqou S, Lee CC, Adler AI: Statins and glycaemic control in individuals with diabetes: a systematic review and meta-analysis. *Diabetologia*. 2014;57:2444–52.
 31. Jensen MT, Andersen HU, Rossing P, et al. : Statins are independently associated with increased HbA1c in type 1 diabetes--The Thousand & 1 Study. *Diabetes Res Clin Pract*. 2016;111:51–7.

Prevalence of Color Vision Blindness at Al-Qadisiyah University

Furkaan Majied Hamied¹, Hyfaa Hussin Jabar²

¹Assist Professor, University of Al-Qadisiyah / College of Medicine/ Department of Surgery,

²MB.Ch.B, Al-Dewaniyah teaching hospital/ Al-Dewaniyah Province/ Iraq

ABSTRACT

Background: Color vision blindness is an important X linked autosomal recessive visual defect affecting the perception of colors.

Purpose: To determine the prevalence of color vision deficiency among a sample of medical colleges group in AL-Qadisiyah university (medical colleges, college of pharmacy and nursing college)

Method: Across-sectional study done in AL-Diwaniyah city at the period from April 2018 to June. 2018 study carried out to assess the prevalence of color vision deficiency among sample of medical colleges group student a sample of 814 student 252 male and 562 females with age range 18 – 24 years all are examined by Ishihara 38 plates.

Result: The prevalence of color vision deficiency was 5.2% for male and 0.4% for female. Deutan more than protan 11 cases deutan 1 female and 10 male while protan 4 cases 1 female and 3 male. There was no significant relation between color vision deficiency and the degree of relationship of the parents.

Conclusion: Prevalence of color vision deficiency in a sample of medical student is (1.8%) with prevalence in male (5.2%) and in female 0.4% Deutan more than protan. There is no relation between color vision deficiency and the degree of parent relationship.

Keyword: Deutan, protan, Color blindness.

INTRODUCTION

Color vision deficiency (CVD) is a chief disorder of the vision that affect the ability to notice some colors or pick out their difference.⁽¹⁾

The mammals retina contain two kinds of cells that receive light. They are termed as rods and cone [Rods] can become aware of brightness as well as darkness and are very sensitive to low light level while the Cones cells can detect colors and are concentrated near the center of the vision⁽²⁾.

The Color vision deficiency is happened when one or more kinds of color receptive[cones]cells red and green as well as blue do not precisely draw together or throw a right color impulses to the optic nerve. The CVD may be hereditary or due to many other causes that affect the color vision. The hereditary kind is habitually

linked to the X chromosome red and green CVD so as it is more occurrence in boys than girls, also it may be less frequently an autosomal prevailing quality blue and yellow CVD and so infrequently an autosomal recessive congenital feature[Achromatopsia]total color vision deficiency⁽³⁻⁴⁻⁵⁾.

The Achromatopsic patient is almost always has additional defect with vision including decrease visual acuity and hyper sensitivity to light (photophobia) and small unconscious eye motion (nystagmus)^(6,7).

The condition are divided in to three major categories: red-green CVD. The second categories blue –yellow CVD and a complete absence of color vision a persons with a red-green defect related to a loss or abnormality of the red sensitive pigment are said to have protan defect protanomaly and protanopia according to

the severity of defect while those with loss or abnormality of the green sensitive cone pigment have a deutan defect also according to the severity (deuteranomalous and detranopia). Yellow-blue CVD is a tritan defect also either tritanomalous or tritanopia. (7) a good number widespread CVD is the red and green color which is called Daltonism⁽⁸⁾ The deficiency of red green color with it is sub type further widespread than blue(CVD) that is so less frequent. (9-11)

SUBJECT AND METHOD

Across sectional study designed to found the prevalence of CVD among a sample of student in the medical colleges group at AL-Qadissiyah university in a period from April 2018 – June. 2018 a sample of 814 student 562 female and 252 male with average age of 18 – 24 years mean age of 20.82 ± 1.58 have been examined after taking their permission for examination and including in the study. Data were collected using a pre-constructed data collection form, which was formulated for the purpose of this study. The general characteristic of the collection formula were

1. Name.
2. Age.
3. Gender.
4. Occupation.
5. Past medical history.
6. Past ocular history.
7. Family history.
8. Dose the parent relative or not? first and second degree relative considered as positive any other considered negative.
9. Result of examination.

Inclusion Criteria

1. Healthy student age 18 – 24 years.
2. Visual acuity not less than 6/6 or corrected by spectacle or contact lenses.

Exclusion Criteria

1. Student with history of ocular Trauma or surgery.
2. History of medical diseases like Diabetes or Hypertension.
3. History of using drug that affect color vision like

digoxin , anti-epileptic drug and barbiturate.

Way Of Examination

All student after taking their permission for examination are examined for visual acuity using Snellen chart. CVD was tested by using pseudo-iso chromatic Ishihara plates which is a good and quick process of examine the defected of color vision from that vision which is normal . we consider using Ishihara plates of 38 plate were used by putting the plate in front of the Student at 70cm in the day light not direct sun light . Each plate have been offered to the student for three to four seconds and they were asked to read all numbers presented in the plate .

Plates from one to twelve revealed the normality or abnormality of color vision if 17 plates reads correctly this mean normal color vision, when the student see thirteen or less this mean defect in color vision red - green defect. The plate 22 to 25 were used to differentiate red color defect kind and green color defect kind⁽¹²⁾ The plate 30 to 38 were used when the patient cannot read the number in plates determined the lines between a two X should be done and completed at ten seconds.

RESULTS

Distribution Of Study Sample According To Age And Gender

The study, as stated in the chapter of patients and methods, included 814 students with a mean age of 20.82 ± 1.58 years and an age range of 18 to 24 years. Male subjects comprised 252 out of 814 (31.0 %), whereas, female subjects contributed to 562 out of 814 (69.0%). Mean age of male subjects was not significantly different from that of female subjects, 21.52 ± 1.56 years versus 20.51 ± 1.49 years, respectively ($P=0.137$), as shown in table 1.

Table 1: Mean age and gender of subjects enrolled in the present study

Gender	n	Mean Age	SD	Mini-mum	Maxi-mum	P*
Male	252	21.52	1.56	18	24	0.137 NS
Female	562	20.51	1.49	18	24	
Total	814	20.82	1.58	18	24	

N: number of cases; SD: Standard deviation;* Independent samples t-test; NS: not significant

Rate Of Color Blindness

The rate of color blindness in the study sample was 15 out of 814 (1.8%), as shown in figure 1. Patients with protan (red color) blindness accounted for 4 out of 814 (0.5%), whereas, patients with deutan (green color) blindness were more frequent and accounted for 11 out of 814 (1.3%), as shown in figure 1 and table 2.

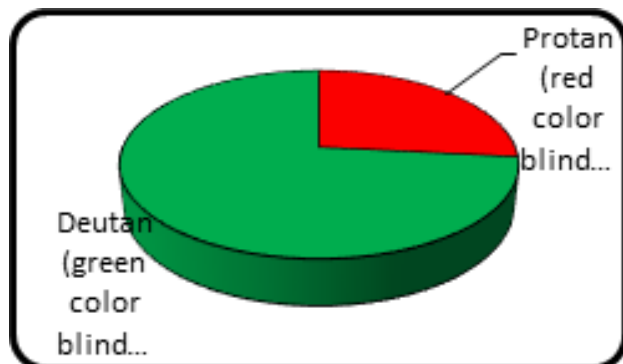


Figure 1: Pie chart showing the proportion of patients with protan (red color) and deutan (green color) blindness

Table 2: Proportions of patients with color blindness

Characteristic	n	% out of total	% out of patients
Color blindness	15	1.8	100
Protan (red color)	4	0.5	26.7
Deutan (green color)	11	1.3	73.3

No case of total CVD is found

No blue – yellow CVD can be detected.

Correlation Between Age And Color Blindness

Mean age of all patients with color blindness was 21.33 ± 1.68 years, whereas, mean age of normal subjects was 20.81 ± 1.58 years and there was no statistical difference in mean age between patients with color blindness and normal subjects ($P=0.205$), as shown in figure 2. Mean age of patients with protan (red color) blindness was 20.25 ± 1.26 years and that of patients with deutan (green color) blindness was 21.73 ± 1.68 years and there was no statistical difference in mean age between the two groups ($P = 0.136$), as shown in figure 3.

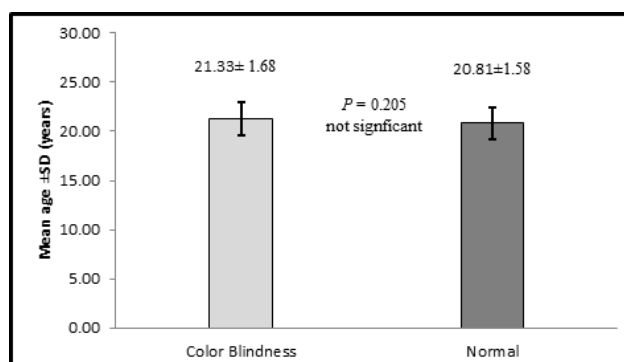


Figure 2: Bar chart showing mean age in patients with color blindness in comparison to normal subjects

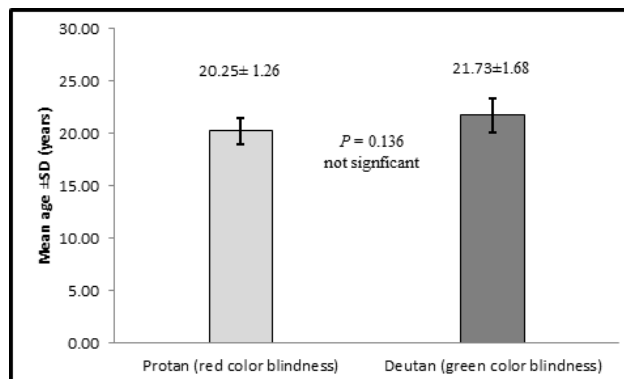


Figure 3: Bar chart showing mean age in patients with protan (red color blindness) versus patients with deutan (green color blindness)

Association Between Gender And Color Blindness

As shown in table3. Out of all patients with color blindness, 13 were male patients accounting for 5.2% out of all male participants and 2 were female patients accounting for 0.4% out of all female participants. The difference statistically was highly significance ($P<0.001$) and the risk of having color blindness was 15.23 in male subjects in comparison with female subjects with a 95% confidence interval of 3.41 - 68.01. On the other hand, patients with protan (red color) blindness included 3 male and 1 female subjects accounting for 1.2 % and 0.2% out of all male and female participants, respectively, the difference was statistically not significant ($P=0.171$); however, the risk of having protan color blindness in male subjects was 6.67 in comparison with female subjects with a confidence interval of 0.70 - 65.30. Moreover, patients with deutan (green color) blindness included 10 male and 1 female subjects accounting for 4.0 % and 0.2% out of all male and female participants, respectively, the difference was statistically highly significant ($P<0.001$); the risk of having deutan color blindness in male subjects was 23.18 in comparison with female subjects with a confidence interval of 2.95 - 182.10.

Table 3: Association between gender and color blindness

Color blindness	Male n = 252	Female n = 562	P*	Odds Ratio	95% CI
All, n (%)	13 (5.2)	2 (0.4)	<0.001	15.23	3.41 - 68.01
Protan, n (%)	3 (1.2)	1 (0.2)	0.171	6.76	0.70 - 65.30
Deutan, n (%)	10 (4.0)	1 (0.2)	<0.001	23.18	2.95 - 182.10

n: number of cases; *Chi-Square after Yates correction for continuity; CI: confidence interval

Association Between CVD And Parent Relationship

We found that 3.3% of cases of CVD have closed relationship parent. 1.2% have no close relationship parent but this difference is not statistically significant (p. value = 0.088), as shown in table 4.

Table 4: Association between color blindness and parent whether relative or not

Parent, relative	Total	Positive test	Negative test	χ^2	P*
Yes	244	8 (3.3%)	236 (96.7%)	2.919	0.088 Not significant
No	570	7 (1.2%)	563 (98.8%)		
Total	814	15 (1.8%)	799 (98.2%)		

*Yates corrected Chi-Square test for continuity

DISCUSSION

Present study found that male also affected more than female ; out of all student participate in the study (814) student 15 student are color blind; 13 of them were males student accounting for 5.2% out of all male participate (252) and 2 were females student accounting for 0.4% out of all females participates (562). The numbers of female student in the medical colleges group are more than males for this reason the number of female in the sample are more than male. Studying the other researches result for CVD prevalence throughout the world shows that it is 0.8 – 9.3% among males and 0.4 – 3.2% among females. ⁽¹³⁾

Many other studies done in Iraq show result near to our result for example:- prevalence of CVD among the student in Erbil city of 8.47% in male and 1.37% in the females ⁽¹⁴⁾.

Among adult in Baghdad were 6.75% ⁽¹⁴⁾. Study done in Shekhan city in AL-Duhok province, Kurdistan Region in Iraq show prevalence of 6.36% in male and 0.84% of female of high school student ⁽¹⁵⁾.

Another study done at AL-Diwaniah city AL-Qadissiyah province for prevalence of congenital red- green CVD among medical student and medical personal in AL-Diwaniah teaching hospital show 4.8% prevalence among male and 1% among female ⁽¹⁶⁾. In Saudi Arabia 2.9 – 11% in male ⁽¹⁷⁻¹⁹⁾. In Qazvin 3.49% of the total population had CVD 2.56% male and 0.93% were female ⁽²⁰⁾. In Tehran 8.18% ⁽²¹⁾. In Jordan the prevalence was 8.72% in males ⁽²²⁾. Study for CVD in European countries show in a Denmark male were 8.7% while in Greek males were 7.95% ⁽²³⁾. In our study the prevalence of female with CVD were 0.4% which is near to the other studies like in Indian population 0.83% ⁽²⁴⁾. The color vision blind patient will not just confuse red and green only because the peak of sensitivity of red and green cone cells (cone cells present in the center of the retina responsible for color vision) is very close to each other so those person will be unable to discriminate any color which contain red or green ⁽²⁵⁾

In our study we found that deutan CVD (green CVD) is more than protan CVD (red CVD). 11 case from the total student affected. By CVD which are (15) student (10) male and (1) female subject accounting for 4.0% and 0.2% out of all male and female participants, respectively while protan (red CVD) included 3 cases male and 1 case female student accounting for 1.2% and 0.2% out of all male and female participant respectively. The deutan more than the protan.

When we compare with other researches In Indian about 7.9% deutan and 3.22% protan⁽²⁶⁾. The cause of this classification of CVD as protan and deutan that at first it is the most common CVD the second cause is that we use only Ishihara plate for testing the CVD which can only used for red – green color blindness not blue – yellow color blindness also it is simple and popular.

CONCLUSION

The prevalence of CVD is 1.8% in total sample of

student with a prevalence of 5.2% in male and 0.4% for female student. The Deutans CVD were more the protans CVD deutans 4% in male and 0.2% in females. While protans 1.2% in male and 0.2% in female.

Ethical Clearance: The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/ have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity.

Conflicts of Interest: There is no conflicts of interest.

Source of Fund: Self

REFERENCES

1. Color blindness – American Academy of ophthalmology. [www.geteyesmart.org / eye smart disease / color – blindness](http://www.geteyesmart.org/eye-smart-disease/color-blindness). CFM (accessed at March 2018)
2. American Academy of ophthalmology [http// www. aao.org](http://www.aaopt.org). 2018
3. J. Birch. “worldwide prevalence of red-green color deficiency” *Jopt, soe, Am A opt Image sci vis*, 2012;29:313 – 320.
4. Diez MA, Luque MJ, capilla p Gomez J, FeZ MD, “Detection and a ssessement of color vision anomalies and deficiency in child *journal of ped. And strab*. 2001;38:195 - 205
5. SS. Deeb “molecular genetics of color vision deficiency” *Clin. Exp. Optom*.2004;87:224 – 229.
6. Gergory L. skuta, Louis B. Cantor, Jayaes weis. basic and clinical course, section 12 American Academy of ophthalmology San Francifco. 2010; 217 – 218.
7. E. M. Cruz, H.G.S. Cerdana, A.M.B cabrera, C. B Garcia, E.T santos – Morabe, M.L.R Nanagas, “prevalence of color vision deficiency among male High school student”, *phillipp J Ophthalmology* 2010;35(1):20 – 24.
8. Adams Aj,Verdon WA, Spivey BE. color vision in Tasman W. Jaeger EA, eds. *Duane’s Foundation of clinical ophthalmology* 15thi. Philadelphia. LIPPincatt Williams and Wilkins 2009.
9. A.K. Khurana, *comprehensive Ophthalmology* Jaypee Brother Medical, New Delhi, India, 6th edition 2015.
10. Citirik M, Acaroglu G, Batman C, Zilelioglu O, Congenital color blindness in young Turkish men *Ophthalmic Epidemiol*. 2005; 12: 133 – 137.
11. Saito A, Mikami A, Hasegawa T, et al. behavioral evidence of color vision deficiency in a protanomalia chimpanzee (*pan troglodytes*) primates 2003; 44:171 – 176.
12. S. Ishihara. The series of plates designed as a test for color deficiency 38 plate edition kanehara co. LTD, Tokyo, Japan , the Latest Edition.
13. Karim and Mohammed A (eds) “prevalence of congenital red green color vision defect among various ethnic group of student in Erbil city” *Jordan Journal of Biological science*. 2013;6:235 – 238.
14. B.M.S. AL-Musawi “prevalence of color vision deficiency among adult male from Baghdad province” *Iraqi postgraduate medical journal*. 2013;31: 134 – 140.
15. Masood A.A. “prevalence of color vision deficiency among student in Hajad and Amad high school in shekhan city” *Duhok polytechnic university, shekhan technical collage of Health, Kurdistan journal of applied research*. 2017;2.
16. Alyaa Abdul A. “prevalence of congenital red – green color vision deficiency in a sample of medical personal in AL-Diwaniah city” 2014.
17. E.P Osuobeni “prevalence of congenital red – green color vision defect in Arab boys from Riyadh, Saudi Arabia” *ophthalmic Epidemiology*. 1996;3:167 – 170.
18. J. Voke, P. Voke “congenital dyschromatopsia among Saudi Arabian” *Saudi med J*,1980;1:209e.
19. Alabdel M. M. “prevalence of congenital color vision defect in Saudi females of Arab origin” *optometry*, 2011; 82:543 – 8.
20. H. Hashemi, Khabazkhoob, Reza pakzad, Abbasali Yekta, J. Heravian, P. Nabovati, et at., “ prevalence of color vision deficiency in northeast of Iran” Available on line at www.sciencedirect.com *journal of current ophthalmology* 2017.
21. M. Khalaj, A. Barikani, M. Mohammadi “prevalence of color vision deficiency in Qazvin” *Zahedan J. Res. Med. Sci*. 2014;16:91-93.
22. M. Modarres, M. Mirsamadi, G.A. Peyman

- “prevalence of congenital color def. in secondary school students in Tehran” *Int Ophthalmol.* 1996;20: 221 – 222.
23. M.T. AL-Aqtum, M.H. AL-Qawasmih “prevalence of color blindness in young Jordanians” *ophthalmological.* 2001;215:39 – 42.
24. M. Norn “prevalence of Ocongenital color blindness among INVIT in East Green Land” *Acta phthalmologica Scandinavica*, 1997;75:206-209.
25. M. fareed, M.A. Anwar, M. AFzal “ prevalence and gene frequency of color vision impairment among children of six population from North Indian region” *Genes & Diseases* 2015;2: 211 – 218.
26. Color Blind Awareness (2015) association of teachers and lecturer (ATL) conference 2015 debates need for educational staff to be Trained to support color blind pupils www.colourblindawareness.org/wp-content/uploads/2015/07/ATL-2015-conference-colour-Blindness.pdf accessed in July 3, 2018.

Youth Resilience Capabilities Avoid Free Sex, HIV/AIDS and Drugs based on *Sekaa Teruna*

GA Marhaeni¹, IGA Surati¹, Ni Wayan Armini¹, I Putu Suiraoa²

¹Department of Midwifery, ²Department of Nutrition, Health Polytechnic, Ministry of Health, Denpasar Bali

ABSTRACT

Adolescence is the age where individuals integrate with adult society. Integration in society has an effective aspect, more or less related to puberty, including striking intellectual changes. Adolescents are more prone to risk behavior due to psycho-social influences, namely limited ability to think logically, the ability to regulate weak emotions, and the influence of peers. The purpose of this study was to improve the ability of adolescent resilience to avoid free sex, HIV / AIDS and drugs based on *Sekaa Teruna* in the Nongan village, Karangasem and Ketewel village, Gianyar. The quasi experimental research with Pre test-posttest control group design was carried out in the villages of Nongan, Karangasem and Ketewel, Gianyar from August to September 2017. Data collection instruments are Spritually Resilient Assessment Packet version 44. Data analysis was performed including descriptive analysis and bivariate analysis with Wilcoxon test and Mann-Whitney test.

The ability of adolescent resilience (about free sex, HIV-AIDS, and drugs) before treatment in the control group, 45.0% of resilient adolescents and in the treatment group 76.7% of resilient adolescents. The ability of adolescent resilience after treatment in the control group, 55.0% of resilient adolescents and in the treatment group 100% of resilient adolescents. There are differences in adolescent resilience before and after being treated both in the control group and in the treatment group There are differences in adolescent resilience in both the control and treatment groups

Keywords: Adolescent, Resilience, *Sekaa Teruna*

INTRODUCTION

Many challenges must be faced by teenagers in the era of globalization. The challenge comes from increasing school demands, free communication / internet access, and access to print and electronic media broadcasts. If adolescents are not able to respond to challenges positively, it will have a negative impact on family, community, social environment, and even threaten and endanger the future of the nation and the state.

Adolescence is the age where individuals integrate with adult society. Integration in society has an effective aspect, more or less related to puberty, including striking intellectual changes (Piaget in Hurlock) ⁽¹⁾. At this time mood can change very quickly. Drastic mood changes in teenagers are often due to homework, school work, or daily activities at home. Sometimes teenagers do things

that are outside the norm to get recognition about their existence in the community ⁽²⁾

There are many problems in young people include: behaviors that contribute to acts of violence and accidental accidents, use of illegal drugs and smoking, having unsafe sex, unsafe diet, and inadequate physical activity ⁽³⁻⁵⁾. Adolescents are more prone to risk behavior due to psycho-social influences ⁽⁶⁾.

Premarital sexual behavior is all sexual behavior that is driven by the opposite sex sexual desire that is done before marriage ⁽²⁾. Approximately 47.0% of the population of teenagers aged 10 to 19 years in the world have had active sexual intercourse and around 2.4% end up with pregnancy before marriage ⁽⁵⁾.

The impact of premarital sex behavior is experienced more heavily in women than men. This impact includes

biological, social and psychological aspects⁽⁷⁻¹¹⁾.

The holder of the control of the lives of the Balinese people is the traditional village, so that almost all individual activities are full of traditional sequences. *Adat* also means rules, laws, moral standards that guide everyone. Balinese people are said to succeed in maintaining cultural values because religious traditions are still strong. Changes in social solidarity in the community in Bali, such as premarital sex behavior is not a social problem but a personal problem that must be solved personally⁽¹²⁾. Premarital sexual behavior that spreads very quickly and widely in the neighborhood where people live has been considered normal, in addition to the consequences of weak traditional sanctions today. Thus, it is necessary to explore the role of resilience and other factors that influence teenage premarital sex behavior in Bali.

Delinquency and abuse of drugs that occur involve a lot of teenagers. In addition, many teenagers also have deviant sexual behavior. The intervention program for adolescents should be through positive youth development programs. One reliable way for teenagers in Bali is *Sekaa Teruna*. *Sekaa Teruna* is a youth organization that functions as a forum for developing youth creativity. This organization can also be a place to preserve local culture and traditions.

Local governments need to improve the function of *Sekaa taruna* to protect teenagers. The results of interviews with the community leader at Nongan and Ketewel Village showed that *Sekaa Teruna* as a youth organization had not carried out its role well. Resilience is the ability to respond healthily and productively when facing obstacles or trauma⁽¹³⁾. Resilience is a tenacious and resilient attitude that a person has when faced with difficult conditions⁽¹⁴⁾. The problem in this study is how the influence of *Sekaa Teruna*-based counseling on adolescent resilience?

The purpose of this study was to improve the ability of adolescent resilience to avoid free sex, HIV/AIDS and drugs based on *Sekaa Teruna* in the Nongan village, Karangasem and Ketewel village, Gianyar

MATERIALS AND METHOD

This type of research is quasi experimental research with Pre test-posttest control group design⁽¹⁵⁾. The

research was carried out in the villages of Nongan, Karangasem and Ketewel, Gianyar from August to September 2017. Consideration of research location selection due to the high incidence of drug abuse and deviant sexual behavior by teenagers in the village.

The population is all adolescents in the village of Nongan, Karangasem and Ketewel, Gianyar with the unit of analysis are adolescents members *sekaa teruna*. Sample selection is nonprobability. The inclusion criteria included: registered as a member of a group of Nongan Karangasem Village cadets and Ketewel Village, Gianyar; no psychiatric disorder based on family member information; without chronic diseases; can read and write. The sample size is calculated by the large sample formula developed by Isaac and Michael with a 5% error rate⁽¹⁶⁾ and an additional 10% to anticipate drop out so that the sample size becomes 60 people. Data collection instruments are standardized questionnaires, namely SRA-44 which was coined by Jared K and Lynn K. from the Institute of Contemplative Education, Cambridge. The questionnaire has seven answer choices. However, in this study the choice of answers was modified into four answer choices. Data analysis was performed including descriptive analysis and bivariate analysis with Wilcoxon test and Mann-Whitney test.

RESULT AND DISCUSSION

Result

Nongan village is an intervention group where it is treated in the form of health counseling with media modules and leaflets. This village consists of 14 *banjars*. The population of Nongan Village is 6646 people consisting of 3319 female and 3327 male. The number of teenagers is 867 people, with 463 male and 404 female. Ketewel Village is a control group with conventional health counseling using leaflets. This village consists of 15 *banjars*. The population is 10,298,000 people consisting of 5,192,000 women and 5,106,000 men. The number of adolescents is 1,267 with details of 654 male and 613 female.

Characteristics of respondents observed included: gender, age, and education. The data is presented in Table 1.

Table 1: Demographic characteristics of Respondents

Characteristics	Intervention group		Control group	
	f	%	f	%
Gender				
Male	27	45	21	35
Female	33	55	39	65
Education level				
Middle school	4	6.7	1	1.7
High school	50	83.3	32	53.3
Diploma	6	10.0	7	11.7
Bachelor	0	0.0	20	33.3
Total	60	100	60	100
Age (year)				
Minimum	17.0		17.0	
Maximum	27.0		29.0	
Average	19.8		22.0	
Standard deviation	2.3		2.3	

In table 1, it can be seen that the respondents in the intervention group were more women (55%), as well as in the control group more women (65%). Based on the level of education in the treatment group, the respondents were mostly high school (83.3%), and in the control group some were high school (53.3%). Based on the age of respondents in the intervention group, the average age was 19.8±2.33 years, while in the intervention group was 22,016±2.38 years.

Table 2: Descriptive of Adolescent Resilience Ability

Descriptive	Intervention group	Control group
Before intervention		
Mean	82.45	84.40
Median	82.00	85.00
Standard deviation	0.90	4.26
Minimum	80.00	71.00
Maximum	85.00	95.00
After intervention		
Mean	104.05	128.00
Median	104.00	128.00
Standard deviation	3.08	0.00
Minimum	97.00	128.00
Maximum	116.00	128.00

From table 2, it is known that the average ability of adolescent resilience before treatment in the control group was 82.45 and after treatment 104.05. The average ability of adolescent resilience before treatment in the treatment group was 84.40 and after treatment became 128.00.

Table 3: Frequency Distribution of Adolescent Resilience Ability

Resilience Ability	Intervention group		Control group	
	f	%	f	%
Before intervention				
Resilient	46	76.7	27	45.0
Not resilient	14	23.3	33	55.0
After intervention				
Resilient	60	100	33	55.0
Not resilient	0	0	27	45.0
Total	60	100	60	100

Before the treatment, respondents from the treatment group mostly (76.7%) had the ability to resilience, while from the control group who had the ability to resilience less than half (45%). After the treatment, there was an increase, namely that in all the respondents, the intervention group had the ability to resilience (100%) and while in the control group who had the ability to resilience to 55%. The difference in the ability of adolescent resilience about free sex, HIV/AIDS and drugs before and after the intervention was carried out using the Wilcoxon test.

Table 4: Differences in Adolescent Resilience in Treatment and Control Groups

Deskriptive	Intervention group			Control Group		
	Pre	Post	p Value	Pre	Post	p Value
Mean	84.40	128.00	0.00	82.45	104.05	0.00
Median	85.0	128.00		82.0	104.0	
Standard deviation	4.26	0.00		0.90	3.08	
Minimum	71.0	128.00		80.0	97.0	
Maximum	95.0	128.00		85.0	116.0	

In table 6 it can be seen that there is an increase in ability which means teenage resilience in the treatment group ($p < 0.05$) and the control group ($p < 0.05$). The difference in the effect of treatment in the treatment group and control on the ability of adolescent resilience before and after the intervention was done with the Mann Whitney test.

The test results showed an increase in the effect of adolescent resilience the treatment group was higher than the control which was 45.75. Health education using modules, and leaflets can significantly improve teenage resilience ($p < 0.05$).

DISCUSSION

Adolescents must have the ability to avoid problems that might occur. Even if teenagers have to face and

overcome problems, they must become stronger. The conditions mentioned above are called resilience. The results of the study showed that adolescents at both research sites had resilience abilities about free sex, HIV/AIDS and drugs. The results showed that in the treatment group there was an increase in resilience in adolescents up to 100% and in the control group there was an increase of up to 55%. Thus it can be concluded that health counseling with the lecture method, discussion and question and answer as well as supplemented with leaflets in the control group as well as modules and leaflets for the treatment group can improve youth resilience.

Resilience in other studies is also interpreted as the ability to bounce back to continue living after experiencing problems getting better. In this case the

relation to the condition if, for example, teenagers are faced with conditions already undergoing risky behaviors namely free sex, HIV-AIDS and drugs. The factors that influence resilience are not only individual and genetic but also cultures that might increase or decrease resilience.

In the results of the study there was an increase in the ability of adolescent resilience in the control group and the treatment group. The results of this study are in accordance with Delyana's (2015) study in Yogyakarta which found that the knowledge and attitudes of adolescents about premarital sex changed significantly before and after being given sexual education. In line with Sarwono's (2011) theory that sexual education is an effective way to prevent risky behavior in adolescents, especially premarital sex behavior.

Respondents from the treatment and control groups, in addition to being given exposure or counseling about resilience, but also equipped with modules and leaflets, with the hope that teenagers are able to read again about tips and tricks to be resilient towards risky behavior. This is consistent with Azwar's (2011) theory that changes in adolescent knowledge and attitudes, should be supported by personal experience, support from the environment, including the mass media, especially support from parents. The more often teenagers get positive support and information about resilience, then the ability of adolescents will increase to prevent risky behavior.

Teenagers who have high resilience have the possibility to develop faster and be happier than adolescents who do not have or have the ability to bounce back from adversity (Reivich & Shatte, 2002). The fundamental assumption in the study of resilience is that some individuals remain fine, even though they have experienced adversity and risk-laden situations, while some other individuals fail to adapt and fall into adversity or even heavier risks.

The results showed that health education with a module and leaflet media in treatment and leaflet groups in the control group could increase adolescent resilience ($p < 0.05$). Reivich & Shatte states that: People can increase their resilience by learning to understand their thinking styles and developing skills to circumvent them so that you can see the true causes of adversity and its effect of life. Thinking style is what causes us to respond emotionally to events, so it's your thinking

style that determines your level of resilience the ability to overcome, steer through, and bounce back when adversity strikes. A person can use his thinking style to overcome the negative consequences of a debilitating event.

This type of counseling media is diverse. The use of media aims to clarify the information conveyed in the counseling. The more media used, the more teenagers understand the material presented. Pri Hastuti and Luluk Mahaningsih (2009) found that lecturing by giving modules was more effective than lectures by giving leaflets. The module contains more detailed information than leaflets, allowing respondents to learn more independently.

Resilient ability in adolescents increases when information is, received complete, clear and consistent. This requirement can be accommodated in a module, as a learning medium. However, the module will not function effectively if it is not accompanied by counseling. In the extension process, there is a perception stage where participants are invited to equalize perceptions between the instructor and participants. Perception is very important to equalize the information conveyed.

The results of this study are different from the results of Pahalani's (2016) study, which revealed emotion regulation therapy using modules as guidelines did not have a significant influence on the ability of teenagers resilience living in orphanages. It is explained that many factors influence youth resilience, especially support from parents and the surrounding environment.

CONCLUSION

The ability of adolescent resilience (about free sex, HIV-AIDS, and drugs) before treatment in the control group, 45.0% of resilient adolescents and in the treatment group 76.7% of resilient adolescents

The ability of adolescent resilience after treatment in the control group, 55.0% of resilient adolescents and in the treatment group 100% of resilient adolescents

There are differences in adolescent resilience before and after being treated both in the control group and in the treatment group

There are differences in adolescent resilience in both the control and treatment groups

Recommendation

Based on the results of the study it can be suggested as follows: 1) For policyholders in the field of Reproductive Health in order to carry out socialization activities on Adolescent Reproductive Health in the form of counseling to Sekaa Teruna regularly and continuously. 2) For the Indigenous village leader to facilitate socialization activities on risky behavior in adolescents. 3) For teenagers to actively seek information so that they have good knowledge and are able to choose healthy things to do.

Conflict of Interest: Authors declare that there is no conflict of interest within this research, publication paper and funding support

Ethical Clearance: Ethical Clearance obtained from the university committee and respondent assignment.

Source Funding: Source Founding; Indonesia Ministry of health

REFERENCES

1. Hurlock. Psikologi Perkembangan. 5th ed. Jakarta: Erlangga; 2002.
2. Soetjningsih, Ranuh Gd. Tumbuh Kembang Anak. Jakarta: EGC; 2014.
3. BKKBN. Kurikulum dan Modul Pelatihan Pemberian Informasi Kesehatan Reproduksi Remaja oleh Pendidik Sebaya. Jakarta: BKKBN Direktorat Remaja dan Perlindungan Hak-hak Reproduksi; 2008.
4. Johnson P, Malow-Iroff M. Adolescents and risk. making sense of adolescent Psychology. London: Praeger; 2008.
5. CDC. Youth Risk Behavior Suvellance-United States. In: CDC. United States: Centers for Deseases control and Prevention; 2012.
6. Steinberg L. Risk Taking in Adolescence: New Perspektives from brain and behavioral science. Curent Dir Physchological Sci. 2007;16:55–9.
7. Blanc A, Way A. Sexual Behavior and Contraceptive Knowledge and Use among Adolescent in Developing Countries. Stud Fam Plan. 1998;29(2):106–16.
8. Greenberg J, Magder L, Aral S. Age at First Coitus: A Marker For Risky Sexual Behavior in Women. Sex Transm Deseases. 1992;19(6):331–4.
9. Manlove, Jennifer, Ryan S, Franzetta K. Pattern of Contraceptive Use Within Teenagers’ First Sexual Relationships. Perspect Sex Reprod Heal. 2003;35(6):246–55.
10. Miller B, Benson B, Galbraight K. Family Relationship and Adolescent Pregnancy Risk: a Research Synthesis. Dev Rev. 2001;21(1):1–38.
11. Singh S. Adolscent Childbearing in Developing Countries: a Global Review. Stud Fam Plan. 1998;29(2):117–36.
12. Laksmiwati I A. Transformasi Sosial dan Perilaku Reproduksi Remaja. UNUD. 1999.
13. Shatte A, Reivick K. The Resilience Factor 7 Essential Skills for Overcoming Life’s Inevitable Obstacles. New York: Broadway Books; 2002.
14. Papalia D, Old S, Feldman R. Human Development (Psikologi Perkembangan). Jakarta: Kencana; 2008.
15. Dahlan M. Statistik untuk Kedokteran dan Kesehatan. 3rd ed. Jakarta: Salemba Medika; 2008.
16. Sugiyono. Metode Penelitian Kuantitatif Kualitatif dan R & D. Bandung: Alfabeta; 2010.

Effect of Salpingectomy on Anti Müllerian Hormone, Follicle-Stimulating Hormone and Inhibin B Hormone

Wassan Wajdi¹, Hayder Adnan Fawzi²

¹CABOG, Assistant Professor in Obstetrics and Gynecology, College of Medicine / Baghdad University, Iraq,

²Clinical Pharmacists, Baghdad Medical City, Iraq

ABSTRACT

Background: Ovarian reserve refers to the term used to describe the number of good quality oocytes left within a woman's ovaries. Salpingectomy undermines the ovarian reserve since it interrupts the ovarian blood supply.

Patients and method: A case-control study conducted in Baghdad teaching hospital from the 1st March 2015 to the 1st March 2016 in which a total of one hundred women were included in this study and divided into two groups (every 50 women), cases with a history of salpingectomy and the control.

The aim of the study: To assess the effect of salpingectomy for tubal pregnancy on biochemical ovarian reserve tests (FSH, AMH, and Inhibin B hormone).

Results: Mean age of the women was 27.8 ± 3.5 years in salpingectomy group. FSH level in salpingectomy group was significantly higher than that in controls (7.9 ± 1.4 vs. 7.3 ± 1.2 mIU/mL, respectively). AMH (4.4 ± 1.0 vs. 7.6 ± 3.6) and inhibin B (309.5 ± 208.8 vs. 414.1 ± 288.9) was significantly lower in salpingectomy group than controls.

Conclusion: Salpingectomy is associated with decreased AMH and inhibin B levels while it associated with increased FSH level. These results suggest that salpingectomy associated with decreased ovarian reserve.

Keywords: *Anti Müllerian, Inhibin B, ovarian reserve, salpingectomy*

INTRODUCTION

Ovarian reserve refers to the size of non-growing follicles or resting primordial follicle population in the ovaries and this, in turn, determines the number of growing follicles, the quality or reproductive potential of their oocyte, which describe the number of good quality oocytes left within a woman's ovaries. A woman's fertility declines with age due to a reduction in the number of eggs (oocyte) in the ovaries. Egg quality also declines with age which further affects fertility potential. ^[1, 2] Diminishing ovarian reserve is a phenomenon noted in women during mid to late thirties and at times earlier,

reflecting the declining follicular pool and oocyte quality. ^[3] Ovarian reserve tests provide an indirect estimate of a woman's remaining follicular pool. Biological (age), biochemical, biophysical, and histological tests have been used to identify ovarian reserve. ^[4] The age is known to be the most important factor determining the pregnancy potential in regularly cycling women. ^[5] However, chronological age alone has a limited value in predicting individual ovarian responses, ^[6, 7] which led to the development and use of various biochemical tests of ovarian reserve. ^[7]

Basal follicle stimulating hormone (FSH) levels measured on day 3 of the menstrual cycle is the most widely used to assess the ovarian response to stimulation. ^[6] An increase in FSH levels occurs due to follicle depletion. It is known to have diurnal, intra- and intercycle variability. There is no universally accepted

Corresponding author:

Hayder Adnan Fawzi

E-mail: hayder.adnan2010@ierit.nahrainuniv.edu.iq

cut-off value to identify a poor response. [8, 9] Anti-Müllerian hormone (AMH) is a dimeric glycoprotein exclusively produced by granulosa cells of preantral and small antral follicles in the ovary, [10, 11] it can be measured on any day of the cycle and does not exhibit intercycle variability. [12, 13]

Inhibin B is a heterodimeric glycoprotein released by the granulosa cells of the follicle. Women with a low day three inhibin B concentration (<45 pg/ml) have a poor response to superovulation for IVF and are less likely to conceive a clinical pregnancy. It also noted that a decrease in inhibin B probably precedes the increase in the FSH concentration. [14, 15] The effect of salpingectomy on ovarian function is uncertain and remains a matter of debate. [16, 17] The close anatomical association of the vascular and nervous supply to the tube and ovary constitute the theoretical rationale for the risk of impaired ovarian function after surgery. [18] The study aims to assess the effect of salpingectomy for tubal pregnancy on biochemical ovarian reserve tests (FSH, AMH, and Inhibin B hormone).

PATIENTS AND METHOD

A case-control study conducted in Baghdad teaching hospital from the 1st March 2015 to 1st March 2016 in which a total of one hundred women were included in this study and divided into two groups: group A: 50 patients' women with history of salpingectomy (cases), group B: 50 normal women with no history of salpingectomy (control). Inclusion criteria: Women with age less than 40 years with regular menstrual cycles (no history of oligomenorrhea), not pregnant and with no history of ovarian surgery included in this study. Exclusion criteria: Women more than 40 years, pregnant women, women with a polycystic ovarian syndrome or any ovulatory dysfunction, women with a history of endometriosis, women with a history of tubal surgery other than salpingectomy excluded from this study. At the 3rd day of menstrual cycle, a 10-mL blood sample was drawn from both groups (case and control). The sample centrifuged for 5 minutes; the supernatant serum was collected and stored at -20 C. follicle stimulating hormone (FSH) level was measured with Gamma counter which uses Radio-immunoassay. Anti-Müllerian hormone and inhibin B levels measured by using special kits. This kit uses enzyme-linked immune sorbent assay (ELISA) based on biotin double antibody sandwich technology. Data analyzed using Statistical Package for

Social Science (SPSS) version 20, continuous variables presented as a mean and standard deviation and discrete variables presented as numbers and percentages. Chi-square test and T-test used to verify the significance of observed findings. Findings with a P value less than 0.05 considered statistically significant.

RESULTS

The mean age of the women was 27.8 ± 3.5 (range; 20 – 34) years in salpingectomy group and 28.3 ± 4.2 (range; 20 – 36) years in the control group, additionally, the majority of the women in both studied groups aged 30 years or less. No statistically significant differences in age had found between both groups, $P=0.53$. As is shown in table 1, the comparison of mean FSH levels between both studied groups revealed that the mean FSH levels of women in salpingectomy group was significantly higher than that in controls, (7.9 ± 1.4) mIU/mL and (7.3 ± 1.2) mIU/mL, respectively, ($P=0.023$). While anti Müllerian hormone (AMH) and inhibin B was significantly lower in salpingectomy group, compare to control.

Table 1: Comparison of mean FSH, inhibin B, and AMH levels between the studied groups

Variables	Salpingectomy group (n=50)	Control group (n=50)	P value
FSH (mIU/mL), Mean \pm SD	7.9 ± 1.4	7.3 ± 1.2	0.023
Inhibin B (pg/ml), Mean \pm SD	309.5 ± 208.8	414.1 ± 288.9	0.041
AMH (ng/ml), Mean \pm SD	4.4 ± 1.0	7.6 ± 3.6	0.001
SD: standard deviation			

Further analysis was performed to assess the inter-correlation between the studied parameters, FSH, AMH and Inhibin B, in both studied groups separately as illustrated in table 2.

Table 2: Correlation analysis matrix for the inter-correlation between AMH, Inhibin B, and FSH stratified by groups

Group	Parameter	AMH		Inhibin B	
		r	P value	r	P value
Salpingectomy group (n=50)	AMH	-	-	0.502	0.001
	FSH	-0.27	0.030	-0.496	0.001
Control group (n=50)	AMH	-	-	0.770	0.001
	FSH	-0.87	0.001	- 0.433	0.002

r: correlation coefficient

Further correlation analysis made for the correlation of each of the studied parameters and the age of the participant. In salpingectomy group, a direct (positive) correlation had been found between FSH and age of the patients, ($r = 0.71$, $P = 0.001$), negative correlation between AMH and age ($r = - 0.095$) however it was statistically insignificant, ($P > 0.05$) and an inverse correlation between Inhibin B and the age ($r = -0.46$, $P = 0.001$). In control group age was significantly and positively correlated with FSH ($r = 0.78$, $P = 0.001$), inversely correlated with AMH ($r = - 0.66$, $P = 0.001$) and inversely correlated with inhibin B but not significant, ($r = - 0.26$, $P > 0.05$), as illustrated in table 3.

Table 3: Correlation of age of women with FSH, AMH and Inhibin B in both studied group

Groups		r	P value
Salpingectomy group (n=50)	FSH	0.710	0.001
	AMH	-0.095	0.510
	Inhibin B	-0.460	0.001
Control group(n=50)	FSH	0.780	0.001
	AMH	-0.660	0.001
	Inhibin B	-0.260	0.074

r: Pearson Correlation coefficient

DISCUSSION

The negative effect of salpingectomy on the ovarian response is not fully understood, although it is possible that unilateral or bilateral removal of the fallopian tubes partly disrupts the ovarian blood supply.^[19] In the current study, the age was not statistically different between both groups, although it was slightly higher in control 28.3 years versus 27.8 years. The mean age was lower than reported by Nouh et al. in which the mean age group of the patients with salpingectomy was 41.4 ± 1.5 years,^[20] also it was less than that reported by Kamal et al.^[21] in

which the mean age group was 34.4 ± 3.6 years. Also, it is less than that found by Xu-ping et al.,^[22] on their study with mean age of 33 years in all studied groups.^[22] This difference in mean age in our study attributed to the inclusion criteria that chosen below 40 years.

In the current study mean FSH level in salpingectomy group was significantly higher than in controls and this in agreement with Iwase A et al., in which the FSH concentrations were significantly higher in the salpingectomy group after surgery when compared to another group.^[23] Also, it agrees with that result reported

by Kamal et al.,^[21] in which they found that FSH value significantly increased after laparoscopic salpingectomy. Moreover, it was in agreement with Xu-ping et al.,^[22] when the mean FSH level was significantly higher in women with salpingectomy as compared with those without salpingectomy. On the other hand, it disagreed with Sezik et al.,^[24] in their study which examined the effect of salpingectomy on ovarian reserve and stromal blood flow after abdominal hysterectomy. This study had a small sample size (24 subjects), and they did not find a difference in ovarian reserve among women who underwent salpingectomy versus those that did not. Also, it disagrees to that registered by Nauh et al. study,^[20] in which they mentioned that FSH is not significantly changed six months postoperatively in both groups, this attributed to the small sample size which was 25 subjects.

Serum anti Müllerian hormone (AMH) level would appear to better reflect the level of ovarian aging than other known markers of ovarian reserve, as basal serum FSH level, inhibin B level, and antral follicle.^[25] In the current study, the level of Anti-Müllerian hormone in salpingectomy group was significantly lower than those in control group, ($P= 0.001$). AMH is secreted primarily by granulocytes of preantral follicles and small antral follicles. With a decreased ovarian blood supply after salpingectomy, the recruitment and development of follicles are compromised, leading to reduced AMH secretion from follicular granulocytes. The previous finding is disagreeing to that found by Singer et al.,^[26] when the level of the AMH is not affected by salpingectomy this is because only six patients in this study treated surgically and 29 of them treated medically by methotrexate drug.^[26] Moreover, it disagrees with that revealed by Findley et al.,^[27] when the mean AMH levels were not significantly different; however they only examined levels at three months after surgery and small sample size in which only 30 subjects for both groups.^[27] The results of the current study agreeing to that revealed by Xu-ping et al.,^[22] in which they reported that AMH level in women with salpingectomy is lower than that without salpingectomy.

Recent studies have shown that inhibin B concentrations may reflect ovarian function. But an absolute cut-off point has not yet been found.^[28] In the current study, the level of inhibin B was significantly lower in salpingectomy group than controls, ($P=0.041$). The presumed linkage in the relationship between

baseline FSH and random AMH is that both hormones are indicators of ovarian reserve. In the current study in salpingectomy group, AMH was inversely and significantly correlated with FSH, which was in agreement with Bala et al., study.^[29]

CONCLUSIONS

Salpingectomy is associated with decreased AMH and inhibin B levels, while it associated with increased FSH level. These results suggest that salpingectomy associated with decreased ovarian reserve.

Conflict of Interest : None

Ethical Clearance: Informed written consent was obtained from all the participants in the study, and the study and all its procedure were done in accordance with the Helsinki Declaration of 1975, as revised in 2000. The study was approved by Gynecology & Obstetric department of Baghdad medical college.

Source of Funding: The work were supported by authors only

REFERENCES

1. O'Connor KA, Holman DJ, Wood JW. Declining fecundity and ovarian ageing in natural fertility populations. *Maturitas*, 1998; 30 (2): 127-36.
2. Scott RT, Jr., Hofmann GE. Prognostic assessment of ovarian reserve. *Fertility and sterility*, 1995; 63 (1): 1-11.
3. Nikolaou D, Templeton A. Early ovarian ageing: a hypothesis. *Detection and clinical relevance. Human reproduction (Oxford, England)*, 2003; 18 (6): 1137-9.
4. Chuang CC, Chen CD, Chao KH, Chen SU, Ho HN, Yang YS. Age is a better predictor of pregnancy potential than basal follicle-stimulating hormone levels in women undergoing in vitro fertilization. *Fertility and sterility*, 2003; 79 (1): 63-8.
5. van Rooij IA, Broekmans FJ, Hunault CC, Scheffer GJ, Eijkemans MJ, de Jong FH, et al. Use of ovarian reserve tests for the prediction of ongoing pregnancy in couples with unexplained or mild male infertility. *Reprod Biomed Online*, 2006; 12 (2): 182-90.

6. Scott RT, Toner JP, Muasher SJ, Oehninger S, Robinson S, Rosenwaks Z. Follicle-stimulating hormone levels on cycle day 3 are predictive of in vitro fertilization outcome. *Fertility and sterility*, 1989; 51 (4): 651-4.
7. Erdem M, Erdem A, Gursoy R, Biberoglu K. Comparison of basal and clomiphene citrate induced FSH and inhibin B, ovarian volume and antral follicle counts as ovarian reserve tests and predictors of poor ovarian response in IVF. *Journal of assisted reproduction and genetics*, 2004; 21 (2): 37-45.
8. Scott RT, Jr., Hofmann GE, Oehninger S, Muasher SJ. Intercycle variability of day 3 follicle-stimulating hormone levels and its effect on stimulation quality in in vitro fertilization. *Fertility and sterility*, 1990; 54 (2): 297-302.
9. Kwee J, Schats R, McDonnell J, Lambalk CB, Schoemaker J. Intercycle variability of ovarian reserve tests: results of a prospective randomized study. *Human reproduction (Oxford, England)*, 2004; 19 (3): 590-5.
10. Durlinger AL, Visser JA, Themmen AP. Regulation of ovarian function: the role of anti-Mullerian hormone. *Reproduction (Cambridge, England)*, 2002; 124 (5): 601-9.
11. Weenen C, Laven JS, Von Bergh AR, Cranfield M, Groome NP, Visser JA, et al. Anti-Mullerian hormone expression pattern in the human ovary: potential implications for initial and cyclic follicle recruitment. *Mol Hum Reprod*, 2004; 10 (2): 77-83.
12. Hehenkamp WJ, Looman CW, Themmen AP, de Jong FH, Te Velde ER, Broekmans FJ. Anti-Mullerian hormone levels in the spontaneous menstrual cycle do not show substantial fluctuation. *The Journal of clinical endocrinology and metabolism*, 2006; 91 (10): 4057-63.
13. Fanchin R, Taieb J, Lozano DH, Ducot B, Frydman R, Bouyer J. High reproducibility of serum anti-Mullerian hormone measurements suggests a multi-staged follicular secretion and strengthens its role in the assessment of ovarian follicular status. *Human reproduction (Oxford, England)*, 2005; 20 (4): 923-7.
14. Seifer DB, Lambert-Messerlian G, Hogan JW, Gardiner AC, Blazar AS, Berk CA. Day 3 serum inhibin-B is predictive of assisted reproductive technologies outcome. *Fertility and sterility*, 1997; 67 (1): 110-4.
15. Seifer DB, Scott RT, Jr., Bergh PA, Abrogast LK, Friedman CI, Mack CK, et al. Women with declining ovarian reserve may demonstrate a decrease in day 3 serum inhibin B before a rise in day 3 follicle-stimulating hormone. *Fertility and sterility*, 1999; 72 (1): 63-5.
16. Strandell A, Lindhard A, Waldenstrom U, Thorburn J, Janson PO, Hamberger L. Hydrosalpinx and IVF outcome: a prospective, randomized multicentre trial in Scandinavia on salpingectomy prior to IVF. *Human reproduction (Oxford, England)*, 1999; 14 (11): 2762-9.
17. Kontoravdis A, Makrakis E, Pantos K, Botsis D, Deligeoroglou E, Creatsas G. Proximal tubal occlusion and salpingectomy result in similar improvement in in vitro fertilization outcome in patients with hydrosalpinx. *Fertility and sterility*, 2006; 86 (6): 1642-9.
18. Lass A, Ellenbogen A, Croucher C, Trew G, Margara R, Becattini C, et al. Effect of salpingectomy on ovarian response to superovulation in an in vitro fertilization-embryo transfer program. *Fertility and sterility*, 1998; 70 (6): 1035-8.
19. Gelbaya TA, Nardo LG, Fitzgerald CT, Horne G, Brison DR, Lieberman BA. Ovarian response to gonadotropins after laparoscopic salpingectomy or the division of fallopian tubes for hydrosalpinges. *Fertility and sterility*, 2006; 85 (5): 1464-8.
20. Nouh A, El Behery M, Alanwar A, Seleim B. Total salpingectomy during abdominal hysterectomy preserves ovarian blood flow and function. *WebmedCentral OBSTETRICS AND GYNAECOLOGY*, 2010; 1 (9): WMC00707.
21. Kamal EM. Ovarian performance after laparoscopic salpingectomy or proximal tubal division of hydrosalpinx. *Middle East Fertility Society Journal*, 2013; 18 (1): 53-7.
22. Ye X-p, Yang Y-z, Sun X-x. A retrospective analysis of the effect of salpingectomy on serum

- anti-Müllerian hormone level and ovarian reserve. *American Journal of Obstetrics & Gynecology*, 212 (1): 53.e1-e10.
23. Iwase A, Nakamura T, Nakahara T, Goto M, Kikkawa F. Assessment of ovarian reserve using anti-Müllerian hormone levels in benign gynecologic conditions and surgical interventions: a systematic narrative review. *Reproductive biology and endocrinology : RB&E*, 2014; 12: 125.
 24. Sezik M, Ozkaya O, Demir F, Sezik HT, Kaya H. Total salpingectomy during abdominal hysterectomy: effects on ovarian reserve and ovarian stromal blood flow. *The journal of obstetrics and gynaecology research*, 2007; 33 (6): 863-9.
 25. Fanchin R, Schonauer LM, Righini C, Frydman N, Frydman R, Taieb J. Serum anti-Müllerian hormone dynamics during controlled ovarian hyperstimulation. *Human reproduction (Oxford, England)*, 2003; 18 (2): 328-32.
 26. Singer T, Kofinas J, Huang J, Elias R, Schattman G, Rosenwaks Z. Anti mullerian hormone serum levels and reproductive outcome are not affected by neither methotrexate nor laparoscopic salpingectomy for the treatment of ectopic pregnancy in IVF patients. *Journal of Minimally Invasive Gynecology*, 2011; 18 (6): S46.
 27. Findley AD, Siedhoff MT, Hobbs KA, Steege JF, Carey ET, McCall CA, et al. Short-term effects of salpingectomy during laparoscopic hysterectomy on ovarian reserve: a pilot randomized controlled trial. *Fertility and sterility*, 2013; 100 (6): 1704-8.
 28. Strandell A, Lindhard A, Waldenstrom U, Thorburn J. Prophylactic salpingectomy does not impair the ovarian response in IVF treatment. *Human reproduction (Oxford, England)*, 2001; 16 (6): 1135-9.
 29. Bala J, Agrawal Y, Seth S, Goyal V, Kumar P. Correlation between anti-Müllerian and follicle-stimulating hormone in female infertility. *International Journal of Health & Allied Sciences*, 2014; 3 (4): 232.

The Effect of Transformational Leadership and Organizational Climate with Satisfaction Partnership at Hospital RSUD Pariaman Indonesia in 2017

Siska Sakti Anggraini¹ Rahmi Fahmy² Dewi Murni, ³Rika Fatmadona⁴

¹Magister Keperawatan Fakultas Keperawatan Universitas Andalas,

²Fakultas Ekonomi Universitas Andalas Indonesia, ³Fakultas Ilmu Keperawatan Universitas Andalas Indonesia,

⁴Fakultas Ilmu Keperawatan Universitas Andalas Indonesia

ABSTRACT

The nurse has *Organizational citizenship behavior (OCB)* that greatly needed because OCB involves some behavior, for example behavior helping others, active in activities organization, act that appropriate with procedure and give service to everyone. The aims of this study was to analyze the effect of transformational leadership and organizational climate to *organizational citizenship behavior* and job satisfaction as mediating variables on nurses implementing in RSUD Pariaman. The sample in this study were 54 nurses implementers. In Choosing the sample in this research used *Total Sampling* technique. The Results of this research is there is a significant influence and positive between transformational leadership variables (t-statistical test 4.87) and climate organization (t-statistical test 8.27) against OCB. There is a significant influence and positive between transformational leadership variables (t-statistics 3.59) and organizational climate (statistical t test 4.71) on job satisfaction. There is a significant influence and positive between variable satisfaction work against OCB (t-statistical test of 5.49). It is expected that the head of the room can change the way the nurses work to be better by establishing good cooperation and communication to their subordinates and motivating them so that the nurses will be satisfied with the work done.

Keywords: *Transformational Leadership, Organizational Climate, Job Satisfaction, organizational citizenship behavior*

INTRODUCTION

Nurses are the spearhead of whether good or not health services are provided to patients. This is due to the dominant number (50-60%) of all personnel available, and the duty to care and keep the patient for 24 hours a day. Nurses are required to be able to provide first aid to patients with responsiveness without complaining no matter the situations and conditions of employment. Such this demands make the nurse as one of the elements of the hospital in desperate need of behaviors from the *Organizational Citizenship Behavior (OCB)* dimension⁽¹⁾.

nurses implementing RSUD Pariaman which amounted to 97 people. The samples in this study were 54 nurses. Sampling of this research using *Total Sampling* technique.

RESULT OF THE RESEARCH

The results show that a small portion nurses aged 35-40 years (40.7%), sex nurses most of the women 44 nurses (81.5%) and nursing education a small part was Diploma 26 nurses (48.1%).

RESEARCH METHODOLOGY

This research is a correlation research with cross sectional design. The population in this study is all

Table 1: The Influence of Transformational Leadership on Organizational Citizenship Behavior (OCB) (Direct Effect)

Direct Effect	Latent Variable Correlation	Path Coefficient	Big Influence (%)	t- Statistics	Information
Leadership toward OCB	0.780981	0.239528	18.71%	4.871024	Significant and Positive

Table 1 shows that the value of t-count of 4.871024 where larger than 2.00 tables (df = 53), it can be concluded that the first hypothesis accepted is “There is a significant and positive influence between transformational leadership variables on *organizational citizenship behavior* (OCB) “

Table 2: The Influence of Organizational Climate on Organizational Citizenship Behavior (OCB) (Direct Effect)

Direct Effect	Latent Variable Correlation	Path Coefficient	Big Influence (%)	t- Statistics	Information
Climate Organization Against OCB	0.807388	0.399714	32.27%	8.273330	Significant and positive

Table 2 shows that the value of t count equal to 8.273330 which higher than t-table of 2.00 (df = 53), it can be concluded that the second hypothesis is accepted that “There is a significant and positive influence between the variables of organizational climate to *organizational citizenship behavior* (OCB) “.

Table 3: The Influence of Transformational Leadership on Job Satisfaction (Direct Effect)

Direct Effect	Latent Variable Correlation	Path Coefficient	Big Influence (%)	t- Statistics	Information
Transformational Leadership on Job Satisfaction	0.696590	0.333451	23.23%	3.597432	signore and Positive

Table 3 shows that the value of t-count is 3.597432 which is bigger than t-table of 2.00 (df = 53), it can be concluded that the third hypothesis accepted is “There is a significant and positive influence between transformational leadership variable to satisfaction work”.

Table 4 : The Influence of Organizational Climate on Job Satisfaction (Direct Effect)

Direct Effect	Latent Variable Correlation	Path Coefficient	Big Influence (%)	t- Statistics	Information
Organizational Climate of Satisfaction	0.709360	0.423302	30.03%	4.714560	Significant and Positive

Table 4 shows that the t-count value of 4.714560 which is greater than the t-table of 2.00 (df = 53), it can be concluded that the fourth hypothesis accepted “There is a significant and positive influence between organizational climate variables on satisfaction work “.

Table 5: Effect of Job Satisfaction on *Organizational Citizenship Behavior*(OCB) (Direct Effect)

Direct Effect	Latent Variable Correlation	Path Coefficient	Big Influence (%)	t- Statistics	Keterangan
Job Satisfaction Against OCB	0.735425	0.285031	20.96%	5.495261	Significant and Positive

Table 5 shows that the t-count value of 5.495261 which is greater than t-table of 2.00 (df = 53), it can be concluded that the fifth hypothesis accepted “There is a significant and positive influence between job satisfaction variable on *organizational citizenship behavior* (OCB) “.

Table 6 : The Influence of Transformational Leadership on *Organizational Citizenship Behavior* (OCB) Through Job Satisfaction (Indirect Effect)

Effects of causality	Path Coefficient	Big Influence (%)	Conclusion
The Influence of Transformation Leadership to OCB through Job Satisfaction	0.095044	4.87%	Influence, Not Significant and Positive

Table 6 shows the influence of transformational leadership on OCB through job satisfaction by 4.87% where significant influence is not less than 5% with the path coefficient value of 0.095044, it can be concluded that the sixth hypothesis is accepted “There is a positive influence between the variables of leadership transformational to *organizational citizenship behavior* (OCB) through job satisfaction “.

DISCUSSION

A. The Influence of Transformational Leadership And Organizational Climate To *Organizational Citizenship Behavior*(OCB)

Based on the result of this research, the influence of transformational leadership toward OCB got the value of T statistic (4,871024) bigger than t table equal to 2,00 (df = 53) and its influence (18,71%) means that there is significant and positive influence between leadership variable transformational to *organizational citizenship behavior* (OCB).

Leaders who are transformational can make their subordinates work harder and want to work more than what they should be doing. Bass in Luthans (2006) states that transformational leadership can make the subordinates become more engaged and concerned about their work, paying more attention and time to their work,

and becoming less attentive to his personal interests ⁽²⁾.

B. The Influence of Transformational Leadership And Organizational Climate On Job Satisfaction

Based on the results of this research, the influence of transformational leadership on Job Satisfaction, the value of T statistic (3.597432) is greater than t table of 2.00 (df = 53) and the influence (23.23%) means that there is a significant and positive influence between variables transformational leadership towards job satisfaction. Job satisfaction has a relationship and can be influenced by many things, one of them is transformational leadership. In Herzberg’s theory of motivation, especially hygiene theory, if extrinsic factors such as corporate leadership, supervision, interpersonal relations, and working conditions are cannot fulfil, it will lead to dissatisfaction and for intrinsic factors or motivating factors such as achievement, job recognition, self-esteem, it will lead to job satisfaction ⁽³⁾.

C. The Effect of Job Satisfaction on *Organizational Citizenship Behavior* (OCB)

Based on the result of this research got the value of T statistic (5,495261) bigger than t table equal to 2,00 (df = 53) and big influence (20,96%) meaning there is significant and positive influence between job satisfaction variable to *organizational citizenship*

behavior (OCB). Research conducted by Hasanbasri (2007), suggests that there is a significant positive relationship between job satisfaction with OCB⁽⁴⁾. Even Kelana (2009) argued that job satisfaction is the most dominant variable affecting OCB⁽⁵⁾.

In a number of literature explains that OCB is an individual behavior that voluntarily performs tasks outside of its responsibilities and positively impacts the organization or to its group members⁽⁶⁾. Satisfied employees are more likely to do their work than the required *job-description*, because they want to reply to their positive work experience⁽⁷⁾.

D. The Influence of Transformational Leadership on Organizational Citizenship Behavior (OCB) Through Job Satisfaction

Based on the result of the research, the influence of 4.87%, where the influence is not significant less than 5% with the parameter coefficient value 0,095044, it can be concluded that there is no significant and positive influence between transformational leadership variable to *organizational citizenship behavior* (OCB) through job satisfaction. From the test of mediation effect test, the value of *variance accounted for* (VAF) is 28,41%, means that job satisfaction variable can be categorized as partial premediation with indirect effect value 0,095044 and direct influence 0,239528. It can be interpreted that the effect of transformational leadership will have an impact on the emergence of job satisfaction raised by nurses, and then it will only cause OCB. The effects of transformational leadership do not directly affect OCB because nurses will feel satisfied in advance with their work and will only reinforce the OCB's attitude.

E. The Influence of Organizational Climate on Organizational Citizenship Behavior (OCB) Through Job Satisfaction

Based on the result of the research, it is found that the influence of 6.29% where the influence is bigger than 5% with the parameter coefficient value 0.120654, it can be concluded that there is a significant and positive influence between *organizational citizenship behavior* (OCB) organizational climate variable through job satisfaction. From the test of mediation effect test, the value of *variance accounted for* (VAF) is 23,19%, means that job satisfaction variable can be categorized as partial premediation with indirect effect value 0,120654 and direct influence 0,399714.

Organizational climate can be a powerful cause of the development of OCB within an organization. In a positive organizational climate, employees feel more willing to do their work than what is required in job descriptions, and will always support the organization's goals if they are treated by the leader with fair and with full awareness and believe that they are treated fairly by the organization. Based on the above analysis, the researcher assumes that the nurse will elicit OCB behavior if there is indirect effect from organizational climate that will make the nurses feel satisfied with their work. Normal expectations in their work. In addition, satisfied employees may provide more roles as they respond to their positive experiences.

CONCLUSION

There is a significant and positive influence between transformational leadership variables, organizational climate variables, on organizational citizenship behavior (OCB)

Conflict of Interest: No conflict of interest arose in this study

Source of Finding: This study was conducted using a source of funds derived from the researcher himself

Ethical Clearance: This study has passed of the medical research ethics of the Dr. M. Djamil Hospital Padang Indonesian.

REFERENCES

1. Runtu, D. Y. N & Widyarini, M. M. N. Iklim Organisasi, Stres Kerja, dan Kepuasan Kerja Pada Perawat. *Jurnal Psikologi*. 2009. 2, 2, 1007-112.
2. Luthans, Fred. *Perilaku Organisasi*. Yogyakarta : Andi.Masud, Fuad. 2004. *Survei Diagnosis Organisasional Konsef Aplikasi*. Semarang: Universitas Diponegoro. 2006.
3. Robbins, Stephen P. dan Judge, Timothy A. *Perilaku Organisasi*. Edisi 16. Jakarta: Salemba Empat. 2015.
4. Hasanbasri, D.M. Hubungan Kepuasan Kerja dan Komitmen Organisasi dengan Organizational Citizenship Behaviour di Politeknik Kesehatan Banjarmasin working paper series. 2007.2, 2-1
5. Kelana, L. Pengaruh Kepuasan Kerja dan Komitmen Organisasi terhadap Organizational Citizenship Behaviour (OCB). 2009. vol 11(2) pp

340-350

6. Organ, D. W., Poskadoff, P. M., & MacKenzie, S. B. Organizational citizenship behaviour: It's nature, antecedents, and consequences. Thousand Oaks, CA: Sage. 2006.
7. Suhanto, Edi. (2009). Pengaruh Stres Kerja dan Iklim Organisasi terhadap Turnover Intention dengan Kepuasan Kerja Sebagai Variabel Intervening. *Jurnal Magister Manajemen Universitas Diponegoro Semarang*. 1(1):1-130

The Correlation between Age, Gender, and Nutritional Status with Pesticide Poisoning at Holtikultura Farmers in Cikajang Sub-District, Garut District, West Java

Suyud Warno Utomo¹, Fahmi Rasyidah¹, Haryoto Kusnoputranto²

¹Department of Environmental Health, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia,

²School of Environmental Science, Universitas Indonesia, Jakarta, Indonesia

ABSTRACT

Pesticides are chemicals used to control agricultural pests. In addition to provide benefits, Pesticides use also affects the environment, as well as poisoning to humans. This study aimed to analyze the correlation between farmers' internal factors such as age, gender, nutritional status, and smoking habits with pesticide poisoning. The design was cross-sectional, with analysis using T-independent test. The sample of this research is 82 farmers holtikultura located in District Cikajang, Garut Sub-district, West Java. The result of bivariate test showed significant difference of cholinesterase enzyme on gender variable ($p = 0,037$) and nutritional status (0.001) and showed no correlation between age and pesticide poisoning at farmer (0,222). The conclusion of this research is gender and nutritional status of farmer influence the status of pesticide poisoning based on cholinesterase enzyme concentration. Further research is expected to analyze other variables related to pesticide poisoning and measure the concentration of pesticide exposure in free air when spraying.

Keywords: *pesticide, pesticide poisonong, cholinesterase.*

INTRODUCTION

Pesticides are chemicals used to kill pests (rats, insects, plants) that negatively affect plant growth. In addition to its benefits to agriculture, the use of pesticides has the potential to cause toxic effects to other organisms including human and environment^[1]. Exposure to pesticides in certain types and amounts may pose a health risk of respiratory distress, diabetes, depression, neurological disorders, and cancer. The risk of health effects will be the higher to groups of people who exposed directly by pesticides^[2]. Acute effects of pesticide exposure might include fatigue, headache, rough skin, decreased concentration, respiratory distress, nausea, tremor, panic, cramps, and in some cases may lead to coma to death. Meanwhile, the chronic effects of pesticide exposure according to some studies include sarcomas, multiple myeloma, prostate cancer, pancreas,

lung, ovary, breast, testes, liver, kidney, intestinal, and brain^[3].

The poisoning caused by pesticide exposure in the world is estimated to reach 250,000 deaths annually^[4]. According to a report from the Pesticide Action Network (PAN), WHO found that there were 735,000 cases of specific chronic diseases caused by pesticide poisoning each year. Rhalem et al reported 2,609 cases of poisoning in Morocco in the period 1982-2007. There were also reported cases of poisoning in Latin America in Bolivia with 274 poisoning cases which 13 died from Numbela's research in 2008. Meanwhile, cases of pesticide poisoning have also been reported in the Asian region covering Bangladesh, Cambodia, China, Japan, Korea, India, Malaysia, Philippines, Sri Lanka, Vietnam and Indonesia^[5].

Garut District is one of the districts located in West Java Province with an area of 3,065.19 km². The strategic location of Garut with the capital of West Java province makes it as one of the suppliers, including food and agriculture needs^[6]. Cikajang sub-district is one of the

Corresponding author:

Suyud Warno Utomo

Email : sw_utomo@yahoo.com

areas of vegetable suppliers with agricultural land area reaching 503.81 km² where 41% of the population work as farmers^[7]. Based on research conducted by Luthfiah in 2016, it found pesticide residues on tomato farm products grown in the Village Cikandang which is one of the villages in the Cikajang sub-district. In addition, the frequency of farmers exposed to pesticides reaches an average of 351 days / year^[8], which would pose a risk for pesticide poisoning for farmers.

Pesticides that enter the body will go through a series of toxicological mechanisms. The most commonly exposed pesticides and impacts on human health are organophosphate and carbamate pesticides. Organophosphate pesticides that have entered the body will accumulate rapidly in fatty tissue, liver, kidneys and salivary glands. These compounds will be stored extensively in fats that can cause prolonged toxic effects and clinical relapse. The organophosphate metabolite product will largely be eliminated through urine, slightly in the feces and air of the exhalation^[9]. Meanwhile, carbamate type pesticides that enter the body will be enzymatically hydrolyzed by the liver. The degradation product of the process will then be excreted by the kidneys and liver^[10].

This study aims to analyze the effect of age, sex, and nutritional status on the incidence of pesticide poisoning based on the concentration of cholinesterase enzyme in horticultural farmers. The results of this study are expected to be used as consideration for the government in making policies related to the control of pesticide use. In addition, the community, especially farmers can be more careful in using pesticides.

METHOD

Subject of Research

Respondents of this research were horticulture farmers who are in charge of spraying pesticides, with the number of 82 people (68 men and 14 women). Respondents were obtained by using random sampling method involving 5 of 12 villages in Cikajang Sub-District. The selection of 5 villages was determined based on the location of the village that is easily accessible by researchers, namely Cikajang Village, Simpang, Padasuka, Cikandang, and Margamulya.

Sampel of Research

Each respondent will take a blood sample of 5 ml for then separated the blood component using centrifuge and the serum taken as much as 1 ml. Blood sampling and serum taken by laboratory staff from Health Laboratory of Garut. The picked serum is then stored at 2-8°C using a cooler box and jelly ice pack to maintain its durability until it reaches Jakarta for further analysis. This study used the services of the Health Laboratory of Jakarta City to analyze cholinesterase levels of serum samples that had been collected. Testing cholinesterase was performed using colorimetric method.

Analysis

Cholinesterase enzyme levels in the blood of farmers were used as biomarkers of pesticide poisoning. Data collected other than pesticide poisoning data are about age, gender, height and weight. The data obtained then analyzed statistically using data processing program. The data were tested with bivariate analysis by using Independent T-test method to see the relationship between dependent variable consisting of age, gender, and nutritional status with independent variable in the form of poisoning status of pesticide and comparing the mean of inter-category variables.

RESULT

The status of pesticide poisoning is determined based on the cholinesterase enzyme levels in the peasant's blood that refer to the normal value of laboratory reference. The normal reference value of cholinesterase enzyme levels for women is 4,300-11,500 U / L and men is 5,400-13,200 U / L. The cholinesterase enzyme levels within the range are categorized as normal samples, whereas if out of range is categorized as an abnormal sample. Data on the status of pesticide poisoning in the respondents can be seen in Table 1.

Table 1. Status of Pesticide Poisoning Based on Cholinesterase Enzyme Concentration on Respondent

	Frequency	Percentage (%)
Normal	81	98,78
Abnormal	1	1,22

Data of frequency, average of cholinesterase, and

p value to see the relationship between dependent and independent variables are presented in Table 2. Data of age indicates that respondents in the age group between 17-54 years have higher average of cholinesterase compared to above age group 55 years old ($8468.14 \pm 1506,06$ vs. $7960,29 \pm 1550,37$; $p = 0,222$). In the gender variables, female respondents had higher mean cholinesterase than men ($9131,71 \pm 1350,68$ vs $8204,56 \pm 1513,15$; $p = 0,037$). Meanwhile, in nutritional status variables, respondents with normal nutritional status had a lower mean cholinesterase than the respondents group with abnormal nutritional status ($8013,53 \pm 1533,65$ vs $9207,04 \pm 1120,01$; $p = 0,001$).

Nutritional status is determined based on the value of the Body Mass Index (BMI) of respondents. The value of BMI is obtained by calculating a formula involving height and weight. The BMI formula is

Information:

BMI = Body Mass Index (kg/m^2)

W = Weight (kg)

H = Height (m)

Samples are normally categorized if BMI values are in the range 18.5-25 kg/m^2 . Whereas if outside the range it will be categorized as an abnormal sample.

Table 2. The result of bivariate analysis of internal risk factors to pesticide poisoning on horticultural farmers

Variable of Research	Category	Frequency	Average of cholinesterase	SD	P value
Age	17-54 years old	65	8468,14	1506,06	0,222
	≥ 55 years old	17	7960,29	1550,37	
Gender	Female	14	9131,71	1350,68	0,037
	Male	68	8204,56	1513,15	
Nutritional Status	Normal	58	8013,53	1533,65	0,001
	Abnormal	24	9207,04	1120,01	

DISCUSSION

Status of Pesticide Poisoning

Cholinesterase enzyme concentration is a biomarker used by researchers to describe the level of pesticide poisoning due to exposure of pesticide spraying activities. The lower the concentration of cholinesterase in the peasant body, the pesticide poisoning status will be more severe.

The results of assessment of farm poisoning status based on cholinesterase concentration in the blood of this study were very low. Of the 82 respondents who measured cholinesterase concentrations, there was only 1 person (1.22%) indicated to be poisoned by pesticides because they have cholinesterase concentrations below the normal reference value. This is in accordance with the enero of Ali in 2015 which also found only

one respondent indicated poisoning from a total of 32 samples at the technician at a pest control company in Jakarta. This is because the respondents whose blood was taken were not entirely in the spraying period of pesticides. In fact, the concentration of cholinesterase in the blood may return to normal if an exposed person rests from pesticide-related activities within a period of more than a week^[11].

Correlation between Age and Pesticide Poisoning

The result of bivariate test with independent t test showed that at $\alpha = 5\%$ there was no significant difference between average of cholinesterase content in the group of productive age and group of older age ($p = 0,222$). The statistical test showed that the age group over 55 years had lower cholinesterase levels, but the difference between the two categories was very small

(507.85 U/L) so assuming no significant correlation between age variables and pesticide poisoning. This result is consistent with studies conducted by Zakaria in 2007 and Zuraida in 2012 showing no association between age and pesticide poisoning^[12, 13]. Meanwhile, a study conducted by Ali in 2015 showed a significant relationship between age and pesticide poisoning with a value of $p = 0.036$ ^[11].

Age associated with the body's ability to perform metabolic functions and immune mechanisms against certain agents. Older age will have an impact on the weakness of the body in warding off foreign agents entering the body^[14]. This is because older farmers are experiencing physical limitations, especially in terms of energy that affect their ability to work for long periods of time.

The National Pesticides Information Center (NPIC) says that the elderly age group tends to be more sensitive to the risk of pesticide poisoning^[15]. This is because the ability of the kidneys to remove toxins from the body has decreased with age. This situation will eventually lead to accumulation of pesticides in the body and risk of causing certain health disorders^[16].

Gender

Based on the result of T-independent statistic test, obtained p value = 0,037 which mean there is significant difference between average of cholinesterase level on female and male respondent. The result of statistical test showed that male respondents had lower mean cholinesterase (8204,26 U/L \pm 1513,15 U/L) than female respondents (9131,71 U/L \pm 1350,68 U/L). This indicates that men tend to be more at risk of pesticide poisoning than women. The results of this study are in accordance with the research of Afriyanto (2008) and Rustia (2009) which shows that the average female respondent's cholinesterase is higher than that of men^[14, 17]. In a study conducted by Sidell F R and Kaminskis A in 1975 also found that cholinesterase activity in erythrocytes was higher in women than in men^[18].

The average difference of cholinesterase enzyme levels in women and men is influenced by various factors. Factors such as differences in workplace exposure are among the factors that influence gender variables. Exposure received by men in the workplace is considered much greater because it is more of a heavy and risky act than women^[19]. Redderson in Sidel F R

and Kaminskis A mentioned that the high activity of cholinesterase in women can be caused by the steroid hormone in women that encourages the liver to release the enzyme^[18]. In addition, the use of oral contraception will also affect cholinesterase activity to be higher^[20], so it is a confounder factor in this study.

Nutritional Status

Based on statistical test, it was found that there was significant difference of mean cholinesterase enzyme level in the group with normal and abnormal nutritional status with p value = 0.001. Rachmadi 1985 in Ali 2015 states that nutritional status affects cholinesterase enzyme activity^[11]. In a study conducted by Marsaulina and Wahyuni in 2007 with a sample of horticultural farmers also showed the results of the relationship between poor nutritional status with the incidence of pesticide poisoning with p value = 0.019. The study concluded that individuals with abnormal nutritional status were 2.2 times more likely to have pesticide poisoning than those with normal nutritional status^[21]. However, these results are not suitable according to research conducted by Afriyanto with a sample of sprayer farmers in 2008. Determination of nutritional status is not only determined based on the value of BMIT alone, but also need to assess the genetic and dietary factors of a person^[14].

Nutritional status also affects the immune system of farmers. Farmers who are constantly exposed to pesticides in unhealthy body condition will decrease initiative and sensitivity to foreign body infections^[21].

CONCLUSION

The result of statistical test proves the correlation of gender and nutritional status to pesticide poisoning measured by cholinesterase enzyme concentration. Meanwhile, age variable has no correlation with pesticide poisoning based on statistical test. The weakness in this study is there is no measurement of the amount of exposure in the environment when farmers are spraying. For the further study, it is expected to measure the concentration of exposure to pesticides in the air. In addition, studies with different variables and methods are also needed to strengthen the results of this study.

Acknowledgment: This research can be done because of the help from several parties. The researcher thanked Dr. Suyud Warno Utomo and Prof. dr. Haryoto Kusnoputranto as a mentor and to the Universitas

Indonesia as a supporter of research funds through the PITTA Grant program.

Ethical Approval: The study was approved by the Universitas Indonesia Faculty of Public Health Institutional Review Board (IRB) with the letter number of 158/UN2.F10/PPM.00.02/2017.

Competing Interest: There is no competing interest or conflict of interest on this research article

REFERENCES

1. WHO. Pesticides. [Cited on 2017 Feb 10] Available on: <http://www.who.int/topics/pesticides/en/>
2. Andersson H, Tago D, Treich N. Pesticides and health: A review of evidence on health effects, valuation of risks, and benefit-cost analysis. *Preference Measurement in Health (Advances in Health Economics and Health Services Research, Volume 24, March)*, pp.203–295; 2014
3. Pan-Germany. Pesticide and health hazards. Facts and figures. [Cited on 2017 Feb 10] Available on: http://www.pan-germany.org/download/Vergift_EN-201112-web.pdf
4. WHO. Pesticides and Health. [Cited on 2017 Feb 10] Available on: http://www.who.int/mental_health/prevention/suicide/en/PesticidesHealth2.pdf
5. Pan-Europe. Pesticides and environment, an overview. *Pesticide Action Network Europe*; 2010
6. BPS. Kabupaten Garut Dalam Angka 2016, [Cited on 2017 Feb 10] Available on: https://garutkab.bps.go.id/new/website/pdf_publicasi/Kabupaten-Garut-Dalam-Angka-2016.pdf
7. Indonesian Statistic Center. Garut Dalam Angka 2016, [Cited on 2017 Feb 10] Available on: https://garutkab.bps.go.id/new/website/pdf_publicasi/Kabupaten-Garut-Dalam-Angka-2016.pdf
8. Luthfiah. Health Risk Analysis Due to Consumption of Tomatoes Containing Profenofos Residues in Cikandang Horticultural Farmers, Cikajang District, Garut Regency, West Java Province 2016. *Universitas Indonesia*; 2016
9. Kazemi M, Tahmasbi AM, Valizadeh, Naserian AA, Soni A. Organophosphate pesticides: A general review. *Agricultural Science Research Journals*, 2(9), pp.512–522. [Cited on 2017 Feb 26] Available on: http://www.resjournals.com/journals/agricultural-science-research-journal/AGRIC_2012_SEPT/Kazemi_et_al.pdf
10. EPA, 2000. Office of Pesticide Programs Science Policy on the use of data on cholinesterase inhibition for risk assessments of organophosphorous and carbamate pesticides. *Cholinesterase Inhibition*. [Cited on 2017 Feb 14] Available on: <https://www.epa.gov/sites/production/files/2015-07/documents/cholin.pdf>
11. Ali MFA. Factors Associated with the Level of Cholinesterase Level Pesticide Poisoning at the Pest Control Company Technicians in Jakarta 2014. *Universitas Islam Negeri Syarif Hidayatullah Jakarta*; 2015
12. Zakaria M. Factors related to pesticide poisoning in pests spraying farmers in Pedeslohoh Village, Adiwerna District, Tegal Regency. *Univesitas Negeri Semarang*; 2007
13. Zuraida. Factors related to the level of pesticide poisoning in farmers in the village of Srimahi Tambun Utara Bekasi in 2008. *Universitas Indonesia*; 2012
14. Afriyanto. Study of pesticide poisoning on chilli horticultural farmers in Candi Village, Bendungan Sub-district, Semarang Regency. *Universitas Diponegoro Semarang*; 2008
15. NPIC. 2011. Older Adults and Pesticides. [Cited on 2017 Feb 10] Available on: <http://npic.orst.edu/factsheets/olderadults.html>
16. Masoro EJ, Schwartz JB. Exploration of aging and toxic response issues; U.S. Environmental Protection Agency, Risk Assessment Forum, EPA 630-R-01-003: Washington DC; 2001.
17. Rustia HN. Relation of Organophosphate Group Pesticide Exposure to Decreasing Cholinesterase Enzyme Activity in Blood of Vegetable Farmers of Pesticide Sprayers. *Universitas Indonesia*; 2009
18. Sidel FR, Kaminskis A. Influence of Age, Sex, and Oral Contraceptives on Human Blood Cholinesterase Activity. *CLIN.CHEM.*21/10, 1393-1395 (1975) [Cited on 2017 August 9] Available on: <https://pdfs.semanticscholar.org/aa07/23503764632b26918c14ef49c6561b860b5e.pdf>
19. UNDP. 2011. Chemicals and Gender. [Cited on 2017 August 9] Available on: <http://www.undp.org/>

content/dam/aplaws/publication/en/publications/
environment-energy/www-ee-library/chemicals-
management/chemicals-and-gender/2011%20
Chemical&Gender.pdf

20. Nielsen JB, Andersen HR. Cholinesterase Activity in Female Greenhouse Workers – Influence of Work Pesticides and Use of Oral Contraceptives. *J Occup Health* 2002; 44: 234-239. [Cited on 2017 August 9] Available on: http://joh.sanei.or.jp/pdf/E44/E44_4_08.pdf
21. Marsaulina I, Wahyuni AS. Factors related to pesticide poisoning in horticultural farmers in Jorlang Hataran District, Simalungun District in 2005. *Media Litbang XVII*, pp.18–25; 2007.

The Relationship between Self-Efficacy and Social Support with Effective Breastfeeding among Postpartum Mothers in Padang West Sumatera Tahun 2017

Vetty Priscilla¹, Meri Neherta²

Nursing Faculty of Andalas University Padang Indonesia

ABSTRACT

Background: Many opportunity gets from breastfeeding, not only for the baby but also for mother. In fact, the breastfeeding rate remains low year by year. The mother's circumstance and herself might influence this rate.

Objective: The objective of this study is to identify the relationship between self-efficacy and social support with effective breastfeeding among mother in Padang, West Sumatera.

Method: This study was using correlation with cross sectional study. It was conducted with 397 mothers who have baby with age less than months. Social support and self-efficacy was investigated by using questionnaires and *LATCH breastfeeding assessment tools* for Effective Breastfeeding. Data were analyzed using Spearman rho Correlation.

Results: There was significant correlation between social support: family's and health workers' and mother's self-efficacy on effective breastfeeding with $p < 0.05$.

Conclusion: More than 50% mother did breastfeeding to their baby. Family's and health workers' support and mother's self- efficacy has relation with effective breastfeeding. It means support from the people surrounding of mother important in order to do effective breastfeeding.

Keywords: *effective breastfeeding, social support, self-efficacy*

INTRODUCTION

Breastfeeding is the process of giving breast milk for the baby. Breastfeeding should be done as soon as possible after the baby is born. This circumstance is done because breast milk is the only best nutrition for infants up to the age of 6 months. Furthermore, the baby is given additional food along with breast milk until the age of the baby reaches 2 years. Consequently, WHO recommends exclusive breastfeeding until the age of 6 months and with additional food/beverages until 2-years-old in an effort to optimize the child health^(1,2). Breastfeeding the babies will be advantageous to everyone, including the babies, mothers, families, communities, and countries,

such as preventing infant illness, improving baby's intelligence, reducing risk and lessening medicating costs⁽³⁻⁵⁾.

METHOD

Cross-sectional design is applied throughout this study. The researchers used accidental sampling with a total result of 397 breastfeeding mothers, and these respondents were distributed from all public health centers in Padang. The ethics approval was granted from Ethical consideration. The respondents in this study received adequate information from the researcher about the purpose, procedures, risks and possible benefits of the study. Confidentiality of the respondent's identity and their answers were maintained throughout the study. The respondents in this study received a set of questionnaires, and they were distributed to the respondents before their healthcare services began.

Corresponding author:

Vetty Priscilla,

E-Mail: vettypriscilla@nrs.unand.ac.id

RESULT

Table 1: The Relationship of Self-efficacy with Effective Breastfeeding

Self-efficacy	Effective breastfeeding		Total	P Value
	Yes	No		
High	219 (92%)	18 (8%)	237 (100%)	0.001
Low	80 (50%)	80 (50%)	160 (100%)	

Table 1 shows that respondents who give effective breastfeeding, 92% have high self-efficacy and 50% with low self-efficacy with p = 0.001

Table 2: The Relationship of Husband’s Support with Effective Breastfeeding

Husband’s support	Effective breastfeeding		Total	P Value
	Yes	No		
High	180 (87%)	27 (13%)	207 (100%)	0.002
Low	119 (63%)	71 (37%)	190 (100%)	

Table 2 shows that respondents who give effective breastfeeding, 87% of them get the husband’s support and 63% have low support with p = 0.002

Table 3: The Relationship of Health Cadre’s Support with Effective Breastfeeding

Cadres’ Support	Effective Breastfeeding		Total	P Value
	Yes	No		
High	101 (83%)	20 (17%)	121 (100%)	0.072
Low	198 (72%)	78 (28%)	276 (100%)	

Table 3 shows respondents who give effective breastfeeding, 83% get high support from health cadre’s and 72% have low support with p value = 0.072

Table 4: The Relationship of Health Workers’ Support with Effective Breastfeeding

Health Workers’ Support	Effective Breastfeeding		Total	P Value
	Yes	No		
High	224 (75%)	76 (25%)	300 (100%)	0,035
Low	75 (77%)	22 (23%)	97 (100%)	

Table 4 shows respondents who give effective breastfeeding, 75% receive high support from health workers and 77% get low support with p value = 0.035

Table 5: The Relationship of Peer's Support with Effective Breastfeeding

Peer's Support	Effective Breastfeeding		Total	P Value
	Yes	No		
High	208 (72%)	82 (28%)	290 (100%)	0.066
Low	91 (85%)	16 (15%)	107 (100%)	

Table 5 shows respondents who give effective breastfeeding, 72% receive high support from their friends and 85% get low support with p value = 0.066

DISCUSSIONS

The Relationship of Self-Efficacy with Effective Breastfeeding

The results of this study indicate that around 237 (60%) of respondents have high self-efficacy in providing exclusive breastfeeding and 160 respondents (40%) with low self-efficacy. According to Bandura (1997), self-efficacy is a theory that heads for behavior. Self-efficacy transition will have a positive impact on behavior but there are times when self-efficacy will have negative effects. The expectations of high self-efficacy actually can be counterproductive. A person who possesses high self-efficacy can cause that individual to have the self-assurance and the effort to show up optimally⁽⁶⁾. Bivariate analysis by using chi-square test got result of p-value = 0,001 ($p < 0,05$). Based on this, statistically, there was a meaningful relationship between self-efficacy with effective breastfeeding. This is supported by research that done in Iran⁽⁷⁾. The research was shown that self efficacy has strong relationship with breastfeeding.

The Relationship of Husband's Support with Effective Breastfeeding

The results of this study indicated that 207 (52%) of respondents had a high support of husbands in breastfeeding and 190 (48%) of them had low husbands' support. Bivariate analysis by using chi-square test got result of p-value = 0,002 ($p < 0,05$). Based on this, statistically, there was a significant relationship between the support of husbands with effective breastfeeding.

One of the closest support obtained by the mother is the support of the husband. Husband's support is the most important part in the success or failure of breastfeeding because the husband determines the smoothness of

knowledge of breast milk (let-down reflex) which is strongly influenced by the emotional state and feelings of the mother⁽⁸⁾. The greater the support gained to continue breastfeeding, the greater the ability of the mother to keep going on breastfeeding^(9,10).

Husband's support is a proponent factor in the success of exclusive breastfeeding. This support is either an emotional or psychological activity given to a breastfeeding mother in presenting her breast milk. It is related to thoughts, feelings, and sensations that can boost the production of breast milk⁽⁸⁾. The greater the support obtain to continue the breastfeeding, the greater the ability and the mother's self-esteem to keep going on that. Either support from husband or family has an essential influence because a mother who gets support from her husband, mother, or sister will resist in breastfeeding and is not worried to change into formula milk⁽⁸⁾.

The Support of Health Cadre's in Effective Breastfeeding

The results of this study showed that 121 respondents (30%) received high support from health cadres in effective breastfeeding and respondents who had the low breastfeeding support were 276 respondents (70%). It is necessary to increase awareness, understanding, and knowledge of *posyandu* (health care center for mothers and babies) cadres about the importance of exclusive breastfeeding as well as to optimize the ability and skill of *posyandu* cadres in order to give health education about exclusive breastfeeding in every *posyandu* domain.

Based on the result of bivariate analysis by using chi-square test got a result of p-value = 0,072 ($p < 0,05$). Statistically, there was no meaningful relationship between health cadres and effective breastfeeding. Breastfeeding is a multidimensional health behavior that is influenced by the interaction of demographic, biological, psychological, and social factors⁽¹¹⁾. Health behavior is a person's response to stimuli or objects

which related to illness and disease, health service system, environment and others ⁽⁹⁾.

The Relationship of Health Workers with Effective Breastfeeding

The results of this study indicated that 300 people (76%), which were the majority of respondents, got high support from health workers to breastfeeding and there were 97 (24%) respondents who got low support. The support of health workers is the physical and psychological comfort, attention, appreciation, or other forms of aids that received by individuals from the health workers ⁽¹¹⁾. Health workers' support can be emotional comfort, rewarding, instrumental, and informational support ^(12, 13). Health workers are a source of social support coming from other individuals who rarely support and have a very rapid changing role. Supporting mothers becomes a significant factor in exclusive breastfeeding ^(6, 14).

Based on the result of bivariate analysis by using chi-square test got a result of p-value = 0,035 (p <0,05). Statistically, there was a meaningful relationship between health workers and effective breastfeeding. According to Green (1980) behavior is influenced by 3 circumstances, they are predisposing factors which include knowledge, attitudes, beliefs, faiths, values; enabling factors which are the physical environment, tools, and health facilities; strengthening factors either health officer's attitudes or behavior. The support of health professionals, doctors, midwives, nurses and health cadres, has an essential role in promoting the success of exclusive breastfeeding ⁽¹²⁾.

The Relationship of Peers Support with Effective Breastfeeding

The results of this study showed that 290 respondents (73%) received high support from their peers in effective breastfeeding and respondents who had the low breastfeeding support were 107 respondents (27%). Support groups are people who have the same dilemmas or goals. They gather regularly to tell each other about their difficulties, successes, news or ideas relating to the problems that they have been handling or goals to be achieved ⁽¹⁵⁾. The meetings of this group are held in a friendly atmosphere, comfortable, in mutual trust and mutual respect. Through these meetings, participants will give and receive mutual support in the form of technical, moral and emotional in order to solve the problems successfully or to achieve the desired goals.

The mother's support group is a particular support group which established for mothers who wish to succeed in breastfeeding optimally ⁽¹⁶⁻¹⁸⁾.

Bivariate analysis by using chi-square test got result of p-value = 0,066 (p <0,05). Based on this, statistically, there was no significant relationship between the support of peers with effective breastfeeding. Support groups are people who have the same dilemmas or goals. They gather regularly to tell each other about their difficulties, successes, news or ideas relating to the problems that they have been handling or goals to be achieved. The meetings of this group are held in a friendly atmosphere, comfortable, in mutual trust and mutual respect. Through these meetings, participants will give and receive mutual support in the form of technical, moral and emotional in order to solve the problems successfully or to achieve the desired goals. The mother's support group is a particular support group which established for mothers who wish to succeed in breastfeeding optimally ⁽⁹⁾.

CONCLUSIONS

More than 50% mother has practiced effective breastfeeding to her baby. Social support such as family's and health workers were relation with effective breastfeeding. Self-efficacy is also another factor related with effective breastfeeding with p value < 0.05.

Conflict of Interest: No conflict of interest arose in this study

Sources of Funding: This study was conducted using a source of funds derived from the researcher herself

Ethical Clearance: This research has passed from the Research Ethics Committee of Medical Faculty of Andalas University Padang Indonesia.

REFERENCES

1. Manrique Tejedor J, Figuerol Caldero MI, Cuellar De Frutos A. [Breastfeeding as a Method of Breast Cancer Prevention]. *Rev Enferm*. 2015;38(12):32-8.
2. Armenta RF, Kritz-Silverstein D, Wingard D, Laughlin GA, Wooten W, Barrett-Connor E, et al. Association of breastfeeding with postmenopausal visceral adiposity among three racial/ethnic groups. *Obesity (Silver Spring)*. 2015;23(2):475-80.
3. Zhou Y, Chen J, Li Q, Huang W, Lan H, Jiang H.

- Association between breastfeeding and breast cancer risk: evidence from a meta-analysis. *Breastfeed Med.* 2015;10(3):175-82.
4. Srinivasan A, Graves L, D'Souza V. Effectiveness of a 3-hour breastfeeding course for family physicians. *Can Fam Physician.* 2014;60(12):e601-6.
 5. Nabulsi M, Hamadeh H, Tamim H, Kabakian T, Charafeddine L, Yehya N, et al. A complex breastfeeding promotion and support intervention in a developing country: study protocol for a randomized clinical trial. *BMC Public Health.* 2014;14:36.
 6. Liu L, Zhu J, Yang J, Wu M, Ye B. The Effect of a Perinatal Breastfeeding Support Program on Breastfeeding Outcomes in Primiparous Mothers. *West J Nurs Res.* 2017;39(7):906-23.
 7. Aghdas K, Talat K, Sepideh B. Effect of immediate and continuous mother-infant skin-to-skin contact on breastfeeding self-efficacy of primiparous women: a randomised control trial. *Women Birth.* 2014;27(1):37-40.
 8. Mithani Y, Premani ZS, Kurji Z, Rashid S. Exploring Fathers' Role in Breastfeeding Practices in the Urban and Semiurban Settings of Karachi, Pakistan. *J Perinat Educ.* 2015;24(4):249-60.
 9. Giglia R. A partnership between researchers and breastfeeding advocates to support safe alcohol consumption during breastfeeding. *Breastfeed Rev.* 2016;24(3):7-11.
 10. Sherriff N, Panton C, Hall V. A new model of father support to promote breastfeeding. *Community Pract.* 2014;87(5):20-4.
 11. Oakley LL, Henderson J, Redshaw M, Quigley MA. The role of support and other factors in early breastfeeding cessation: an analysis of data from a maternity survey in England. *BMC Pregnancy Childbirth.* 2014;14:88.
 12. Demirtas B. Multiparous mothers: Breastfeeding support provided by nurses. *Int J Nurs Pract.* 2015;21(5):493-504.
 13. Tuan NT, Nguyen PH, Hajeebhoy N, Frongillo EA. Gaps between breastfeeding awareness and practices in Vietnamese mothers result from inadequate support in health facilities and social norms. *J Nutr.* 2014;144(11):1811-7.
 14. Pentecost R, Grassley JS. Adolescents' needs for nurses' support when initiating breastfeeding. *J Hum Lact.* 2014;30(2):224-8.
 15. Chang SM, Rowe J, Goopy S. Non-family support for breastfeeding maintenance among career women in Taiwan: a qualitative study. *Int J Nurs Pract.* 2014;20(3):293-301.
 16. Veghari G, Ahmadpour-Kacho M, Zahedpasha Y. The comparison of parents' educational level on the breastfeeding status between turkman and non-turkman ethnic groups in the north of iran. *Ann Med Health Sci Res.* 2014;4(6):899-903.
 17. Friesen CA, Hormuth LJ, Curtis TJ. The Bosom Buddy Project: A Breastfeeding Support Group Sponsored by the Indiana Black Breastfeeding Coalition for Black and Minority Women in Indiana. *J Hum Lact.* 2015;31(4):587-91.
 18. Niela-Vilen H, Axelin A, Melender HL, Salanterä S. Aiming to be a breastfeeding mother in a neonatal intensive care unit and at home: a thematic analysis of peer-support group discussion in social media. *Matern Child Nutr.* 2015;11(4):712-26.

Seroprevalence and Histological Study of *Toxoplasma gondii* in Chicken (*Gallus domesticus*) in Tikrit City, Iraq

Hanan Adhoi¹, Omaima Ibrahim Mahmood²

¹Dep. Biology/College of Education for Woman/Tikrit University,

²Dep. Microbiology/College of Veterinary Medicine/Tikrit University

ABSTRACT

Toxoplasmosis is one of the most common zoonotic disease caused by unicellular protozoan parasite *Toxoplasma gondii* that can be infected the human and animals. Recently, in Iraq with increasing chicken meat consumption, may be as one of the sources of human infection, this study was carried out to determine the seroprevalence of *T. gondii* in chicken, and demonstrated the histological effects of parasite in infected chicken in Tikrit city and its surroundings, Iraq. One hundred and thirty seven blood samples were collected from free Range chickens to detected toxoplasmosis by using Latex agglutination test (LAT) and Enzyme Linked Immunosorbent Assay (ELISA). Organs including brain and liver were also collected for histopathological examination. Results revealed that 32.1% and 29.2% of free ranging chickens positive by LAT and ELISA tests respectively. The results showed there were no significant differences $P < 0.05$ between infection with *toxoplasmosis* and age of the animals, and their habitat using both detection methods. Histopathological studies revealed necrosed areas and inflammatory cells in brain and liver.

Keywords: *Toxoplasmosis, Chickens, seroprevalence, histopathological effects, Iraq.*

INTRODUCTION

Toxoplasmosis is a zoonotic disease of worldwide distribution caused by *Toxoplasma gondii*, an obligate intracellular protozoan with a highly broad host range that infects most warm-blooded animals including birds, humans, domestic and wild animals [1,2].

The infections with toxoplasmosis are usually acquired by ingesting undercooked or raw meat containing tissue cysts, or by ingestion of food or water contaminated with oocysts from cat feces [3]. Though *T. gondii* can rarely cause clinical disease in chickens [4] they play an important role in the epidemiology of *T. gondii* infection because they are ground-feeding birds, and tissues of infected chickens are considered a good

source of infection for cats as well as, humans and other animals [4]. Many research examined that the free-range chickens are considered as an important indicator of soil contamination with *T. gondii* oocysts whereas cats excrete environmentally resistant oocysts after consuming tissues of *T. gondii*-infected birds [5,6].

This study aimed to investigate the seroprevalence of *Toxoplasma gondii* in chicken (*Gallus domesticus*), in Tikrit city and its surroundings and demonstrated the histological effects of parasite in infected chicken with toxoplasmosis.

MATERIALS AND METHOD

Study area and Samples Collection

Since December 2017 to April 2018, samples were obtained from Chicken farms (*Gallus domesticus*) from different regions in Tikrit city and its surroundings, Iraq. Data of each chicken was recorded on a questionnaire, the information included area, age, sex, general body conditions, symptoms, and if any of pet animals are kept. A total of (137) blood samples were collected directly

Corresponding author:

Omaima Ibrahim Mahmood

Dep. Microbiology/College of Veterinary Medicine/
Tikrit University, Mobile : +9647702079037

E-mail address: dr_aim_s@yahoo.com

from free range chickens (1-4 years old females), Sera were separated by using centrifuge at 1500×g for 5 min and stored at -20°C until use for diagnostic steps.

Diagnostic methods

Latex agglutination test (LAT)

Sera were examined using latex agglutination test by using commercially available kit (Spinreact, Spain). The test was performed according to the manufacturer's instructions.

Enzyme Linked Immunosorbent Assay (ELISA)

Toxoplasma IgG antibodies were detected using ELISA IgG kit (BiocheckInc, USA). The assay was performed following the instructions of the manufacturer.

Histological examination for positive chicken

Brains and liver for seropositive chickens were fixed in 10 % neutral-buffered formalin, routine procedures were made for sectioning and staining with hematoxylin and eosin H and E and examined under a light microscope.

Statistical Analysis

The results were analyzed by SPSS software using Chi-Square test and statistical significance was considered at $p < 0.05$.

RESULTS

Serological findings

The overall prevalence of *T. gondii* was 32.1 % (44 of 137) and 29.2% (40 of 137) in chicken, using LAT and ELISA tests, respectively.

The results appeared that the infection in chicken isn't highly age-dependent, and there are no significant association between infection with *toxoplasmosis* and habitat of the animals using LAT or ELISA tests, table (1).

Histological findings

Brain

According to histological examination for the seropositive chicken with *T. gondii*, in brain tissue, microglia necrosis and inflammatory cells with high activation around blood vessels was observed. High congestion in the thalamus region confirmed presence of inflammation, figure (1).

Liver

In *T. gondii* infected chicken, hepatic cell necrosis and mononuclear cell infiltrations was seen. In the periportal areas and around the central veins, lymphocytic cell infiltrations were found. A few parasitic bodies were present in the cytoplasm of the hepatocytes. Karyolysis was observed in the nuclei of necrotic hepatocytes which appeared like cloudy swelling, figure (2 & 3).

Table 1: Prevalence of *T. gondii* infection in chickens using Latex and ELISA test according to age and habitat

Variables	Latex			ELISA		
	No. positive	%	P-Value	No. positive	%	P-Value
Age ≤ 1 year ≥ 1 year	23	52.3	0.209	25	62.5	0.266
	21	47.7		15	37.5	
Habitat Center of the city rural areas	26	59.1	0.900	28	70	0.337
	18	40.9		12	30	

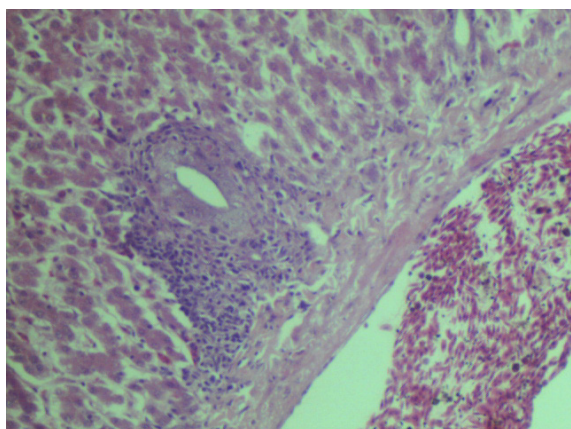


Fig 1. Brain of a seropositive chicken with toxoplasmosis. Microglia necrosis and inflammatory cells with high activation around blood vessels and high congestion in the thalamus region. H & E staining, 40X.

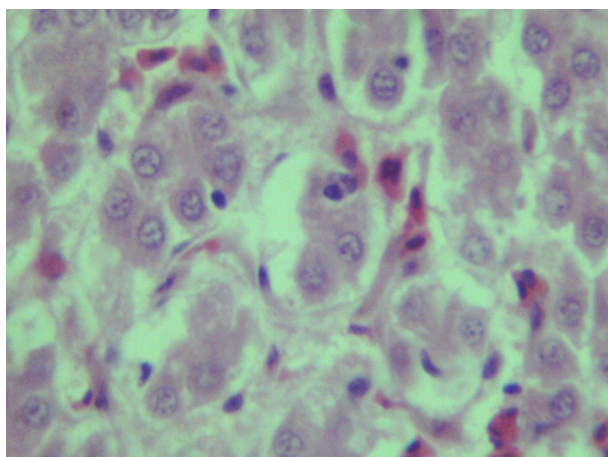


Fig 2. Liver of a seropositive chicken with toxoplasmosis. Hepatic cell necrosis and some parasitic bodies. H & E staining, 40X.

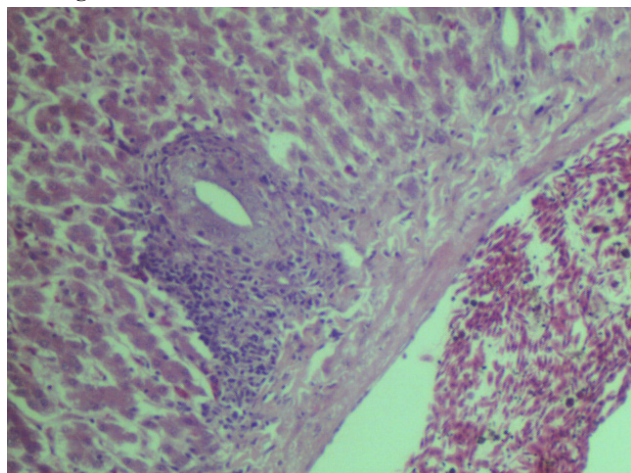


Fig 3. Liver of a seropositive chicken with toxoplasmosis. Lymphocytic cell infiltrations in periportal areas and around the central veins. H & E staining, 40X.

DISCUSSION

The results of this study proved the occurrence of considerable percentages of *T. gondii* infection in

free range chickens in the studied area. Chicken plays an important role as one of the most important hosts in the epidemiology of *T. gondii* infection because it becomes infected mostly during feeding on the ground contaminated with oocysts and human may become infected with this parasite after eating undercooked infected chicken meat and its viscera ^[7] or maybe its eggs ^[4].

In the present study, both LAT and ELISA were able to detect *T. gondii* antibody in chickens. To our knowledge, limited studies were conducted for detection of *T. gondii* among chicken in Iraq, Mahmood et al. (2006) reported 81.81% in Nineveh governorate/ Iraq in Broiler chickens ^[8], and 60% of chicken were seropositive for *Toxoplasma* antibody by LAT in Sulaimania Province, Iraq ^[9] and 12 of 50 (24%), samples being positive by Real-Time PCR technique for detection *Toxoplasma* in Al-Qadissiya province, Iraq ^[10].

The high seroprevalence rate of infection in present study agreed with the seroprevalence study in Saudia Arabia (32%)^[11] and in agreement with others from Egypt reported that, 200 (33.3%) were positive for toxoplasmosis ^[12] and from Jordan in which *T. gondii* seroprevalence of 36% was detected ^[13] Our finding was lower than that of EL Massry et al survey (47.2%) from Giza province in Egypt ^[14]. These differences in prevalence rate of the disease could be explained by the variation in geographical location, environmental characters, hygienic practices, the number of chicken examined in each study and type of tests used ^[15, 16].

Current results demonstrated a non-significant relationship between the seroprevalence of *T. gondii* and age, while a significant relationship between the prevalence of *T. gondii* and the different age groups of chicken was detected in many studies, Masood et al. found that The highest seroprevalence (54.14%) was detected in older birds (>1.5 years but < 2 years.) ^[17]. Mose et al. also showed that the high rate of infection was detected in older chicken (>2 years) ^[18]. This might be due that the birds with all ages have had the same opportunities for exposure and to get infection.

In current study, no significant difference between urban and rural areas in free ranged chicken infected with toxoplasmosis. This result disagree with study in southern Brazil ^[19] which found that the lower percentage of *T. gondii* seropositive chickens was found in rural areas than in urban and suburban localities. While

antibodies were detected in chickens obtained from all Local Government Areas in Nigeria with higher titer in rural than urban chickens [20].

Soil contaminated with parasite oocysts shedding by cats is the most important source of infection for intermediate hosts like chickens [7] because their habits of scratching the ground and feeding, facilitated the greater way to the hidden feces of cats [6]. The free-range chicken in the study area habitats in backyards of houses in urban areas and around homesteads in rural areas. In most areas of Iraq included the study area, the free-range chickens are slaughtered at home and their viscera such as heads are left for scavengers that can include cats and other animals, and since the study has reported high number of cats around the houses and farms, which is very important, as cats are reservoirs for animal and human toxoplasmosis [4]. That could explain the high prevalence observed in the study area whether in urban and rural areas.

Seropositive chickens in the current study were clinically healthy and this agree with many studies [7], since there are only a few reports of clinical toxoplasmosis in chickens worldwide [4].

The main histopathological changes were observed in this study included necrosis, hemorrhage and inflammatory cell infiltration. These observations were consistent to the previous findings by Kittas et al. (1984) in some previous mouse model studies [21] and Akhtar et al. (2014) in *T. gondii*-infected chickens [17]. Though, there were no histopathological changes observed in another studies in any of the infected chickens and no tissue cysts were found in the inoculated groups [22].

CONCLUSION

The high prevalence of toxoplasmosis in chickens in our study, displays the wide contamination with *T. gondii* oocysts in the living environment of people, and free range chicken might be an important source of infection in human with toxoplasmosis.

Conflict of interest: The Authors declares no conflict of interest related to this work.

Financial Disclosure: have no financial interests related to the material in the manuscript.

Funding/ Support: This study was not supported.

Ethical approval: The Animal Ethics Committee, College of Veterinary Medicine, Tikrit University approved the research protocol. All ethical standards have been applied to experimental animals throughout the experiment period .

REFERENCES

1. Montoya JG, and Liesenfeld O. Toxoplasmosis. Lancet. 2004; 363: 1965-1976.
2. Dubey JP. and Beattie CP. Toxoplasmosis of animals and man. CRC Press, Boca Raton, FL, 1988; pp. 220.
3. Tenter AM, Heckeroth AR, and Weiss LM. *Toxoplasma gondii*: from animals to humans. Intern J Parasito. 2000; 30: 1217-1258.
4. Dubey JP. *Toxoplasma gondii* infections in chickens (*Gallus domesticus*): Prevalence, clinical disease, diagnosis, and public health significance. Zoonoses Public Health. 2000; 57:60-73.
5. Dubey JP. Toxoplasmosis of animals and humans. 2nd ed. Boca Raton, Florida: CRC Press. 2010.
6. Xin-Chao L, Yu H, Deng-Ge H, Zhen-Chao Z, Ke L, Shuai W, Li-Xin X, Ruo-Feng Y, Xiang-Rui L. Detection of *Toxoplasma gondii* in chicken and soil of chicken farms in Nanjing region. Infect Dis Poverty 2017; 6:62.
7. Devada K, Anandan R, Dubey JP, Serologic prevalence of *Toxoplasma gondii* in chickens in Madras. Ind J Parasitol 1998; 84: 621-622.
8. Mahmood AF, Nashwan AA, Waked HM, Bashar MJ, Yaser YH. Detection of *Toxoplasma gondii* antibodies in Broiler chickens in Ninevah governorate. JDU. 2006; 9:145-148.
9. Mohammed AA, Abdullah SH. Diagnostic Study of Toxoplasmosis in Domestic Chickens in Sulaimani Province .AL-Qadissiya J Vet Med Sci. 2013; 12 (2): 63
10. Al-nasrawi HA, Hassan HN, and Saba FK. Molecular Detection of *Toxoplasma gondii* in Human and Chicken by Real-Time PCR Technique. IJAR. 2014; 3:1023-1027.
11. Elamin MH. Seroprevalence and molecular detection of *Toxoplasma gondii* infection among chicken (*Gallus domesticus*) in Riyadh Region, Saudi Arabia. WULFENIA. 2014; 21(2): 30-37.
12. Hassanain MA, Derbala ZA, and Kutkat MA.

- Serological diagnosis of *Toxoplasma gondii* (Apicomplexa: Toxoplasminae) infection in laying hens. *Egypt J Appl Sci.* 1997; 12: 1-8.
13. Morsy TA, Michael SA, and El Refaii A. *Toxoplasma* antibodies in chickens in Aman, Jordan. *J Egypt Soc Parasitol.* 1978; 8: 313-316.
 14. El-Massey A, Mahdy OA, El-Ghaysh A, Dubey JP. Prevalence of *Toxoplasma gondii* antibodies in sera of turkeys, chickens, and ducks from Egypt. *J Parasitol.* 2000; 86: 627-628.
 15. Dubey JP, Graham DH, Blackston CR, Lehmann T, Gennari SM, Ragozo AMA, Nishi SM, Shen SK, Kwok OCH, Hill DE, and Thulliez P. Biological and genetic characterisation of *Toxoplasma gondii* isolates from chickens (*Gallus domesticus*) from Saõ Paulo, Brazil: unexpected findings. *Int J Parasitol.* 2002; 32: 99-105.
 16. Karatepe M, Kılıç S, Karatepe B, Babü B. Prevalence of *Toxoplasma gondii* Antibodies in Domestic (*Columba livia domestica*) and Wild (*Columba livia livia*) Pigeons in Niğde region, Turkey. *Turkiye Parazitoloj Derg.* 2011; 35: 23-6.
 17. Masood A, Awais AA, Mian MA, Muhammad KS, Kamran A, and Elzbeita HS. Seroprevalence of *Toxoplasma gondii* in the backyard chickens of the rural areas of Faisalabad, Punjab, Pakistan. *Int J Agric Biol.* 2014; 16:1105_1111.
 18. Mose JM, Kagira JM, Karanja SM, Ngotho M, Kamau DM, et al. Detection of Natural *Toxoplasma gondii* Infection in Chicken in Thika Region of Kenya Using Nested Polymerase Chain Reaction. *Biomed Res* 2016: Int.Link:<https://goo.gl/kkRW4r>.
 - 19- da Silva DS, Bahia-Oliveira LM, Shen SK, Kwok OC, Lehman T, Dubey JP. Prevalence of *Toxoplasma gondii* in chickens from an area in southern Brazil highly endemic to humans. *J Parasitol.* 2003; 89(2): 394-6.
 20. Ayinmode AB, Olaosebikan RI. Seroprevalence of *Toxoplasma gondii* infection in free ranged chicken from rural and urban settlements in Oyo State, Nigeria. *Afr J Med Sci.* 2014; 43: 51-7.
 21. Kittas S, Kittas C, Paizi_Biza P, Henry L. A histological and immunohistochemical study of the changes included in the brains of white mice by infection with *Toxoplasma gondii*. *Brazil J Exp Pathol.* 1984; 65: 67-74.
 22. Shuai W, Guang WZ, Wang W, Qing X, Meng Z, Cheng Y, et al. Pathogenicity of two *Toxoplasma gondii* strains in chickens of different ages infected via intraperitoneal injection. *Avian Pathol.* 2014; 43: 91-95.

Presence of ABO Antigens of Blood Types in Saliva of Women with Urinary Tract Infection

Salma L Dahash¹, Azhar Hatif Oleiwi Al-Kuraishi², Zainab Abd Al-Amir³

¹MSc, Lecturer, ²PhD, Ass. Prof, ³PhD, Lecturer, Department of Obstetric & Gynecology, College of Medicine, Al-Mustansiriyah University, Baghdad, Republic of Iraq

ABSTRACT

Absence of the ABO antigen in saliva is a health disadvantage, and could increase susceptibility to a number of diseases such as urinary tract infection.

objective is to explore the influence of secretion of ABO blood group antigens into the body fluids (saliva) in women suffer from UTI.

A total of 241 women aged 18-45 years were included who complained of symptoms indicating UTIs who were attending Obstetrics and Gynecology Department of Al-Yarmouk Teaching Hospital in Baghdad during the period from March 2016 to May 2017. The secretor status of the patients was then determined using the haemagglutination inhibition assay for salivary ABO antigens. ABO antigens secretors were found in 36 women and was higher in women in the age group less than 25 and 25-29 years. Education, occupation and source of water have showed significant effect on infected women with ABO antigens secretor and non-secretor. There are significant differences between both ABO antigens secretors and non-secretor in the presence of pus cells and RBCs, and 13 women infected with *Trichomonas vaginalis* and 11 of them with negative ABO antigens secretors. Positive growth reported in 399 specimens. Single Bacterial growths in 149 and 62 with more than one species. The species of bacteria is primarily *Escherichia coli* followed by *Streptococcus*, *Staphelococcus aureus*, *Pseudomonas*, *Proteus*, and *Klebseilla*. In conclusion, absence of ABO antigens in saliva increases the susceptibility to UTI with a greater tendency to increased symptoms.

Keywords: ABO antigens, Saliva, Urinary Tract Infection

INTRODUCTION

Urinary tract infections are amongst the commonest infections with an extensive fiscal liability to the public, particularly in women, babies and the elderly as around one in two women and one in twenty men will get the infection in their lifetime¹. The threat of women getting Urinary tract infections in their lives is said to be above 50%, with almost 25 percent experiencing a recurrence². Almost 53% of women aged more than 55 years and about 36% of younger women record a recurrence in a time within one year³. The most common causative pathogens are Gram-negative rods "*Escherichia coli* which cause about 80% of acute infections. Other Gram-negative creatures comprise *Klebsiella pneumonia* and *Proteus mirabilis*, creatures which inhabit enteric area like *Serratia*, *Pseudomonas*, and *Enterobacter* are rare

in the outpatient groups, and nonetheless they are very common in people with intricate Urinary tract infections⁴. A Gram positive coagulase known *Staphylococcus saprophyticus* negative *Staphylococcus*, results in nearly 10 percent of infections in sexually active young women". *Trichomonus vaginalis* also can cause UTIs, which is more common in the small group of women⁵.

A Secretor can be described as "an individual who secretes their ABO antigens secretors into body fluids like saliva and mucus", while non-secretor on the other hand puts little to none of their ABO antigens secretors into these fluids. Many researchers reported the susceptibility to affect by disease increased among non-ABO antigens secretors giving reasons for these associations to be due to presence of these antigens will add a degree of protection against infectious agents⁶ that

will influence pathogenic activity⁷. Non-ABO antigens secretors are at a bigger threat for recurring of Urinary tract infections and are more probable to experience renal scars⁸. Therefore, the present study aimed to determine the relationship between the ABO antigens and susceptibility of women to UTIs.

PATIENTS AND METHODS

This was a cross sectional study included 241 married women aged 18-45 years and live in Baghdad city, complaining of symptoms indicating UTIs who were attended to Obstetrics and Gynecology Department of Al-Yarmouk Teaching Hospital in Baghdad, Iraq during the period from March 2016 to May 2017. Urine specimens were collected using a clean, sterile, plastic bags from each infected woman also 1 ml of non-stimulated saliva was collected from each woman into a sterile glass jar. Questionnaire including socio-demographic and clinical data.

The collected urine samples were centrifuged, then microscopic examination was performed. Each sample was cultured aerobic and facultative anaerobic on different media (Blood agar, Mac Conkey agar, Chocolate agar, Manitol salt agar, Milk agar, Sabouroud Dextrose agar to isolate bacteria and fungi). Regarding isolates diagnosis, it was done according to the well-known established microbiological methods, principally based on morphological characters, Gram-staining method and biochemical reactions.

The salivary presence of ABO antigens was determined using haemagglutination inhibition assay using anti A, B and D sera based on a principle that if ABO antigens present in saliva they will bind with antibodies in the antisera added. The antibodies were not available in the mixture (Saliva & Antisera) to agglutinate with RBCs suspensions and the subject is a positive ABO antigen secretory and *vice versa* is none or a negative ABO antigens secretory subject^{9,10}.

Data analysis done using Statistical Packages for Social Sciences- version 24). and appropriate statistical tests were applied according to the variables compared.

FINDINGS

The presence of ABO antigens secretor was found in 36 women and higher levels were reported among women in the age group less than 25 years and 25-29 years (9 and 12 respectively) (Table 1).

Education, occupation and source of water have significant effect on the presence of UTI and there is a significant difference between ABO antigens secretor and non-secretor (Table 2).

The main symptom is suprapubic pain in both ABO antigen secretor and non-secretors, followed by itching and secretions. The more prevalent paired of presence of symptoms is between 7 to 13 days in both ABO antigens secretor and non-secretor (Table 3).

The microscope examination indicated that there are significant differences between both ABO antigens secretor and non-secretor in the presence of pus cells and RBCs. The patients with ABO antigens secretors have no blood cells in urine and only 8 patients have excretion of epithelial cells in urine (Table 4).

Also microscopic examinations indicated that 13 women infected with *Trichomonas vaginalis* and 11 of them (84.6%) were ABO antigens non-secretor

The results of culture in specific media indicated that 399 give positive growth and only 2(0.8%) give no growth. The bacterial growths were present as single bacterial infection is 149, while mixed infections are 62 women that infected with more than one type of bacteria. Fifty-eight women infected with two types of bacteria, while only 4 women infected with three types of bacteria. There are significant differences between ABO antigens secretor and non-secretor (Table 5).

The species of bacteria that present in urine of women included in this study is primarily *Escherichia coli* followed by *Streptococcus*, *Staphelococcus aureus*, *Pseudomonas*, *Proteus*, and *Klebseilla* which is the latest one. Also significant differences were observed between ABO antigens secretor and non-secretor (Table 6).

Table 1. Distribution ABO antigens secretor in saliva according to age group.

Age (years)	ABO antigens secretor in saliva		
	Yes (n=36) n (%)	No (n=205) n (%)	Total (n=241) n (%)
<25	9 (25.0)	28 (13.7)	37 (15.4)
25-29	12 (33.3)	55 (26.8)	67 (27.8)
30-34	4 (11.1)	62 (30.2)	66 (27.4)
35-39	8 (22.2)	44 (21.5)	52 (21.6)
≥ 40	3 (8.3)	16 (7.8)	19 (7.9)
P. value = 0.13			

Table 2. Association between socio-demographic characteristics and presence of ABO antigens secretor of the studied group.

Variable		ABO antigen secretor in saliva			P. value
		Yes(n=36) n(%)	No (n=205) n(%)	Total (n= 241) n(%)	
Education	Illiterate	1 (2.8)	3 (1.5)	4 (1.7)	0.002*
	Primary	10 (27.8)	120 (58.5)	130 (53.9)	
	Intermediate	12 (33.3)	54 (26.3)	66 (27.4)	
	Secondary	6 (16.7)	18 (8.8)	24 (10.0)	
	College & Higher	7 (19.4)	10 (4.9)	17 (7.1)	
Occupation	Housewife	30 (83.3)	194 (94.6)	224 (92.9)	0.015*
	Employed	6 (16.7)	11 (5.4)	17 (7.1)	
Source of water	Tap water	26 (72.2)	179 (87.3)	205 (85.1)	0.019*
	Filter	10 (27.8)	26 (12.7)	36 (14.9)	
*Significant at P < 0.05					

Table 3. Distribution of main presenting symptoms of the studied group in correlation to the presence of ABO antigens.

Variable		ABO antigens secretor in saliva*			P value
		Yes (n=36) n (%)	No (n=205) n(%)	Total (n= 241) n(%)	
Symptoms	Supra-pubic pain	34 (94.4)	194 (94.6)	228 (94.6)	0.992
	Itching	1(2.8)	6(2.9)	7 (2.9)	
	Secretions	1(2.8)	5(2.4)	6 (2.5)	
Period of infection (days)	< 7	5 (13.9)	24 (11.7)	29 (12.0)	0.924
	7 - 13	30 (83.3)	176 (85.9)	206 (85.5)	
	≥ 14	1 (2.8)	5 (2.4)	6 (2.5)	
	Mean ± SD (range)	7.3±1.6(4-14)	7.6±5.5(4-60)	7.5±5.1(4-60)	

*values are number and (%) unless mentioned.
SD: standard deviation,

Table 4. Results of microscope examination in correlation to the presence of ABO antigens in saliva of women infected with UTIs.

Direct microscope examination		ABO antigens secretor in saliva			P.value
		Yes (n=36) n (%)	No (n=205) n (%)	Total (n=241) n (%)	
Pus cells	Negative	24 (66.7)	38 (18.5)	62 (25.7)	0.0001*
	+	12 (33.3)	107 (52.2)	119 (49.4)	
	++	0 (0.0)	55 (26.8)	55 (22.8)	
	+++	0 (0.0)	5 (2.4)	5 (2.1)	
RBCs	Negative	36 (100.0)	177 (86.3)	213 (88.4)	0.062
	+	0 (0.0)	26 (12.7)	26 (10.8)	
	++	0 (0.0)	2 (1.0)	2 (0.8)	
Epithelial cells	Negative	28 (77.8)	117 (57.1)	145 (60.2)	0.106
	+	6 (16.7)	50 (24.4)	56 (23.2)	
	++	2 (5.6)	36 (17.6)	38 (15.8)	
	+++	0 (0.0)	2 (1.0)	2 (0.8)	

*Significant at P<0.05

Table 5. Result of cutler in specific media in correlation with presence of ABO antigens in saliva of women infected with UTIs.

Culture finding	ABO antigens secretor in saliva		
	Yes (n=36) n (%)	No (n=205) n (%)	Total (n=241) n (%)
No growth	2 (5.6)	0 (0.0)	2 (0.8)
One type of bacteria	28 (77.8)	149 (72.7)	177 (73.4)
Two type of bacteria	6 (16.7)	52 (25.4)	58(24.1)
Three type of bacteria	0 (0.0)	4 (2.0)	4 (1.7)

Table 6. Species of bacteria that present in correlation with presence of ABO antigens in saliva of women infected with UTIs.

Species of bacteria	ABO antigen secretor in saliva			P value
	Yes (n=36) n (%)	No (n=205) n (%)	Total (n=241) n (%)	
Escherichia coli	19 (52.8)	91 (44.4)	110 (45.6)	0.35
Streptococcus	7 (19.4)	54 (26.3)	61 (25.3)	0.38
Staphylococcus aureus	10 (27.8)	40 (19.5)	50 (20.7)	0.26
Pseudomonas	0 (0.0)	31 (15.1)	31 (12.9)	0.012*
Proteus	2 (5.6)	30 (14.6)	32 (13.3)	0.14
Klebsiella	2 (5.6)	19 (9.3)	21 (8.7)	0.47

*Significant difference.

DISCUSSION

Urinary tract infection (UTIs) reported in almost 50% of women at some point in their lives¹¹, and higher morbidity rates associated with these infections. In the genetics of secretor system two options exist; a person can be either ABO antigens secretor or a non-secretor. This was found to be completely independent of person's blood type "A, B, AB, or O". Several researches have suggested that too many diseases observed in some ABO antigens non-secretor individuals including UTI¹², *Helicobacter pylori* infection¹³ and viral infections¹⁴.

The current study revealed a non-significant association between secretor status and symptoms and the period of infection, while there was a significant association between presence of ABO antigens secretor and presence of pus, RBC, and epithelial cells in urine

when examined microscopically. Regarding RBCs, all secretors positive had no RBCs in the urine while the sloughed epithelial cells reported in 8 secretors cases. These were also seen in the infected bacteria and *Trichomonas vaginalis*, the heavily bacterial infection with mixed species were present in non-secretor of ABO antigens, these findings agreed other researchers^{15, 16}, however, enteric bacteria; in particular, *Escherichia coli* remain the most frequent case of UTIs. The infection with *Trichomonas vaginalis* was more prevalent in non ABO antigens secretor (84.6%). These may be due to the non-secretary people do not have the enzyme glycosyl-transferase and glyco-compounds giving a way for attachment of the organism with epithelial surface therefore resulting in an infection¹⁵. It is clear that non-secretor saliva not only does not avert the connection of candida but also stimulates the attachment to the nerves.

The virulence features of candida are as a result of host identification by the cell surface linkage¹⁶. Other researchers attributed this susceptibility to infections to low levels of IgG and IgA antibodies in non-secretors¹⁷. Antibodies seem to offer native immunity through destruction of the organism; secretors destroy attacking organisms and stop their access to the host. This description best suits current study that single and little growth seen in secretor women while mixed and heavy growth seen in non-secretors. Other researches stated that the secretor status alters the carbohydrates present in the body fluids and this will influence microbial attachment and persistence¹⁸. The present study agreed other study on UTI that the primary cause is *Escherichia coli*. Stapleton et al,¹⁹ have stated that females with persistent UTI associated to *E. coli* are mainly non-secretors. The tendency for greater adherence of the uropathogenic *E. coli* was shown by uroepithelial cells of non-secretors when matched with secretors. This appears that absence of secretor substances combines to give an increased risk of recurrent UTI.

In this study, it was found that some demographic characteristics like education, occupation and source of water were associated with absence of ABO antigens and hence increased the susceptibility of UTIs. The same finding was reported by Emir et al,²⁰; as they mentioned that UTI was high among pregnant women in the presence of associated different risk factors (anemia, low socio-demographic features, past history of UTI and sexual activity).

CONCLUSIONS

The absence of ABO antigens in saliva might increase the susceptibility to UTI in women with a greater tendency to increase symptoms, number and type of causative infectious agent and tend to present worst in low socio-demographic status.

Conflict of Interest : None

Source of Funding: Self-funded

Ethical Clearance: All official ethical agreements were approved. Data of participants were collected according to the World Medical Association Declaration of Helsinki 2013, and signed consent was obtained from each participant

REFERENCES

1. Aydin A, Ahmed K, Zaman I, Khan MS, Dasgupta P. Recurrent urinary tract infections in women. International urogynecology journal. 2015 Jun 1;26(6):795-804.
2. Fihn SD. Clinical practice. Acute uncomplicated urinary tract infection in women. N Engl J Med. 2003. 349(3):259–266.
3. Scholes D, Hooton TM, Roberts PL, Stapleton AE, Gupta K, Stamm WE. Risk factors for recurrent urinary tract infection in young women. J Infect Dis. 2000. 182(4):1177–1182.
4. Wilson ML, Loretta GL. Medical Microbiology, CID 2004; 38 (15): 1150-58.
5. Hooton TM, Fihn SD, Johnson C, Roberts PL, & Stamm WE. Association between bacterial vaginosis and acute cystitis in women using diaphragms. Arch Intern Med. 1989; 149: 1932–36.
6. Raza MW, Blackwell CC & Molyneux P. Association between secretor status and respiratory viral illness. BMJ 1991; 303: 815–18.
7. May SJ, Blackwell CC, Brett RP, MacCallum CJ & Weir DM. Non-secretion of ABO blood group antigens: a host factor predisposing to recurrent urinary tract infections and renal scarring. FEMS Microbiol. Immunol. 1989; 47, 383-388.
8. Jantusch BA, Criss VR, O'Donnell R. Association of Lewis blood group phenotypes with urinary tract infection in children. J Pediatr 1994 Jun; 124(6):863-68.
9. Mohan H. Pathology Practical Book. 3rd ed. Mohan H, editor. Delhi: Jaypee Brothers Medical Pub; 2013. pp217-220.
10. Dayaprasad GK, Venkatesh D. Non-secretor status; a predisposing factor for vaginal candidiasis. Indian J Physiol Pharmacol. 2004;48(2):225-9.
11. Keryne A. The Merck Manual of Diagnosis and Therapy. 19th ed. Mischel A, Susan C, Dian C, editors. USA: Gary Zelco; 2011. p 233-227 .
12. Nudelman E, Clausen H, Hakomori HIS & Stamm WE. Binding of Uropathogenic *Escherichia coli* R45 to glycolipids extracted from vaginal epithelial cells is dependent on histo-blood group secretor status. Ann Stapleton J Clin Invest, 1992.

- 90: 965-72.
13. Lindén S, Mahdavi J, Semino-Mora C, Olsen C & Carlstedt I. Role of ABO Secretor Status in Mucosal Innate Immunity and *H. pylori* Infection. *PLOS Pathog.* 2008; 4(1): e2.
 14. Ali S, Niang MAF, N'doye I, Critchlow CW, Hawes SE, Hill AVS and Kiviat NB. Secretor Polymorphism and Human Immunodeficiency Virus Infection in Senegalese Women. *J of Infect Dis*, 2000; 181:737–39.
 15. Thom SM, Blackwell CC & MacCallum CJ. Non-secretion of blood group antigens and susceptibility to infection by *Candida* species. *FEMS Microbiol Immunol* 1989; 1(6–7): 401–405.
 16. Cameron BJ & Douglas LJ. Blood group glycolipids as epithelial cell receptors for *Candida albicans*. *Infect Immun* 1996; 64: 891–896.
 17. Grundbacher FJ. Immunoglobulins, secretor status, and the incidence of rheumatic fever and rheumatic heart disease. *Hum Hered* 1972; 22: 399–404.
 18. Kulkarni DG & Venkatesh D. Non-secretor status; a predisposing factor for vaginal candidiasis. *Indian J Physiol Pharmacol* 2004; 48 (2): 225–229.
 19. Stapleton A, Nudelman E, Clausen H, Hakomori S & Stamm WE. Binding of uropathogenic *Escherichia coli* R 45 to glycolipids extracted from vaginal epithelial cell is dependent on histo-blood group secretor status. *J Clin Invest* 1992; 90: 965–972.
 20. Emiru T, Beyene G, Tsegaye W & Melaku S. Associated risk factors of urinary tract infection among pregnant women at Felege Hiwot Referral Hospital, Bahir Dar, North West Ethiopia. *Emiru et. al., BMC Research Notes* 2013; 6:292.

Does the Overweight Trend of Children Aged 0-24 Months in Indonesia Tend to be Increasing and What Factors are Related?: (IFLS Data Analysis Study of 2000, 2007, and 2014)

Rifda Wulansari¹, Rini Meiandayati¹, Laily Hanifah¹, Endang L. Achadi¹

¹Faculty of Public Health, Indonesia of University

ABSTRACT

Background: Overweight is still one of the nutritional problems in Indonesia. It considered as the first signal of the emergence of a group of non communicable disease. Indonesia shows that the problem it on average is still above 5%. **Objective:** This study aims to examine the trend patterns and see whether the factors associated with the occurrence of overweight in children 0-24 months different or not in 2000 and 2014. **Method:** cross sectional approach. Trend data use IFLS 2000, 2007, 2014, see the difference, IFLS 2000 and 2014. Sampling technique by total sampling. **Results :** The trend pattern shows the incidence of overweight in children 0-24 months in 2000 amounted to 7.03%, in 2007 by 8.86% and in 2014 of 7.79%. Chi-Square showed in 2000 factors that have greater chance of overweight of children 0-24 months is birth weight > 3900 gram ($p = 0.033$) and mother's job ($p = 0.0030$). In 2014, the length of birth ($p = 0.032$). Logistic regression showed in 2000 that birth weight > 3900 gram tend to overweight at age 0-24 months of 2.20 times greater than normal ($p = 0.038$). In 2014, birth weight > 3900 gram is 2.07 times greater than normal ($p = 0.047$). The length of birth ≥ 48 cm is 2.05 times greater than below ($p = 0.013$). **Conclusion:** There is a fluctuation in the pattern of overweight in children aged 0-24 months from 2000, 2007 and 2014 which in general there is no improvement. The nutritional status of the child at birth appears to be an important factor associated with overweight in children. The role of maternal nutritional status, before and during pregnancy that may affect fetal growth should also be considered.

Keywords: Children 0-24 months, Overweight, IFLS survey data, Trends, Indonesia

INTRODUCTION

To date, Indonesia still faces multiple nutritional problems. Overweight is considered as the first sign of the emergence of non communicable diseases that currently occur in both developed and developing countries.^[1]

In fact, overweight in children are multifactorial complex problems.^[2] The period of the first 1000 days of life is early of human life calculated from the first day of pregnancy, the birth of a baby up to the age of 2 years. This period is a crucial period in which the development and growth of a human being go on rapidly, both physically, cognitively, emotionally.^[3]

Research evidence suggests that early life also contributes to childhood obesity, so the problem and effects can be prevented early.^[4] The environment from

conception to the age of 2 years is the most important factor that must be changed and repaired to prevent obesity and its effects.^{[5][6]}

There are four periods in the first 1000 days of life that contribute to the incidence of overweight: (1) woman's pre-pregnancy period; (2) pregnancy period; (3) exclusive breastfeeding; (4) complementary feeding.^{[7][8]}

Many evidences indicate that prevalence of overweight is rising sharply around the world. South Korea by 20.5%. In Thailand, 16%.^{[9][10]} The National Basic Health Research data, the prevalence of overweight in adolescents aged 15 years and older in Central Java reaches 18.4%, while Surakarta City at 10.7%.^{[11][12]} In Indonesia, the cause of death due to communicable diseases decreased from by 44.2% in 1995 to 28.1% in

2007.^[13]

Several factors of the first two years of life that contribute to the incidence of overweight in children aged 0-24 months are maternal diabetes history, birth weight, prelacteal feeding, and exclusive breastfeeding.^[7]

Women who have diabetes prior to pregnancy are at risk of having obese children.^[2] In exclusive breastfeeding period can prevent certain diseases which are vulnerable to baby, such as asthma, diarrhea, and diabetes in relation to the incidence of overweight. Prelacteal, is very dangerous because the baby's digestive tract is not strong enough to digest food and drink other than breast milk. The birth weight can also be an indicator of overweight risk in children.^[14] Study by Anggraini reported that the abnormal birth weight (low/big) has a higher risk of overweight.^{[15] [16]}

STUDY METHOD

This study used secondary data obtained from Indonesia Family Life Survey (IFLS) that was carried out in 2000, 2007, 2014. The design was cross-sectional approach. This study aimed to find out the trend of overweight and whether there were differences in factors

related to the incidence of overweight in 2000 and 2014.

The population of study was all children aged 0-24 months in Indonesia that became the respondents in 2000, 2007, 2014 to get on the trend of overweight. To determine differences in factors related to the incidence of overweight, the respondents in 2000 and 2014. The inclusion criteria were children aged 0-24 months, having complete information on weight, height, birth month, and year of birth. The exclusion criteria were ill children, twin pregnancy/*gemelli* and not having complete data. Data analysis applied included univariate, bivariate, and multivariate.

RESULTS AND DISCUSSION

RESULTS

This study used IFLS data that was conducted in 2000, 2007, 2014. In investigation of survey data, the complete data of all variables was obtained, except data on maternal diabetes history in 2000 which was not obtained as in 2014.

Nutritional Status of Children Aged 0-24 Months in 2000-2014

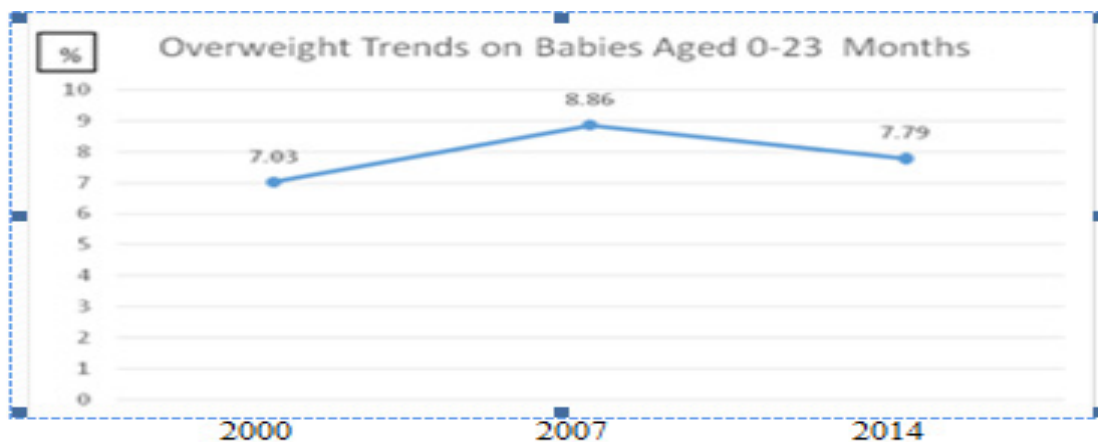


Figure 1. Pattern of Overweight Trend From 2000 – 2014

Figure 1 illustrates that the trend pattern of the overweight incidence tend to be fluctuating. The highest proportion of the overweight incidence occurred in 2007 (8.86%). This fluctuation was seen once in the proportion of overweight in 2000 at 7.03%, then increased to 8.86% in 2007 and back down to 7.79% in 2014.

Comparison of Factors Related to the Incidence of Overweight in Children Aged 0-24 Months in 2000 – 2014

Table 1. Comparison of Characteristics on Infants and Mothers As Well As the Caring Pattern on Overweight Events Based on Each Proportion (%) in 2000 and 2014

Variable	Category	2000				P-value	2014				P-value
		Overweight		No			Overweight		No		
		N	%	N	%		N	%	N	%	
Infants Age	0-6 months (0)	42	10.3	366	90	0.165	65	14.4	387	86	0.001
	6-12 months (1)	25	7.4	314	93		30	7.2	384	93	
	12-23 months	27	5.2	489	95		0.004	30	4.0	713	
Birth Weight	<2500 g (0)	4	4.6	83	95	0.398	8	7.8	94	92	0.815
	≥ 2500 – 3900 g (1)	74	7	989	93		101	7.2	1298	93	
	>3900 g (2)	16	14.2	97	86		0.025	16	14.8	92	
Birth Length	<48 cm(0)	10	5.8	162	94	0.382	8	3.9	196	96	0.028
	≥48 cm (1)	84	7.7	1007	92		117	8.3	1288	92	
Pre lacteal	No (0)	45	6.6	634	93	0.234	312	29.4	749	71	0.197
	Yes (1)	49	8.4	535	92		213	38.9	335	61	
Exclusive Breastfeeding	no (0)	92	7.5	1129	93	0.501	107	7.9	1249	92	0.672
	Yes (1)	2	4.8	40	95		18	7.1	235	93	
Diabetes History	No (0)	-	-	-	-	-	124	7.7	1477	92	0.616
	Yes (1)	-	-	-	-	-	1	12.5	7.0	88	
Maternal Employment	No (0)	60	6.5	867	94	0.029	93	7.5	1145	93	0.483
	Yes (1)	34	10.1	302	90		32	7.8	339	91	

Chi square p<0.005

Table 1, The proportion of overweight children at the age of 0-6 months in 2014 showed the highest proportion at 14.4% compared to in 2000 (10.3%). Then the birth weight > 3900 gram in 2014 had the highest proportion of overweight (14.8%) compared to in 2000 (14.2%). Evidently, the birth length ≥ 48 cm in 2000 had a smaller proportion (7.7%) than in 2014 (8.3%).

The exclusive breastfeeding, mothers who provided the exclusive breastfeeding had 7.9% in 2014, which

was higher than in 2000 at 7.5%. Because there was no information on maternal diabetes history obtained in 2000, then the comparison with 2014 could not be carried out. In 2014, it showed that the proportion of mothers with diabetes history was 12.5%, which was higher than mothers with no diabetes history at only 7.7%. While the higher proportion of maternal employed was also found in 2000 at 10.1%, and it decreased to 7.8% in 2014.

Table 2. Comparison of Relations Factors and Results of Chi-Square causing overweight in Infants aged 0-24 months

2000		2014	
Variable	p value	Variable	p value
Birth weight > 3900 gr	0.033	Birth weight > 3900 gr	0.118
Birth length \geq 48 cm	0.383	Birth length \geq 48 cm	0.032
Prelacteal	0.235	Prelacteal	-0.198
Exclusive Breastfeeding	-0.505	Exclusive Breastfeeding	-0.672
Diabetes history	(no obs)	Diabetes history	0.620
Maternal Employment	0.030	Maternal Employment	0.483

Table 2 explains that the results of relation of variables in 2000 showed that the birth weight > 3900 gram had a higher probability of overweight if compared with normal birth weight or low birth weight. In 2014, it was only the birth length \geq 48 cm that had a higher probability of overweight.

The diabetes history in 2000 did not show data observed, so the direction of relation and its significance to the incidence could not be determined and compared

with 2014, in 2014 mothers with diabetes history had a higher probability of the overweight incidence than mothers with no diabetes history, but statistically insignificant.

Maternal employment, in 2000 the probability to the incidence of overweight was higher than the unemployed mothers, and there was a significant relation. This condition was different with year 2014.

Table 3. Comparison of Logistic Regression Influential Factors towards Overweight Trends in Infants aged 0-24 months

2000					2014				
No.	Variable	B (p value)	μ	OR	No	Variable	B (p value)	μ	OR
1.	Birth Weight > 3900 gr	0.068 (0.038)	0.089	2.204	1.	Birth Weight > 3900 gr	0.065 (0.047)	0.067	2.072
2.	Birth Length	0.008 (0.710)	0.684	1.113	2.	Birth Length	0.039 (0.013)	0.873	2.058
3.	Prelacteal	0.016 (0.258)	0.462	1.286	3.	Prelacteal	-0.019 (0.167)	0.340	0.753
4.	Exclusive Breastfeeding	-0.017 (0.654)	0.033	0.744	4.	Exclusive Breastfeeding	-0.017 (0.296)	0.157	0.765
5.	Maternal Employemen	0.030 (0.104)	0.266	1.492	5.	Diabetes history	0.030 (0.765)	0.005	1.459
					6.	Maternal Employemen	0.008 (0.615)	0.230	1.120

The results of multivariate in logistic regression showed that in 2000 the significant variable was birth weight > 3900 gram. The statistical results showed that children born > 3900 gram were likely to get overweight at the age of 0-24 months by 2.20 times greater than the children born low birth weight ($p = 0.038$). In 2014, logistic regression showed that the significant variables were birth weight and birth length. It can be concluded that children born > 3900 gram were likely to get overweight at the age of 0-24 months by 2.07 times greater than low birth weight ($p = 0.047$). The children with birth length ≥ 48 cm were likely to get overweight at the age of 0-24 months by 2.05 times greater than birth length < 48 cm ($p = 0.013$).

DISCUSSION

Studies conducted periodically in a long-term period from the period of women's pregnancy to the birth of baby at certain ages are indeed still limited in Indonesia. IFLS has carried it out from 1993 to 2014. There are limited data found in IFLS such as role of maternal nutritional status before and during pregnancy that can affect the fetal growth which should be included, but it cannot be considered anymore because the variable cannot be measured in the survey data.

The Trend Pattern of the Incidence of Overweight in Children Aged 0-24 Months

Figure 1 shows the fluctuating trend pattern of the overweight incidence in children aged 0-24 months in Indonesia. The world's data indicates the childhood obesity in Indonesia at 11.5% and ranks the 21st in the world.^[5] Data of the results of nutritional status records that 1.6% children at the age of 0-59 months experience obesity with the highest prevalence in Jakarta and Bali (3.3%), followed by Riau Islands (3.0%) and Papua (2.7%).^[18]

Data in this study presented that the highest incidence of overweight in children aged 0-24 months occurred in 2007 at 8.86% (Figure 1). Although there was a decrease in the percentage of the incidence from 2007 to 2014 by 1.07%, but the percentage has been a health problem in Indonesia because the value is more than 5%.

Relation between the Characteristics of Children Aged 0-24 Months and Factors Affecting the Incidence of Overweight

In Table 2, several related factors are shown statistically significant. In 2000, there were two variables significantly related, birth weight > 3900 gram ($p = 0.033$) and maternal employment ($p = 0.030$). In 2014, birth length ≥ 48 cm was the only variable significantly related. Theoretically, the baby's birth weight above normal has a positive relation. The maternal diabetes history was associated with the birth weight and greater fetal adiposity. It is possible that intra-urine condition has changed that is capable of programming fetus to be more susceptible to obesity due to an increasing exposure to nutrition transferred through the placental circulation.^[18] Because it can increase the risk of central fat accumulation, insulin resistance, metabolic syndrome, and cardiovascular disease.^[16] The results of study stated that maternal employment factor was significantly related ($p = 0.030$) to the incidence of overweight in children aged 0-24 months. The maternal employment has an important role in nutritional problems and related to the family's affordability in food availability.

The birth length shows a significant relation ($p = 0.030$) to the incidence of overweight in children aged 0-24 months. Since a child is born until the age of two years, the child will grow fast. After that period, the growth starts to slow down. By a slow growth, a child needs more calories, then he/she has an erratic dietary pattern.^[18]

The Table 3 explains the comparison of most dominant factors affecting the incidence of overweight. Accordingly, the birth weight ≥ 3900 gram in 2000 and 2014 both were the most dominant factor in affecting the incidence of overweight.

CONCLUSION

This study is an analytic observation study with cross-sectional approach. There is a fluctuation in the trend pattern of overweight in children from 2000, 2007, 2014. The chi-square test show that in 2000 factors significantly related are birth weight > 3900 gram ($p = 0.033$) and maternal employment ($p = 0.030$), in 2014 the factor is birth length ≥ 48 cm ($p = 0.03$). The logistic regression explains that the birth weight ≥ 3900 gram in 2000 had a greater probability of the overweight incidence by 2.20 times compared to the birth weight < 3900 gram, and in 2014 the probability was greater by 2.05 times. The birth length ≥ 48 cm had a greater probability of the overweight incidence by 2.05 times

compared to the birth length < 48 cm.

Conflict of Interest: There is no conflict of interest with anyone

Source of Funding: PITTA grant from Indonesia Of University

Ethical Clearance: Ethical clearance was received from The Ethical Committee for Research and Community Development, Faculty of Public Health Universitas Indonesia No.573/UN2.F10/PPM.00.02/2017

REFERENCES

- [1] Garrow JS. Obesity and Related Diseases. London: Churchill Livingstone; 1998. p. 1-16.
- [2] Wood J. F. The Impact of the First 1,000 Days on Childhood Obesity; 2016. p.1-10
- [3] Achadi, Endang. Critical Period 1000 Days First Life & Long Term Impact on Health and Function. Department of Community Health Nutrition. Public Health of Faculty University of Indonesia. Jakarta; 2014.
- [4] Yousafzai, Aisha K et. Al. Effect of responsive stimulation and nutrition intervention on Infants's development and growth at age 4 years in a disadvantaged population in Pakistan: a longitudinal follow-up of a cluster-randomised factorial effectiveness trial. *Lancet Glob Health*; 2016. p 4:e548-58.
- [5] WHO. Global Nutrition Report From Promise to Impact : Ending Malnutrition by 2030; 2016
- [6] Barker, DJP. Developmental Origins of Chronic Disease. *Public Health*; 2012. p.126, 185-9
- [7] Mameli, Chiara. Mazzantini, Sara. Zuccotti, Gian Vincenzo. Nutrition in the First 1000 Days: The Origin of Childhood Obesity. *International Journal of Environmental Research and Public Health*; 2016. p 1-9.
- [8] Kramer, M.S. Determinants of Low Birth Weight: Methodological Assesment And Meta-Analysis. *Buletin of the World Health Organization*; 1987. 65 (5): 663-737
- [9] Inoue S, Zimmet P, and Caterson I. The Asia-Pacific Perspective: Redefining Obesity and its Treatment. *Health Communication* . Australia; 2000
- [10] Ismail D, Herini ES, Hagung P, & Sadjimin T. Fast Food Consumption and Obesity: Relationship among Elementary School Students in Yogyakarta. *Paediatrica Indonesiana*; 1999.
- [11] Ministry of Health RI. National Policy Framework for the Acceleration of Nutrition Improvement in the First Millennium of Life (Movement of 1000 HPK). Jakarta; 2013
- [12] Atmarita. Nutrition Status And Child Food 0-35 Month And Pregnant Mother / WUS. Scientific Meeting. Indonesian Nutritionist Association (Persagi). Jakarta; 2016.
- [13] Loaiza S, Coustasse A, Urrutia – Rojas, Atalah E. Birth Weight and Obesity Risk at First Grade I a cohort of chillean Infants. *Nutrition Hospitalia*; 2011. p. 26 (1): 214-219
- [14] Anggraini S. Risk Factors Obesity In children's Kindergarten in the city of Bogor. IPB Bogor; 2008.
- [15] Bouhours – Nouet N, Dufresne S, Boux de Casson F, Mathieu E, Dovay O, Gatelais et al. High Birth Weight and Early Post Natal Weight Gain Protect Obese Infants and Adolescence From Trucal Adiposity and Insulin Resistance. *Diabetes Care*; 2008. p.31: 1031 – 36
- [16] Ministry of Health. Pocket Book of Nutritional Status in 2015. Jakarta. Directorate Of Community Nutrition. Director General of Public Health and Ministry of Health RI; 2016.
- [17] Asian Development Bank. Key Indicators for Asian and The Pasific. Phillipines. ADB ;2016. ISBN: 978-92-9257-630-1_
- [18] Curhan GC, Willet WC, Spiegelman D, Colditz GA, et al. Birth Weight and Adult Hypertension and Obesity in Woman Sirculation; 1996. 94: 1310 – 5.

Physiological Blood Parameters of Young University Adults with Blood Glucose, Blood Pressure and Smokers

Nada Saad Naji Al-Tae

Department of pollution, Faculty of Environmental Sciences, AL-Qasium green University, Iraq

ABSTRACT

This study deals with a new study on the propagation of diabetes, hypertension and smoking among university students. A total of 254 students (77 females and 177 males) were enrolled. Including, 41 healthy and 42 students who were fasting blood glucose; 31 were healthy and 68 were suffering from blood pressure; 39 non smokers and 33 students who were smokers; aged 19-26 years. Statistically significant changes ($p < 0.05$) in blood parameters and cases in comparison with healthy and non-smoker students. The findings of this study highlight the prevalence of blood glucose and blood pressure in students also smoking and its relation to the number of cigarettes. Educational programs are needful to raise people's awareness around the critical of health impacts of situation and the significance of all of the above criteria.

Keywords: *blood glucose, blood pressure, smoking, blood parameters.*

INTRODUCTION

In 2010, around 285 million people worldwide in the age group of 20-79 are suffering from diabetes, and it is expected to be 438 million in 2030 of the adult population. This global increase in the propagation of diabetes is attributed to population growth, urbanization, aging, increased physical inactivity and obesity¹. Depending on a national survey conducted in Iraq in 2006, it was evaluated that 10.4% of the adult population had hyperglycemia², and it is predicted to increase by the year of 2030 to 2 million³. In developed countries, cardiovascular disorder is prevalent with adjustable risk factors is arterial hypertension; where 20%-50% of the adult population is affected⁴. A survey conducted in 1979 found that 12% of the Iraqi population had hypertension⁵, and by 2006 it increased to 40.4%⁶, and 29.4% in 2008 for both sexes⁷. In a study⁸ on cardiovascular risk profile among university students, found that the spread of blood pressure was 5.6% for systolic blood pressure and 8.6% for diastolic blood pressure. In Iraq smoking is a common practice among university students. As in a study⁹, tobacco smoking was higher among men under the age of 40 years also study¹⁰ in Iraq, the prevalence of cigarette smoking among medical students was 21%; about 42% of them started smoking at the age of 18-19 years or their first year of medical school. According

to¹¹, the main cause of health cases of infectious diseases in the past century has turned into chronic diseases at present. Chronic diseases such as diabetes, hypertension and cardiovascular diseases are slow progressive non infectious conditions that are considered the major leading causes of death worldwide. Rapid alters in lifestyles and food patterns that occurred after urbanization and industrialization have accelerated in recent years. Later, there was an increase in inappropriate diet pattern, lack of physical activities and use of smoking, and an increase in chronic disease¹². Blood problems can have a significant influence on patients and should be vigorously pursued and treated¹³. Diabetics often have abnormalities in the blood, these comprise anemia and other erythrocyte problems, white blood cells as well as platelet anomalies are also prevalent among people of diabetes, and diabetes diagnosis can be established by measuring fasting blood glucose¹⁴. High blood pressure is strongly related to structural and functional disorders of the organs involve in hematopoiesis¹⁵, and blood viscosity is increased in most patient with hypertensive¹⁶. Smoking is also has an effect on blood parameters. In a study¹⁷ suggested that the smoking of cigarette affect the characteristics of blood as it leads to death. And¹⁸ showed that continuous cigarette smoking had severe adverse impacts on hematological parameters.

MATERIALS AND METHOD

Criteria of participants

A sample of 254 students aged between 19 and 26 years was selected randomly among students of the Faculty of Environmental Sciences at AL-Qasium green University in Iraq. About 83 of blood glucose were divided according to¹⁹: health (<100 mg/100cm³), pre-diabetes (100–125 mg/100cm³), diabetes (≥ 126 mg/100cm³), and hypoglycemia (≤ 70 mg/100cm³). In addition, 99 of a clinic blood pressure level were divided according to²⁰: normotensive ($<120/<80$), EPB, elevated blood pressure (120-129/ <80 mmHg) hypertension (130-139/80-89 or $\geq 140/90$) and hypotension ($<90/60$ mmHg). And 72 male was only applied for smoking. Women were not comprised because of the tradition of Iraq society, in which restricts the arrival of researchers to females at the time of study, and prevents their smoking. They were divided into: 39 non smokers [control], 9 light Smokers [≤ 10 cigarette daily], 16 moderate smokers [11–20 cigarette daily], and 8 heavy smokers [≥ 20 cigarette daily].

Collection of data and measurement

The data were collected using a self-administered questionnaire was developed in Arabic language, and it is built on several axes such as: age, smoking case, the number of smoking cigarettes per day and duration of smoking, the family history of diabetes and physical activities. Pregnant female were eliminated from study to avoid the potential impact of pregnancy on anthropometric and laboratory parameters. The criteria for selecting students were that no one should suffer any medical complication such as heart disease, stroke or any other disorder. A total of 5 ml of the venous blood sample was gathered from the entire study member in the morning after the fasting period for at least 8–10 hours, and blood was transferred to EDTA-tube. Total

blood count was measured including: WBC, White blood cells; LYM, lymphocyte; LYM%, Lymphocytes percentage; MON, Monocytes; MON%, Monocytes percentage; GRA, granulocytes; GRA%, granulocyte percentage; RBC, red blood cell; HCT, hematocrit; HGB, hemoglobin; MCV, Mean corpuscular volume; MCHC, Mean corpuscular hemoglobin concentration; MCH, mean concentration hemoglobin; RDW/SD, Red cell distribution width/standard deviation; RDW, Red cell distribution width; MPV, Mean platelet volume; PLT, Platelet count; PCT, Plateletcrit; PDW, platelet distribution width. Using a complete automated blood analyzer (Mythic, France). Blood glucose were measured using the active glucose meter Accu-chek (68305 Mannheim, Germany). Blood pressure was measured by the electronic pressure device, by taking the pressure rate while students were at rest for at least 10-15 minutes.

Statistical analysis

Data of hematological parameters were analyzed using ANOVA, differences of the entire study students for the blood parameters were statistically assessed using F-test. Least significant difference, LSD was applied to compare the results, descriptive analysis was also used to show the mean and standard deviation, SD of the results. $P < 0.05$ was *significant and the various letters indicated significance in $p < 0.05$. The same letters indicate insignificance at $p < 0.05$.

RESULTS

Table 1. A statistically significant ($p < 0.05$) increase in most parameters in diabetic, pre-diabetic and hypoglycemia; also insignificant increase (LYM, RBC, and PDW) and an insignificant reduction (MCH) in hypoglycemia. Other parameters decreased significantly in diabetes, pre-diabetes and hypoglycemia compared to health.

Table 1. Blood parameters of fasting blood glucose classes.

Parameters	Fasting blood glucose classes				LSD
	Health	Pre-diabetes	Diabetes	Hypoglycemia	
WBC	5.82±0.083a	7.66±0.054b	8.22±0.130b	7.22±0.178b	0.162
LYM	1.90±0.141a	2.10±0.070b	3.04±0.054b	1.98±0.044a	0.116
MON	0.60±0.012a	0.64±0.054a	0.72±0.044b	0.60±0.012a	0.048
GRA	5.54±0.357a	4.54±0.250b	4.42±0.268b	4.54±0.250b	0.370
LYM%	24.88±0.36a	29.7±0.331b	29.2±0.524b	29.8±0.967b	0.790
MON%	7.66±0.230a	8.24±0.207b	9.16±0.114b	8.06±0.054b	0.224
GRA%	65.6±0.544a	63.76±0.70b	61.24±0.09b	61.2±0.738b	0.776
RBC	5.098±0.09a	5.18±0.158b	5.47±0.276b	5.22±0.074a	0.227
HGB	14.42±0.28a	15.36±0.18b	15.58±0.26b	14.5±0.187b	0.308
HCT	46.96±0.33a	50.56±0.05b	50.86±0.16b	48.00±0.62b	0.489
MCV	94.64±0.11a	95.46±0.08b	96.46±0.27b	94.42±0.10b	0.044
MCH	29.12±0.04a	29.54±0.05b	29.74±0.05b	29.00±0.18a	0.134
MCHC	38.76±0.05a	30.48±0.08b	30.52±0.12b	30.44±0.05b	0.116
RDW	12.76±0.16a	12.28±0.13b	12.20±0.07b	12.56±0.11b	0.164
RDW/SD	48.76±0.13a	46.84±0.08b	46.60±0.42b	47.36±0.55b	0.447
PLT	267.2±0.83a	242.8±0.83b	216.4±0.54b	183.6±0.54b	0.948
MPV	8.34±0.050a	8.66±0.050b	8.78±0.040b	8.24±0.040b	0.070
PCT	0.22±0.000a	0.18±0.001b	0.17±0.001b	0.214±0.002b	0.002
PDW	14.04±0.11a	14.28±0.04b	14.56±0.08b	14.16±0.110a	0.127

*Significance when p<0.05.

Table 2: Most physiological blood parameters have increased in both pre-hypertension and hypertension, and decreased in hypotension when compared with normotensive. A significant decline in MPV from blood glucose classes compared with healthy.

Table 2. Blood parameters of blood pressure classes

Parameters	Blood pressure				LSD
	Normotensive	Elevated blood pressure	Hypertension	Hypotension	
WBC	8.64±0.288a	8.92±0.649a	9.30±0.406b	7.08±0.327b	0.629
LYM	2.02±0.164a	2.44±0.288b	2.48±0.180b	2.00±0.187b	
MON	0.78±0.044a	0.92±0.083a	1.00±0.070b	0.68±0.083b	0.019
GRA	5.30±0.187a	6.02±0.414b	6.10±0.374b	4.46±0.336b	0.454
LYM%	28.48±0.98a	29.7±0.331b	32.02±0.77b	27.7±0.430b	0.910
MON%	9.16±0.304a	9.22±0.268a	11.16±0.09b	7.84±0.167b	0.300
GRA%	62.94±0.76a	65.96±0.08b	68.2±0.148b	61.0±0.738b	1.273
RBC	5.096±0.08a	5.39±0.141b	5.91±0.062b	5.18±0.315a	0.241

Cont... Table 2. Blood parameters of blood pressure classes

HGB	13.76±0.15a	14.24±0.21b	17.24±0.15b	16.82±0.13b	0.218
HCT	46.76±0.11a	48.8±0.100b	53.76±0.77b	55.4±0.300b	0.563
MCV	92.62±0.10a	94.88±0.13b	97.46±0.05b	93.80±0.44b	0.319
MCH	28.04±0.13a	29.58±0.38b	29.56±0.13b	28.04±0.13b	0.292
MCHC	30.30±0.07a	30.84±0.05b	30.86±0.05b	30.44±0.05b	0.079
RDW	12.7±0.120a	12.86±0.15a	12.9±0.070b	13.28±0.14b	0.170
RDW/SD	47.36±0.11a	49.06±0.47b	49.34±0.53b	47.54±0.11b	0.488
PLT	194.2±2.28a	240.2±1.48b	241.8±0.83b	197.6±2.30b	2.454
MPV	9.08±0.080a	8.34±0.150b	8.08±0.100b	8.36±0.150b	0.170
PCT	0.169±0.05a	0.22±0.003a	0.24±0.001b	0.22±0.002a	0.059
PDW	14.1±0.070a	15.10±0.12b	15.38±0.08b	14.66±0.02b	0.177

The *significance when $p < 0.05$.

Table 3: Shows a significant increase at $p < 0.05$ in WBC, MON%, RBC, HCT, HGB, MCV, MCHC, MCH, PLT, RDW/SD, RDW, MPV and PDW, whilst a statistically decrease in PCT at of smokers compared with control. The rest of parameters were not-significant at $p < 0.05$ in smokers compared with control.

Table 3: Blood parameters of smoking status.

Parameters	Smoking status				LSD
	Non-smoker	light smokers	moderate smokers	heavy smokers	
WBC	6.96±0.790a	7.96±0.610b	7.98±0.630b	9.10±0.330b	0.825
LYM	1.98±0.506a	2.04±0.296a	2.12±0.238a	2.40±0.367a	
MON	0.78±0.013a	0.50±0.070a	0.52±0.109a	0.56±0.114a	
GRA	4.06±0.743a	5.14±0.150a	5.36±0.645a	5.74±0.103a	
LYM%	27.4±0.323a	27.96±0.79a	29.76±0.65a	31.5±0.2.65a	
MON%	5.98±0.798a	6.38±0.476a	6.68±0.356a	7.16±0.384b	0.715
GRA%	62.3±0.705a	64.41±0.58a	65.56±0.49a	66.2±0.234a	
RBC	4.85±0.354a	5.00±0.380a	5.55±0.139b	5.71±0.181b	0.380
HGB	13.8±0.273a	14.44±0.35b	15.5±0.583b	16.3±0.254b	0.245
HCT	43.83±1.07a	48.56±1.65b	50.90±0.62b	55.72±0.74b	1.493
MCV	92.22±0.27a	95.88±0.54b	97.48±0.84b	98.52±0.37b	0.793
MCH	27.90±0.39a	29.51±0.10b	29.18±0.08b	30.16±0.56b	0.470
MCHC	30.28±0.16a	30.32±0.38a	31.78±0.08b	30.86±0.13b	0.302
RDW	46.34±0.41a	46.78±0.48a	52.30±0.29b	53.28±0.17b	0.484
RDW/SD	49.22±0.19a	49.58±0.26a	55.52±0.08b	57.42±0.28b	0.298
PLT	296.4±1.14a	253.2±1.92b	222.6±0.54b	207.2±1.30b	1.773
MPV	7.86±0.050a	8.42±0.040b	8.66±0.05b	8.74±0.080b	0.379
PCT	0.21±0.000a	0.20±0.000b	0.15±0.001b	0.214±0.002b	0.001
PDW	14.42±0.04a	15.10±0.07b	15.36±0.05b	16.18±0.080b	0.087

Table-1: Smoking status of students according to blood parameters.

The *significance at $p < 0.05$.

DISCUSSION

Many hematological alters affecting WBCs and RBCs appeared to be directly connected with diabetes²¹, and other blood abnormalities noted in blood glucose patients include platelet abnormalities²². In²³ showed that the number of leukocytes is high, while there is no change in the number of monocytes in blood glucose patients, these results are consistent with some current outcomes. While²⁴ study appeared an insignificant increase in RBC in diabetic patients. Significant increases in MCV and HCT may be due to several morphological alters demonstrated by WBCs and structural changes in plasma connected with diabetes T₂²⁵. The RDW values were low between blood glucose and health students, and this result was consistent with²⁶. The cause of increase in PDW and MPV may be associated with blood vessel complications in diabetics²⁷. A significant increase in WBC of blood pressure classes came favorable²⁸. High glucose and high blood pressure are noted to trigger activation of kinase C protein, which can perform a role in rising the leukocytes oxidative stress caused by high blood pressure and diabetes²⁹. And³⁰ noted that RDW as increased significantly in patients with pre-hypertension and hypertension groups. While³¹ found that MPV, PDW and PLT are those indicators that can assist diagnose high blood pressure. HCT is positively connected with hyper-insulinemia and hazard factors linked with resistance of insulin, such as high blood pressure³². Smoking of cigarette has severe adverse effects on most hematological parameters, the significant increase in these parameters in smoker are correlated with previous studies^{33,34}. Actually, the constituents of cigarette induces increase in a count of leucocytes. The main one is nicotine, the role of nicotine is to stimulate the secretion of hormones that lead to elevate total leucocytes count³⁵. Smoking cigarettes generates a unique state of polycythemia combined into chronic hypoxia, leading to increased production of RBC due to elevated carboxy hemoglobin level³⁶. The current study established significantly larger values of MCV, MCH, MCHC, RDW and RDW/SD among smokers and by³⁷. The smaller values of PCT in smokers agreed with³⁸.

CONCLUSION

The measurement of physiological blood parameters is necessary, because these changes in parameters can be linked with increased risk of many diseases. Monitoring

blood glucose, blood pressure and young smoking is worth doing because a high proportion of students were either blood glucose and blood pressure or smoker.

Conflict of Interest: The author declares no conflict of interest.

Ethical Clearance: Ethical clearance taken from the local Ethics committee of the Environmental Department, College of Environmental Science, Al-Qassim Green University in Iraq.

Funding : This study was self-funded.

REFERENCES

1. Ramachandran A, Ma RC, Snehalatha C. Diabetes in Asia. *Lancet* 2010;375(9712):408-18.
2. World Health Organization (WHO), 2006. The Work of WHO in the Eastern Mediterranean Region: Annual Report of the Regional Director. Available from: <http://www.emro.who.int/rd/annualreports/2006/chapter16-print.htm>.
3. World Health Organization (WHO), 2009. Country and Regional Data. World Health Organization. Available from: <http://www.who.int/diabetes/facts/world-figures/en/index2.html>.
4. Rembek M, Goch A, Goch J. The clinical course of acute ST-elevation myocardial infarction in patients with hypertension. *Kardiologia Polska* 2010; 68(2):157-163.
5. Alwan A. Health in Iraq: Review of the Current Health Situation, Challenges Facing Reconstruction of the Health Sector, and our Vision for the Immediate Future, Ministry of Health 2004; pp.21-22. Available on: <http://www>.
6. Ministry of Health, Directorate of public health and primary health care and Ministry of Planning and Development in collaboration with World Health Organization. Chronic non communicable diseases risk factors survey in Iraq 2006:pp.51.
7. World Health Organization: World Health Statistics: Part II, Highlighted Topics. In Geneva: WHO Press 2012: 34.
8. Al-Asadi JN, Habib OS, AL-Naama LM. Cardiovascular risk profile among college. *Bahrain Med Bull* 2006;28(3):126-130.
9. Al-Badri HJA, Khaleefah AMA, Ali AA, Sahib AJ. Socio-economic determinants of smoking among

- Iraqi adults: Data from Non-Communicable Risk Factor STEPS survey 2015. *PLoS One* 2017; 12(9):e0184989.
10. Yasso FS, Yaso SS, Yasso PS, Dafdony IV. Prevalence of cigarette smoking among medical iraqi students. *American Journal of Public Health Research* 2014; 2(1):10-15.
 11. Alwan A. Health in Iraq: Review of the Current Health Situation, Challenges Facing Reconstruction of the Health Sector, and our Vision for the Immediate Future, Ministry of Health 2004;pp.21-22. Available on: <http://www>.
 12. Gluckman PD, Hanson MA. The developmental origins of health and disease. Early life origins of health and disease. Cambridge University Press 2006; pp.1-7.
 13. Hillson R. Diabetes and the blood-red cells. *Pract Diabetes* 2015; 32:124-126.
 14. Colagiuri S, Lee CM, Wong TY, et al. Glycemic thresholds for diabetes-specific retinopathy: implications for diagnostic criteria for diabetes. *Diabetes Care* 2011; 34(1):145-150.
 15. Weber MA, Schiffrin EL, White WB, et al. Clinical practice guidelines for the management of hypertension in the community. *J Clin Hypertens* 2014;16(1):14-26.
 16. Sandhagen B. Red cell fluidity in hypertension. *Clin Hemorheol Microcirc* 1998;21(3-4):179-81.
 17. Bain BJ, Rothwell M, Feher MD, et al. Acute changes in haematological parameters on cessation of smoking. *Journal of the Royal Society of Medicine* 1992;85(2):80-83.
 18. Malenica M, Prnjavorac B, Bego T, et al. Effect of cigarette smoking on hematological parameters in healthy population. *Med Arch* 2017;71(2):132-136.
 19. American Diabetes Association. Standards of medical care in diabetes-diabetes care. *The Journal of Clinical and Applied Research and Education* 2018;41:1-150.
 20. Editorial. New guidelines for hypertension in children and adolescents. *J Clin Hypertens* 2018; 20:837-839.
 21. Mbata CA, Adebayo A, Chinyere N, Nyeso WA. Some haematological parameters in diabetic patients in port harcourt Nigeria. *AJMS*. 2015;3(2):2348-7186.
 22. Mirza S, Hossain M, Mathews C, et al. Type 2-diabetes is associated with elevated levels of TNF-alpha, IL-6 and adiponectin and low levels of leptin in a population of Mexican American: a cross-sectional study. *Cytokine* 2012;57(1):136-142.
 23. Gkrania-Klotsas E, Ye Z, Cooper AJ, et al. Differential white blood cell count and type 2 diabetes: systematic review and meta-analysis of cross-sectional and prospective studies. *PLoS ONE* 2010;5(10):e13405.
 24. Biadgo B, Melku M, Abebe SM, Abebe M. Hematological indices and their correlation with fasting blood glucose level and anthropometric measurements in type 2 diabetes mellitus patients in Gondar, Northwest Ethiopia. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy* 2016;2016(9):19-99.
 25. Marcinkowska-Gapinska A, Kowal PA. Blood fluidity and thermography in patients with diabetes mellitus and coronary artery disease in comparison to the healthy subject. *Clin Hemorheol Microcirc* 2006;35(4):473-479.
 26. Engström G, Smith JG, Persson M, et al. Red cell distribution width, haemoglobin A1c and incidence of diabetes mellitus. *J Intern Med* 2014;276(2):174-183.
 27. Yenigün EC, Gülay OGU, Pirpir A, Hondur A, Yıldırım S. Increased mean platelet volume in type 2 diabetes mellitus. *Dicle Medical Journal* 2014; 41:17-22.
 28. Shankar A, Klein BE, Klein R. Relationship between white blood cell count and incident hypertension. *Am J Hypertens* 2004; 17(3):233-239.
 29. Yasunari K, Maeda K, Nakamura M, Yoshikawa J. Oxidative stress in leukocytes is a possible link between blood pressure, blood glucose, and C-reacting protein. *Hypertension* 2002; 39(3):777-780.
 30. Tanindi A, Topal FE, Topal F, Celik B. Red cell distribution width in patients with prehypertension and hypertension. *Blood Press* 2012; 21:177-81.
 31. Yang K, Tao L, Mahara G, et al. An association of platelet indices with blood pressure in Beijing adults Applying quadratic inference function for a longitudinal study. *Medicine* 2016; 95:39.

32. Nakanishi N, Suzuki K, Tatara K. Haematocrit and risk of development of type 2 diabetes mellitus in middle-aged Japanese men. *Diabet Med* 2004; 21(25):476-482.
33. Sherke BA, Vadapalli K, Bhargava DV, Sherke AR, Gopireddy MMR. Effect of number of cigarettes smoked per day on red blood cell, leucocytes and platelet count in adult Indian male smokers-A case control study. *International Journal of Medical Research and Health Sciences* 2016; 5:13-17.
34. Leu Shipa SA, Rana MM, Miah MF, Alam J, Mahmud MGR. Effect of intensity of cigarette smoking on leukocytes among adult men and women smokers in Bangladesh. *Asia Pac J Med Toxicol* 2017; 6(1):12-19.
35. Sweetnam PM, Gyarnell JW. Some long term effects of smoking on haemostatic system a report from the Caerphilly and speedwell collaborative surveys. *J Clin Pathol* 1987; 40(8):909-9013.
36. Ravala M, Paula A. Cerebral venous thrombosis and venous infarction: Case report of a rare initial presentation of smoker's polycythemia case rep. *Neurol* 2010; 2(3):150-156.
37. Kung CM, Wang HL, Tseng ZL. Cigarette smoking exacerbates health problems in young men. *Clinical and investigative medicine* 2008; 31(3): E138-149.
38. Bashir BA, Gibreel MO, Abdalatif HM, et al. Impact of tobacco cigarette smoking on hematologic parameters among male subjects in port Sudan Ahlia college, Sudan Sch. J. App. Med. Sci 2016;4(4A):1124-1128.

NIHL that Affected by High Frequency Noise on Workers at Production Area in Water Supply Company PT. X

Sjahrul Meizar Nasri¹, Dimas Brilliant Sunarno¹, Laksita Ri Hastiti¹

¹Occupational Health and Safety Department, Faculty of Public Health, Universitas Indonesia, Kampus UI, Depok, Indonesia

ABSTRACT

Noise level in Water Treatment Plant (WTP) is high enough. Increasing the need for clean water in line with the increasing population, making the Water Supply Company (PDAM) is required to increase production capacity. There are machines and production processes that have different characteristics than other types of industries. There are 306 PDAMs throughout Indonesia, the potential number of workers exposed to noise is very large, it is necessary to further investigate the relationship between noise characteristics and its determinants to hearing loss to PDAM workers to obtain the most appropriate form of control. This study used a cross sectional study design. The stages of this study are to measure the noise level and provide questionnaires as primary data, analyzing the worker audiometric results as secondary data and using Chi Square statistical test and multi determinant analysis to find out the relationship between independent and dependent variables. The results obtained that the source of noise in water treatment plants are pumps, exhaust fan, compressor, blower, vacuum and waterfall. The findings show that there are around 84.4% of workers in the production area exposed to noise > 85 dBA and 15.6% of workers have hearing loss. It is concluded that exposure workers over 85 dBA with dominant noise frequency > 2000 Hz can cause hearing impairment and aggravate if workers are > 40 years old and have a working life > 14 years.

Keywords: *Noise; Water Supply Company; Hearing Loss; Noise frequency.*

INTRODUCTION

The need for clean water is increasing every year with the increasing population in the world(1). The United Nations estimates that the world's population will increase to 9.3 billion by 2050. Previous study examined that the quality of groundwater and river water in DKI Jakarta Province in 2030 will be worse than the quality of groundwater and river water in the year 2000. More water supply is needed from water treatment plants in order to meet the need for clean water in the future(2).

The noise level at the water treatment plant is quite high. In Latvia, there was a level of noise exposure

around the blowers found at the local water treatment plant of 100 dB which exposed workers(3). Whereas in Indonesia, based on previous research the level of noise exposure in the production area of the Regional Drinking Water Company (PDAM) Tirtanadi Medan has exceeded the national quality standard KEP-48 / MENLH / 11/1996.

PT X is a regional water supply company that is responsible for the operation of clean water supply for residents of DKI Jakarta. Each PDAM uses production equipment to support the processing of dirty water into clean water. Overall there are 306 PDAMs throughout Indonesia. The use of production equipment such as pumps, air compressors, blowers and large capacity Variable Speed Drives (VSD) is a source of noise hazards for workers. The use of production tools that produce noise has the potential to reduce hearing function for workers (data on May, 2000).

Correspondence to :

Sjahrul M. Nasri

C Building, Occupational Health and Safety
Department UI, UI Campus, Depok, West Java, 16424,
Indonesia, E-mail: sjahrul.mn@gmail.com

Tel: +628-128-761-955

Noise hazards in PDAMs also have specific characteristics compared to other industrial fields. In its operational activities, fluctuations in the flow of water in the pipe due to valve closure, water hammer and turbulence flow also cause noise hazards(7). Other previous research, piping systems that drain water will create vibrations and noise resulting from the movement of water, air, piping system components and pipe support structures. In order for the clean water produced at the water treatment plant to be distributed evenly to all consumers, a booster pump is needed to increase the pressure and supply of clean water. In the operation of the booster pump, frequent water supply fluctuations in the booster pump occur(4). If the water supply to the booster pump decreases, it will cause cavitation at the pump. If cavitation occurs at the pump, it will increase the noise and vibration generated by the pump(5). These things certainly become a noisy danger for workers who work in the vicinity. Clean water service that is relentless 24 hours a day and 7 days a week requires workers to work in a 3 shifts rotation system, this increases the dose of noise exposure received by workers.

NIOSH (National Institute for Occupational Safety and Health) estimates the number of workers who have the potential to experience hearing impairment due to work activities ranging from 30 million workers(6). While the prevalence of employees with noise-induced hearing loss or Noise-Induced Hearing Loss (NIHL) in PT X is quite high, which is 8.7% for the right ear and 10.6% for the left ear with a source of workplace exposure of 95 dBA. As many as 23.8% of NIHL sufferers among PT X employees work in the production area.

The aim of this study is to know the relationship between noise frequency, noise level and worker characteristics (age, years of service, use of ear protectors, smoking habits, history of Diabetes Mellitus, history of hypertension, noise-related habits, use of ototoxic drugs and vibration exposure) to impaired function hearing on workers in the production area of PT X.

MATERIALS AND METHOD

The study design was an analytical study with cross sectional. This research is to see the description of noise source characteristics in the PDAM and to see the relationship of noise exposure with hearing impairment by analyzing other factors that can influence it, including

age, noise frequency, years of service, use of personal protective equipment (ear protectors), disease, smoking habits, hobbies related to noise, chemical exposure and vibration. This research was conducted in the PT X production area located in DKI Jakarta. The PT X production area consists of two water treatment plants, namely at Water Treatment Plant 1, Water Treatment Plant 2 and booster pump. The number of population used in this study were 64 workers. The sample taken was that the entire working population had met the inclusion criteria and did not include exclusion criteria. The study samples were all workers who work in the PT X production area when the research was conducted. Primary data was obtained from filling out the self administrative questionnaire and the results of Leq_{8hours} calculation of the noise exposure dose for workers exposed to noise in the PT X production area, as well as the measurement of the dominant noise frequency. Secondary data was obtained from PT X partner clinics that were trusted to conduct Medical Check-Up for PT X workers.

FINDINGS AND DISCUSSIONS

The source of noise in the PT X Water Supply Company is from the distribution pump, booster pump, exhaust / fan, blower, compressor, accelerator motor, waterfall, and vacuum. A total of 11 measurement points (26.2%) from a total of 42 measurement points in the PT X production area had a noise pressure above 85 dBA. A total of 3 measurement points (7.1%) of a total of 42 measurement points in the PT X production area have a dominant noise source above 2000 Hz. A total of 2 points (4.7%) from a total of 42 intermittent noise types.

According to Table 1, based on the results of audiometric examinations on the right and left ears, a number of 54 (84.4%) participants had normal hearing function status. While as many as 10 participants (15.6%) experienced a mild interference in their hearing function. In further investigated, there were 2 participants who experienced mild disruption only in their right ear, and there were 3 participants who experienced mild interference only in their left ear. While participants who experienced mild disruption in both ears were 5 participants.

Table 1. Prevalence of Hearing Loss at PT X

Prevalence of Hearing Loss	f	%
Mild Interference	10	15,6%
Normal	54	84,4%
Total	64	100,0%

Table 2. Result of Research

Variable		f	%	P-Value	Odd Ratio	CI
Noise Exposure	> 85 dBA	54	84,4%	0,594	-	95%
	≤ 85 dBA	10	15,6%			
Dominant Noise Frequency	> 2000 Hz	20	31,3%	0,004	7,4	95%
	≤ 2000 Hz	44	68,8%			
Age	> 40 years old	39	60,9%	0,04	7,2	95%
	≤ 40 years old	25	39,1%			
Years of Service	> 14 years old	39	60,9%	0,04	7,2	95%
	≤ 14 years old	25	39,1%			
Smoking Habit	Smoking	43	67,2%	0,208	-	95%
	Not Smoking	21	32,8%			
History of DM	Yes	0	0,0%	-	-	95%
	No	64	100,0%			
History of Hypertension	Yes	6	9,4%	0,21	-	95%
	No	58	90,6%			
Noise Related Hobbies	Have	4	6,3%	0,594	-	95%
	Have not	60	93,8%			
Chemical Exposure	Yes	0	0,0%	-	-	95%
	No	64	100,0%			
Vibration Exposure	Yes	49	76,6%	0,78	-	95%
	No	15	23,4%			

According to Table 2, the results of Leq_{8hours} noise exposure dose measurements showed that 54 participants (84.4%) were exposed to noise above the TLV. Characteristics of workers in the production area of PT X are 39 people (60.9%) over the age of 40 years, 39 people (60.9%) have a service life of over 14 years, 43 people (67.2%) are smokers, 64 people (100%) had no history of Diabetes Mellitus, was not exposed to chemicals and did not use ototoxic drugs, 49 people (76.6%) were exposed to vibrations, and 4 people (6.3%) had noisy habits. The results of the audiometric examination at the last Medical Check-Up were obtained as many as 10 participants (15.6%) experienced hearing impairment. A

total of 8 participants (80%) who experienced hearing impairment worked at the location of the science production sub-area 1. Judging at a frequency of 4000 Hz, as many as 51 participants (73.9%) had normal hearing function, 7 (10.1%) experienced mild interference, 9 (13%) experienced moderate disturbances, 1 (1.4%) experienced moderate severe disorders and 1 participant (1.4%) experienced severe hearing loss at a frequency of 4000 Hz. The dominant factors of age, working period and noise frequency have a statistically significant effect on hearing impairment in workers in the PT X production area. The noise exposure factor also affects the occurrence of hearing loss but has not reached a

statistically significant limit. The results of the multi determinant analysis show the frequency of noise gives the most powerful influence on hearing impairment. It can be concluded that workers exposed to noise above 85 dBA that have a dominant noise frequency > 2000 Hz can cause hearing impairment and are exacerbated if workers are > 40 years old and have a service life of > 14 years

Based on the findings of this research, it is suggested that the company need to control the risk of hearing loss in workers at the production area of PT X in accordance with the control hierarchy. [Substitution] To replace the compressor at IPA 1 with the type of compressor that does not produce noise pressure above 85 dBA, which is a silent air compressor with a noise pressure below 60 dBA. [Engineering Control] Adds a cover to the compressor at IPA 1 to reduce the dose of noise exposure received by workers in the production area of PT X. Perform periodic maintenance specifically and routinely on production equipment that results in noise pressure above the NAV and dominant noise frequency above 2000 Hz. [Administration] PT X needs to implement the Hearing Conservation Program (PKP) expressly accompanied by policies from the management and overall to increase top management's commitment to controlling noise hazards in the workplace. Rotations of workplaces should be held for workers over the age of 40 years and / or workers with a work period of more than 14 years so as not to work in areas with noisy exposure above the TLV. Training should be held on physical hazards in the workplace, especially noise and vibration hazards to increase workers' awareness of the importance of complying with all regulations and policies related to physical hazards in the workplace. It is necessary to stop smoking campaigns to reduce the risk of hearing loss in workers due to smoking habits, because most of the participants in this study were smokers. Workers in the PT X production area often exchange shift schedules due to personal interests. Workers in the PT X production area must comply with the standard shift schedule which is 8 hours per day to reduce the dose of noise exposure received and provide resting time on the ear organs. PT X needs to do noise mapping to make it easier to plan for controlling the risk of noise hazards in the production area of PT X. [Personal Protective Equipment] PT X is obliged to provide ear protection equipment of high

quality and quantity to meet the needs, and put it in a place that is easily accessible by workers.

CONCLUSION

The high frequency noise > 4000 Hz can cause hearing impairment and the damage can be worsened if the workers are more than 40 years old and already worked at the company for more than 14 years.

Conflict of Interest : None.

Ethical Clearance : Was obtained from the Ethics Committee Faculty of Public Health Universitas Indonesia No. 621/UN2.F10/PPM.00.02/2018

Source of Funding : This work is supported by Hibah PITTA 2018 funded by DRPM Universitas Indonesia No. 233/UN2.R3.1/PPM.00/2018.

REFERENCES

1. Vo CJ, Green P. Global Water Resources : Vulnerability from Climate Change and Population Growth. 2000;289(JULY):284–9.
2. Kumar P, Masago Y, Mishra BK, Jalilov S, Emam AR, Kefi M, et al. Current assessment and future outlook for water resources considering climate change and a population burst: A case study of Ciliwung River, Jakarta City, Indonesia. *Water (Switzerland)*. 2017;9(6).
3. Sulojeva J, Percovs A, Maľukova J, Urbane V. Occupational Safety Management Aspects on Municipal Waste Water Treatment Plant. 2011;1.
4. Moore S. A review of noise and vibration in fluid-filled pipe systems. *Acoustics*. 2016;(November):1–10.
5. Testud P, Moussou P, Hirschberg A, Aurégan Y. Noise generated by cavitating single-hole and multi-hole orifices in a water pipe. *J Fluids Struct*. 2007;23(2):163–89.
6. Franks JR, Stephenson MR, Merry CJ. Preventing Occupational Hearing Loss: a Practical Guide. *Niosh*. 1996;1996(June). Gruber E, Cunefare K. Noise Control within Building Water Supply Lines. *J Acoustical Soc of Amer.ens*. 2015;138(3):1808.

Analysis of Factors Related to Behavior Cognition and Effects on Pregnant Women in Maternal and Child Health (Mch) Handbook Utilisation

Rekawati Susilaningrum¹, Sri Utami², Nursalam Nursalam¹, Rr Dian Tristiana²

¹Polytechnic of Health, Ministry of Health the Republic of Indonesia, ²Faculty of Nursing, Universitas Airlangga, Surabaya

ABSTRACT

Background: Mothers' and childrens' mortality remains a problem, especially in developing countries. Various policies have been introduced by the government to reduce maternal and infant mortality, one of which is the use of Maternal and Child Health Handbooks (MCH) for pregnant women and mothers with toddlers. This study wants to explore factors related to perceived benefits, perceived bridges, and self-efficacy of pregnant women using MCH Handbooks. **Method:** This study was a cross-sectional study conducted on pregnant women and mothers with toddlers in health centres in Surabaya. The number of respondents in this study were 114 selected by simple random sampling. **Results:** There is a significant relationship between age ($p = 0.010$) and pregnancy history ($p = 0.000$) with obstacles perceived by respondent in the use of MCH Handbooks. There is a significant relationship between education levels ($p = 0.040$), pregnancy history ($p = 0.001$) and number of children ($p = 0.002$) with self efficacy in the use of MCH Handbooks. There is a significant relationship between income ($p = 0.004$) and perceived benefits in the use of MCH Handbooks. **Conclusion:** The factors that are related to the obstacles perceived by mothers in the use of MCH Handbooks are age and pregnancy history. The level of education, the history of pregnancy and the number of children related to the mother's self-efficacy in using the MCH Handbook and income are related to the benefits perceived in using the MCH Handbook.

Keyword: *factors, perceived barrier, perceived benefit, self-efficacy, Maternal and Child Health Handbook*

INTRODUCTION

Some the programs for the Sustainable Development Goal (SDGs) are to reduce maternal mortality rates to below 70 per 100,000 live births, ending preventable infant and under-five deaths.¹ The World Health Organization data show that around 830 mothers die every day due to complications of pregnancy and childbirth.² Indonesia's maternal mortality is still a problem despite a decline in the incidence of maternal mortality³ from 32,007 in 2016 to 10,294 in 2017. East Java is the province in Indonesia which accounts for 75% of maternal and child mortality rates in Indonesia.¹

The government has implemented policies to reduce maternal and child mortality by increasing access to quality health services for everyone at every stage of life by approaching a continuum of care through

comprehensive interventions (promotive, preventive, curative and rehabilitative) in full. One of the real activities is campaign and community empowerment, namely the application of the Maternal and Child Health (MCH) Handbook. Some research results show that the use of MCH Handbooks can increase antenatal care visits and improve communication between mothers and health care providers^{4,5}.

The Maternal and Child Health Handbook is a tool to detect early disturbances or problems with maternal and child health, to encourage communication and offer counseling tools with information that is important for mothers, families, and communities regarding services, maternal and child health, including references and MCH service standards, nutrition, immunisation, and child development. The MCH Handbook is one of the tools for disseminating information about maternal

and child health services for pregnant women, on childbirth and during the puerperium period until the baby is 5 years old. The MCH Handbook contains a history of pregnancy, birth, child growth and development, a history of immunisation and a child growth chart.⁶”mendeley” : { “formattedCitation” : “⁶”, “plainTextFormattedCitation” : “6”, “previouslyFormattedCitation” : “⁶” }, “properties” : { “noteIndex” : 3 }, “schema” : “https://github.com/citation-style-language/schema/raw/master/csl-citation.json” }

The MCH Handbook is an effort to indirectly reduce maternal mortality in Indonesia. However, the use of MCH Handbooks is still not optimal. All pregnant women visiting the health centre have MCH Handbooks. Puskesmas officials stated that even though pregnant women had MCH Handbooks, they were rarely read or studied by mothers and families for various reasons including not having time, not understanding, and assuming that the MCH Handbook was a notebook for health workers; they even found MCH Handbooks were often damaged.

Less than optimal maternal behaviour in the utilisation of MCH Handbooks can be influenced by several factors including knowledge, attitude, and awareness of mothers about the importance of the MCH Handbook so that mothers are less committed to using the MCH Handbook properly. Previous research shows that there is a relationship between the function of recording in MCH Handbooks and MCH knowledge; there is no relationship between the functions of education and communication in the MCH Handbooks and MCH knowledge⁷ and the role of cadres as supervisors.⁸ Factors related to the lack of mother’s willingness to use the MCH Handbook need to be studied, especially the perceived barriers and the mother’s self-efficacy in using the MCH Handbook.

METHOD

Desain

This study is a cross-sectional study.

Instrument

The instrument includes prior related behaviour and socio-cultural biological psychological personal factors. Questionnaires about characteristics were developed by researchers by adopting and developing questionnaires.⁹

Data on the characteristics of respondents include age, ethnicity, educational level, occupation, income, number of children, history of pregnancy, insurance ownership, history of ownership of the MCH Handbook.

Behaviour-Specific Cognitions and Effect

This instrument measures perceived benefits of action, barriers to action and self efficacy in the act. This instrument was developed by researchers by adopting ideas from the previous research questionnaire.⁹ It was further developed and modified by researchers in accordance with the use of MCH Handbooks.

RESPONDENTS

The sample in this study was pregnant women and mothers who had children under five in two health centres in Surabaya with the inclusion criteria: 1) Willing to become a respondent, 2) Having an MCH Handbook; 3) Can read and write. The sample size for this study was 114 respondents.

Data Collection

Researchers asked for data on pregnant women and mothers with toddlers in the health centre where the study was conducted. The researcher chose random sampling of respondents who then came to the respondent’s house based on data from the health care service. The researcher gave a description of the study and asked the respondent to sign an informed consent form if they were willing to become research respondents. Then, the researcher asked the respondents to fill in demographic data and fill out the research questionnaire.

Ethical Clearance

This study has received ethical approval from the health research ethics committee of the health ministry of Surabaya health ministry, number 206 / S / KEPK / VI / 2018.

RESULTS

Most respondents were aged from 17-25 years, a total of 48 respondents (42.1 %). The educational level of the majority of respondents was primary level, totalling 60 respondents (52.6 %). The income level of most respondents was the same because of the regional minimum wage level in Surabaya; 84 people (73.7%) had similar income levels. The pregnancy history of the

majority of respondents, namely primipara as much as 85% (74.6%) and most have a number of children, one of which is 57 respondents (50 %).

Table 1 Demographic data of respondents

Data	N	%
Age		
Late teenager	48	42.1
Early adult	41	36
Late adult	23	20.2
Early elderly	2	1.8
Education		
Elementary school	60	52.6
Middle school	39	34.2
High school	15	13.2
Income		
<regional minimum wage	6	5.3
= regional minimum wage	84	73.7
> regional minimum wage	24	21.1
Pregnancy history		
Primipara	85	74.6
multipara	29	25.4
Number of children		
1	57	50
2-3	38	33.3
>3	19	16.7

Table 2 Frequency of cognition and effect behaviour

Variable	N	%
Perceived benefit		
Very helpful	39	34.2
Helpful	29	25.4
Less useful	39	34.2
Useless	7	6.1
Perceived barriers		
Not blocking	78	68.4
Inhibiting	36	31.6
Self-efficacy		
Very confident	62	54.4
Sure enough	41	36
Not sure	11	9.6

The results showed that 34.2% of the respondents stated that the use of MCH Handbooks was very useful. A total of 78 respondents (68.4%) stated that they were not hampered by using MCH Handbooks and 62 respondents (54.4%) had good self-efficacy (Table 2).

Table 3: Relationship of demographic factors with behavioural cognition and effects

Variable	Behavior cognition and effects											
	Benefits				Barriers				Self efficacy			
	Mean	p	CI		Mean	p	CI		Mean	p	CI	
Age		.216				.010				.513		
Late teenager	2.381		2.186	2.577	1.495		1.385	1.605	1.789		1.530	2.048
Early adult	2.385		2.197	2.574	1.444		1.338	1.550	1.687		1.437	1.937
Late adult	2.552		2.332	2.773	1.580		1.456	1.704	1.918		1.626	2.211
Early elderly	2.836		2.229	3.443	1.957		1.615	2.299	1.643		.838	2.448
Education		.991				.784				.040		
Elementary school	2.546		2.332	2.761	1.642		1.521	1.762	1.555		1.271	1.840
Middle school	2.540		2.306	2.774	1.605		1.473	1.737	1.782		1.472	2.093

Cont... Table 3: Relationship of demographic factors with behavioural cognition and effects

Variable	Behavior cognition and effects											
	Benefits				Barriers				Self efficacy			
	Mean	p	CI		Mean	p	CI		Mean	p	CI	
High school	2.530		2.233	2.826	1.611		1.444	1.778	1.940		1.547	2.334
Income		.004				.281				.737		
< regional minimum wage	2.947		2.564	3.330	1.610		1.395	1.826	1.690		1.182	2.198
= regional minimum wage	2.355		2.178	2.533	1.669		1.569	1.769	1.833		1.598	2.068
> regional minimum wage	2.314		2.078	2.551	1.578		1.445	1.712	1.755		1.441	2.069
Pregnancy history		.528				.000				.001		
Primipara	2.570		2.358	2.782	1.146		1.027	1.266	1.531		1.250	1.813
multipara	2.507		2.261	2.753	2.092		1.954	2.231	1.987		1.661	2.314
Number of children		.181				.762				.002		
1	2.608		2.367	2.848	1.645		1.509	1.780	1.443		1.123	1.762
2-3	2.614		2.371	2.858	1.619		1.482	1.756	1.845		1.522	2.168
>3	2.395		2.125	2.664	1.594		1.442	1.745	1.990		1.633	2.348

The results showed that there is a significant relationship between age and perceived barriers in the use of MCH Handbooks ($p = 0.010$) and there is no significant relationship between age and perceived benefits ($p = 0.216$) and self-efficacy (0.513) in the use of the MCH Handbook. There is a significant relationship between the level of education with self-efficacy ($p = 0.040$) in the use of MCH Handbooks, but there is no significant relationship between the level of education with perceived benefits ($p = 0.991$) and perceived barriers ($p = 0.784$) in the use of MCH Handbooks. The results show a significant relationship between income and perceived benefits ($p = 0.004$) in the use of MCH Handbooks but there is no significant relationship between income and perceived barriers ($p = 0.281$) and self-efficacy ($p = 0.737$) in the use of MCH Handbooks. The history of pregnancy has a significant relationship with perceived barriers ($p = 0.000$) and self-efficacy (p

$= 0.001$) in the use of MCH books but does not have a significant relationship with perceived benefits ($p = 0.528$) in the use of MCH Handbooks. The number of children has a significant relationship with self-efficacy ($p = 0.002$) in the use of MCH Handbooks but does not have a significant relationship with benefits ($p = 0.181$) and perceived barriers ($p = 0.762$) in the use of MCH Handbooks.

DISCUSSION

Age has a significant relationship with perceived obstacles in the use of MCH Handbooks. Most respondents are in their late teens to early adulthood. Most respondents stated that they were not hampered by using KIA Handbooks.

The results of previous studies stated that mothers of productive age were more interested in utilising the

MCH Handbooks and always carried KIA Handbooks as a medium to communicate with health workers.¹⁰ Other studies state that the older the mother's age, the more interested they are in using antenatal care services.¹¹ Age affects a person's mindset and capture power. As you get older, you will develop a catching power and mindset. Greater maturity in the age of a pregnant woman can influence how much information she receives. However, other studies show that the use of MCH Handbooks is most common among mothers of a young age at the age of <20 years due to the fact that at this age, the mother usually experiences her first pregnancy and pays more attention to the condition of her pregnancy.

The mother's education level has a significant relationship with self-efficacy in the use of MCH Handbooks. Some respondents in this study have primary school level education. Most respondents have a high level of self-efficacy.

Previous research shows that the level of education is related to the use of antenatal care.¹² A high level of education and a good level of knowledge will facilitate the mother in receiving information and analysing it.¹³ Bandura in Masrarah states that one of the processes of self-efficacy is cognitive, which is related to the level of one's knowledge. A good level of knowledge and a high level of education will contribute to a person's high self-efficacy. However, not only is a high level of education related to high self-efficacy, there are several other factors that affect a person's self-efficacy, namely income level and previous experience.

Income has a significant relationship with perceived benefits and self-efficacy in the use of MCH Handbooks. Most respondents have income equal to the amount of the regional minimum wage (regional minimum wages).

Income is related to the welfare of mothers and families. Previous research shows that mothers from wealthy families will be more exposed to information from various media such as TV, internet and newspapers and that will increase their knowledge regarding antenatal care services.¹⁴ In addition, income is related to perceived barriers in obtaining health priorities at a higher order than basic needs,^{15,16} so that individuals who have less income can neglect the use of MCH Handbooks at the health centre.

Pregnancy history has a significant relationship with perceived barriers and self-efficacy in the use of

MCH Handbooks. Most respondents have a history of primiparous pregnancy. Previous research also states that most primiparous mothers use KIA Handbooks well compared to multiparous mothers.¹⁷ This may be because the mother who is experiencing a first pregnancy will focus more on the care obtained so that MCH Handbooks will be used more often by primiparous mothers.

Primigravida mothers will always want good pregnancies because they have no previous pregnancy experience. So, primiparous mothers tend to want to always take care of their pregnancy so they can deliver safely and comfortably. The results of previous studies showed that primiparous mothers tended to check their pregnancies more frequently than multiparous mothers.¹⁸ Other studies state that experience is a determining factor in increasing a person's self-efficacy (Bandura, 1986). In multiparous mothers, pregnancy experiences make mothers feel that they have experience in dealing with pregnancy so that mothers are less motivated to use the MCH Handbook.

The number of children has a significant relationship with self-efficacy in mothers in terms of the use of MCH Handbooks. Most respondents had one child and had very high self-efficacy.

In mothers with one child, they have had experience of using MCH Handbooks so they have high self-efficacy.

CONCLUSIONS

The factors related to the obstacles felt by mothers in the use of MCH Handbooks are age and history of pregnancy. The level of education, the history of pregnancy and the number of children related to the mother's self-efficacy in using the MCH Handbook and income are related to the benefits felt from using the MCH Handbook.

The MCH Handbook can encourage mothers by offering various information related to family health issues and prevention of illness in pregnant women, thus improving maternal and child health. Therefore, the use of MCH Handbooks is very important to ensure mothers and children receive ongoing care.

Source of Funding: This research was funded by the Ministry of Research and Technology of the Republic of Indonesia.

Conflict of Interest: None

REFERENCES

1. Kemenkes RI. Kesehatan dalam Kerangka Sustainable Development Goals (SDGs) [Internet]. Departemen Kesehatan RI. 2015 [cited 2018 Sep 11]. Available from: http://www.pusat2.litbang.depkes.go.id/pusat2_v1/wp-content/uploads/2015/12/SDGs-Ditjen-BGKIA.pdf
2. world health organization. Maternal mortality [Internet]. Health Topics. 2018 [cited 2018 Sep 10]. Available from: <http://www.who.int/news-room/fact-sheets/detail/maternal-mortality>
3. Ministry of Health Republic of Indonesia. Inilah Capaian Kinerja KEMENKES RI Tahun 2015- 2017 [Internet]. Ministry of Health Republic of Indonesia. 2017 [cited 2018 Sep 12]. Available from: <http://www.depkes.go.id/article/print/17081700004/-inilah-capaian-kinerja-kemenkes-ri-tahun-2015--2017.html>
4. Bhuiyan SU, Begum HA, Lee AS, Shao YW. Maternal and child health handbook: Utilization and lessons learned from selected evidencebased studies. *J Public Heal Dev.* 2017;15(2).
5. Yanagisawa S, Soyano A, Igarashi H, Ura M, Nakamura Y. Effect of a maternal and child health handbook on maternal knowledge and behaviour: a community-based controlled trial in rural Cambodia. *Heal Policy Plan.* 2015;30(9):1184–1192.
6. Baequni, Nakamura Y. Is Maternal and Child Health Handbook effective?: Meta-Analysis of the Effects of MCH Handbook. *J Int Heal* [Internet]. 2012;27(2). Available from: https://www.jstage.jst.go.jp/article/jaih/27/2/27_121/_pdf
7. Sistiarani C, Gamelia E, Sari DUP. Fungsi Pemanfaatan Buku KIA terhadap Pengetahuan Kesehatan Ibu dan Anak pada Ibu. *Natl Public Heal J.* 2014;8(8).
8. Widagdo L, Husodo BT. Pemanfaatan buku kia oleh kader posyandu: studi pada Kader posyandu di wilayah kerja puskesmas kedungadem Kabupaten bojonegoro. *Makara Kesehat.* 2009;13(1):39–47.
9. Pender NJ. Health Promotion Model Manual. In University of Michigan; 2011. p. 1–17.
10. Hagiwara A, Ueyama M, Ramlawi A, Sawada Y. Is The Maternal and Child Health (MCH) handbook Effective in Impriving Health – Related Behavior ? Evidance From Palestina. *J Public Heal Policy.* 2013;34(1):31–45.
11. Akowuah JA, Agyei-Baffour P, Awunyo-Vitor D. Determinants of Antenatal Healthcare Utilisation by Pregnant Women in Third Trimester in Peri-Urban Ghana. *J Trop Med.* 2018;
12. Choulagai B, Onta S, Subedi N, Mehata S, Bhandari G, Poudyal A. Barriers to using skilled birth attendants’ services in mid-and far-western Nepal: a cross-sectional study. Choulagai B, Onta S, Sube N, Mehata S, Bhandari GP, Poudyal A, al. 2013;13(1).
13. Notoatmodjo S. *Publick Health Science and Art.* 2007.
14. Deo KK, Paudel YR, Khatri RB, Bhaskar RK, Paudel R, Mehata S, et al. Barriers to Utilization of Antenatal Care Services in Eastern Nepal. *Front Public Heal.* 2015;3.
15. Umayah R. Hubungan Tingkat Ekonomi Ibu Hamil dan Tingkat Kepuasan Dengan Keteraturan Pemeriksaan Kehamilan di RB&BP Asy syifa’ PKU Muhammadiyah Wedi Klaten. e-journal Keperawatan [Internet]. 2010;4(2). Available from: <http://digilib.uns.ac.id>
16. Sari KIP, Efendy HV. Analisis Faktor yang Berpengaruh Terhadap Kunjungan Antenatal care. *J Keperawatan dan Kebidangan.* 2017;9(1).
17. Oktarina, Mugeni. The Relationships Among Knowledge, Attitude, and Compliance of Gravida (Expectant Mothers) and the Utilization of Maternal and Child Health (MCH) Book at Puskesmas Geger and Kedundung in Bangkalan, East Java. *Bul Penelit Sist Kesehat.* 2015;18(2):141–150.
18. Winjoksastro H. *Ilmu Kebidanan.* Jakarta: Yayasan Bina Pustaka; 2005.

Road Accident Investigation in Indonesia: An Analysis from Human Aspect Perspective

Mufti Wirawan¹, Ridwan Zahdi Syaaf¹, Indri Hapsari Susilowati¹

¹Department of Occupational Health and Safety, Faculty of Public Health,
Universitas Indonesia, 16424 Depok, Indonesia

ABSTRACT

National Transportation Safety Committee (NTSC) Indonesia mentioned that human aspect precipitated 72.73% of the total road accidents that occurred from 2007 – 2011 . This study analyzed the road accident phenomena in Indonesia in 2011 – 2013 (21 cases) from human factors perspective in road accident. The goal is to uncover human factors issue in road accident investigation. Unit analysis is posed from road accident investigation report which has been investigated by National Transportation Safety Committee (NTSC) Indonesia in 2011 – 2013. The result of this study consists of two parts. First, data recording stands to be main issue in the investigation of road accident. Incomplete data record leads to misleading analysis of road accident investigation. Second, from unsafe acts factor: user road type and vehicle ownership are weak defense factors that contribute to road accident, while license type, driving experience, and fatigue are uncomprehensive data in unsafe acts factor occurred. Time, crash type, vehicle type, weather condition, light condition, and road condition are weak defense factors that contribute to road accident in precursors of unsafe acts factor. This result shows that precursors of unsafe acts factor in road accident in Indonesia has more weakness than unsafe acts as a barrier in road transportation to prevent more accident in road transportation.

Keywords: *Human Factors, Road Accident, Investigation.*

INTRODUCTION

The National Transportation Safety Committee (NTSC) Indonesia mentioned that 72.73% of road accidents in 2007-2011 were caused by human aspect ⁽¹⁾. The percentage was far exceeding other factors such as vehicle factor (15.15%), infrastructure factor (3.03%), and any other factors that cannot be described and investigated later by National Police of Indonesia (9.09%).

NTSC Indonesia has released 21 investigation reports of road accidents during 2011 – 2013. There are 13 reports that mentioned human aspect as the main

factor behind road accidents in Indonesia. Meanwhile, the other reports mentioned vehicle factor, infrastructure factor, and environment factor as the main causes of accidents ⁽²⁾.

The aim of this study is to review the investigation reports released by NTSC from 2011 – 2013 from human factors perspective. This study uses swiss-cheese model as a conceptual framework. The barrier is divided into unsafe acts factor and precursors of unsafe acts factor.

METHOD

This study employs a descriptive analysis based on the data from 21 investigation reports of road accidents in Indonesia from 2011 – 2013 released by NTSC Indonesia in their official website. The investigation reports contain the chronology of accident, the facts and information founded by the investigation team, the analysis from accident investigation team, the results of investigation, and the recommendations from the

Corresponding Author:

Mufti Wirawan, Department of Occupational Health and Safety, Faculty of Public Health, Universitas Indonesia, Depok 16424, INDONESIA.
Email: muftiwirawan@ui.ac.id

investigation result.

Besides the results of those reports, this study also carries out analysis by focusing on two barriers related to human factors perspectives, namely: Precursors of Unsafe acts factor and Unsafe acts factor ⁽³⁾. Precursors of Unsafe acts factor consists of: Period of Accident (Days, Date, Month, and Year), Time of Accident (Day or Night), Location, Speed Zone, Type of Accident, Type of Vehicle, Weather Condition, Light Condition, and Road Condition. Unsafe acts factor consists of: Age, Sex, Road User Type, License Type, Vehicle Ownership, Driving Experience, Health Condition, Medical Condition, Fatigue, Seat Belt Used, Number of Injury, and Number of Fatality.

RESULTS

There are two parts of results from this study. The first one is Data Record. There are inconsistent

Data Record from the reports of investigation. Not all investigation reports contain comprehensive data. Incomprehensive data applied to two factors: precursors of unsafe acts and unsafe act. precursors unsafe acts There are no data on the Speed Zone from the precursors of unsafe act. All reports did not mention anything about the speed zone that has been violated by driver. There are also incomplete data regarding the light condition and weather condition. There are 9 reports which did not mention the light condition, and there is 1 report which did not mention the weather condition. unsafe acts Incomplete data from unsafe acts factor consist of: Health Condition, Medical Condition, Seat Belt Used, License Type, Driving Experience, and Fatigue.

The second part of the result shows that Time, Crash Type, Vehicle Type, Light Condition, Road Condition, and Weather Condition constitute the factor levels of precursors of unsafe acts that are confined as the main issues related to human factor.

Table 1. Precursors of Unsafe acts Level Descriptions

Precursors Unsafe acts Factor	Factors	Number of cases	Percentage (%)
Days	Wednesday, Saturday, Sunday	4	19.05%
Date	Date 10	3	14.29%
Month	February	4	19.05%
Year	2012, 2013	8	38.10%
Time	Night (00.01 – 06.00)	10	47.62%
Location	West Java	8	38.10%
Accident Type	Crash	15	71.43%
Vehicle Type	Bus	14	66.67%
Weather Condition	Sunny	15	71.43%
Light Condition	Dark	9	42.86%
Road Condition	Asphalt	14	66.67%

From unsafe acts level, it can be seen that road user type and vehicle ownership constitute the two main factors in road accidents, while there are some other factors that yet to be also recorded.

Table 2. Unsafe acts Factor

Unsafe acts Factors	Factors	Number of cases	Percentage (%)
Age	31 – 40 years	7	33,33%
Sex	Man	21	100%
Road User Type	Driver	21	100%
Vehicle Ownership	Not ownership	21	100%
Fatality	8 – 16 persons ($\sum = 256$ persons)	15	71.43%
Injury	< 10 persons ($\sum = 396$ injury)	8	38.10%

DISCUSSION

Data recording remains to be big issues in road accident investigation. World Health Organization mentioned that data recording has become a problem in the investigation of road accident in Indonesia. In fact, there are no comprehensive recording between the years 2009 – 2010⁽⁴⁾. Incomprehensive data recording on accidents could reduce the accurateness of the investigation result and produce a misleading conclusion of the accident investigation. Human aspect as the main cause of road accident is based on the current model of investigation. Humans are treated as the main factor that contributes to road accidents. However, when we look from the perspective of human factors as a scientific approach in investigation, data recording on unsafe acts are minimum, while data on precursors of unsafe acts are more comprehensive. This means that it is too early to conclude that humans are the main factor in road accidents, as there are barrier levels of precursors of unsafe acts that still need to be observed and analyzed.

Reason (1997) expressed that accident is organizational risk. Human is part of organization with their limitations and capabilities⁽⁵⁾. If we look onto the study, there are still a lot of rooms for organizational barrier and defenses to analyze and explore in order to get a more comprehensive analysis of road accident. However, it is not easy to see road accident as an organizational accident. Data in organizational barrier

are not available or not recorded⁽³⁾. Road users are not “organizational” group of people, unlike workers in a company or members in an organization.

The Road Accident Investigation Report published by NTSC Indonesia uses an epidemiological approach consisting of 4 factors: Human, Vehicle, Infrastructure, and Environment. Pratte (1998) mentioned that there are three main factors of epidemiological approach of road accident research, namely Human, Vehicle, and Environment. This model of Road Accident Investigation Report published by NTSC Indonesia uses similar approach that was proposed by Pratte⁽⁶⁾. Although, there are no data on Alcohol and Drug Used in Human Aspect, various studies show that blood alcohol level is correlated to road accident^(7,8). Other studies show that drugs and medical conditions also increases the risk of road accidents⁽⁹⁾.

Despite all these, there is no data on the five supporting factors of Human Aspect recorded in the road accidents investigation report issued by NTSC. The five factors have, in fact, contributed to the numbers of accidents from the human aspect according to epidemiological approach. Several studies show that the positive alcohol level in the drivers’ blood contributes positively to road accidents involving land transportations^(7,8). In addition to alcohol, other studies also find that the driving under the influence of drugs and certain medical conditions also constitutes a human aspect that plays a role in road accidents^(9,10). The data concerning health can be used as a material for further investigation on the role or contribution of human aspect in an accident.

The use of seatbelts constitutes one human-related factor that can reduce the rate of accidents. It is estimated that the use of seatbelts may reduce up to 40% - 60% risk of traffic accident (7). The investigation result issued by NTSC, however, does not include any data on the use of seatbelts.

With regards to age, studies conducted in developing countries found that drivers with older ages (over 70 years old) have minor contribution in traffic accidents. This can be caused by the small numbers of drivers that belongs to such age group or the lack of data thereon⁽⁶⁾. In the investigation result issued by NTSC, most drivers belong to the productive age groups, ranging from 31 to 40 years old. This figure is quite different from the ones found in developed countries. For example, in

2003 the ratio of older drivers (aged > 75 years) was twice that of young drivers (aged 16 to 24 years), and in 2009 over 50% traffic accidents involved elderly driver⁽¹¹⁾. Nonetheless, similar situation is expected to occur in Indonesia in the near future, and thus, measures to anticipate this are necessary.

CONCLUSION

Based on the analysis from human factor perspective, there are some external factors which have high contribution with road crash, such as accident type, vehicle type, weather condition, and road condition. Otherwise, there was less contribution from human factor due to the data of accident investigation for 2011 – 2013 were not comprehensive, particularly data about human factors (unsafe act). But, data record related precursor of unsafe act was more complete. This data will give misleading to see the causes of crass road from human factor perspective.

Conflict of Interest: NIL

Ethical Clearance: The study was approved by the Ethical Committee of Faculty of Public Health, Universitas Indonesia, Indonesia, with the approval number 366/UN2.F10/PPM.00.02/2018

Source of Funding: This work is supported by Hibah PITTA 2017 funded by DRPM Universitas Indonesia No.601/UN2.R3.1/HKP.05.00/2017

REFERENCES

1. KNKT. Analisis Data Kecelakaan Dan Investigasi Transportasi Laut Tahun 2007-2011. Konf Pers Akhir Tahun 2011 KNKT. 2011;
2. Training I. Auditorium KNKT, Kementerian Perhubungan. 2012;
3. Salmon PM, Lenne MG. Systems-based Human Factors analysis of road traffic accidents: Barriers and solutions. Australas Road Saf Res Polic Educ Conf [Internet]. 2009;(November):201–9. Available from: <http://casr.adelaide.edu.au/rsr/RSR2009/RS094023.pdf>
4. World Health Organization. Global status report on road safety. Inj Prev [Internet]. 2015;318. Available from: http://www.who.int/violence_injury_prevention/road_safety_status/2013/en/%5Cnhttp://www.who.int/violence_injury_prevention/road_safety_status/2015/en/
5. Reason J. Managing The Risks Of Organizational Accidents. Ashgate Publishing Limited; 1997.
6. Pratte D. Road to Ruin: Road Traffic Accidents in The Developing World. Traffic. 1998;13:46–62.
7. Polen MR, Friedman G. Automobile Injury: Selected Risk Factors and Prevention in the Health Care Setting. J Am Med Assoc. 1998;259(1):77–81.
8. Waller PF, Stewart J., Hansen A. The Potentiating Effects of Alcohol on Driver Injury. J Am Med Assoc. 1996;255:522–7.
9. Oyebanji O. Road Traffic Accidents and Wastage of Human Resources in Nigeria. Ekistics. 1984;51(306):242–50.
10. Odero W. Road Traffic Accidents in Kenya: An Epidemiological Appraisal. East Afr Med J. 1995;72(5):299–305.
11. Susilowati IH, Yasukouchi A. Cognitive characteristics of older Japanese drivers. J Physiol Anthropol. 2012;31(2):1–10.

The Association between Eat Culture and Obesity among Adolescents in Tana Toraja

Erni Yetti R¹, Muhammad Safar², Andi Zulkifli³, Rahayu Indriasari⁴, Zadrak Tombeg⁵, Saskiyanto Manggabarani⁶, Anto J. Hadi⁷

¹Student Doctoral Program of the Faculty of Public Health, Hasanuddin University, Makassar, Indonesia; Health Promotion and Behavioral Sciences Lecturer, Sinar Kasih Midwifery Academy Toraja, Tana Toraja, Indonesia, ²Professor of Health Promotion and Behavioral Sciences, Faculty of Public Health, ³Professor of Epidemiology at the Faculty of Public Health, ⁴Nutrition Lecturer at Public Health Faculty, Hasanuddin University, Makassar, Indonesia, ⁵Lecturers of Maternal and Child Health, Sinar Kasih Midwifery Academy Toraja, Tana Toraja, Indonesia, ⁶Nutrition Lecturer, Faculty of Public Health, Helvetia Institute of Health, Medan, Indonesia, ⁷Lecturer, Faculty of Public Health, Helvetia Institute of Health, Medan, Indonesia

ABSTRACT

Obesity is a new problem experienced by the world population, especially developing countries. Obese sufferers increase the risk of degenerative diseases, mental health and death. The aim is to analyze the cultural relationship between eating and the incidence of obesity in adolescents. This study was cross sectional survey by using purposive sampling to select samples. A total 79 adolescents were selected and investigated during this study. The result of this study shows a relationship between fast food consumption and the incidence of obesity ($p < 0.001$). There is a significant relationship between food frequency and obesity ($p < 0.001$). There is no correlation between food preference and obesity ($p = 0.833$). Eat culture has a correlation with the incidence of obesity in terms of food consumption, meal frequency but not food preference. Food culture is closely related to local customs. Especially in fast food consumption and daily food preferences. It is suggested to adolescents to concern on their food consumption by knowing the principle of balanced consumption, and more intelligent in choosing the food that will be consumed.

Keywords: Obesity, Eat Culture, Fast Food Consumption, Meal Frequency, Food Preference

INTRODUCTION

Obesity has become a serious health problem in adolescents^{1,2}. This obesity is the fifth leading cause of death in the world. Overweight has become a global pandemic throughout the world and is declared by WHO as the biggest chronic health problem. Obesity is caused by several factors, including genetic, socio-economic, behavioral and environmental factors³⁻⁵. The status of obesity in children to adults increases the risk of degenerative diseases and mortality⁶. Nowadays, social and cultural impact on changes in their "tastes" of food, from food choices, to eating patterns, it is increasing over

time, in this case their choice of tastes is increasingly westernized⁷.

Obesity has become a major health problem in recent years in Indonesia, the US and around the world⁸. Cases of obesity have increased for at least 5 decades, and the cause of the biggest mental illness⁹. Surveys in 13 countries and found that there was a significant relationship between depression and obesity¹⁰. Based on data from the International Obesity Unity shows that around 155 million school-aged children suffer from obesity worldwide¹.

Obesity in adolescents is also at risk for non-communicable disease (NCD)⁴. Obesity can increase the risk of diseases such as cardiovascular disease, diabetes, hypertension, dyslipidemia, and insulin resistance¹¹. Being overweight in adolescents compared to normal

Correspondence Author:

Erni Yetti R

E-mail: erniyetti12345@gmail.com

weight (12-19 years) is at greater risk of developing cardiovascular disease, (5-15 years) experiencing an increase in glucose, blood pressure, insulin, and lipids and an increase in body mass. Metabolic symptoms have been diagnosed in 25% - 50% of pediatric obesity¹².

The number of obesity cases in adolescents and adults is worried for the government. Obesity and all its causes constitute a serious threat to the people of Indonesia. Based on data from Basic Health Research showed an increase in the prevalence of obesity in adolescents from 1.4% in 2007 to 7.3% in 2013. The prevalence of school-age children obesity in South Sulawesi in 2013 was 6.5% overweight and 4.2% obesity which is lower than the national figure of 10.8% over body weight and 8.0% obesity¹³.

Obesity is one of the complex phenomena influenced by genetic, behavioral, environmental and family factors. The balance between energy intake and expenditure causes obesity. An environment that encourages lack of physical activity, and consumption of high-fat foods, high-carbohydrate foods support a positive energy balance. Less physical activity during childhood and adolescence and the influence of media are risk factors that influence the incidence of obesity in adolescents who are classified as children at age “at risk for overweight¹⁴.

Accuracy about increasing the prevalence of obesity is very important for public health policies and programs to prevent related chronic diseases¹⁵. Eating habits are one of the important factors that influence the nutritional status of adolescents. Adolescents commonly do not know the effect of excessive eating patterns¹⁶⁻¹⁸. A good eating culture can reduce the incidence of illness and non-communicable disease. Modifying lifestyle can reduce the risk of the prevalence of disease in adolescents in Korea. Regional social and demographic factors are factors that cause disease¹⁹.

Tana Toraja Regency is one of the regions in South Sulawesi that has a unique culture. This region is mountainous area that rich in natural resources and has many obese school-age children. The aim of the study was to investigate relationship between eating culture and the incidence of obesity in adolescents in Tana Toraja.

MATERIAL AND METHOD

This research was conducted in Tana Toraja from January to March 2018. The type of research was cross sectional study. Preliminary study was done before the main research conducted. 75 adolescents were selected by purposive sampling. Primary data includes characteristics of fast food, meal frequency, and food preferences. Data were obtained through interviews by using structured questionnaire, food frequency questionnaire, and repeated 24-hour recall food. Anthropometric data including body weight was measured using an automatic stepping scale with a capacity of 150 kg with a precision level of 0.1 kg. Whereas height is measured using microtoise with capacity 200 cm and accuracy 0.1 cm. Obesity status data was determined using body mass index for age z score (BAZ), then z-score was calculated using WHO Anthro Plus 2007 software. Univariate analysis was to see an overview of the characteristics of adolescents. Bivariate analysis and multivariate analysis were conducted to see the most significant variables on the incidence of obesity.

RESULTS

Table 1 shows the description of gender, age, and incidence of adolescent obesity. Based on the homogeneity test results showed that the obese and non-obese group had homogeneity (p>0.05).

Table 1. Characteristic of participant

Characteristics	Obesity status				Total	p*
	Obese		Non-obese			
	n	%	n	%		
Sex						
Male	6	17.1	29	82.9	35(100)	0.056
Female	10	25.6	29	74.4	39(100)	

Cont... Table 1. Characteristic of participant

Age						
13yo	3	27.3	8	72.7	11(100)	0,098
14yo	9	30.0	21	70.0	30(100)	
15yo	4	12.1	29	87.9	33(100)	
Weight						
45–50kg	2	6.3	30	93.8	32(100)	0,308
51–58kg	4	21.1	15	78.9	19(100)	
59–66kg	4	33.3	8	66.7	12(100)	
67–74kg	3	60.0	2	60.0	5(100)	
75–83kg	3	50.0	3	50.0	6(100)	
Height						
139–144cm	3	42.9	4	57.1	7(100)	0,750
145–150cm	2	10.0	18	90.0	20(100)	
151–156cm	4	25.0	12	75.0	16(100)	
157–162cm	6	30.0	14	70.0	20(100)	
163–168cm	1	9.1	10	90.9	11(100)	

*Homogeneity-test

The relationship of eat culture with the incidence of obesity in adolescents is presented in **Table 2**. Among obese adolescent, 39% consume fast food, 38.5% high food frequency, and 37% like for food preference. The habit of consuming fast food has a significant effect on the incidence of obesity with a value ($p= 0.004^*/0.004^{**}$).

The frequency of eating has a significant and significant effect on the incidence of obesity with value ($p= 0.010^*/0.009^{**}$). Eating preferences have a significant and significant effect on the incidence of obesity with a value ($p = 0.015^*/0.014^{**}$).

Table 2. Relationship between eating culture and obesity

Variables	Obesity status				Total	p
	Obese		Non-obese			
	n	%	n	%		
Fast Food consumption						
Consume	11	39.3	17	60.7	28	0.004*
Not consume	5	10.9	41	89.1	46	0.004**
Eating frequency						
High	10	38.5	16	61.5	26	0.010*
Enough	6	12.5	42	87,5	48	0.009**
Food preference						
Like	10	37.0	17	63.0	27	0.015*
Dislike	6	12.8	21	87.2	47	0.014*

*Chi-Square **Paired Test

The variables that eligible to be included in multivariate analysis were fast food consumption, meal frequency, and eating preferences. The method used was ratio statistics and chi square test to see the risk and most related variables. Food preference variable was the most associated with obesity. Based on odds ratio analysis, consumption of fast food, frequency of eating, eating preferences 3 to 5 times more at risk for the incidence of obesity (**Table 3**).

Table 3. Multi logistic regression

Variable	B	p	Exp (B)	OR	95% CI
Fast Food consumption	3.732	0.000	41.753	5.306	5.672 - 307.360
Meal frequency	4.222	0.001	68.158	4.373	6.075 - 764.759
Food preference	4.782	0.000	119.372	4.020	8.595 - 1657.811

DISCUSSION

Fast food is generally produced using machines that are classified as foods that are high in carbohydrates and fat. Researchers in the United States find that alternative foods available in automatic machines have a negative effect on the quality of food in children²⁰. In accordance with the conditions of fast food that is fried with savory flavors that exist in the Tana Toraja region in addition to containing high carbohydrates also contain fat. The fat consumed is not converted into energy because the carbohydrates consumed are not used up. As a result, there is accumulation of fat and carbohydrates simultaneously which may cause excess weight. The results of this study are similar to a study where the consumption of fast food, which has high energy density and glycemic load, and attracts teenagers to consume more portions, adversely affect weight gain and obesity²¹.

The influence of the environment and the economic status of the family is proven to be a risk factor for obesity. Parents' knowledge that instills awareness of the importance of health in eating food, so teens are careful in selecting food. Almost every geographical area has at least one fast food restaurant. The presence of a fast food business near the residence encourages the desire to eat fast food. One of the factors driving the existence of a business entity that offers fast food is because the Tana Toraja area is very popular and is very much visited by tourists. This is what causes changes in food consumption behavior due to the availability of fast food. This study is supported by a research that exposure to fast food restaurants can be distributed in support of behavioral changes to sustained consumption of ready-to-eat foods^{22,23}. A good method is used in the

prevention of excess weight which will lead to highly recommended obesity by limiting consumption of fast food and providing knowledge about a healthier menu selection²³.

The availability of food also affects the frequency of eating teenagers, in addition to the consumption of food in the household also available fast food so that the frequency of eating more than 3 times a day and not balanced with physical activity, especially in young women. The choice of food type and meal portion can be caused by the time and place of research²⁴.

Excessive eating frequency can cause buildup because previously consumed food has not been used up as energy and continues to increase according to the frequency of eating for a day. Torajanese tradition in serving the average food contains high fat because the culture of the Toraja tribe is different from other tribes in Indonesia. This research is in line with the research of Lee et al. (2003) in Seoul Korea found that overeating was significantly associated and risked overweight in adolescents¹. But contrary to previous research in Makassar Indonesia states that the frequency of meals has no real effect because the settings have been done correctly²⁴.

Parents play important role in the formation of eating habits and food preferences for their children. They can influence their children's food preferences by providing certain foods, as models and attitudes to certain situations²⁵. It is important because children are vulnerable since unhealthy foods are provided in surrounding them, such as in the school²⁶.

Exposure to a variety of foods can encourage teens to choose the type of food available. The habit of providing food according to desire will encourage teenagers to choose these foods even though there are other types of food. The availability of food is influenced by family economic conditions. The high food preferences in adolescents are caused by the family's economic status. Adequate economic conditions tend to lead to excessive food purchases. This causes food to always be available as desired. Teenagers who come from families with higher income levels have different food preferences than children from low-income families²⁰.

Food preferences in Toraja adolescent are strongly supported by local traditions. Tradition where the deceased person will be celebrated with a luxurious custom party with food available is very high in carbohydrates and fat. This study supports the results of research in Korea which states that the selection of food among adolescents is influenced by the level of household income²⁷. Good socio-economic status of the family causes an increase in the prevalence of obesity in children and adolescents in the United States¹⁸.

CONCLUSIONS

Food culture is closely related to local customs. Especially in fast food consumption and daily food preferences.

Conflict of Interest: The author (s) declare that they have no conflict interest

Source of Funding: Self-funded

Ethical Clearance: Ethical approval has been obtained from Ethical Commission of Health Research, Faculty of Medicine, with protocol number UH179121963.

REFERENCES

1. Lee HA, Lee WK, Kong K-A, et al. The effect of eating behavior on being overweight or obese during preadolescence. *Journal of Preventive Medicine and Public Health*. 2011;44(5):226.
2. Al-Hazzaa H, Al-Sobayel H, Abahussain N, Qahwaji D, Alahmadi M, Musaiger A. Association of dietary habits with levels of physical activity and screen time among adolescents living in Saudi Arabia. *Journal of human nutrition and dietetics*. 2014;27(s2):204-213.
3. Chu M, Choe B-H. Obesity and metabolic syndrome among children and adolescents in Korea. *Journal of the Korean Medical Association*. 2010;53(2):142-152.
4. Lee HA, Park H. Overview of noncommunicable diseases in Korean children and adolescents: focus on obesity and its effect on metabolic syndrome. *Journal of Preventive Medicine and Public Health*. 2013;46(4):173.
5. Hu FB. Sedentary lifestyle and risk of obesity and type 2 diabetes. *Lipids*. 2003;38(2):103-108.
6. Brown T, Smith S, Bhopal R, Kasim A, Summerbell C. Diet and physical activity interventions to prevent or treat obesity in South Asian children and adults: a systematic review and meta-analysis. *International journal of environmental research and public health*. 2015;12(1):566-594.
7. Al-Rethaiaa AS, Fahmy A-EA, Al-Shwaiyat NM. Obesity and eating habits among college students in Saudi Arabia: a cross sectional study. *Nutrition journal*. 2010;9(1):39.
8. Ha H, Han C, Kim B. Can Obesity Cause Depression? A Pseudo-panel Analysis. *J Prev Med Public Health*. 2017;50(4):262-267.
9. Burkhauser RV, Cawley J, Schmeiser MD. The timing of the rise in US obesity varies with measure of fatness. *Economics & Human Biology*. 2009;7(3):307-318.
10. Scott KM, Bruffaerts R, Simon GE, et al. Obesity and mental disorders in the general population: results from the world mental health surveys. *International journal of obesity*. 2008;32(1):192-200.
11. Yun JE, Kimm H, Choi YJ, Jee SH, Huh KB. Smoking is associated with abdominal obesity, not overall obesity, in men with type 2 diabetes. *Journal of Preventive Medicine and Public Health*. 2012;45(5):316.
12. IglayReger HB, Peterson MD, Liu D, et al. Sleep duration predicts cardiometabolic risk in obese adolescents. *The Journal of pediatrics*. 2014;164(5):1085-1090. e1081.
13. Depkes RI. Riset kesehatan dasar. Jakarta: Badan Penelitian dan Pengembangan Kesehatan Departemen Kesehatan Republik Indonesia. 2013.
14. Lubans DR, Smith JJ, Skinner G, Morgan PJ.

- Development and implementation of a smartphone application to promote physical activity and reduce screen-time in adolescent boys. *Frontiers in public health*. 2014;2.
15. Bae J, Joung H, Kim JY, Kwon KN, Kim Y, Park SW. Validity of self-reported height, weight, and body mass index of the Korea Youth Risk Behavior Web-based Survey questionnaire. *J Prev Med Public Health*. 2010;43(5):396-402.
 16. Abudayya AH, Stigum H, Shi Z, Abed Y, Holmboe-Ottesen G. Sociodemographic correlates of food habits among school adolescents (12–15 year) in north Gaza Strip. *BMC Public Health*. 2009;9(1):185.
 17. Kant AK, Graubard BI. 20-Year trends in dietary and meal behaviors were similar in US children and adolescents of different race/ethnicity. *The Journal of nutrition*. 2011;141(10):1880-1888.
 18. Kant AK, Graubard BI. Family income and education were related with 30-year time trends in dietary and meal behaviors of American children and adolescents. *The Journal of nutrition*. 2013;143(5):690-700.
 19. Ryu SY, Park J, Choi SW, Han MA. Associations between socio-demographic characteristics and healthy lifestyles in Korean Adults: the result of the 2010 Community Health Survey. *Journal of Preventive Medicine and Public Health*. 2014;47(2):113.
 20. Patrick H, Nicklas TA. A review of family and social determinants of children's eating patterns and diet quality. *Journal of the American College of Nutrition*. 2005;24(2):83-92.
 21. Rosenheck R. Fast food consumption and increased caloric intake: a systematic review of a trajectory towards weight gain and obesity risk. *Obesity Reviews*. 2008;9(6):535-547.
 22. Lopez RP. Neighborhood risk factors for obesity. *Obesity*. 2007;15(8):2111-2119.
 23. Sallis JF, Glanz K. Physical activity and food environments: solutions to the obesity epidemic. *The Milbank Quarterly*. 2009;87(1):123-154.
 24. Anto A, Sudarman S, Manggabarani S. The Effect Of Counseling to Modification the Lifestyle On Prevention Of Obesity In Adolescents. *PROMOTIF: Jurnal Kesehatan Masyarakat*. 2017;7(2):99-106.
 25. Klesges RC, Stein RJ, Eck LH, Isbell TR, Klesges LM. Parental influence on food selection in young children and its relationships to childhood obesity. *The American journal of clinical nutrition*. 1991;53(4):859-864.
 26. Arundhana AI, Utami AP, Muqni AD, and Thalavera MT. Regional Differences in Obesity Prevalence and Associated Factors among Adults: Indonesian Basic Health Research 2007 and 2013. *Malaysian Journal of Nutrition*. 2018; 24(2): 193-201.
 27. Hong S, Bae HC, Kim HS, Park EC. Variation in meal-skipping rates of Korean adolescents according to socio-economic status: results of the Korea Youth Risk Behavior Web-based Survey. *J Prev Med Public Health*. 2014;47(3):158-168..

Analysis of Environmental Risk Factors and Dynamics of Transmission with Incidence of Filariasis in Kubu Raya District West Kalimantan Province

Suyud Warno Utomo¹, Wiyono², Haryoto Kusnoputranto³

¹Department of Environmental Health, Faculty of Public Health, University of Indonesia, Campus of Depok, West Java, Indonesia, ²Postgraduate Program, Department of Environmental Health, Faculty of Public Health, Universitas Indonesia, Depok, West Java, Indonesia, ³Professor of Environmental Science, School of Environmental Science, Universitas Indonesia, Jakarta, Indonesia

ABSTRACT

Filariasis is a chronic infectious disease caused by filarial worm infection and is transmitted through the bite of various types of mosquitoes. The objective of this study was to analyze the environmental risk factors and the dynamics of transmission with the incidence of filariasis. The method used was observational analytic research with the case-control design. The sample size was 126 respondents with a ratio of case: control (1:2). The data collection was conducted by interview and observation. The results showed that there was correlation between the existence of swamp ($P:0,000$; $OR:5,200$), shrubs ($P:0,001$; $OR:6,460$), type of occupation ($P:0,000$; $OR:9,500$), level of knowledge ($P:0,000$; $OR:5,399$), the habit of doing an activity at night ($P:0,000$; $OR:7,300$), habit of using mosquito repellents ($P:0,004$; $OR:3,300$), habit of using mosquito net ($P:0,000$; $OR:7,045$), and the existence of a vector ($P: 0,000$; $OR: 7,263$) with the incidence of filariasis. Meanwhile, the logistic regression test showed the most significant risk factors on the existence of shrubs ($P:0,002$; $OR:48,700$), type of occupation ($P:0,004$; $OR:39,919$), level of knowledge ($P:0,013$; $OR:11,206$), the habit of doing an activity at night ($P:0,040$; $OR: 5,833$), habit of using mosquito repellents ($P:0,005$; $OR:10,680$), and the existence of a vector with the incidence of filariasis. It can be concluded that there was a correlation between environmental risk factors and the dynamics of transmission with the incidence of filariasis, thus, prevention efforts need to be conducted by reducing risk factors and educating the public about the efforts of promotion and prevention of filariasis transmission.

Keyword: *Filariasis, environmental risk factors, socio-cultural, dynamic of transmission, Kubu Raya District*

INTRODUCTION

Filariasis or often called elephantiasis is a chronic infectious disease caused by filarial worm infection and is transmitted through the bite of various types of mosquitoes. The worms are commonly in the lymph nodes, particularly in the groin and underarms as well as other large lymph nodes. The lymph nodes can be damaged and disrupted its function in tackling bacterial and fungal infections on the leg or hand injuries⁽¹⁾.

Filariasis is one of the Neglected Tropical Disease (NTDs), which is a group of infectious disease infections caused by parasites, bacteria and viruses affecting more than one billion people worldwide. It is called neglected because it may survive exclusively in the poor population area, remote area, rural area, and urban slums⁽²⁾.

Filariasis is caused by three species of filarial worms, namely *Wuchereria Bancrofti*, *Brugia malayi* and *Brugia timori*, while the vector of the disease is mosquito. Nowadays, there are 23 species of mosquitoes from genus *Mansonia*, *Anopheles*, *Culex*, *Aedes*, and *Armigeres* which may act as potential filariasis vectors⁽³⁾.

Corresponding Author:

Suyud Warno Utomo,

Email: sw_utomo@yahoo.com

Filariasis infection that occurs in the communities can attack all ages, where people can be infected during the childhood with symptoms will be seen in the future. Moreover, filariasis can cause temporary or permanent disability. In endemic countries, lymphatic filariasis has major social and economic impacts with an estimated annual loss of 1 billion US dollars and destructs economic activity of up to 88% (4).

By 2015, more than 556 million people worldwide are treated for LF, and as many as 538 million people suffer from LF. The LF causes genital debilitating disease (hydrocele) in 25 million people and lymphedema or elephantiasis in 15 million people of which mostly women (5-6).

Filariasis is a chronic infectious disease caused by filarial worms and is transmitted by mosquito vectors such as *Mansonia*, *Anopheles*, *Culex*, *Armigeres*, particularly in warm or tropical climates (7). The worms live in the lymph nodes with acute clinical manifestations such as recurrent fevers and inflammation of the lymph nodes, at an advanced stage may cause permanent disability in the form of enlargement of the legs, arms, breasts and genital organ (8-9).

The disease is found in almost all parts of Indonesia such as in Sumatra, Java, Kalimantan, Sulawesi, Nusa Tenggara, and Papua, both urban and rural areas. The rural cases are found in eastern Indonesia, whereas urban cases are found in Bekasi, Tangerang, Pekalongan and Lebak (Banten). According to the results of the rapid survey in 2000, the number of chronic sufferers reported is 6,233 people that spread over 1,553 villages in 231 districts and 26 provinces (10).

West Kalimantan Province consists of 14 districts/cities and 9 of which are filarial endemic areas. The number of chronic filariasis cases in 2014 is 268 patients, 2015 is 272 patients, and 2016 is 275 patients. The

highest MF rate is in Kubu Raya District of 5.03% with the number of chronic filariasis cases of 56 patients (11).

In Kubu Raya District, the number of chronic filariasis case until 2013 is 52 patients, 2014 is 54 patients, 2015 is 56 patients, and 2016 is 56 patients (12). The objective of this study was to analyze environmental risk factors and the dynamics of transmission related to filariasis incidence in Kabupaten Kubu Raya.

METHODOLOGY

This research was observational analytic research with the case-control design using retrospective study approach (13). The case sample was 42 and the control sample was 84 (ratio 1:2). Research data were obtained by interviewing respondents about characteristic, type of occupation, behavior, and knowledge of respondents as well as observation of environment. The data were analyzed through statistical test analysis (chi-square) using a computer device to know the correlation of each variable with filariasis incidence.

RESULTS

Table 1 shows that of 126 respondents there were 64 (50.8%) respondents living close to the swamp, 111 (88.1%) respondents living close to the rice field, and 88 (69.8%) respondents living close to shrubs. Meanwhile, there were 55 (43.7%) respondents have aquatic plants around their house, 76 (60.3%) respondents have no predatory fish around their house, 35 (27.8%) respondents have risky vectors, 60 (47.6%) respondents have risky hosts, 80 (63.5%) respondents have risky type of occupation, 71 (56.3%) respondents have less knowledge, 33 (26.2%) respondents have habit of doing an activity at night, 43 (34.1%) respondents have habit of not using mosquito repellents, and 55 (43.7%) respondents have habit of using mosquito net.

Table 1. Frequency distribution of variables group of physical environment, biology and the dynamics of transmission with the incidence of filariasis in Kubu Raya District 2017.

Variable Group of Physical Environment, Biology and Dynamics of Transmission		Number (N)	Percentage (%)
The existence of swamp	Exist	64	50,8
	No	62	49,2
Total		126	100

Cont... Table1. Frequency distribution of variablesgroup of physical environment, biology and the dynamics of transmission with the incidence of filariasis in Kubu Raya District 2017.

The existence of rice field	Exist	111	88,1
	No	15	11,9
	Total	126	100
The existence of shrubs	Exist	88	69,8
	No	38	30,2
	Total	126	100
The existence of aquatic plants	Exist	55	43,7
	No	71	56,3
	Total	126	100
The existence of predatory fish	Exist	50	39,7
	No	76	60,3
	Total	126	100
The existence of vectors	Risky	35	27,8
	Not Risky	91	72,2
	Total	126	100
The existence of hosts	Risky	60	47,6
	Not Risky	66	52,4
	Total	126	100
Type of occupation	Risky	80	63,5
	Not Risky	46	36,5
	Total	126	100
Level of knowledge	Less	71	56,3
	Enough	55	43,7
	Total	126	100
Habit of doing an activity at night	Risky	33	26,2
	Not Risky	93	73,8
	Total	126	100
Habit of using mosquito repellents	Risky	43	34,1
	Not Risky	83	65,9
	Total	126	100
Habit of using mosquito net	Risky	55	43,7
	Not Risky	71	56,3
	Total	126	100

Table2. Correlation between the existence of swamps, rice field, shrubs, type of occupation, level of knowledge, habit of doing an activity at night, habit of using mosquito repellents, and habit of using mosquito net with the incidence of filariasis in Kubu Raya District in 2017.

Variable	Incidence of Filariasis					p	OR	CI 95 %
	Yes		No					
	N	%	N	%				
The existence of swamps	Exist Not Exist	32 10	76,2 23.8	32 52	38.1 61.9	0.000*	5.200	2.255-11.991
The existence of rice fields	Exist Not Exist	41 1	97,6 2.4	70 14	83,3 16,7	0.041*	8.200	1.040-64.663
The existence of shrubs	Exist Not Exist	38 4	90,5 9.5	50 34	69.8 30.2	0.001*	6.460	2.111-19.771
The existence of aquatic plants	Exist Not Exist	23 19	54.8 45,2	32 52	38,1 61.9	0.112	1.967	.929-4.166
The existence of predatory fish	Not Exist Exist	20 22	47,6 52,4	30 54	35.7 64,3	0.274	1.636	0.771-3.472
The existence of vectors	Risky Not Risky	23 19	54.8 45,2	12 72	14.385.7	0.000*	7.263	3.068-17.195
The existence of hosts	Risky Not Risky	25 17	59.5 40.5	35 49	41,7 58.3	0.089*	2.059	0.969-4.374
Type of occupation	Risky Not Risky	38 4	90.5 9.5	42 42	50 50	0.000*	9.500	3.114-28.986
Level of knowledge	Less Enough	34 8	81 19	37 47	44 56	0.000*	5.399	2.234-13.048
Habit of doing an activity at night	Risky Not Risky	22 20	52,4 47.6	11 73	13,1 86.9	0.000*	7.300	3.038-17.541
Habit of using mosquito repellents	Risky Not Risky	22 20	52,4 47.6	21 63	25 75	0.004*	3.300	1.511-7.209
Habit of using mosquito net	Risky Not Risky	31 11	73.8 26.2	24 60	28.6 71.4	0.000*	7.045	3.057-16.238

Description* = Significant (p < 0.05) based on the continuity correction value^b

Table 2 shows that there was a correlation between several variables and the incidence of filariasis, namely the existence of swamp (p-value: 0.000, OR: 5.200, 95%), rice field (p-value: 0.041, OR: 8.200) (p-value: 0.041, OR: 6.460), vector (p-value: 0.000, OR: 7.263) type occupation (p-value: 0.000, OR: 5.399), habit of doing night activity (p-value: 0.000, OR: 7.300), habit of using mosquito repellents (p-value: 0.004, OR: 3.300), habit of using mosquito net (p-value: 0.000, OR: 7.057), while the variables that did not show any correlation to the incidence of filariasis were the existence of aquatic plants (p-value: 0.112, OR: 1.967), predatory fish (p-value: 0.274, OR: 1.636) and hosts (p-value: 0.089, OR: 2.059).

Table 3. Final Modeling of Multivariate Analysis

Variable	B	P	OR	95% C.I.for EXP(B)	
				lower	Upper
Type of occupation*	3.687	.004	39.919	3.226	494.010
Level of knowledge*	2.416	.013	11.206	1.658	75.755
Habit of using Mosquito repellents*	2.368	.005	10.680	2.072	55.044
The existence of rice field	1.175	.537	3.239	.078	134.895
The existenceof shrubs*	3.886	.002	48.700	4.284	553.662
The existenceof vectors*	2.488	.005	12.036	2.092	69.231
The existence of hosts	.254	.737	1.289	.292	5.692
The existence of aquatic plants	-.473	.534	.623	.140	2.770
The existence of predatory fish	.779	.284	2.180	.524	9.061
Habit of using mosquito net	1.110	.130	3.034	.721	12.768
Existence of swamps	1.206	.112	3.341	.754	14.811
Habit of doing an activity at night *	1.764	.040	5.833	1.087	31.304
Constant	-28.077				

The results of multivariate test showed that the existence of shrubs, type of occupation, level of knowledge, habit of doing an activity at night, habit of using mosquito repellents, vector density are the dominant variables on the incidence of filariasis with OR = 48.700. Therefore, it can be predicted that the respondents who have shrubs around their house had 48.7 times greater chance to experience filariasis.

DISCUSSION

Correlation between the Existence of Swamps and the Incidence of Filariasis

The existence of swamp was associated with the incidence of filarias. It is in line with the study conducted by Nasrin⁽¹⁴⁾, Ansari R⁽¹⁵⁾, Santoso, Sitorus H, Oktarina R⁽¹⁶⁾, stated that the existence of water puddle which is a breeding ground for vector mosquitoes may increase the risk of filariasis transmission in an area. The existence of swamp may be a potential place as a breeding ground for mosquitoes in which the mosquito density is higher because of aquatic plants such as kyambang (silvinia) and water hyacinth often found in swamps. Furthermore,

mosquito density is higher in swamps, as it is a place favored by mosquitoes to breed⁽¹⁷⁾.

Correlation between the Existence of Rice Field and the Incidence of Filariasis

The results showed that there was a significant correlation between the existence of rice field and the incidence of filariasis. This is in accordance with the study conducted by Ashari⁽¹⁵⁾ who revealed that respondents living close to the rice fields with a distance of <100 m will have a risk to be infected with filariasis by 9.5 times greater than respondents living far away from rice fields. The rice field is one of the mosquitoes resting place so that the presence of rice fields is one of the risk factors of filariasis transmission where mosquitoes can rest after sucking human blood every day, however, however, the result of the research not in line with that conducted by Syuhada Y, Nurjazuli, Nur Endah W, Pekalongan in 2010, stated that the existence of rice fields is not associated with filariasis⁽¹⁸⁾.

Correlation between the Existence of Shrubs and the Incidence of Filariasis

The existence of shrubs was associated with the incidence of filariasis. This is in accordance with the research conducted by Ardias⁽¹⁹⁾, Ashari⁽¹⁵⁾. However, according to research conducted by Febrianto B, the existence of wild shrubs is not associated with filariasis incidence in Pekalongan District⁽²⁰⁾. Furthermore, the study on transmigrants in Padang Pariaman District who came after the natives were treated, indicated that transmigrants whose settlements are closer to the forest⁽²¹⁾ are more commonly infected with filariasis either clinically or through blood tests⁽²¹⁾. Most of the respondent's area still have shrubs around their house, this occurs because people live far apart with an agricultural land and plantation or the empty land which is one of the mosquitoes resting place around their houses

Correlation between the Existence of Aquatic plants and the Incidence of Filariasis

There was no correlation between the existence of aquatic plants and the incidence of filariasis. This is in accordance with the study conducted by Syuhada Y, Nurjazuli, Nurendah W⁽¹⁸⁾. This is because almost all respondents have ponds or a place to spawn fish containing aquatic plants around their house. However, Anshari⁽¹⁵⁾ reported that aquatic plants are associated with filariasis incidence. The existence of aquatic plants will also affect the vector density, as it will make the water conditions to be more optimal for vector breeding and protecting vector from the predator. Furthermore, ecological factors such as temperature and humidity may also affect the vector density, thus it may increase the risk of filariasis transmission in an area^(22, 48).

Correlation between the Existence of Predatory fish and the Incidence of Filariasis

The presence of predatory fish was not associated with the incidence of filariasis. This can be due to the results of observations found in the field in which not all water reservoirs such as ponds, ditches and puddles have predatory fish. Thus, the ability of various types of larvae fish (Blue panchax/*Panchax*spp.) can not affect mosquito populations. Besides predatory animals, there are insects as enemy for adult mosquitoes, such as dragonflies, bats, lizards and so on, thus the frequency of mosquito bites on humans can be reduced⁽¹⁵⁾. However, the existence of predator is important in the prevention of mosquito larvae breeding in areas with a high vector

density⁽²³⁾.

Correlation between the Type of Occupation and the Incidence of Filariasis

The type of risky occupation was associated with the incidence of filariasis. This is in accordance with the study conducted by Nasrin⁽¹⁵⁾, Afra⁽²¹⁾ in Padang Pariaman District. Occupation such as fishermen who have a habit of sailing at night can be infected by mosquitoes that breed on the shore. This is related to the habit of biting by mosquitoes at night⁽²⁴⁾. In addition to fishermen, people with livelihoods as farmers can also be infected as they work in mosquito breeding spot which is a filariasis transmission such as in rice fields, swamps, and forests⁽²⁵⁾.

Correlation between the Level of Knowledge and the Incidence of Filariasis

The level of knowledge was associated with the incidence of filariasis. This is in line with the study conducted by Nasrin⁽¹⁵⁾, and Marzuki⁽²⁶⁾ who predicted that people who do not know about filariasis disease in endemic areas have a risk to be infected by 3.2 risk times greater than people who have a better knowledge. However, in contrast to the study conducted by Ardias in Sambas district, respondents who have less knowledge generally only know the habitat of mosquitoes. They do not know that filariasis is an infectious disease, how the symptoms of filariasis, causes of filariasis, filariasis prevention, time of mosquito eradication, and target of filariasis⁽¹⁹⁾. The level of public knowledge or respondents, in general, can be improved through the provision of educational facilities and infrastructures by the government in order to gain the better knowledge.

Correlation between the Habit of doing an activity at night and the Incidence of Filariasis

The habit of doing an activity at night was significantly associated with the incidence of filariasis. This is in line with the study conducted by Kadarusman⁽²⁷⁾; Windiastuti, Suhartono, Nurjazuli⁽²⁸⁾ who stated that respondents who have a habit of doing an activity at night have a chance to be infected with filariasis by 26.3 times greater than respondents who do not have the habit of doing an activity at night. This is similar to the study conducted by Amelia R⁽²⁹⁾ that habit of doing an activity at night has a correlation to the incidence of filariasis with value ($p = 0.002$; $OR = 15.167$). The habit of doing

an activity at night will open up greater chances to contact with *Anopheles* mosquitoes. Respondents should wear long dresses and trousers as well as using mosquito repellents to minimize the risk of mosquito bite during outdoor activities at night⁽³⁰⁾.

Correlation between the Habit of Using Mosquito Repellents and the Incidence of Filariasis

The habit of using mosquito repellents was associated with the incidence of filariasis. This is in accordance with the study conducted by Ardias⁽¹⁹⁾ who revealed that people who have habit of not using mosquito repellents have a risk to be infected with filariasis by 27.21 times greater than those who have a habit of using mosquito repellent. This finding is similar with the results obtained by Nasrin⁽¹⁴⁾ Windiastuti, Suhartono, Nurjazuli⁽²⁸⁾. One way to prevent mosquito bites is by using mosquito repellent which is self-protection method used by individuals or small groups in the community to protect themselves from mosquito bites by preventing contact between the human body and mosquitoes. This method is very useful because the equipment is small, easy to carry and used as well as simple in its use. The mosquito repellents include anti-mosquito drugs that are applied by burning, and, spraying and rubbing⁽²⁹⁾.

Correlation between the Habit of Using Mosquito Net and the Incidence of Filariasis

The habit of using mosquito net was associated with the incidence of filariasis. This is in accordance with the research conducted by Ansari⁽¹⁵⁾; Noerjoedianto⁽³¹⁾. The habit of using mosquito net at bedtime theoretically has contributed to the prevention of filariasis transmission, because in general the activity of biting by mosquitoes is highest at night. Several efforts to avoid the bite of mosquitoes include covering the room with wire screen and using bed nets. These efforts are recommended by the health ministry, particularly in areas that have a risk to be infected by filariasis⁽¹⁹⁾.

Correlation between the Existence of Vector and the Incidence of Filariasis

The existence of the vector was associated with the incidence of filariasis. A study on mosquitoes shows that the infective form is mainly found in the mosquitoes caught in the fields near the forest⁽³²⁾. How to reduce the contact between vectors and humans in rural areas has not been conducted, this is due to a little understanding

of communities and the low economic status. The communities still do not understand the use of mosquito nets, they only wear mosquito nets when the weather is cold. In addition, the use of mosquito repellents such as lemongrass oil has not been favored in Indonesia. Therefore, a good counseling on the importance of using mosquito repellents is still needed⁽³³⁾. Several types of vectors are involved in filariasis transmission, including mosquitoes from the genus *Culex*, *Anopheles*, *Aedes* and *Mansonia*⁽⁴⁷⁾. In Brazil, the only known vector is the mosquito from the genus *Culex*, which is commonly found in the study area⁽³⁴⁾.

Correlation between the Existence of Hosts and the Incidence of Filariasis

The existence of the hosts was not associated with the incidence of filariasis. In contrast to the theory of Bell.JC, that Brugia filariasis is a zoonotic disease that can infect animals other than humans, namely: ape (*Macaca fascicularis*), lutung (*Presbytis cristatus*) and cat (*Felis catus*), while dog (*Canis fascicularis*) is a reservoir for *Dirofilaria immitis*⁽³⁵⁾. Cats, dogs and leaf monkeys are several known hosts that serve as reservoirs for the Brugian filarial parasite⁽³⁶⁾. A number of reports published in zoonosis filariae involve cats from several countries including Thailand⁽³⁷⁾, Indonesia⁽³⁸⁾, Philippines⁽³⁹⁾, and other countries in Southeast Asia^(40, 41). Based on the results of this study, the existence of the hosts is not associated with the incidence of filariasis, however, it is suspected that the existence of these animals plays a role in the dynamics of transmission of filariasis in Kubu Raya District. Therefore, it is necessary to conduct further research on these filarial hosts.

CONCLUSION

There is a correlation between the existence of swamps, paddy fields, shrubs, type of work, level of knowledge, habit of doing an activity at night, habit of using of mosquito repellents, habit of using mosquito net, and the existence of vector with the incidence of filariasis in Kubu Raya District. Socialization is recommended to the community regarding the attitude and behavior of communities in preventing the transmission of filariasis through community activities in the village involving community leaders, health workers and local village officials.

Acknowledgement: This research was conducted in framework of implementation of PITTA Grant

Program University of Indonesia 2017, with assignment agreement no:1980/UN2.R12/HKP.05.00 /2017.

Competing Interest: This research is part of final task of University of Indonesia students, thus, there is no competition in conducting this research.

Ethical Clearance: The study was approved by the Institutional Review Board (IRB) of Faculty of Public Health, Universitas Indonesia.

REFERENCES

1. Kemenkes RI. Filariasis Resolution. Jakarta: Permenkes RI 94/2014; 2015.
2. Hotez PJ. Neglected Infections of Poverty in the United State of America. *PLoS Negl Trop Dis*; 2008.
3. Depkes RI. Epidemiologi Filariasis Indonesia. Jakarta: Ditjen PPM dan PLP; 2002.
4. Katarbarwa MN, Eyamba A, Nwane P, Enyong P, Yaya S. Seventeen Years of annual distribution of ivermectin has not interrupted onchocerciasis transmission in North Region, Cameroon. *The American journal of tropical medicine and hygiene* 85: 1041–1049; 2011
5. Ottesen EA, Hooper PJ, Bradley M, Biswas G. The global programme to eliminate lymphatic filariasis: health impact after 8 years. *PLoS Neg Trop Dis* 2; 2008
6. Boyd A, Won KY, McClintock SK, Donovan CV, Laney SJ, et al. A Community-Based Study of Factors Associated with Continuing Transmission of Lymphatic Filariasis in Leogane, Haiti. *PLoS Negl Trop Dis* 4(3); 2010
7. Simonsen PE, Fischer PU, Hoerauf A, Weil GJ. The filariases. *Manson's Tropical Diseases*. Elsevier Saunders. London; 2014. pp. 737–765
8. Chin J. 2006. *Manual for Infectious Disease*. Jakarta: CV Infomedika; 2006.
9. Klion AD. *Filarial Infections in Travelers and Immigrants, Current Infectious Disease*; 2008
10. Depkes RI. Epidemiologi Filariasis. Jakarta: Ditjen PP & PL; 2006
11. Dinkes Kalbar. *Profil Kesehatan Dinkes Kalimantan Barat*. Kalbar; 2014.
12. Dinkes Kubu Raya. *Laporan Tahunan Seksi P2M Dinkes Kubu Raya*; 2014.
13. Notoatmodjo S. *Metodologi Penelitian Kesehatan*. Jakarta: CV RinekaCipta; 2010
14. Nasrin. *Faktor-faktor Lingkungan dan Perilaku yang Berhubungan dengan Filariasis di Kabupaten Bangka Barat*. Semarang: Universitas Diponegoro; 2008.
15. Suhartono AR, Onny S. Risk Factor Analysis of Filariasis at Tanjung Bayur Orchard on Sungai Asam Village, Pontianak. *Jurnal Kesling Indonesia* Vol.3/2; 2004.
16. Santoso, Sitorus H, Oktarina R. Faktor Risiko Filariasis di Kabupaten Muaro Jambi. *Jambi: Buletin Penelitian Kesehatan*; 2013. 41(3):152-162
17. Depkes RI. *Ekologi dan Aspek Perilaku Vektor*, Dit. Jen. PP & PL. Jakarta: Depkes RI; 2007
18. Syuhada Y, Nurjazuli, NurEndah W. Study of Environmental and Behavioral as Risk Factor of Filariasis in Buaran and Tirto Pekalongan Regency. *Jurnal Kesehatan Lingkungan Indonesia* Vol. 11; 2012.
19. Ardias, et.al. Environmental and Community Behavior Factor Associated With The Incidence of Filariasis in Sambas District. *Jurnal Kesling Indonesia*, Vol.11; 2012.
20. Febrianto B, Maharani A, Widiarti. Faktor Risiko Filariasis di Desa Samborejo, Kecamatan Tirto, Kabupaten Pekalongan Jawa Tengah, *Buletin Penelitian Kesehatan*, vol.36; 2008
21. Afra D, Haminarti N, Abdiana. Faktor-Faktor yang Berhubungan dengan Kejadian Filariasis di Kabupaten Padang Pariaman Tahun 2010-2013. *Pariaman*; 2013
22. Chandra G. Nature Limits Filarial Transmission. *Parasite & Vectors*; 2008
23. Sucipto CD. *Vektor Penyakit Tropis*. Yogyakarta: Gosityen Publishing; 2001
24. Mutheneni SR. Influence of Socioeconomic Aspects on Lymphatic Filariasis: A case-control Study in Andhra Pradesh, India, *J Vector Borne Disease* 53; 2016.
25. Sutanto I, Ismid IS, Sjarifuddin PK, Sungkar S. *Buku ajar Parasitologi Kedokteran*. Jakarta: Badan penerbit FKUI; 2011.
26. Marzuki. *Faktor Lingkungan dan Perilaku yang*

- Berpengaruh Terhadap Kejadian Filariasis Pada Daerah Endemis Filariasis di Kecamatan Maro Sebo Kabupaten Muaro Jambi Propinsi Jambi. Semarang: Universitas Diponegoro; 2008.
27. Kadarusman. Faktor- faktor yang berhubungan dengan kejadian filariasis di desa Talang Babat Kecamatan Muara Sabak Kabupaten Tanjung Jabung Timur Propinsi Jambi. Depok: FKM-UI; 2003.
 28. Windiastuti IA, Suhartono, Nurjazuli. The Association between Environmental House Condition, Socio-economic, and Behaviour Factors with filariasis Occurance in South Pekalongan Sub-distict, Pekalongan City. *Jurnal Kesehatan Lingkungan Indonesia* Vol. 12; 2013.
 29. Amelia R. Analisis Factor Risiko Kejadian Penyakit Filariasis. Semarang: Unnes Journal of Public Health UJPH; 2014
 30. Reyke U. Analisis Faktor-Faktor Risiko Kejadian Filariasis. Volume 24; 2008
 31. Noerjoedianto D. Dinamika Penularan dan Faktor Risiko Kejadian Filariasis di Kecamatan Kumpeh Kabupaten Muaro Jambi tahun 2014. Jambi: Jurnal Penelitian Universitas Jambi Seri Sains; 2014.
 32. Oemijati S. Masalah dalam Pemberantasan Filariasis di Indonesia - Cermin Dunia Kedokteran. Litbang PT. Kalbe Farma; 1990. (64)7-10.
 33. Nurjana MA. Aspek Epidemiologi Dalam Penanggulangan Filariasis di Indonesia, Badan Litbang Kesehatan. Jakarta: DEPKES RI Jurnal Vektor Penyakit. Vol. I; 2009
 34. Ramachandran CP. A guide to Methods and Techniques in Filariasis Investigations - Filariasis Research Officer. Kuala Lumpur: Inst Med Res; 1970
 35. Bell JC, Stephen RP, Jack MP. Zoonosis - Infeksi yang Ditularkan dari Hewan ke Manusia. Jakarta: Penerbit Buku Kedokteran; 1995.
 36. Laing A, Edeson J, Wharton R. Studies on filarial in Malaysia: The vertebrata hosts of Brugi Malayi and Brugi pahangi. *Ann Trop. Med Parasite*; 1960. 53 (4) : 90-92
 37. Nuchprayoon S, Junpee A, Nithiuthai S, Chungpivat S, Suvannadabba S, Poovorawan Y. Detection of filarial parasites in domestic cats by PCR-RFLP of ITS1. *Vet Parasitol*; 2006
 38. Palmieri JR, Ratiwayanto S, Masbar S, Tirtokusumo S, Rusch J, Marwoto HA. Evidence of possible natural infections of man with Brugi pahangi in South Kalimantan (Borneo), Indonesia. *Trop Geogr Med*; 1985. 37(3): 239-244
 39. Roseboom LE, Cabrera BP. Filariasis caused by Brugi Malayi in the Republic of Philippines, *Am. J Epidemiol*; 1965. 81 : 200-215: 1965
 40. Irwin PJ, Jefferies R. Arthropod-transmitted disease of companion animal in South-east Asia, *Trends Parasitol*; 2004. 20 (1): 27-34
 41. Lim B, Mak J. Human behaviour and zoonotic disease in Malaysia - Human ecology and infectious disease. London: Academic Press; 1983.
 42. Moloo A. Neglected Tropical Diseases. Geneva; 2016.

Correlation between Food Hygiene Sanitation and Escherichia Coli (*E.coli*) Contamination on Snacks Sold around Elementary School in Jatiasih Subdistrict, Bekasi Indonesia

Clara Andyna Hazairin¹, I Made Djaja¹, Budi Hartono¹

¹Department of Environmental Health, Faculty of Public Health, University of Indonesia, Depok, Indonesia

ABSTRACT

Background: Snacks has an important role to provide nutrition for school-age children. However, they are vulnerable to contamination caused by pathogens such as bacteria. Food contamination can be caused by several factors, one of them is food hygiene sanitation. Therefore, this study aims to determine hygiene sanitation factors associated with *Escherichia coli* (*E.coli*) contamination on snacks sold at elementary schools located in Jatiasih Subdistrict, Bekasi, Indonesia. **Materials and Method:** Subject of this study were 51 food handlers who sell snacks around elementary schools area. This study was a cross-sectional study and used primary data. Analysis data used chi-square test and regression-logistic test. **Findings:** Results from Chi-square test indicate that there are association between food handler personal hygiene (OR = 4.500 [CI 95% 1.20 – 16.81]), food stall sanitation (OR = 5.146 [95% CI 1.243 – 21.30]), and food container (OR = 4.167 [95% CI 1.194 – 14.54]). Results from logistic regression test indicate that food stall sanitation (OR = 4.93) and cooked-food container (OR = 3.98) are the most dominant factors to *E.coli* contamination on snacks that are sold around elementary schools in Jatiasih Subdistrict, Bekasi. **Conclusion** The most dominant factor responsible for *E.coli* contamination on snacks at elementary schools, Jatiasih Subdistrict, Bekasi are food stall sanitation with OR = 4.93. Authors suggest stakeholders in Bekasi City should give counselling and training about hygiene sanitation for food handlers in every school, provide sanitation facility, and PPE for food handlers such as aprons and gloves.

Keywords: hygiene sanitation, *E.coli* contamination, snacks at elementary schools

INTRODUCTION

Foodborne diseases are acute or sub-acute non-infectious diseases caused by microorganisms or chemical agents entering the body through food.¹⁸ If foodborne diseases attack high-risk groups such as infants, children, pregnant women, and the elderly, it can lead to death and disability of those risk groups.¹⁰ Foodborne diseases become one of public health problems caused by poor food security. Food handlers play an important role in keeping the food safe and

preventing contamination. Research by Monney et al (2013) urged that food handlers can contaminate food through poor hygiene practice, inadequate cooked food container, and poor sanitation.¹²

Bacteria that causes foodborne diseases can be transmitted through various stages in the food preparation process, such as contamination caused by infected animal feces, meat exposed to infected intestines, skin, or fur, and contamination during the food processing and serving.¹³ One of pathogen used as an indicator of food or drink contamination is *Escherichia coli* (*E. coli*). It is stated in WHO data from 2007-2015, *Escherichia coli* (*E. coli*) bacteria are responsible for 1-3 million of DALYs caused by foodborne diseases, one of them is diarrhea.¹⁹

Correspondence Author:

Budi Hartono. Department of Environmental Health, Faculty of Public Health, University of Indonesia, 16424 Depok, Indonesia. Tel: (+62) 217863579 ; Fax: 7863479, Email: budi_h@ui.ac.id

Based on the Final Report of Monitoring and Verification of National Security Profile of PJAS (Snacks for Students) of 2008, 98.9% students buy snacks at school (Indonesia National Agency of Drug and Food Control).³ However, snacks for students are susceptible to bacterial contamination resulting from poor sanitation and hygiene. In addition, result of research by Ministry of Health of Indonesia states that the highest contamination on Snacks for Students in Indonesia from 2009-2014 is caused by microbial contamination that is almost equal to 70%.⁵

Bekasi is one of big cities located in West Java, Indonesia. Based on the data of Bekasi Health Profile of 2016, it is indicated that diarrhea is still in the highest 5 major diseases that lead to illnesses and death in Bekasi. Based on the data, the morbidity rate of diarrhea of all age in Bekasi is 75,689 cases. Generally, the case of diarrhea occurs on the age group of 5-14 years.⁶ Jatiasih Subdistrict is one of subdistricts with the highest number of diarrhea sufferers in Bekasi City. In September 2017, there was food poisoning at an elementary school in Jatiasih subdistrict, Bekasi. A total of 17 students simultaneously experienced nausea, vomiting, and diarrhea after consuming one of the snacks sold at school.⁷

The problems are snacks for students are vulnerable to contamination caused by disease-carrying bacteria such as *E.coli*. This study aims to analyze the contamination of *E.coli* in snacks for students in Jatiasih subdistrict, Bekasi, and relate it to factors that influence *E.coli* contamination on snacks for students, which are hygiene and sanitation.

MATERIALS AND METHOD

The research use cross-sectional design. It was conducted at Elementary Schools in Jatiasih sub-district, Bekasi. Data collection was conducted in April to May 2018. Data collection of *E.coli* contamination on snacks for students was determined through food sampling and laboratory tests using *Total Plate Count* (TPC) method with a medium of CCA (*Chromocul Coliform Agar*). Data related to hygiene sanitation factor was obtained from interview using questionnaire. While handler's personal hygiene, food stall sanitation, utensils sanitation and cooked food container and food serving were conducted using observation checklist instrument.

The sampling technique used in this research was total sampling. The sample criteria were food handlers at elementary schools in Jatiasih subdistrict, Bekasi and vendors selling snacks that contain high water and high protein. The number of samples were 51 food handlers and 51 snack samples. Snacks with high water and high protein were chose as the sample criteria based on the types of food that were susceptible to bacterial contamination, one them was food that contain high water and protein.

Data processing was performed on SPSS Statistic 19. The data was analyzed in univariate, bivariate, and multivariate analysis. Univariate analysis was performed to show the frequency distribution of each research variable. Bivariate analysis using Chi-square test was conducted to find out the correlation between independent and dependent variables with the confidence interval of 95%. In addition, multivariate analysis was conducted using multiple logistic regression test to find the most dominant variable that cause *E.coli* contamination on snacks in Jatiasih subdistrict, Bekasi.

FINDINGS

From the results of laboratory examination, 16 (31.4%) types of snacks sold around 47 elementary schools in Jatiasih Subdistrict, Bekasi are positively contaminated with *E.coli*. It is found that the knowledge related to food hygiene sanitation of 17 (33.3%) food handlers is poor. Food handler personal hygiene of 26 (51.0%) food handlers is poor. Food stall of 29 (56.9%) food handlers is poor. Utensils sanitation of 32 (62.7%) food handlers is poor. Cooked-food container of 20 (39.2%) food handlers is poor. Meanwhile, food serving of 23 (45.1%) food handlers is poor (Fig 1).

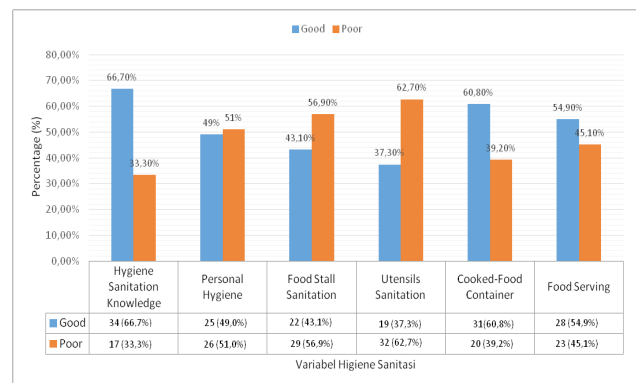


Fig 1. Univariate Analysis on Hygiene Sanitation of Snacks for Students at Elementary Schools in Jatiasih subdistrict, Bekasi, of 2018

The correlation between hygiene sanitation and *E.coli* contamination variables on snacks was found through *Chi-square test*. It is found that there is a significant correlation between food handler personal hygiene (OR = 4,500 [95% CI 1.20-16.81]), food stall sanitation (Fig. 2), and cooked food container (Fig. 3). Then, logistic regression test was conducted to determine the dominant factor that is affecting *E.coli* contamination on snacks among the three independent variables which are significant in bivariate analysis.

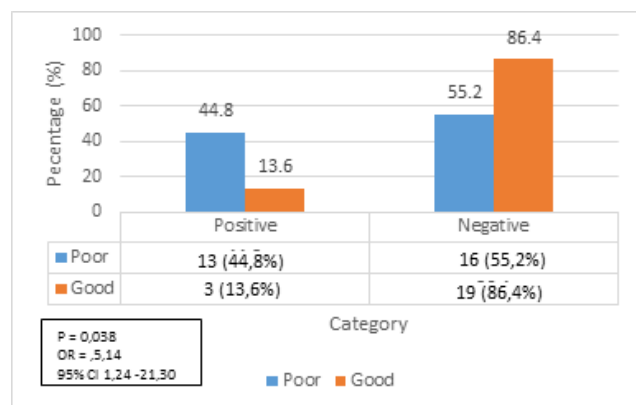


Fig 2. Correlation between *E.coli* Contamination and Food Stall Sanitation in Jatiasih, Bekasi

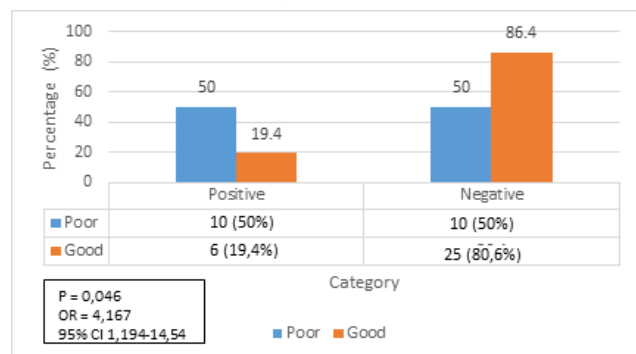


Fig 3. Correlation between *E.coli* Contamination and Cooked Food Container in Jatiasih Subdistrict, Bekasi

From the results of logistic regression test, it can be interpreted that the food stall sanitation (OR = 4.932; 95% CI 1.125-21.62) and cooked food container (OR = 3.985; 95% CI 1.062-14.94) simultaneously affect *E.coli* contamination on snacks sold around elementary schools in Jatiasih subdistrict, Bekasi, altogether with other independent variables. After performing the logistic regression test, the logistic regression model equation is as follows:

B value on food stall sanitation (b1x1), cooked food container (b1x2), and Constant (a) variables is obtained from the following equation (Equation 1):

The logistic regression test was then followed by

the interaction test. Interaction test was conducted with the aim to determine whether there is any substantial interaction among independent variables, moreover variables are said to have interaction if $p < 0.05$. From the interaction test result, there is no interaction among each independent variable .

Based on the results of logistic regression test, it is found that the sanitation variable which food stall sanitation is the most significant factor or has a significant correlation with *E.coli* contamination on snacks at Elementary schools in Jatiasih Subdistrict, Bekasi.

From the results of this research, it is known that *E.coli* contamination on snacks at elementary schools in Jatiasih Subdistrict, Bekasi is quite high that 16 of 51 samples (31,4%) are contaminated with *E.coli* bacteria. The presence of *E.coli* on food can be indicated by cross-contamination.

Cross-contamination causes *E.coli* from human feces to be in various places through various vectors, namely fly, human hand, and environment media such as soil and water.⁸ *E.coli* found on food can be caused by several factors, such as poor hygiene practice during cooked food container, poor hygiene behavior when serving food, inappropriate food heating temperature, poor storage sanitation, and poor sanitation facilities.²

This study indicates that there is a significant correlation between food handlers personal hygiene regarding *E.coli* contamination on snacks. Based on research conducted by Baluka, et al (2015), the presence of bacteria on food served in restaurants located in Uganda is caused by the handler’s poor hygiene practice.⁴ Todd et al (2008) urged the risk of food contamination caused by microorganisms is affected by the hygiene practice and knowledge of food handler.¹⁷

The number of food handlers who does not behave well is high because there are many food handlers who do not wear personal protective equipment (PPE) when serving food, such as gloves (100%) or apron (96.1%). In addition, most food handlers do not wash their hands before and after serving food (94.1%).

From the results of in-depth interviews, food handlers do not feel the necessity to wear gloves or aprons as it is considered to inhibit the process of food serving. Poor hygiene practices such as not wearing hair

cover and gloves, having long nails, and wearing hand jewelry can cause cross-contamination.¹⁶

Food stall sanitation also has a significant correlation to *E.coli* contamination on snacks. A research urged that poor sanitation affects the emergence of bacteria that cause foodborne diseases such as *Campylobacter*, *Salmonella*, *Staphylococcus aureus*, *Bacillus cereus* and *Escherichia coli*.⁹ Based on FAO data (1997), poor infrastructure of food management, lack of clean water source, poor sanitation facilities, and environment conditions that is not suitable for food may contribute to the quality of bacteria on food.¹¹ In addition, the environment around unsanitary selling places can be breeding sites for vectors like flies.¹⁵

Street vendors and snack shops around elementary schools in Jatiasih subdistrict, Bekasi tend to sell food in open space or at the side of the road which is easily exposed to dust and odor, and several locations of street vendors are close to open trash cans and wastewater channels (62.7%), so that many flies are found around that place. Some canteens in elementary schools are not facilitated by adequate sanitation facilities such as lid trash can (90%) as well as sink (78.4%).

Cooked food container variable becomes one of the factors that is affecting *E.coli* contamination on snacks. There are numerous food handlers at Elementary Schools in Jatiasih Subdistrict, Bekasi who do not cover the food, so it causes contamination by the environment. Microorganisms, including pathogenic diseases, may increase when utensils, such as knives and food containers are cleaned inappropriately or unsanitary.¹ In addition, food stored in food containers tends to be easily contaminated with pathogenic microorganisms and it also reduces the quality of food.¹⁴

Generally, food handlers around Elementary schools in Jatiasih Subdistrict, Bekasi are still using open containers to keep their cooked food (66.7%), moreover open food containers tend to be placed close to the source of pollution (76,5%).

CONCLUSION

It is found that 16 (31.4%) snacks sold in 47 elementary schools, Jatiasih subdistrict, Bekasi are positively contaminated with *E.coli*. There is a significant correlation between personal hygiene, food stall sanitation, and cooked food container variable. The most

dominant factor responsible for *E.coli* contamination on snacks at elementary schools, Jatiasih Subdistrict, Bekasi are food stall sanitation with OR = 4.93 and cooked food container with OR = 3.98. Quality improvement of hygiene sanitation and snacks sold around Elementary schools in Jatiasih Subdistrict, Bekasi needs to be conducted thoroughly to prevent the occurrence of *E.coli* contamination on snacks for students. Community Health Center, Health Department, Elementary Schools and vendors around schools can work together to create a good hygiene sanitation in serving snacks for students.

Moreover, the provision of adequate sanitation facilities such as lid trash cans and sinks, counseling or training regarding hygiene sanitation to food handlers at schools, regular inspection on food stalls around schools by Community Health Center or Health Department, wear aprons and gloves when serving food, use closed and clean cooked food containers, and implementation of clean and healthy behavior both for food handlers and consumers are some efforts that can be done to prevent the occurrence of *E.coli* contamination on snacks for elementary school students. It is also suggested that containers used to place cooked food are not made of hazardous materials and have no defect or damage.

Conflict of Interest: There is no conflict of interest for this research.

Source of Funding: The source of funding for this research is a self-fund from the authors and was also supported by the grant from PITTA Programme in Universitas Indonesia

Ethical Clearance: This research's number of ethical approval from the Ethical Research Committee is 129/UN2.F10/PPM.00.02/2018 dated March 19th 2018.

REFERENCES

1. Alum, Akanele E, Urom, Chukwu S, Ben, Ahudie C. Microbiological Contamination Of Food: The Mechanisms, Impacts And Prevention. Int. J. Scientific and Technology Research 2016. Available form: <http://www.ijstr.org/final-print/mar2016/Microbiological-Contamination-Of-Food-The-Mechanisms-Impacts-And-Prevention.pdf> [Cited: June 2018].
2. Annan-Prah A, Amewowor D, Osel-koli, Amo ono S, Akorli S, Saka E, Ndadi H. Street foods: Handling, hygiene and client expectations in a World Heritage

- Site Town, Cape Coast, Ghana. *African J. Microbiol* 2011. Res. 5: 1629-1634.
3. Indonesia National Agency of rug and Food Control. Guidelines for Street-Food in School to Achieve Balanced Nutrition. Jakarta: Direktorat of Food Standardization 2013.
 4. Baluka S, Miller R, Kaneene B. Hygiene Practices and Food Contamination in Managed Food Service Facilities in Uganda. *African J. Food Science* 2015. Doi: 10.5897/AJFS2014.1170.
 5. Health Department of Republic Indonesia. Current Situation of Food Sell Around School in 2014. Jakarta: Ministry of Health Republic Indonesia 2015.
 6. Health Department of Bekasi City. Health Profile of Bekasi City in 2016. Indonesia: Division of Environmental Health 2016.
 7. Health Department of Bekasi City. Current Data of Food Poisoning Outbreaks In Bekasi City 2017. Indonesia: Divisiin of Environmental Health 2017.
 8. Food and Agriculture Organization (FAO). Preventing E.coli in Food. United State: The Food Chain Crisis Management Framework (FCC) 2011.
 9. Haileselassie, M, Taddele H, Adhana K. Sources of Contamination of Raw and Ready-to-eat foods and their public health risks in Mekelle City, Ethiopia. Ethiopia: ISABB J. Food and Agriculture Science 2012. doi: 10.5897/ISAAB-JFAS11.030. Available from: <https://www.academicjournals.org/journal/ISAAB-JFAS/article-full-text-pdf/8D7E09F44868> [Cited: May 2018].
 10. Jahan, Saulat. Epidemiology of Foodborne Illness. Saudi Arabia: Research and Information Unit Ministry of Health 2012.
 11. Kibret and Abera. The Sanitary Conditions of Food Service Establishment and Food Safety Knowledge and Practices of Food Handlers in Bahir Dar Town. *Ethiop J. Health Sci* 2012. Ethiopia: NCBI. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3437977/> [Cited: May 2018].
 12. Monney, Isaac, Agyei D, Owusu W. Hygienic Practices among Food Vendors in Educational Institutions in Ghana: The Case of Kongo. *MDPI Journal* 2013. doi:10.3390/foods2030282.
 13. Mutalib A, Syafinaz, Sakai, Shirai. An Overview of Foodborne Illness and Food Safety in Malaysia. *Intl. Food Research Journal* 2015. 22(3): 896-901. Available from: [http://www.ifrj.upm.edu.my/22%20\(03\)%202015/\(3\).pdf](http://www.ifrj.upm.edu.my/22%20(03)%202015/(3).pdf) [Cited: April 2018].
 14. Nurudeen, Lawal A, Ajayi S. A Survey Of Hygiene And Sanitary Practices Of Street Food Vendors In The Central State Of Northern Nigeria. *J. of Public Health and Epidemiology* 2014. doi: 10.5897/jphe2013.0607. Available from: http://www.academicjournals.org/article/article1400492581_Nurudeen%20et%20al.pdf [Cited: June 2018].
 15. Okojie and Isah. Sanitary Conditions of Food Vending Sites and Food Handling Practices of Street Food Vendors in Benin City, Nigeria: Implication for Food Hygiene and Safety. *J. Environmental and Public Health* 2014. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4166661/pdf/JEPH2014-701316.pdf> [Cited: June 2018].
 16. Tan, S, Chang, Soon H, Ghazali H, Mahyudin N. A Qualitative Study On Personal Hygiene Knowledge And Practices Among Food Handlers At Selected Primary Schools In Klang Valley Area, Selangor, Malaysia. *Intl. Food Research Journal* 2013. 20(1): 71-76.
 17. Todd E C, Greig J, Bartleson C, Michaels B. Outbreaks where food workers have been implicated in the spread of food borne disease. Part 5. Sources of Contamination and Pathogen Excretion from Infected Persons. *J. Food Protection* 2008. 71:2582-2595.
 18. Wang S, Duan H, Zhang W, Li Jun-Wen. Analysis of Bacterial Foodborne Dsease Outbreaks in China Between 1994-2005. *J.Fems* 2007. doi: 10.1111/j.1574-695x.2007.00305.x.
 19. World Health Organization (WHO). WHO Estimates of The Global Burden of Foodborne Diseases. Switzerland: WHO Library Cataloguing in Publication Data 2015.

Hypertension in Chefs: Prevalence and Relationship with the Characteristics of People

Novita Medyati¹, Ridwan Amiruddin², Syamsiar Russeng³, Stang Abdul Rahman⁴

¹Students of Doctoral Program, Faculty of Public Health, UNHAS Makassar, ²Professor of Epidemiology, Faculty of Public Health, UNHAS Makassar, ³Lecturer of Occupational Health Sciences, Faculty of Public Health, UNHAS Makassar, ⁴Lecturer of Biostatistics, Faculty of Public Health, UNHAS Makassar

ABSTRACT

Hypertension is the closest trigger factor for cardiovascular disease while cardiovascular disease is the leading cause of death in the world. This study is aimed to determine the prevalence of hypertension based on the characteristics of chefs. This type of research is quantitative, with a cross-sectional study design, using 80 chefs as samples determined by purposive sampling. Data collection of this research used a questionnaire, blood pressure measurement using a Sphygmomanometer tool, body mass index (height was measured using microtoise which has an accuracy of 0.1 cm Chi Square test and T-test with 95% CI and significant level $p < 0.05$. The average study subjects had systole blood pressure 131.30 with an average dispersion from the sample of 16.51 and diastole blood pressure 81.39 with an average dispersion of 12.02. Normotensive prevalence, pre-hypertension and hypertension had scores of 22.5%, 46.3%, and 31.3%. An increase of awareness for a healthy lifestyle is needed in order to prevent an increase of hypertension cases among informal sector workers, especially chefs.

Keywords: Prevalence, Normotension, Pre-hypertension, Hypertension

INTRODUCTION

The international community has issued a declaration to reduce the rate of hypertension by up to 25% by 2025¹. Nevertheless, WHO data in 2011 shows that globally hypertension has attacked one billion people and 2/3 of them are in developing countries with low to moderate income² and it is estimated that the figure will continue to increase until 2025³. Hypertension in Indonesia also experienced an increase in cases with the prevalence of national hypertension based on Riskesdas 2013 of 25.8%³, but in 2016 the results of the National Health Indicators Survey (Sirkesnas) based on coverage data at the District / City Health Office and Puskesmas refer to year records 2015 the prevalence of high blood pressure in the population aged ≥ 18 years was 32.4 percent⁴.

The results of data collection collected by Pusdatin show that the prevalence of hypertension in Indonesia in 2013 in the population aged 18 years and over, based on the diagnosis of health personnel by 9.4% and based on blood pressure measurements by 25.8%. The islands of Sulawesi and Kalimantan are provinces with a high prevalence of hypertension, while the prevalence of coronary heart disease, heart failure and stroke in several provinces in Sulawesi and Kalimantan also have a high enough number⁵.

Hypertension is the closest trigger to some types of cardiovascular diseases such as stroke and ischemic heart disease^{6,7}. Ignorance of hypertension risk factors results in the majority of the public being unaware of their health conditions associated with hypertension^{6,8}. Currently, hypertension does not only attack the elderly, but also it attacks adolescents to adults⁹. Although it is known that genetic factors play an essential role in the case of hypertension, nevertheless, currently unhealthy lifestyles are the main trigger factors for hypertension, such as consuming foods that are high in saturated

Corresponding author:

Novita Medyati

E-mail: novitauncen@gmail.com,

Mob.: 085344101041

fat and using sodium and sugar salt, lack of exercise, low fibrous food, and smoking habits and consuming alcohol^{2,10}.

Working can be one of the risk factors for hypertension like the relationship between noisy work environment¹¹, stress¹² with hypertension, has been known. A study behind this study found a high prevalence of hypertension in the group of chefs compared to other groups of workers¹³. This study is aimed to further identify the prevalence and risk factors of hypertension in chefs in food stalls as well as factors that can be used as predictors of the occurrence of hypertension.

MATERIALS AND METHODS

This study belongs to quantitative with a cross-sectional study design, using a sample of 80 chefs determined by purposive sampling, with the inclusion criteria of respondents who have worked as chefs for 2 years and are willing to take part in this study. Data were collected using a questionnaire for factors related

to hypertension in the form of gender, age, education level, marital status, ethnicity, dietary physical activity, smoking habits, and Body Mass Index. Blood pressure measurement using the Sphygmomanometer tool, body mass index (height was measured used microtoise which has an accuracy of 0.1 cm); body weight was measured with a stepping scale. Data processing was done using SPSS version 20 for Windows and analyzed using Chi Square test and test T-test with 95% CI and significant level $\rho < 0.05$.

RESULTS

The frequency distribution of respondents' characteristics in table 1 shows the largest percentage of the chef is female. The largest age group is 26-45 years old, married, has a low education level, and the most ethnic group is Toraja. It can be seen that the characteristics that have a significant relationship with systolic blood pressure and diastole are only with the characteristics of age and marital status.

Table 1. The average blood pressure of Systole and Diastole based on the respondents' characteristics

Characteristics	Systole ρ Value (Mean \pm SD)	Diastole ρ Value (Mean \pm SD)	n(%)
Sex	0.165	0.578	
Male	134.29 \pm 17.53	82.26 \pm 14.85	34(42.5)
Female	129.09 \pm 15.53	80.74 \pm 9.53	46(57.5)
Age	0.000	0.001	
> 45	141.54 \pm 16.11	87.04 \pm 9.27	24(30.0)
26 - 45	130.32 \pm 14.65	81.41 \pm 12.24	41(51.2)
17 - 25	117.60 \pm 10.69	72.27 \pm 10.09	15(18.8)
Marital Status	0.021	0.005	
Married	133.58 \pm 17.18	83.39 \pm 12.19	62(77.5)
Not married	123.44 \pm 11.06	74.50 \pm 8.58	18(22.5)
Education Level	0.199	0.449	
Low	130.40 \pm 15.53	81.00 \pm 11.81	70(87.5)
High	137.60 \pm 22.18	84.10 \pm 13.78	10(12.5)
Tribes	0.244	0.218	
Bugis/Makassar	127.31 \pm 22.87	75.31 \pm 18.131	13(16.3)
Toraja	136.65 \pm 16.43	83.85 \pm 11.83	26(32.5)
Jawa	128.90 \pm 14.71	81.62 \pm 8.40	21(26.3)
Others	129.45 \pm 12.64	81.90 \pm 10.04	20(25.0)
TOTAL	131.30 \pm 16.51	81.39 \pm 12.02	80(100)

Overall, the average subject has systole blood pressure of 131.30 with an average dispersion from the sample of

16.51 and diastole blood pressure of 81.39 with an average dispersion of 12.02. Furthermore, Table 1 also shows that based on respondents' characteristics. The highest systole and diastole blood pressure were found in the age group of > 45 years (141.54/87.04) followed by respondents from the Toraja tribe (136.65/83.85).

Table 2. Prevalence of Blood Pressure and Its Relation to Some Variables

Variables	Normotension (%) (<120/<80 mmHg)	Pre-hypertension (%) (≥120/≥80 mmHg)	Hypertension (%) (≥140/≥90 mmHg)	n	pValue
Sex					
Male	5(14.7)	17(50.0)	12(35.3)	34	0.352
Female	13(28.3)	20(43.5)	13(28.3)	46	
Age					
> 45	2(8.3)	7(29.2)	15(62.5)	24	0.000
26 - 45	8(19.5)	23(56.1)	10(24.4)	41	
17 - 25	8(53.3)	7(46.7)	0(0.0)	15	
Marital Status					
Married	12(19.4)	27(43.5)	23(37.1)	62	0.042
Not Married	6(33.3)	10(55.6)	2(11.1)	18	
Education Level					
Low	16(22.9)	33(47.1)	21(30.0)	70	0.604
High	2(20.0)	4(40.0)	4(40.0)	10	
Tribe					
Bugis/Makassar	5(38.5)	5(38.5)	3(23.1)	13	0.859
Toraja	3(11.5)	12(46.2)	11(42.3)	26	
Jawa	4(19.0)	12(57.1)	5(23.8)	21	
Others	6(30.0)	8(40.0)	6(30.0)	20	
Stall Ownership					
Owner	3(9.7)	16(51.6)	12(38.7)	31	0.086
Not owner	15(30.6)	21(42.9)	13(26.5)	45	
Smoking activity					
Not smoking	14(26.4)	23(43.4)	16(30.2)	53	0.496
Smoking	4(14.8)	14(51.9)	9(33.3)	21	
Total	18(22.5)	37(46.3)	25(31.3)	80	

Chi Square test, $\rho < 0.05$

Normotension prevalence, pre-hypertension and hypertension in table 2, based on the characteristics, show that the age group > 45 (62.5%) has the greatest prevalence of hypertension. While the greatest prevalence of pre-hypertension by subjects with the Javanese (57.1%). Ages 17-25 years were the group of subjects who had the largest Normotension prevalence (53.3%). There is a significant relationship between age with hypertension status ($\rho = 0,000$) and marital status with hypertension status ($\rho = 0.042$).

DISCUSSION

The increase of blood pressure that exceeds the

threshold value, is a trigger for hypertension. It is characterized by an increase in systolic and diastolic blood pressure, mostly experienced by the old age group², as illustrated in table 1, the age group > 45 years is a group of subjects who have high blood pressure both in systolic and diastole blood pressure. Nevertheless, this is undeniable because systolic blood pressure usually increases with a person's age even though diastolic blood pressure only increases up to the age of 50 years after that will decrease with age¹⁴.

The second highest group of systolic and diastolic blood pressure is the Toraja tribe in South Sulawesi.

The Toraja is a tribe, whose food habits have a close relationship with the local customs. Consumption of foods that are mostly derived from animal fats and high in salt and flavoring ingredients are the characteristic of Toraja food, so it can be said that eating habits can lead to an increase in systolic blood pressure^{15,10}. The results of the same study in the Minangkabau tribe in West Sumatra showed an association between fat consumption and systolic blood pressure ($p < 0.05$)¹⁶.

Hypertension is one of the risk factors that greatly contribute to the incidence of cardiovascular disease. Based on the results of the study, pre-hypertension has the highest prevalence value (46.3%). The term pre-hypertension was first introduced by the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High BP (JNC VII), which defines pre-hypertension as a blood pressure status with a range of 120–139 / 80–89 mm Hg¹⁷. Pre-hypertension is a group that is at risk for hypertension which will eventually develop towards cardiovascular disease because every increase of 20/10 mmHg, the risk of developing cardiovascular disease will increase two folds¹⁸.

High prevalence with hypertension status at the age of > 45 years (62.5%), along with increasing age will tend to increase^{7,14}. This situation will be further aggravated if someone with hypertension has also other risk factors such as diabetes¹⁹, being overweight²⁰ and smoking activity¹⁴. Age is a risk factor that has a very significant relationship with hypertension, as well as marital status. Some research results indicate that there is a significant relationship between marriage and stress while it is known that stress is also one of the triggers of hypertension²¹. With the existence of a very significant relationship, the chances of experiencing cardiovascular disease will be even greater. Overcoming in terms of changes in lifestyle becomes essential to be done so that an increase in blood pressure and an increase in cardiovascular disease can be controlled.

CONCLUSION

The average study subjects have a systole blood pressure of 131.30 with an average dispersion from the sample of 16.51 and diastole blood pressure of 81.39 with an average dispersion of 12.02. Normotension prevalence is scored 22.3%, 46.3% prehypertension and 31.3% hypertension with varying percentages in

each characteristic. However, the characteristics of age and marital status have a significant relationship with hypertension.

Conflict of Interest: The authors declared no conflict of interest.

Source of Funding: The source of funding came from a doctoral dissertation grant provided by Ministry of Research, Technology, and Higher Education of the Republic of Indonesia.

Ethical Clearance: Ethical approval was obtained from Hasanuddin University number 768/H4.8.4.5.31/PP36-KOMETIK/2017.

REFERENCES

1. Lily I Rilantono AUR. CARDIOVASCULAR DISEASE IN WOMEN: 21st Century Challenge. Jakarta: Medical Faculty Publishing Board Universitas Indonesia; 2014.
2. Bosu WK. Epidemic of hypertension in Ghana: a systematic review. BMC Public Health. 2010 July;10(418).
3. Indonesia MoH. "Know Your Blood Pressure: Prevent Hypertension With Family Approach" <http://www.p2ptm.kemkes.go.id> 2017 [cited 2018 30 Juli].
4. Indonesia MoH. SIRKESNAS Tahun 2016 <http://labdata.litbang.depkes.go.id>: Research and Development Agency MoH of Indonesia. ; 2016 [cited 2018 30 Juli].
5. Pusdatin. Heart Health Situation. Jakarta: Ministry of Health of the Republic of Indonesia, 2014.
6. Pusdatin. Hypertension: the silent killer <http://www.pusdatin.kemkes.go.id> Ministry of Health of the Republic of Indonesia; 2015 [cited 2018 30 Juli].
7. Kjeldsen SE. Hypertension and cardiovascular risk: General aspects. Pharmacol Res 2018. p. 95-9.
8. Lugo-Mata ea. Factors associated with the level of knowledge about hypertension in primary care patients. Medicina Universitaria. 2017 October;19(77):184---8.
9. Ploth D W MJK, Fonner V A, Horowitz B, Zager P, Schrader R, Fredrick F, Laggis C, Sweat M D. Prevalence of CKD, Diabetes, and Hypertension in Rural Tanzania. Kidney Int Rep. 2018

- April;3(4):905-15.
10. Appel LJ. The Effects of Dietary Factors on Blood Pressure. *Cardiol Clin.* 2017;35(2):197-212.
 11. Wang ea. Occupational noise exposure and hypertension: the Dongfeng-Tongji Cohort Study. *J Am Soc Hypertens* 2018. p. 71-9
 12. Cuevas AGW, D. R. Albert, M. A. Psychosocial Factors and Hypertension: A Review of the Literature. *Cardiol Clin.* 2017;35(2):223-30.
 13. Bosu WK. The prevalence, awareness, and control of hypertension among workers in West Africa: a systematic review. *Glob Health Action.* 2015 January;8:26227.
 14. Kabo P. Coronary Heart Disease: Disease or Natural Process. [Book] Jakarta: Medical Faculty Publishing Board Universitas Indonesia; 2014.
 15. Garfinkle MA, cartographer Salt and essential hypertension: pathophysiology and implications for treatment: *J Am Soc Hypertens*; 2017 April.
 16. Andamsari ea. RELATIONSHIP OF EAT PATTERNS WITH BLOOD PRESSURE ON ADULTS IN WEST SUMATERA. *Andalas Medical Magazine.* 2015 Januari-April;38(1).
 17. Kalaitzidis RGB, G. L. Prehypertension: is it relevant for nephrologists? *Kidney Int.* 2009 November;77(3):194-200.
 18. Chobanian AVB, G. L. Black, H. R. Cushman, W. C. Green, L. A. Izzo, J. L., Jr. Jones, D. W. Materson, B. J. Oparil, S. Wright, J. T., Jr. Roccella, E. J. Joint National Committee on Prevention, Detection Evaluation Treatment of High Blood Pressure. National Heart, Lung Blood, Institute National High Blood Pressure Education Program Coordinating Committee. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension. 2003 December;42(6):1206-52.
 19. Petrie JRG, T. J. Touyz, R. M. Diabetes, Hypertension, and Cardiovascular Disease: Clinical Insights and Vascular Mechanisms. *Can J Cardiol.* 2018;34(5):575-84.
 20. Sutradhar B, Dipayan. Prevalence and predictors of pre hypertension and hypertension among school going adolescents (14–19 years) of Tripura, India. *Indian Journal of Medical Specialities.* 2017 July;8(4):179-86.
 21. Fitriani A. Socio-Economic Conditions and Stress in Hypertensive Women Members of the Taklim Assembly. *National Public Health Journal.* 2012 Desember;7(5):214-8.

Profile of Bile Duct Injuries Following Laparoscopic Cholecystectomy

Warsinggih¹, Ihwan Kusuma¹, Debby Sumaraw¹, Prihantono Prihantono¹

¹ Department of Surgery, Faculty of Medicine, Hasanuddin University, Makassar, Indonesia

ABSTRACT

Introduction: Laparoscopic cholecystectomy procedure was the gold standard for symptomatic cholelithiasis and cholecystitis, but it was associated with a higher incidence of bile duct injury than an open approach.

Methods: Retrospective study of bile duct injuries cases at Wahidin Sudirohusodo Hospital Makassar in 2017. **Results:** A total of 111 laparoscopic cholecystectomy patients, 71 women and 40 men, median age of 46 years. 13 patients conversion an opened cholecystectomy resulted in severe adhesion 76.9% (10 patients), bleeding 7.6% (1 patients) and bile duct injury 15.4% (2 patients). Of four patients, 3.6% had bile duct injuries which discovered during operation 2 patients (50%) had significant leak bile symptoms and discovered postoperative other two patients (50%) had biloma as the major symptom. Two patients had right hepatic duct injuries (Strasberg type C), then treated with biliary drainage; one patient had a lateral wall injury to the common hepatic duct (Strasberg type D, then treated with T-tube drainage; and 1 patient had transected to the common hepatic duct (Strasberg type E2), then reconstructed with Roux en Y hepaticojejunostomy. Regarding the Clavien–Dindo classification, of 4 bile duct injuries patients, 75% (3 patients) were classified as grade III b, respectively, 25% (1 patient) as grade III a.

Conclusion: Laparoscopic cholecystectomy had become the treatment of choice for symptomatic cholelithiasis, and it was associated with an increase bile duct injury incidence. Despite increasing awareness of this problem, yet more attention should be concerned both related to preventive care and early recognition of such injury care.

Keywords: Laparoscopic; cholecystectomy; bile duct injuries; complications; biloma.

INTRODUCTION

Laparoscopic cholecystectomy was the gold standard procedure for the management of symptomatic gallbladder stones or acute cholecystitis.¹ Although there were significant benefits related to the method, such as less pain and shorter hospital length of stay. However, the laparoscopic procedure had some weakness, as some publications, it was associated with higher incidence of bile ducts injuries compared with an open cholecystectomy era.² Bile duct injury following cholecystectomy was an iatrogenic catastrophe related to significant preoperative morbidity and mortality and less survival and quality of life, and high rates of subsequent litigation. Therefore, it should be regarded as preventable care.^{3,4} So far, this had not been documented, as some studies had shown increased risks⁵, while others could not verify this.⁶ At Wahidin Sudirohusodo Hospital,

researchers initiated a retrospective study of bile duct injuries following laparoscopic cholecystectomy during 2017. The purpose of this article was to evaluate the incidence and risk factors and analyze treatment options for this patient group.

METHOD

This research represented a retrospective database of cholecystectomy patients who developed bile duct injuries after laparoscopic cholecystectomy procedures from January to December 2017 at Wahiddin Sudirohusodo Hospital. The hospital was a teaching hospital in Makassar. During the period January to December 2017, laparoscopic cholecystectomies procedure were performed for 110 patients at this hospital, and then investigated the incidence of bile duct injuries. These data were obtained from the patient medical register.

Data about bile duct injuries were retrospectively retrieved from the hospital's patient files and entered into a database. The severity of the injury was classified according to Dindo, Demartines and Clavien, 2004.⁷ And type of injuries according to Strasberg (2002).⁸ A part of the following of first postoperative month, there were no regular planned visits. All patients were tracked until death or were screened by 31 December 2017.

RESULTS

During the study period, 111 patients—40 men and 71 women— had laparoscopic cholecystectomy procedures during that period. The median age was 46 (range 14–77) years old. Out of 111 patients, 13 patients converted to open cholecystectomy because of severe adhesion 76.9% (10 patients), bleeding 7.6% (1 patients) and bile duct injury 15.4% (2 patients). A general overview of patient characteristics is shown in Table 1.

Table 1: General Characteristics of Laparoscopic Cholecystectomy Patients

	n	%
Sex		
Men	40	36
Women	71	64
Primary operation		
Laparoscopic Procedures	98	88.3
Converted	13	11.7

Source: Primary Data, 2017

Four patients had a bile duct injury compared with the total incidence of bile duct injuries was 3.6% with the median age was 50 (range 45-57) years old. A 45-year-old woman with obesity as a risk factor leaked what assumed to be an aberrant bile duct (Strasberg type C) while dissecting the gallbladder from the hepatic bed that was discovered during the primary laparoscopic operation. She underwent a ligation to the duct and placed an intraabdominal drain. While other an obese 57-year-old woman had a tangential injury to the common hepatic duct that was discovered during the primary laparoscopic operation and repaired with an open Roux en Y hepaticojejunostomy. A 49-year-old woman with cholecystitis as a risk factor underwent an open operation 11 days after laparoscopic cholecystectomy due to a giant biloma. From intraoperative cholangiography, the

leak was assumed from the lateral wall to the common hepatic duct (Strasberg type D. She was treated with the placement of a T-tube. The last patient, a 52 years woman with a history of several lower abdominal operation before underwent percutaneous biliary drainage ten days post laparoscopic cholecystectomy after we found biloma on abdominal computed tomography. The leak was assumed as an aberrant bile duct (Strasberg type C). A general characteristic of 4 patients with bile duct injuries is shown in Table 2,3,4 and 5.

Table 2: General Characteristics of Bile Duct Injuries Patients

	N	%
Sex		
Men	0	0
Women	4	100
Risk factor		
Cholecystitis	1	25
Obesity	2	75
History of abdominal operation before	1	25

Table 3: Strasberg Classification of bile duct injuries

Type	N	%
A Cystic or aberrant ducts	0	0
B Partial occlusion of the biliary tree	0	0
C Abberant duct without continuity with the CBD	2	50
D Lateral damage extrahepatic duct	1	25
E1 CBD > 2 cm from hepatic confluence	0	0
E2 CBD < 2 cm from hepatic confluence	1	25
E3 Hepatic confluence	0	0
E4 Division of right or left hepatic duct	0	0

Table 4: The severity of the injury was classified as Clavien Dindo

Grade	N	%
I No pharmacological treatment need	0	0
II Requiring Pharmacological treatment	0	0
III Requiring surgery		
IIIa Not under general anesthesia	1	25
IIIb Under general anesthesia	3	75
IV Life threatening	0	0
V Death	0	0

DISCUSSION

Incidence and Risk Factors

In this research, we found a frequency of 3.6% bile duct injuries. Chuang et al., 2012 found risen from 0.1-0.5% for open cholecystectomy to 3% for Laparoscopic cholecystectomy.⁹ Risk factors for BDI were related to the surgeon, patient and local pathology. The experience and learning curve of the surgeon was an essential factor in the reduction of bile duct injuries.¹⁰ Some patients factors were related to obesity, age, and gender. The problem of morbid obesity in the laparoscopic procedures was considerably different from patient to patient. Some patients presented fewer problems compared with the open operation, whereas others were less easy resulted from their internal fat deposition which obscures the anatomy of Calot's triangle. Fatty hepatics could be challenging to elevate and were easily lacerated. Although increased age and male gender are associated with an increased postoperative mortality rate after cholecystectomy, they are not significant risk factors for significant bile duct injuries. However, local factors included "dangerous anatomy" and "dangerous pathological conditions" predisposing to biliary injury. They were presented in 15-35% of injuries, but since there were no comparable cases without biliary injuries, conclusions based on statistical comparisons were not possible. Dangerous anatomy included aberrant (anomalous) anatomy and pathological conditions that obscured the view of vital structures such as adhesions, inflammatory phlegmon, and excessive fat in the porta hepatis. Adhesions from previous abdominal operations and pathological conditions such as inflammation can distort the anatomy and predispose to injury. Undoubtedly, however, some technical errors were

made during the 'easy' cholecystectomy with normal anatomy because of 'lack of care'.^{11,12} In this research, chronic cholecystitis with adhesions and obesity were the most commonly reported postoperative problems encountered.

Mechanism of Injury

The safe execution of both open and laparoscopic cholecystectomies relied on similar operative principles, despite some different approaches. In this research, all of bile duct injuries resulted from technical errors. Two cases of injuries were the lumen of the common hepatic duct injuries which were due to manipulation or forceful "dilatation" when secured the cystic duct or cystic artery. The other two cases injuries were the accessory right hepatic duct due to too broad a dissection plane on the hepatic bed during detachment of the gallbladder.

Converted operations

In adopting LC as the routine option, it could be stressed that the need for conversion was encountered for 20-25% of cases. There were two types of conversions: a conversion for safety and a conversion by necessity. Operations converted selectively after an initial laparoscopy, or shortly after prior trial dissection when progress under laparoscopic conditions was deemed hazardous and had the same risk as an open procedure. However, operations which "forced" surgeon converted process as it was due to a complication and significantly higher risk of biliary injury compared with open surgery. A French audit showed that the most frequent causes of conversion were acute cholecystitis, duct stones, and contracted gallbladder, while the most frequent reasons of transformation for technical difficulty was a hemorrhage. Conversion in the presence of difficult anatomy directly reflected common sense and good judgment; 'the object of the procedure should be completed to the cholecystectomy by the most appropriate. It meant not by laparoscopy at all costs'.^{13,14}

As many as 11.8% of the 111 operations in this research were a conversion from laparoscopic to open surgery because of severe adhesion 76.9% (10 patients), bleeding 7.6% (1 patients) and bile duct injury 15.4% (2 patients). All of the converted operations were made by necessity.

Surgical Management

The time of diagnosis following before biliary

tract injury and classification (which included the extent and level of the injury) was critical for optimal treatment. Several injuries could create short-and long-term complications (intra-abdominal fluid collections and biliary fistula or abscess, biliary or anastomotic strictures, biliary cirrhosis, and cholangitis).¹⁵

In this research, injury of the aberrant right hepatic duct (Strasberg type C) recognized during the intraoperative period; the researcher directly performed ligation to the duct and placement an intraabdominal subhepatic drain. While if the same injury identified in the postoperative period, researcher performed percutaneous biliary drainage. Moreover, transection injury related to the common hepatic duct (Strasberg type E2) designated during intraoperative, researcher performed Roux en Y hepaticojejunostomy used an open procedure. Then, oblique injury about the common hepatic duct (Strasberg type D) identified in the postoperative period, researcher sutured the duct and drainage of bile with T-tube placement.

PREVENTION

Prevention of iatrogenic injuries to the bile ducts during laparoscopic cholecystectomy relied on (i) through an understanding of the anatomy, risk factors and the mechanisms of injury, (ii) image interpretation skills; (iii) meticulous technique and (iv) timely decision for elective conversion in the presence of difficult anatomy. Epidemiologists classified prevention of health problems into primary and secondary¹⁶ such as:

Primary prevention

In the case of LC, primary prevention was protecting patients from bile duct injury. In preoperative, protection cares was surgeon training and patient selection. Of the preoperative tests, only gallbladder wall thickness >7 mm on ultrasound scan accurately used to predict the difficulty of the operation such as lengthen the duration of the procedure. However, there were no reliable preoperative indicators to determine the risk of biliary and vascular injuries during LC. Prevention care for these complications, therefore, depended on the adoption of correct surgical technique and a low threshold for conversion. Since the major direct causes of biliary injury such as misidentification of anatomy and technical errors were recognized, safety entirely depended on a complete visualization, display and structures identification of triangle of Calot.

Consequently, the 30° laparoscope provided a better view of the anatomy, especially for common bile duct. The technique had to be standardized with adequate lateral and inferior retraction of Hartmann's pouch (infundibulum) to separate a cystic duct from the common bile duct.

The dissection should commence high on the neck of the gallbladder. The correct technique of clip application was necessary. The majority of the surgeon used clips to secure the medial end of the cystic duct, and only minority surgeon used ligation this duct. During the detachment of gallbladder from its hepatic bed, the dissection should be kept close to the gallbladder and above the fascial covering of the gallbladder bed. This maneuver functioned to avoid both bleedings from the hepatic parenchyma and injury of segmental ducts in segment IV, V of the hepatic.

Secondary prevention: an. early detection

The consequence of bile duct injury could be reduced by early recognition of the injury and optimal repair. If the injury was discovered during operation, the outcome was better than the injury was discovered late. Only one-third of bile duct injuries sustained during LC were detected at the primary operation, then majority cases (60%-80%) were found at an average of 10 postoperative days. Early recognition of the injury could be achieved by investigating the source of any biliary leakage observed during the operation, the use of intraoperative cholangiography, and possibly intraoperative (completion) ultrasonography. The use of intraoperative fluorocholangiography (IOFC) during cholecystectomy had been controversial since recommended by Mirizzi in 1937. Some surgeons used it routinely, others were selectively or not at all. Proponents of the routine use argued IOFC delineated biliary anatomy and provided a 'road map' of the entire biliary tree. Failure describing the whole extra and intrahepatic biliary tract patient with Trendelenberg position was an indication for conversion. Routine IOFC ensured familiarity with the technique and its interpretation so that the procedure was carried out expeditiously well inside 10 minutes. A previous prospective study performed the method to determine the frequency and type of bile duct abnormalities, and to determine the efficacy of routine IOFC during LC in the prevention of bile duct injuries, shown anatomical biliary abnormalities in 98 of 513 cholangiograms (19%). If damage to the biliary tracts occurs early during

operation, the cholangiogram allowed the surgeon to detect the injury, then made a prompt repair and thereby reduced morbidity associated with a delayed diagnosis.

CONCLUSION

Laparoscopic cholecystectomy becomes the prompt treatment for symptomatic cholelithiasis, and it was associated with an increase of incidence of bile duct injury. Despite increasing awareness of this problem, yet more attention should be paid both in prevention and early recognition of such injury. Long-term follow-up was required.

Ethical Clearance - Taken from Hasanuddin University Ethical committee

Source of Funding - Self-funding

Conflict of Interest - None

REFERENCES

1. Acar, Turan, et al. Laparoscopic cholecystectomy in the treatment of acute cholecystitis: comparison of results between early and late cholecystectomy. *The Pan African medical journal*, 2017, 26. DOI: 10.11604/pamj.2017.26.49.8359.
2. McKinley, S. K., Brunt, L. M. and Schwaitzberg, S. D. Prevention of bile duct injury: the case for incorporating educational theories of expertise. *Surgical Endoscopy and Other Interventional Techniques*. 2014; 28(12) ; 3385–91. DOI: 10.1007/s00464-014-3605-8.
3. Connor, S. and Garden, O. J. Bile duct injury in the era of laparoscopic cholecystectomy. *British Journal of Surgery*, 2006, 93(2); 158–168. DOI: 10.1002/bjs.5266.
4. Viste, A. et al. Bile duct injuries following laparoscopic cholecystectomy. *Scandinavian Journal of Surgery*. 2015, 104(4); 233–237. DOI: 10.1177/1457496915570088.
5. Karvonen, J., Salminen, P., and Grönroos, J. M. Bile duct injuries during open and laparoscopic cholecystectomy in the laparoscopic era: Alarming trends. *Surgical Endoscopy and Other Interventional Techniques*, 2011; 25(9); 2906–2910. DOI: 10.1007/s00464-011-1641-1.
6. Harboe, K. M., and Bardram, L. Nationwide quality improvement of cholecystectomy: Results from a national database. *International Journal for Quality in Health Care*, 2011; 23(5); 565–573. DOI: 10.1093/intqhc/mzr041.
7. Dindo, D., Demartines, N. and Clavien, P. A. Classification of surgical complications: A new proposal with evaluation in a cohort of 6336 patients and results of a survey, *Annals of Surgery*, 2004; 240(2); 205–213. DOI: 10.1097/01.sla.0000133083.54934.ae.
8. Strasberg, S. M., Hertl, M. and Soper, N. J. An analysis of the problem of biliary injury during laparoscopic cholecystectomy. *Journal of the American College of Surgeons*. The United States, 1995; 180(1);101–125.
9. Chuang, K. I. et al. Does increase experience with laparoscopic cholecystectomy yield more complex bile duct injuries? *American Journal of Surgery*. Elsevier Inc., 2012; 203(4);480–487. DOI: 10.1016/j.amjsurg.2011.08.018.
10. Moore, M. J., and Bennett, C. L. The learning curve for laparoscopic cholecystectomy. *The American Journal of Surgery*, 1995;170(1); 55–59. DOI: 10.1016/S0002-9610(99)80252-9.
11. Strasberg, S. M. Avoidance of biliary injury during laparoscopic cholecystectomy. *Journal of Hepato-Biliary-Pancreatic Surgery*, 2002; 9(5); 543–547. DOI: 10.1007/s005340200071.
12. Shallaly, G. E. I.; Cuschieri, A. Nature, aetiology and outcome of bile duct injuries after laparoscopic cholecystectomy. *HPB*, 2000, 2.1: 3-12.. DOI: 10.1016/S1365-182X(17)30693-7.
13. Rashid, T. et al. Conversion of Laparoscopic Cholecystectomy Into Open Cholecystectomy: an Experience in 300 Cases. *Journal of Ayub Medical College, Abbottabad*, 2016; 28(1); 116–119.
14. Hu, A. et al. Risk factors for conversion of laparoscopic cholecystectomy to open surgery - A systematic literature review of 30 studies. *American Journal of Surgery* 2017; 214(5); 920–930. DOI: 10.1016/j.amjsurg.2017.07.029.
15. Felekouras, E. et al. Early or Delayed Intervention for Bile Duct Injuries following Laparoscopic Cholecystectomy ? A Dilemma Looking for an Answer, 2015. DOI: 10.1155/2015/104235.
16. Karanikas, M. et al. Biliary tract injuries after lap cholecystectomy—types, surgical intervention, and timing. *Annals of Translational Medicine*, 2016;4(9);163–163. DOI: 10.21037/atm.2016.05.07.

Participatory Approaches in Creating a Concept of Healthy Public Transport Facilities Toward Healthy Community

Andi Surahman Batara¹, Muhammad Syafar², Sukri Palutturi², Stang Abdul Rahman²,
Darmawansyah², Veni Hadju², Amran Razak²

¹Public Health Faculty, Muslim University of Indonesia, Makassar, Indonesia,

²Public Health Faculty, Hasanuddin University, Makassar, Indonesia

ABSTRACT

The demand for public transport in developing countries nowadays is very high. Ironically, most of the public transport facilities including transit facilities in developing countries are often inconvenient, uncomfortable, and dangerous. Therefore, a proper guidance in developing public transport facilities is urgently needed. The study aimed to create a new concept of healthy passenger station based on stakeholder ideas and participation.

The study applied mixed methods with a sequential exploratory approach which used qualitative and quantitative approach respectively. The study consists of 3 phases; exploring the stakeholder's perceptions, forming a new concept of the healthy station, and applying the new concept. The healthy station must meet two main indicators; environmental indicators and social indicators. The concept consists of 4 classifications of the healthy station; Paripurna, Mandiri, Madya, and Pratama, respectively from the best to the worst condition.

Keywords: *Healthy Station, Healthy Setting, Healthy Concept, Transport, Healthy Community*

INTRODUCTION

The rapid growth of population demands the sufficient transport systems and facilities. The demand for public transport in developing countries nowadays is very high. The majority of inhabitants still prefer to use road based transport such as buses, taxies, and passenger cars to get their destination. Ironically, public transport facilities including transit facilities and station in developing countries are commonly inconvenient, uncomfortable, and dangerous. This fact currently brings the developing countries into serious issues in transportation system including air pollution, accidents, environmental damage, and lack of accessibility.¹

In developing facilities, many aspects must be considered including economy, health, environment, and social. In 1987, World Health Organization (WHO)

launched a program called "Healthy City" which emphasized in healthy setting.^{2,3} WHO describes the healthy setting as "*Health is created and lived by people within the settings of their everyday life; where they learn, work, play, and love* (Ottawa Charter, 1986). Healthy setting aims to maximize the prevention efforts with holistic approaches (whole system). This system is very important to boost a holistic approach model of health.⁴ The healthy setting pays more attention to determinant factors of health-related to daily life of society.⁵ The healthy setting can also be defined as the arrangement of places or social context where people do their daily activities in which environment, organization, and individual factors interact to influence people health and prosperity.⁶

Healthy setting concept purely appeared from the concept of the important role of local government in shaping and developing public health condition.⁷ The setting approach requires four principles including participation, equivalence, partnership, and sustainability and the healthy setting is characterized by three related

Corresponding author:

Andi Surahman Batara

E-mail: as.ammanibatara@gmail.com

dimensions; public health ecology model, perspective system, and whole system focus.⁴ The healthy setting must be applied in all sectors including transportation system because it plays an important role in creating healthy community.

Numbers of studies showed the impact of transport system facilities to both human health and environmental quality. Good public transport facility can attract the society to take public transports which increase their physical activities and reduce air pollution from their private cars. Therefore, the study aimed to find or create a new integrated concept in developing good public transport facilities based on stakeholders' ideas and perceptions. The transport facility in the study focuses on passenger station or transit facilities as an important part of the transport system.

METHOD

The study applied mixed methods with a sequential exploratory approach which used qualitative and quantitative approach respectively. The study consists of 3 phases; exploring the stakeholder's perceptions, forming a new concept of the healthy station, and applying the new formed concept. The data was collected through observation, in-depth interview, focus group discussion (FGD), and the study tested the new concept in 24 stations in South Sulawesi. The data collection started from December 2016 to September 2017. The participants of the study came from different backgrounds including governmental sectors, Non Governmental Organizations, users/ passengers of the stations; and sellers. The qualitative data was analyzed by using software called "NVIVO" and the quantitative data were analyzed using statistical software "SPSS".

RESULT

Phase 1

The stakeholders or the participants of the study agreed that the healthy passenger station must meet two main indicators; environment (environmental design) and social. Environmental aspects including the availability of the smoking room, nursery room, disable support facility, vehicle check-up service, health service/ onsite clinic facility, good sanitation, and the existing of green spaces/ park. Social indicators cover safety and comfort. Both indicators aim to create healthy, comfort, and safe terminal for users, workers, and communities.

Good environmental structure of the station indirectly shapes good social condition.

Phase 2

The study set an observational questioner of 70 questions as a tool and instrument in evaluating the existing stations whether the station is a healthy station or unhealthy station. The questioner is based on the indicators of the healthy station which was created in phase 1. The questioner used the Likert scale. There are 3 answers; a, b, and c. The answer is worth 3 for a, 2 for b, and 1 for c.

Number of questions : 70

The highest score : $70 \times 3 = 210$

The lowest score : $70 \times 1 = 70$

The highest percentage : $210/210 \times 100\% = 100\%$

The lowest percentage : $70/210 \times 100\% = 33.3\%$

The average $100 - 33.3\% = 66.7\%$

The study then created 4 categories of the healthy station; Paripurna, Mandiri, Madya, and Pratama, respectively from the highest score to the lowest score based on the range of their value from the questioner. The higher score is the healthier terminal.

$$\text{Scale Range} = \frac{\text{The average}}{4} = \frac{66.7\%}{4} = 16.67$$

- a) Paripurna = 100-16.67
= 83.32
>83.32 is classified as Paripurna terminal (the best terminal) (Class 1)
- b) Mandiri = 83.32-16.67
= 66.65
66.65- 83.32 is classified as Mandiri terminal (Class 2)
- c) Madya = 66.65-16.67
= 49.98
49.98-66.64 is classified as Madya terminal (Class 3)
- d) Pratama = 49.98-16.67
= 33.31
33.31-49.97 is classified as Pratama terminal (Class 4)

Phase 3

From 24 stations evaluated in South Sulawesi, there are only 5 Madya terminals (Class 3) and 7 Pratama terminals (Class 4), while the rest of the stations are uncategorized table 1 reveals that the stations in South Sulawesi are in poor condition.

Table 1. The result of measurement and evaluation of the passenger stations in South Sulawesi, Indonesia

Class	Number	Percentage (%)
Pariपुरna	0	0
Mandiri	0	0
Madya	5	20,8
Pratama	7	29,2
Uncategorized	12	50

DISCUSSION

Environmental Indicators

Supporting facilities for people with disabilities

A good station must be accessible and friendly for all including the person with a disability. The right of people with disability has been protected and recognized internationally through “Convention on the rights of persons with disabilities” conducted by United Nations. The convention addressed all issues related to disabled including communication, discrimination, reasonable accommodation, and universal design.⁹ Indonesia has also put disability issues as a serious concern by passing the Law of the Republic Indonesia No. 8 in 2016 on Disability. Good transportation system allows people with disabilities to be more active, explore their self-potential, and advanced their personal skills. A study literature of the relationship between health and employment conducted by Ellie showed that productive and active people (working people) have better functional status and better self-related health; the study also reviewed the links between employment and health among people with disabilities which revealed that of the 47.377 adults (25 to 64 of ages) with disabilities across the United States who work had less frequent mental health (18%0 than those did not work (40%).¹⁰ The high number of unemployment among person with disabilities are caused by many factors including lack of universal access in the structural building, lack of special need facilities such as accessible toilets and wheelchair pathway.^{11,12}

Nursery room

Exclusive breastfeeding is very important and highly recommended for a mother. Exclusive breastfeeding is that the infant only receives breast milk without any additional food or drink for the first 6 months of baby

age.¹³ A study conducted by Cesar and team showed that infants exclusively breastfeed have only 12% risk of death compared those without breastfeeding.¹⁴ Breast milk is the best food for the infants and the strongest antibodies.¹⁵ Supporting breastfeeding program means creating a bright future generation and healthy community. Therefore, all public facilities must provide comfortable, safe, and private rooms for the mother to breastfeed and look after their baby. According to the stakeholders, the availability of nursery room will attract passengers with a baby to take public transportation.

Smoking room

Smoking activity is always a hot debate between health and human right concerns. The smokers have right to smoke, on the other hand, all people have right to inhale fresh air without contamination from the smoking activity. To solve this problem, some countries take a pathway by providing smoking policy control such as establishing smoking room facilities in the public area. The smoking room allows the smokers to get their right to smoke and at the same time protect non-smokers from the exposure of effects of smoking.

Secondhand smoking has been known as very dangerous exposure. The Secondhand exposure is strongly linked to coronary heart disease, stroke, dementia, breast cancer, chronic respiratory illness, depression, and mental illness.¹⁶ The concentration depends on the intensity of smoking, dilution by ventilation, and other processes removing smoke from the air. Moreover, the concentrations are highly determined by design and operation of a building.¹⁷ Therefore, a specific room for smoking is needed to restrict the wider spread of contaminants from smoking.

Vehicle service facilities

According to WHO until may 2017, more than 1.25 million people die annually because of road traffic accidents. 90% fatalities on the road globally happen in low and middle-income countries. Between 20% and 50% million people suffer non-fatal injury but many of those sufferers experience disability. The risk factors of road accidents include human error, speeding, driving under the influence of alcohol and other psychoactive substances, nonuse of safety tools, distracted driving, unsafe road infrastructure, and unsafe vehicles.¹⁸ However, vehicle condition factor can be prevented by providing regular check-up facility in the station. The

vehicle must regularly be checked up before starting the trip to reduce the potential incident in their operations.

Green Spaces

Station is an assembly point for the vehicles to stop and transit, to drop and pick up the passengers. There are high potential air pollutions from the vehicle combustion operating in the station. Air pollution can cause the inflammation of respiratory system, cardiovascular diseases, and reduce lung function.¹⁹ According to Brauer et al. 89 percent of the population globally are exposed by air pollutants which exceeded the air quality guideline of World Health Organization. WHO estimated about 800.000 of early deaths caused by PM annually.²⁰ PM 2.5 is correlated with low birth weights, premature birth, and small for gestational age births, and ozone exposure was suspected to give negative effect to birth weight and neurodevelopment.¹⁹ Moreover, a study in Canada found a strong correlation between chronic exposure to traffic-related air pollution (particularly NO₂) and increasing the risk of ischemic heart diseases.²¹

Many studies had proved that the green spaces have positive effects on mental health. Beckerman et al (2012) reported positive outcomes of green spaces to mood, stress relief, concentration and memory, childhood development, and aggression. Green spaces also reduces anthropogenic noise buffering and production of natural sounds, improve pro-environmental behavior and improve sleep quality.²²

Health service facilities and sanitation

Station is a very busy place every time; people come from and go to different areas. This condition can lead to the spread out of many diseases easily as well as traffic accidents. The stakeholders considered that the availability of health service facility in the station is very important to provide first aid service for people in the terminal. The medical service also can provide regular check up for long-distance drivers to check their health condition which can reduces traffic accidents. Development of a station also must ensure the availability of good sanitation facilities including proper waste management, toilets, drainage system, and clean water.

Social Indicators (Comfort and safety)

Public facilities must be comfortable and safe for

all. The analysis showed that good environmental design makes the passengers comfortable in the stations. The comfort can depend on the availability of basic necessity such as toilets, free smoking area for smokers, nursery room for mothers with babies, green spaces for relaxing and waiting, free from odor, clean environments, and supporting facilities for person with disabilities. The security of the station is very important; everybody has to be convinced that they are secured during their time in the station. Security or safety includes no crime, safe food, safe environment, and no accidents.

The case study: The station in South Sulawesi, Indonesia

From 24 station evaluated in South Sulawesi, only 50% of the stations meet the categories formed in this study, and none of the station met the category of Paripurna (Class 1/ the best) and Mandiri (class 2). There were 7 Pratama stations and 5 Madya stations, while the value of the other 50 % of the stations had very low. Most of the stations did not have supporting facilities for person with disabilities, green spaces, health service facilities, vehicle check-up facilities, smoking room, and nursery area. There are two main factors causing this condition; 1) There is no specific guideline of the healthy station provided by the government and 2) The country has very limited resources to create a high-quality station.

CONCLUSION

The development of public facilities particularly station as part of transportation facilities must ensure that people are comfortable, convenient, and safe. The development is also required to pay attention to environmental condition. The stakeholders agreed that a station must ensure that all people get their right during their time in the station. Person with disabilities can travel easily, smokers can get their right to smoke without harming non-smoker, and children get their right to be feed by breast milk in the station. Moreover, the station also needs to provide health service facilities, vehicle service facilities, sanitation facilities, and green spaces.

Conflict Interests: There is no possibility of conflict interests.

Funding : The study is self-funded

Ethical Clearance: The study has passed through The Health Ethic Commission of Medical School of Hasanuddin University, No. 924/H04.8.4.5.3.1/PP36-KOMETIK/2016

REFERENCES

- Pojani D, Stead D. Sustainable Urban Transport in the Developing World: Beyond Megacities. *Sustainability*. 2015 Jun 17;7(6):7784–805.
- Lawrence RJ, Fudge C. Healthy Cities in a global and regional context. *Health Promot Int*. 2009 Nov 1;24(Supplement 1):i11–8.
- Newman L, Baum F, Javanparast S, O'Rourke K, Carlon L. Addressing social determinants of health inequities through settings: a rapid review. *Health Promot Int*. 2015 Sep;30(suppl 2):ii126–ii143.
- Dooris M. Healthy settings: challenges to generating evidence of effectiveness. *Health Promot Int*. 2006 Mar 1;21(1):55–65.
- Doherty S, Dooris M. The healthy settings approach: the growing interest within colleges and universities. 2006;24(3):42–3.
- McQueen DV, Jones CM, International Union for Health Promotion and Education, editors. *Global perspectives on health promotion effectiveness*. New York, NY: Springer; 2007. 425 p.
- Webster P, Lipp A. The evolution of the WHO city health profiles: a content review. *Health Promot Int*. 2009 Nov 1;24(Supplement 1):i56–63.
- Palutturi S. *Healthy Cities Konsep Global, Implementasi Lokal Untuk Indonesia*. Yogyakarta: Pustaka Pelajar; 2017.
- United Nation. *Convention on the rights of persons with disabilities and optional protocol* [Internet]. Available from: <http://www.un.org/disabilities/documents/convention/convoptprot-e.pdf>
- Hartman EC. *A Literature Review on the Relationship between Employment and Health: How this Relationship may Influence Managed Long Term Care*. [cited 2017 Oct 10]; Available from: <https://www.uwstout.edu/svri/upload/The-relationship-between-employment-and-health-A-literature-review.pdf>
- Meager N, Higgins T. *Disability and skills in a changing economy*. UK Commission for employment and skills; 2011.
- Uromi SM, Mazagwa MI. Challenges Facing People with Disabilities and Possible Solutions in Tanzania. *Journal of Educational Policy and Entrepreneurial Research (JEPER)*. 2014 Oct;11(2):158–65.
- WHO. *Nutrition: Exclusive breastfeeding* [Internet]. World Health Organization (WHO); 2017 [cited 2017 Oct 1]. Available from: http://www.who.int/nutrition/topics/exclusive_breastfeeding/en/
- Victora CG, Bahl R, Barros AJD, França GVA, Horton S, Krasevec J, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *The Lancet*. 2016 Jan;387(10017):475–90.
- Zareai M, O'Brien ML, Fallon AB. Creating a breastfeeding culture: a comparison of breastfeeding practises in Australia and Iran. *Breastfeed Rev Prof Publ Nurs Mothers Assoc Aust*. 2007 Jul;15(2):15–20.
- Nicogossian A, Himathongkam T, Kloiber O, Zimmerman T, Hu Y, Fritschler L, et al. *Health effects of tobacco secondhand smoke: focus on children health, A review of the evidence and self-Assessment* [Internet]. Virginia, USA: Center for the study of international medical policies and practices (CSIMPP); 2016. Available from: <https://www.wma.net/wp-content/uploads/2016/11/SHS-WMA-rev2.pdf>
- Samet JM, Norman LA, Wilbanks C, Pinto A. *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General* [Internet]. U.S. Department of Health and Human Services; 2006 [cited 2017 Aug 5]. Available from: <https://www.surgeongeneral.gov/library/reports/secondhandsmoke/fullreport.pdf>
- Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jaraan E, et al. *World Report on road traffic injury prevention* [Internet]. World Health Organization (WHO); 2004 [cited 2017 Mar 7]. Available from: <http://apps.who.int/iris/bitstream/10665/42871/1/9241562609.pdf>
- Shah PS, Balkhair T. Air pollution and birth outcomes: A systematic review. *Environ Int*. 2011 Feb;37(2):498–516.
- Brauer M, Amann M, Burnett RT, Cohen A, Dentener F, Ezzati M, et al. *Exposure Assessment for Estimation of the Global Burden of Disease Attributable to Outdoor Air Pollution*. *Environ Sci Technol*. 2012 Jan 17;46(2):652–60.

21. Beckerman BS, Jerrett M, Finkelstein M, Kanaroglou P, Brook JR, Arain MA, et al. The Association Between Chronic Exposure to Traffic-Related Air Pollution and Ischemic Heart Disease. *J Toxicol Environ Health A*. 2012 Apr;75(7):402–11.
22. WHO. Urban green spaces and Health [Internet]. WHO for European regional office; 2016 [cited 2017 Aug 10]. Available from: http://www.euro.who.int/__data/assets/pdf_file/0005/321971/Urban-green-spaces-and-health-review-evidence.pdf?ua=1

Meeting the Unmet Need with a Fit Model for Contraception Mix

Dyah Utari¹, Tris Eryando²

¹PhD Candidates, ²Professor Candidates, Department of Public Health, Faculty of Public Health, Universitas Indonesia (FPH-UI)

ABSTRACT

The broadening of access for equipment and service availability is the key in increasing the scope of family planning and reproductive health. Through the estimation of fit mix model of contraception will help the supply of contraception to meet the society's needs. This study aims to estimate a fit model for contraception mix for the five provinces in Java Island. The data used were SDKI (IDHS) data in 2003, 2007, and 2012. The method used to formulate the fit contraception model was calculating the number of fertile women according to the phases of reproduction and number of children. Then, the formulation of appropriate method was conducted following the contraception guidance from *Pendewasaan Usia Perkawinan (PUP)*, a program aiming to raise the age of marriage. The results of the study show that on average, the main needs for contraception in the society are the surgery method for females and the contraception method for males. This finding differs significantly from the common practice of contraception mix that generally is skewed towards the injection method. To provide contraception that not only fits the stages and the public's needs but also broaden the society's knowledge, it is expected that the society use appropriate contraception as this will increase the success rate of the decline in fertility and the increase of reproductive health.

Keywords : *family planning, mix method, contraception supply.*

INTRODUCTION

The total Fertility Rate in the world ranges from 0.8 in Singapore up to 6.89 in Nigeria¹. In this list, Indonesia is on the 102th position with a TFR of 2.6 in 2012² and an excess of as many as 3.4 million in the number of its total population in 2010 compared to the projected number³.

Java as the most populous island in Indonesia requires more attention in the field of family planning. The Government, in this regard BKKBN, experiences problems in the family planning program management with a stagnation of TFR occurred at a figure of 2.6 in 2003-2012⁴.

One factor that can maintain the decline in fertility is the selection of methods offered to the community. The choice of the given method is mainly offered in rural or remote areas where access to health facilities is difficult. This is similar to research conducted by Magadi and Curtis that the preferences, needs and beliefs related to contraception vary widely in the community. Study of Magadi and Curtis yielded the conclusion that family planning programs have to be able to accommodate the various needs of contraception users⁵.

Increased access to a wider service including long term contraceptive can decrease the failure of contraception and unintended pregnancy especially in areas that have restricted access⁶. Research conducted by Bongaarts & Johansson predict that when service quality is increased and the market for contraceptives as well as wider knowledge and education related contraception increases then the types and the balance of the contraceptive used among existing contraceptive method will be achieved⁷.

Corresponding author:

Dyah Utari

Department of Public Health FPH-UI,

A Building, 1st Floor, Depok-Indonesia.

E- dyah.utari15@gmail.com; dyah.utari52@ui.ac.id

Previous research shows an increase in the availability of contraceptive methods will help acceptors to choose a method that suits their reproductive goals, either the aim is to delay, space out, limit or stop the birth/having children⁸. The selection of the method of contraception is the key element of family planning services because it represents the right to reproduce⁹.

The skewness of mix contraceptives in Indonesia led to the hormonal method, especially injection, have occurred since the year 2003¹⁰. When the skewness is purely due to the preference of the acceptors then there would be a problem. But investigation results show that this is the effect of various conditions such as lack of knowledge of related methods that are used as acceptors¹¹. In addition, the limited access also forces the acceptors to choose methods that are available and most affordable.

Increased access to a wider service including long term contraceptive can decrease the failure of contraception and unintended pregnancy especially in areas that have restricted access¹². A high concentration on one or more particular types of contraception is a sign of the availability of existing methods in the society is unequal¹³. The Government and local authorities in implementing a mandatory family planning provide the infrastructure and facilities required.

During this time the supply of contraceptives in Indonesia have not adapted to the integrity of the ideal community yet. The study aims to formulate a fit model for the contraceptive mix based on age and number of children in five provinces in Java Island. The model obtained can be the benchmark for the supply of contraceptives in Java. With proper supply of contraceptives it is expected that the society can use contraceptives in accordance with their needs.

MATERIAL AND METHOD

This study uses secondary data from Indonesia Demographic and Health Surveys in 2003, 2007 and 2012 to see the dynamic mix of contraceptives. The fit model of contraceptive mix is formulated from data analysis of the year 2012. Samples taken are all married women aged 15-49 years. Respondents selected were then grouped in accordance with the range of reproductive age as follows:

Table 1: Respondent Group According of Age

GROUP	AGE
Group 1	15-19 years old
Group 2	20-35 years old
Group 3	36-49 years old

Respondents in each group were then categorized according to the number of children

Table 2: Respondent Categorize

GROUP	TOTAL OF CHILDREN
Group A	0 – 2 children
Group C	3 or more children

The next stage is formulating a recommended contraceptive in accordance with the raise of the age of marriage with the following details:

15-19: married women aged 15-19 years are categorized into the stage of delaying. The recommended contraceptive method is kondom, oral and pills¹⁴.

20-35: this is a period of gestation. Empirically age range 20-35 is the best time to get pregnant and give birth to a child. In principle all methods of childbirth can be used at this age except. In the PUP (*Pendewasaan Usia Perkawinan*) guide after the birth of the first child it is recommended to use IUD right away¹⁴. At this age the method of discharging MOW/MOP after having 3 or more children can also be chosen;

The age of over 35: this is the period to prevent pregnancy. The main contraceptive recommended for PUP age 35 years and above is MOW/MOP and the other option is the IUD to those who have 1-2 children¹⁴.

RESULTS

Analysis of methods of contraception are conducted on six provinces in Java island namely Jakarta, West Java, Central Java, Yogyakarta, East Java, and Banten. In 2003 contraceptive mixes in some provinces began to show skewness towards certain methods. West Java, Central Java and Banten province experienced skewness towards injection method. DKI Jakarta, Yogyakarta and East Java have not experienced skewness.

Table 3: Contraceptive Mix in Java Island in the Year 2003

Province	Pill	IUD	Injection	Condom	Female Sterilization	Male Sterilization	Norplant	TOTAL
DKI Jakarta	21,79	17,36	47,24	5,34	5,63	0,13	2,51	100
West Java	27,37	6,41	56,31	0,73	4,48	1,7	2,99	100
Central Java	14	9,98	51,99	1,88	8,63	1,22	11,64	100
Yogyakarta	12,03	30,77	35,89	5,59	9,92	0,59	4,99	100
East Java	20,81	17,49	42,12	1,23	9,46	0,25	8,37	100
Banten	19,04	8,6	60,8	1,89	3,04	1,55	4,87	100

Data from 2007 showed that skewed contraceptive mix was injection method in Central Java, West Java, East Java, and Banten provinces. The province with the most balanced contraceptive mix is the province of Yogyakarta.

Table 4: Contraceptive Mix in Java Island in the Year 2007

Province	Pill	IUD	Injection	Condom	Female Sterilization	Male Sterilization	Norplant	TOTAL
DKI Jakarta	24,36	11,67	48,03	6,27	4,74	0,62	3,82	100
West Java	32,15	8,72	51,15	2,6	2,55	0,69	2,13	100
Central Java	14,39	6,6	62,56	2,64	8,62	0,94	4,25	100
Yogyakarta	12,26	25,76	39,49	11,91	6,4	0,35	3,59	100
East Java	19,35	12,62	53,85	0,85	6,57	0,05	6,67	100
Banten	17,83	8,04	64,55	1,22	5,17	0,54	2,65	100

Data from 2012 show that contraception mix that experienced skewness was injection method in Central Java, West Java, East Java and Banten provinces. The province with a relatively balanced contraception mix was Yogyakarta.

Table 5: Contraceptive Mix in Java Island in the Year 2012

Province	Pill	IUD	Injection	Condom	Female Sterilization	Male Sterilization	Norplant	TOTAL
DKI Jakarta	24,05	12,03	48,87	5,1	7,23	0	2,56	100
West Java	27,61	6,93	55,15	2,51	5,26	0,09	2,34	100
Central Java	16,38	6,05	54,88	4,74	7,79	0,65	9,41	100
Yogyakarta	17,13	22,93	37,46	9,06	6,81	0	6,44	100
East Java	23,33	8,38	55,25	2,04	5,72	0,41	4,86	100
Banten	21,22	5,67	62,14	3,98	3,82	0,1	3,06	100

Hormonal contraceptive methods such as pills and injecting relatively dominant when compared to other methods. In the year 2003, skewness started to show towards the injection method. Skewness occurred until the year 2012. The province of East Java in 2003 has not experienced skewness, but in 2007 up to 2012 there was a skewness

towards injection methods. The proportion of contraceptive methods in DKI Jakarta and Yogyakarta was relatively stable from 2003 until the year 2012 and did not experience skewness.

Distribution of fertile women age and number of children in each province showed a relatively similar trend. Women aged 15-19 years were married in all provincial on average do not have children or have 1 or 2 children.

Women aged 20-35 years on average have yet to have children or have up to 2 children. Only a small percentage of the respondents have more than 2 children.

Table 6: Distribution of Age and Number of Children in each Province

Provinsi	Usia/ Jumlah Anak						TOTAL
	15-19		20-34		>35		
	0-2	>3	0-2	>3	0-2	>3	
DKI Jakarta	347		1044	58	547	395	2391
West Java	338		863	78	449	496	2224
Central Java	303		786	34	523	352	1998
Yogyakarta	218		587	25	498	191	1519
East Java	251		810	51	557	310	1979
Banten	343		867	95	313	450	2068

The result of the respondent’s calculation according to the age stages and the number of children is then calculated according to the appropriate contraception. The fit model for contraceptive mix obtained Yogyakarta province has the highest requirement in MOW / MOP method 29,78% then IUD, implant, injection, pill, and condom. East Java Province has the highest requirement of IUD method 35,59%, then MOW / MOP, implant, suntil, pill, and condom. Banten Province has the highest need in MOW / MOP method, IUD, injection, pill, implant, and condom.

Table 7: Fit Model of Contraceptive Mix in each Province According to Age and Number of Children

Provinsi	Pil	IUD	Suntik	Kondom	MOW/ MOP	Susuk
DKI Jakarta	15,74	23,56	15,74	4,83	29,17	10,91
West Java	10,14	22,75	10,14	5,07	34,14	9,70
Central Java	10,12	23,77	10,12	5,06	31,56	9,83
Yogyakarta	9,56	26,87	9,56	4,78	29,78	9,66
East Java	8,46	35,59	8,46	4,23	31,02	10,23
Banten	11,06	20,35	11,06	5,53	31,63	10,48

DISCUSSION

The contraceptive mix is the proportion of contraceptive methods in society. This proportion illustrates the choice of existing methods in society. The

misuse of the proportion of contraceptive use (method mix) is the condition of 50% or more of contraceptive users in a country using similar contraceptive devices¹⁵. In Java, skewness from 2003 to 2012 changed

significantly. In 2003 skewness started to show towards the injection method, the skew happened until 2012.

The shift in contraceptive mix is very important for governments, donor countries (donors) and researchers who study the dynamics of contraception¹⁶. Skewness can be influenced by a variety of factors. Some are influenced by sexual function perception, even research found there is no correlation between oral contraception with sexual function¹⁷. Another study conducted by Schoemaker in Indonesia mentioned to understand the reason women choose contraceptive methods can be seen from the desire to limit the number of children¹⁸.

The fit model for contraceptive mix model obtained in Jakarta Province shows that MOW/MOP method should be the highest priority with 29,17% requirement followed by IUD, injection method, pill, implant, and condom. West Java Province has the highest requirement in MOW / MOP method (34.14%) then IUD, injection method, pill, implant and condom. Central Java Province has the highest requirement of MOW / MOP (31,56%) then IUD (23,77%), injection and pill (10,12%) implantation (9,83%) and condom (5.0,0%).

Yogyakarta province has the highest requirement in MOW / MOP method 29,78% then IUD, implant, injection, pill, and condom. East Java Province has the highest requirement of IUD method 35,59%, then MOW / MOP, implant, suntil, pill, and condom. Banten Province has the highest need in MOW / MOP method, IUD, injection, pill, implant, and condom.

The difference between existing conditions and ideal contraceptive mix has some possibilities:

1. The first possibility is the lack of public knowledge in determining appropriate methods of contraception. Lack of community knowledge related to appropriate reproductive and contraceptive stages is caused by inadequate information from provider, formal knowledge or health promotion from the government.

2. A second possibility is inadequate access and services both in scope and in conformity with needs.

Providing appropriate contraceptive services to the needs and purposes of reproduction will have a major positive impact. If all women who want to avoid pregnancy get contraceptives according to their goals as well as all pregnant women and newborns get WHO standard health care, it is predictable that the number of

unwanted pregnancies will fall by 70%, the maternal mortality rate will drop by 67% the newborn's mortality rate will drop 77% and HIV-to-AIDS transmission from mother to newborn can be reduced to 93%¹⁹.

The fit model of mix contraceptive mix from this research can be used as a parameter to the provision of contraceptives in six Provinces on Java island. Supplies of the contraceptive method that corresponds to the needs that have been adapted to the stages of the reproduction and the number of children and supported by an increase in the knowledge society is expected to increase the scope and success of the family planning program, lowering unmet need numbers and supporting the community in meeting their reproduction rights.

CONCLUSIONS

Mix contraceptives in four provinces in Java island experience deviation towards the injection method. The fit model of mix contraceptive obtained differs significantly from the real conditions. It reflects that the public has yet to get a contraceptive and family planning services according to their needs. The Government should take real steps in order to meet contraceptive needs of society. Some ways to achieve this are as follows:

Increasing public knowledge by means of socialization and promotion in the field so that people can identify family planning with the right contraception needed;

The provision of contraceptives in accordance with the needs of the community;

Revitalizing family planning program especially in remote areas with difficult access to healthcare facilities.

Source of Funding: This study is fully supporting by Indexed International Publication Grant for University of Indonesia Student Final Project (PITTA).

Ethical Clearance: This research has passed the Ethics test by the Committee of Ethics Testing from the University of Indonesia. SDKI data used include Informed Consent for each respondent. Permit the use of the data has been obtained from DHS through the email associated with it.

Conflict of Interest: Nil

REFERENCES

1. Central Intelligence Agency. Country comparison: Total fertility rate [Internet]. Cia.Gov. 2016.
2. Badan Pusat Statistik, Badan Koordinasi Keluarga Berencanaan Nasional, Departemen Kesehatan, Macro International. Survei Demografi dan Kesehatan Indonesia 2012. Sdki. 2013;16.
3. Rate F. Analisis Fertilitas Hasil Sensus Penduduk 2010. 2017;(Bongaarts 2005):2015–7.
5. Magadi MA, Curtis SL. Trends and Determinants of Contraceptive Method Choice in Kenya. 1995.
6. Polis CB, Bradley SEK, Bankole A, Onda T, Croft T, Singh S. Contraceptive Failure Rates in the Developing World: An Analysis of Demographic and Health Survey Data in 43 Countries. Guttmacher Inst [Internet]. 2016;(March):1–75.
7. Bongaarts J, Johansson E. Future Trends in Contraception in the Developing World: Prevalence and Method Mix. Vol. 33, Population and Development Review 141. 2002. p. 25–30.
8. Bulatao R, Powell V, Palmore J a., Ward SE. Choosing a Contraceptive: Method Choice in Asia and the United States. Vol. 19, Contemporary Sociology. 1989. 414 p.
9. Bruce J. Fundamental elements of the quality of care: a simple framework. [Internet]. Vol. 21, Studies in family planning. 1990. p. 61–91.
10. Survey H. Demographic and Health Survey 2002-2003. 2003.
11. Hull TH, Mosley H. Revitalization of family planning in Indonesia. 2009;(February).
12. Polis CB, Bradley SEK, Bankole A, Onda T, Croft T, Singh S. Typical-use contraceptive failure rates in 43 countries with Demographic and Health Survey data : summary of a detailed report. Elsevier [Internet]. 2016;94(1):11–7.
13. Seiber EE, Bertrand JT, Sullivan TM. Changes in contraceptive method mix in developing countries. Int Fam Plan Perspect. 2007;33(3):117–23.
14. Badan Koordinasi Keluarga Berencanaan Nasional. Pendewasaan usia perkawinan dan hak-hak reproduksi bagi remaja indonesia. 2008.
15. Ross J, Keesbury J, Hardee K. Trends in the contraceptive method mix in low- and middle-income countries: analysis using a new "average deviation" measure. Glob Heal Sci Pract [Internet]. 2015;3(1):34–55.
16. Bertrand JT, Sullivan TM, Knowles EA, Zeeshan MF, Shelton JD. Contraceptive method skew and shifts in method mix in low- and middle-income countries. Int Perspect Sex Reprod Health. 2014;40(3):144–53.
17. Hajian S, Sheikhan Z. Comparison of sexual function in oral contraception pills and Condom in women referring to health centers of Tehran Shahid Beheshti University of Medical Sciences. Iran J Obstet Gynecol Infertil. 2015;18(167):8–15.
18. Juan B, Schoemaker J. Contraceptive Use Among the Poor in Indonesia. 2003;106–14.
19. Susheela Singh Jacqueline E. Darroch Lori S. Ashford. Adding it up The Cost Benefits of Investing in Sexual an Reproductive Health 2014. Guttmacher Institute. 2014.

The Analysis of Safety Culture of Welders at Shipyard

Rizky Maharja¹, Abdul Rohim Tualeka¹, Tjipto Suwandi²

¹Departement of Occupational Health and Safety, Faculty of Public Health, Airlangga University, Surabaya, Indonesia, ²The Indonesian Association of Occupational Health and Safety, Jakarta Pusat, Indonesia

ABSTRACT

Welding have several potential to cause work accidents. Therefore, it is necessary to prevent work accident, one of them through safety culture. Safety culture is made up of three factors: psychological factors, job factors, and situational factors. The purpose of this study is to analyze safety culture based on the factors of safety culture in welders in shipyard company. This research was an observational research using cross-sectional design. The variables were safety climate, safety behavior, and safety culture. The results showed that most respondents had a very good perception of OSH and the safety climate profile was in a good category, most respondents had good safety behavior and safety behavior profile was in a good category. In addition, most respondents had a very good safety culture and profile of safety culture was 74,89% and in a good category. Based on these results, it is expected to develop the safety culture and make some efforts to improve the safety behavior of welder. The management of this shipyard company may take action to perform an analysis of safety culture level as a form of oversight of the existing safety culture.

Keywords: *safety culture, safety climate, safety behavior, welder, shipyard*

INTRODUCTION

Work accident is an unexpected incident that can cause loss, both of direct loss and indirect loss that affect workers, property, and production process¹. Work accident can happen in entire work, include welding. Welding has several hazards including light hazard, smoke and welding gas, noise, heat, electric current hazard, fire hazard, and explosion hazard that can cause work accidents⁴. A Study have reported that welding is ranked second as work that can be causing workers to have eye injuries². Also, every year there are 100 welding workers injured during welding process, which are 25 of them suffered serious injuries³

Therefore, it is necessary an effort to prevent the work accident, one of them is through safety culture⁵.

Safety culture is included in a sub-component of an organizational culture that directly related to individuals, job, and organizations that have a role and influence in safety and health⁶. Safety culture is formed by 3 factors: psychology or individuals factor is measured by safety climate (perception), job factor is measured safety behavior observations, and situational factor is measured by the audit or inspection of safety management system⁷

The purpose of this study is to analyze safety culture based on the factors of safety culture, so it can be done the development of safety culture as an approaching form of work accident prevention on welders during work up to retirement and can improve the performance of welding workers in work.

MATERIAL AND METHOD

This research was an observational research using cross-sectional design. Research location was in the Division of Warship in a shipyard company. Participants were 58 welders. The variables studied were safety climate, safety behavior, and safety culture. Safety climate was used the Nordic Occupational Safety Climate Questionnaire (NOSACQ-50), safety culture was measured by questionnaire from the Workcover

Corresponding author:

Abdul Rohim Tualeka

Lecturer in Occupational Health and Safety
Department, Public Health Faculty, Airlangga
University, Surabaya, 60115, Indonesia
Tel: +62 31 5920948/ +6281333519732
Fax: +62 31 5924618 E-mail: inzut.tualeka@gmail.com

New South Wales, and safety behavior was observed for 15-20 minutes in each worker twice for 2 days. Besides that, the safety management audit result data was obtained from audit results conducted by the company. All of the questionnaires were calculated by the validity and reliability test.

FINDINGS

Safety Climate Factor of Welders

Table 1. The Frequency Distribution of Respondent's Safety Climate

Variable	Category	Percentage (%)
Safety Climate	Very good	29.3
	Good	25.9
	Poor	17.2
	Very Poor	27.6

Table 1 shows that most of the respondent has a very good perception of OSH as many as 29.3%. The percentage of the safety climate is:

The percentage shows that the safety climate profile is in a good category.

Safety Behavior Factor of Welders

Table 2: The Frequency Distribution of Respondent's Safety Behavior

Variable	Category	Percentage (%)
Safety Behavior	Good	41.4
	Enough	25.9
	Poor	32.8

Table 2 presents that most of the respondents have a good safety behavior as many as 41.4%. The percentage of the safety climate is:

The percentage shows that the safety behavior profile is in a good category.

Safety Culture of Welders

Table 3: The Frequency Distribution of Respondent's Safety Culture

Variable	Category	Percentage (%)
Safety Culture	Very good	53.4
	Good	46.6

Table 3 explains that most of the respondents have a very good safety culture on aspects of training and supervision, safe working procedures, consultation and communication, safety reporting, management commitment, injury management and return to work.

Table 4: The Safety Culture Profile

Factors	Percentage (%)	Safety Culture Profile
Safety Climate	75%	74.89%
Safety Behavior	64.14%	
Audit of OSH Management	85.54%	

Based on the percentage of safety climate (75%), safety behavior (64.14%), and audit result of OSH management system (85,5%), the average score of safety culture is 74,89%. Table 4 reveals that safety culture profiles at a good level.

DISCUSSION

Safety Climate of Welders

Safety climate is an individual factor in safety culture. Safety climate was the worker's perception of occupational safety and health in the workplace⁹. Based on the research results obtained that most of the respondents have a good safety climate. This indicates that the respondents have a good perception related to occupational safety and health in workplace, particularly related to safety management priorities, commitment and competencies, management authority on safety, equity management in safety, workers commitment to safety, safety workers priorities and risk-taking, learning, safety communication, and trust in competence, workers believe in the ability of the safety system.

Based on interviews, most of the respondents considered that everything that management do related to OSH aims to avoid the work accidents and to protect workers from hazards potential during the welding process. This indicates that respondents have positive responses to the OSH efforts conducted by the management. The safety climate indicated a real cultural indication in the organization¹⁰. The current study found that creating an appropriate and positive safety climate would further motivate workers to pay more attention to activities related to occupational safety and health compared with the negative safety climate¹¹. The perception was a dynamic and changeable thing⁶. So that one's view would change if the environment changes¹². Therefore, the management should create possible conditions that enable the perception of workers to be better so that OSH program could be effective in the implementation.

One of the efforts that can be done to create a positive safety climate is to create a good and complete OSH management system. This is caused by safety climate gave a subjective assessment of various safety characteristics, while the safety management system tends to provide objective evidence⁷. This shows that safety climate and safety management system complete each other. Besides that, changes in the safety management system would effect to the worker's perception⁶. Therefore, the management should create and maintain a good safety management system. Safety management system was a system used to manage all aspects of OSH in the company¹³. Implementation of OSH management is an absolute thing to be done because the government has obliged this through legislation. This company has implemented OSH management well. This was proved by the result of OSH management audit that shows the achievement with a percentage of 85,54%. This result proved that entire levels of workers in this company were committed and support the implementation of OSH in the workplace.

Safety Behavior of Welders

Safety behavior is job factors in safety culture. Safety behavior which was the focus of this research was the use of the correct PPE and appropriate with the procedure in the welding process. Welding process had several hazard potential that was health and safety hazards. Health hazard obtained from welding gas, noise, vibration, and ergonomic, while safety hazards

consist of fire and explosion, lack of oxygen in confined spaces, electricity, slipping and falling¹⁴.

The potential hazards of the welding process could be minimized by using PPE. Personal Protective Equipment (PPE) is one tool that had the ability to protect someone which function was to isolate part or whole body from potential hazards in the workplace. The PPE used in welding process appropriate to the prevailing standard procedure in the Division of Warship are helmets, work clothes or coverall, stiwel or foot protector, safety shoes, long leather gloves, leather apron, hand/head cap, head sheat, welding respirator, hand sheat, and ear plug.

The result of the research shows that most of the respondents have good enough safety behavior in the use of PPE. The most commonly used PPE by respondents are helmets, work clothes, safety shoes, long leather gloves, leather apron, hand/head cap, welding respirator, and hand cover. However, there is still PPE that is rarely used by the respondents such as earplug, stiwel, and leather apron. A small percentage of respondents rarely use earplug because they feel disturbed and uncomfortable. The respondents also rarely use stiwel because they feel enough use work clothes and safety shoes. While leather apron is used in certain working position and the management does not provide leather apron in accordance with the number of workers due to economic reason. Helmets are rarely used during the welding process because the head cap form is not possible to use a helmet, so the helmet is used except that work or after finish the welding process. Besides that, some PPE also used imperfectly, for example, the head sheat is not buttoned so that it still has the potential to be exposed by fire sparks, not using black glass that can cause visual disorder due to welding light, and not be hooking the helmet.

Based on the observation, respondents realize are aware of the importance of using PPE for example immediately replace the filter mask if it is dirty or unfit for use and replace the gloves if there is a hole or tear. While research, filter mask for welding runs out so that the workers use two fabric masks inserted into the mask as a replacement. This indicates that workers are aware and willing to perform safety behavior, but the availability of PPE facilities is still awaiting purchase and distribution.

Safety Culture of Welders

Safety culture was the value of individuals and groups, perceptions, attitudes, competencies, and behaviors that can determine the running of OSH management system in company¹⁵. In addition, safety culture was the impact of the organization that influenced attitudes and workers behavior associated with risks at work¹⁰. The results show that most of the respondents have a very good safety culture related to the six aspects of safety culture. The six aspects are training and supervision, safe working procedures, consultation and communication, safety reporting, management commitment, injury management and *return to work*.

The six aspects show that respondents judge everything done by the management to improve OSH at work has been very good. Based on them, it can be concluded that safety culture is good or strong. The literature said that management's behavior in strong safety culture could be seen in all decision taken considering related risk aspect, safety became the main part from company tried to understand the risks that could arise and the solution that can be given, provided appropriate resources with job risks, able to learned from experience of OSH problems faced, and made efforts to improve the poor performance of OSH¹².

In addition to the six aspects described above, safety culture was sub-component from the organizational culture that was an interaction from safety climate, safety behavior, and audit of OSH management system⁷. Based on the percentage of these three aspects obtained the safety culture profile in a good category in the Division of Warship. Safety culture in a good category was a positive safety culture. The reference said that characteristics of positive safety culture are open communication and feedback on suggestions and inputs to all levels in organization, all workers focused on all things that could prevent work accident to happen as well as the disease because of work, there is commitment of entire workers and the management in following all the rules and the process to created an healthy and safety work environment, prioritizing safety factors from all factors that could affect the performance of the company, and all workers were appreciated and protected¹⁶.

Safety culture in the good category also indicates that the scope of each forming factor is good and integrated. This indicates that each of these factors interconnects and interacts with each other. These

findings were in line with the previous study that there was an interrelationship between safety climate and safety behavior, safety behavior and OSH management system, and safety climate and OSH management system⁷. These result also further support the idea that safety culture was formed from a set of components of belief, motivation, personality skills, and intelligence, behavior, and environment¹⁰.

Besides that, safety culture is a concept that involved the human aspect that had internal aspects that were not visible (mind/perception) and observable external aspects (behaviors) that are within a social context (organization)¹⁶. *Business Process Model of Safety Culture* indicated that safety climate, safety behavior, and OSH management system were combinations of inputs in the process of establishing a safety culture⁸. Therefore, this three factors can't stand alone, so the representation of the safety culture should involve this three factors and not only use one indicator from one of that factors.

Although the safety culture results have shown the good results, still needed efforts to develop the safety culture. Culture concept, in general, is adaptive that could change according to human needs¹⁷. Based on this, it can be concluded that safety culture can be developed, formed, or created in accordance with the goals and characteristics of the company. According to the previous study said that in the development of safety culture needed to pay attention to several things that the measurement of safety behavior, observation of worker's readiness, observation of work environment condition, and management commitment¹⁸. Besides that, development is done by various ways, for example through the leadership approach, Behavioral Based Safety (BBS) program, integration of OSH management system, improves supervision and etc¹⁶. Also, it is necessary to analyze the power of OSH culture aimed at understanding the shifting mindset and behavior from time to time, so that the safety culture can develop well and mature.

CONCLUSION

This study has shown that the safety culture of welders in shipyard company was excellent and the percentage of safety culture profile is in a good category it means that all forming factors of safety culture that are individual factors, job factors, and situational factors interconnected and interact with each other.

The management of this shipyard company may take action to perform a level of analysis or a safety culture ladder as a form of oversight of the existing safety culture. This study was not possible to assess safety climate, safety behavior, and safety culture at each level of workers. So, further research needs to measure them at each level of workers to get more varied results and can be compared with others, so that can be determined the best solution in developing the safety culture in the future.

Conflict of Interest: None

Source of Funding: Self

Ethical Clearance: This study was approved by Health Research Ethics Committee, Faculty of Public Health, Airlangga University

REFERENCES

1. Tarwaka. Dasar-Dasar Keselamatan Kerja Serta Pencegahan Kecelakaan Di Tempat Kerja. Surakarta: Harapan Press. 2012.
2. Wahyuni, A. Sri S. Keluhan Subjektif Photokeratitis Pada Tukang Las Bogor, Bandung. Skripsi. Bandung: Fakultas Ilmu Masyarakat, Universitas Indonesia. 2012.
3. Japan Ministry of Health, Labor, and Welfare. A Safety Manual for Technical Intern Trainees: Preventing Accidents While Engaged in Welding and Related Operations. Ministry of Health, Labour, and Welfare. Japan. Preventing Accidents While Engaged in Welding and Related Operations; 2012 [updated 2012 March; citaced 2017 December 5]. Available form: https://www.jitco.or.jp/download/data/saigaibousi_English.pdf
4. American Federation of State, County, and Municipal Employees. Welding Hazards [Internet]. AFSCME Research and Collective Bargaining Department, Health, and Safety Program; 2011 [updated 2011 September; citaced 2017 6 September]. Available from: <https://www.afscme.org/news/publications/workplace-health-and-safety/fact-sheets/pdf/Welding-Hazards-AFSCME-fact-sheet.pdf> (sitasi 6 September 2017)
5. Hudson, P.T.W. Implementing A Safety Culture in A Major Multi-National. 2007. *Safety Science* (45):697-722.
6. Cooper, D. Improving Safety Culture: A Practical Guide. United Kingdom: Applied Behavioral Science. 2001.
7. Cooper, M.D. Towards A Model of Safety Culture. *Applied Behavioural Science* (36):111-136
8. Cooper, D. Surfacing Your Safety Culture. Proceedings Major Hazards Commission at The Federal Ministry of Environment: Human Factors Conference. 2002.
9. Zohar, D. Safety Climate in Industrial Organizations: Theoretical and Applied Implications. 1980. *Journal of Applied Psychology* 65 (1):96-102
10. Guldenmund, F.W. The Nature of Safety Culture: A Review of Theory and Research. 2000. *Safety Science* (34):215-257
11. Lisnanditha, Y. Pengaruh Kepemimpinan, Budaya Keselamatan Kerja, dan Iklim Keselamatan Terhadap perilaku Keselamatan Kerja: Studi Kasus di PT. Krama Yudha Ratu Motor [Internet]. Univeritas Indonesia; 2012 [updated 2012; citaced 2017 November 30]. Available from: <http://lib.ui.ac.id/file?file=digital/20318379-S-Yudithia%20Lisnanditha.pdf>
12. Gunawan, F.A. Safety Leadership: Kepemimpinan Keselamatan Kerja. Jakarta: Penerbit Dian Rakyat. 2013.
13. Ramli, S. SMART SAFETY: Panduan Penerapan SMK3 yang Efektif. Jakarta: PT. Dian Rakyat. 2013
14. Health and Safety Executive. Health and Safety at Work: Summary Statistic for Great Britain [Internet]. Health and Safety Executive; 2016. [updated November 2016; citaced 2017 July 2017] Available from: <http://www.hse.gov.uk/statistics/overall/hssh1516.pdf?pdf=hssh1516>
15. International Atomic Energy Agency. Safety Culture: A Report by The International Nuclear Advisory Group. Vienna: International Atomic Energy Agency. 1991.
16. Tarwaka. Keselamatan, Kesehatan Kerja, dan Ergonomi (K3E) dalam Perspektif Bisnis. Surakarta: Harapan Press. 2015.
17. Indrawijaya, A.I. Teori, Perilaku, dan Budaya Organisasi. Bandung: PT Refika Aditama. 2015.
18. Amirah, N.A., Asma, W.I., Muda, M.S., Aziz, W.A., dan Amin, W. M. Safety Culture in Combating Occupational Safety and Health Problems in the Malaysian Manufacturing Sectors. 2017. *Asian Social Science*. Vol9. No.3. 2013.

The Mediation Effect of Emotional Labor between Customer Orientation and Posttraumatic Growth

Eun-Kyung Lee¹, Jin-Hwa Park¹

¹Assistant Professor, College of Nursing, Daegu Catholic University

ABSTRACT

Purpose: This study aimed to identify the mediating effect of emotional labor in the relationship between customer orientation and posttraumatic growth among Korean emergency nurses. **Method:** A cross-sectional study design was used. Participants were 135 registered nurses working in the emergency room of four tertiary hospitals in Korea. Data were collected through convenience sampling using self-reported questionnaires. Data were analyzed using hierarchical regression and Sobel test. **Results:** Customer orientation was positively associated with posttraumatic growth and emotional modulation efforts in profession. Emotional modulation efforts mediated the relationship between customer orientation and posttraumatic growth. **Conclusion:** The findings provide evidence for emotional modulation efforts in profession as a factor that buffer effects of customer orientation on posttraumatic growth.

Keywords: *Customer orientation, Emotional labor, Growth, Nurse, Trauma*

INTRODUCTION

Customer orientation means that a service provider performs all offering actions according to customers' needs and requests.¹ In an organization where jobs are done in face-to-face activities, customer orientation is classified as a critical organizational management strategy because it enables organizations to achieve their goals effectively, by identifying customer needs and achieving customer satisfaction.² This trend is expanded to the medical circle so that customer orientation is emphasized in hospitals.³ According to the previous studies, customer orientation influences productivity of hospital and a qualitative improvement in nursing service⁴, and effectively reduces patients' psychological anxiety.⁵ Therefore, nurses' customer orientation is of very importance in terms of hospital's competitiveness security and a qualitative improvement in nursing service

Nurses in emergency departments tend to work hasty in order to prepare for an urgent situation so that

they have difficulty listening to and sharing the requests and problems of patients or their caregivers.⁶ Moreover, they are exposed to verbal violence of patients or their caregivers.⁷ In this circumstance, nurses suppress their feelings or experience emotional labor, their effort to overcome a situation on the basis of their vocation as nurse.⁸

Nurses' emotional labor works as the predisposing factor of job burnout and turnover intention, and produces negative effects like their lowering intention to keep the current nursing job, and therefore, it is classified as the concept requiring intervention.^{9,10,11} Most studies on nurses' emotional labor made use of the tool modified on the basis of the tool developed for hotel employees⁹. Since the sub factors of the tool are the frequency of emotional labor, a level of attention by emotional display norm, and emotional dissonance¹², there is a limitation in measuring the attributes of nurses' emotional labor accurately. Hong reported nurses' emotional labor by two attributes, which one is nurses' effort to feel their actual emotion to express and the other is their effort to express the emotion inconsistent with their actual emotion.⁸ Nursing with their hiding an actual emotion lowers job satisfaction, whereas the expression of their true inner emotion increases job satisfaction.¹³ Therefore, it is expected that each attribute of emotional

Corresponding author:

Jin-Hwa Park,

Assistant Professor, Daegu Catholic University, 33, Duryugongwon-ro, 17-gil, Nam-gu, Daegu, Korea

labor influences nurses differently.

If exposed to stress situations repeatedly, nurses feel skepticism and despair of their existence, and lose a hope¹⁴, but positive changes may also occur, which is called posttraumatic growth.¹⁵ The trauma defined in posttraumatic growth is a crisis event perceived subjectively by a person who already experienced trauma.¹⁶ Nurses in emergency departments care for patients who have suicidal accidents, and are exposed to violent crimes⁶, so that they experience relatively more trauma than nurses in wards. Given the point that the cognitive process of a person experiencing a traumatic event influences posttraumatic growth (Han, 2016), it can be expected that there will be a difference in posttraumatic growth depending on the attributes of emotional labor experienced by nurses.

In the previous studies related to the variables in this study, most of researches are looking for the influencing factors on customer orientation or relations between customer orientation and nursing productivity.^{4,17,18} As a result, it was difficult to find the influence of customer orientation on each nurse. And most studies on nurses' emotional labor made use of the tool modified on the basis of the tool developed for service employees, and therefore there was a limitation in analyzing domestic nurses' emotional labor⁹. It is difficult to find a research on nurses' posttraumatic growth, and most studies were conducted with ordinary people who experienced trauma¹⁹. Most studies focused on structural analysis on the influence of cognitive coping and social support on posttraumatic growth on the basis of posttraumatic growth model^{20,21}.

The purpose of this study is to analyze the mediating effect of each attribute constituting emotional labor on the relation between two attributes with the use of the emotional labor tool developed for domestic nurses.

METHOD

Participants

A convenience sample of emergency center nurses was recruited from four tertiary hospitals in Korea. To determine the appropriate number of participants, we calculated the sample size using the G*Power 3.1.0 program. A power analysis determined that a minimum 131 participants were needed to obtain statistically significant results.

After completing the questionnaire survey, five respondents were excluded due to incomplete data or lack of response. A total of 145 nurses received a self-administered questionnaire. In total, 140 nurses returned the questionnaire. Data from five respondents were excluded from the analysis due to incomplete data or lack of response. Therefore, data of 135 nurses were included in the final analysis.

Measurements

Customer orientation was measured using 12-items SOCO (Selling orientation, Customer orientation).¹ The instrument was translated into Korean and modified for nurse.²² All items were measured using a 5-point Likert scale from 1 (never) to 5 (always), where higher scores indicated stronger customer orientation. Cronbach's alpha coefficient was reported 0.86¹ and 0.96²². This study showed Cronbach's $\alpha=0.89$.

Emotional labor was measured using 16-items emotional labor for nurses in Korea.⁸ This scale divides the nurses' emotional labor from the efforts in emotional harmony and the control of emotional disharmony. The effort in emotional harmony consists of one factor, emotional modulation efforts in profession. The control of emotional disharmony consists of two factors, patient-focused emotional suppression and emotional pretense by norms. All items were measured using a 5-point Likert scale. The scale has three factors: 7-item emotional modulation efforts in the profession, 5-item patient-focused emotional suppression, and 4-item emotional pretense by norms. Higher scores indicated stronger emotional labor. Hong reported Cronbach's alpha coefficients for sub-factors of .80, .77, and .69, respectively.⁸ In this study, Cronbach's alpha were 0.83, 0.84, and 0.72 respectively.

Posttraumatic growth was measured using 16 items Korean version of the posttraumatic growth inventory (K-PTGI). PTGI originally was developed by Tedeschi and Calhoun.⁸ The K-PTGI has been translated into Korean and modified and has been proven to be a valid and reliable tool within in the Korean population.²³ The adapted K-PTGI has four factors: 6-item changes of self-perception, 5-item the increase of interpersonal depth, 3-item finding new possibilities, and 2-item the increase of spiritual interest. Item responses ranged from 0 (no change) to 5 (high degree of change). Higher scores indicate greater levels of growth. Cronbach's alpha

coefficient was measured 0.94.²³ In the current study, the internal reliability coefficient was 0.91.

Ethical consideration

This study was approved by the Institutional Review Board of D university (CUIRB-2017-0022).

DATA ANALYSIS

The analyses were performed using IBM SPSS Statistics 19.0. Descriptive statistics, correlation analysis and hierarchical regression analysis were used. To test mediation effect of emotional labor, the guidelines provided by Baron and Kenny (1986) were followed. To estimate the mediation effect, Sobel test was used.

RESULTS

Table 1 shows the general characteristics and table 2 shows the score of variables.

Posttraumatic growth was positively correlated with customer orientation ($r=.51, p<.001$), emotional modulation efforts in profession ($r=.55, p<.001$), patient-focused emotional suppression ($r=.17, p=.047$), and emotional pretense by norms ($r=.27, p=.002$). Customer orientation was positively correlated with emotional modulation efforts in profession ($r=.66, p<.001$).

Table1. Differences in PTG according to General Characteristics (N=136)

Characteristics	Categories	n(%) or M±SD
Age (years)		29.24±5.34
	≤25	40(29.4)
	26-30	50(36.8)
	31-35	31(22.8)
	≥36	15(11.0)
Gender	Female	124(91.2)
	Male	12(8.8)
Marital status	Married	33(24.3)
	Single	103(75.7)
Education level	Diploma	27(19.9)
	Bachelor	99(72.8)
	Master	10(7.4)
Work experience (years)	Average	6.12±5.09
	≤1	15(11.0)

Cont... Table 1

	1-≤3	29(21.3)
	3-≤6	39(28.7)
	>6	53(39.0)
Emergency work experience (years)	Average	3.86±3.21
	≤1	27(19.9)
	1-≤3	40(29.4)
	3-≤6	47(34.6)
	>6	22(16.2)

Table 2. Descriptive Statistics of Variables (N=136)

Variables	Item	Item M	±	SD	Range
Customer orientation	12	3.58	±	0.44	1-5
Emotional labor	16	3.27	±	0.40	1-5
Emotional modulation efforts in profession	7	3.41	±	0.49	1-5
Patient-focused emotional suppression	5	3.21	±	0.70	1-5
Emotional pretense by norms	4	3.10	±	0.52	1-5
Posttraumatic growth	16	2.57	±	0.65	0-5
Relating others	5	2.75	±	0.76	0-5
Changed perception of self	6	2.75	±	0.71	0-5
New possibilities	3	2.80	±	0.87	0-5
Spiritual change	2	1.28	±	1.29	0-5

In this study, all of the basic assumptions of regression were met. In the first step, customer orientation (independent variable) predicted the posttraumatic growth (dependent variable) ($\beta=.51, p<.001$). In the second step, customer orientation significantly predicted emotional modulation efforts in profession (mediator) ($\beta=.66, p<.001$). Patient-focused emotional suppression ($\beta=.06, p=.595$) and emotional pretense by norms were not predictors of posttraumatic growth ($\beta=.04, p=.200$). In the third step, when both customer orientation and

emotional modulation efforts in profession entered, emotional modulation efforts in profession significantly predicted posttraumatic growth ($\beta=.37, p<.001$). In the final step, when emotional modulation efforts in profession entered into the equation between customer orientation and posttraumatic growth, the β weigh for customer orientation was reduced ($\beta=.26, p<.001$). The

results indicated that emotional modulation efforts in profession partially mediated the effects of customer orientation on posttraumatic growth. A sobel test also verified that the mediating effect of emotional modulation efforts in profession was significant ($Z=6.29, p<.001$).

Table 3. Correlations among Variables (N=136)

	CO	EMEP	PFES	EPN
	r (p)	r (p)	r (p)	r (p)
Emotional modulation efforts in profession	.66(<.001)	1		
Patient-focused emotional suppression	.05(.595)	.18(.034)	1	
Emotional pretense by norms	.11(.200)	.27(.002)	.27(.002)	1
Posttraumatic growth	.51(<.001)	.55(<.001)	.17(.047)	.27(.002)

CO=Customer orientation; EMEP=Emotional modulation efforts in profession; PFES=Patient-focused emotional suppression; EPN=Emotional pretense by norms

Table 4. Mediating Effect of Emotional Labor between Customer Orientation and Posttraumatic Growth (N=136)

Equations	B	β	t	p	Adj. R²	F	p
1. CO→ PG	.99	.51	6.81	<.001	.26	46.34	<.001
2. CO→ Emotional labor							
CO→ EMEP	.44	.66	10.05	<.001	.43	100.98	<.001
CO→ PFES	.03	.06	0.53	.595	.01	0.28	.595
CO→ EPN	.05	.04	1.29	.200	.01	1.66	.200
3. CO, EMEP→ PG					.33	33.65	<.001
CO→ PG	.52	.26	2.81	.006			
EMEP→ PG	1.10	.37	3.98	<.001			
				Sobel test: $Z=6.29, p<.001$			

DISCUSSION

The posttraumatic growth of the subjects in this study scored 2.59 points, lower than the points (2.62) of Chinese nursing university students²⁴, the points (3.05) of psychiatric nurses overseas, and the points (3.31) of local nurses²⁵. According to the research on mental health social workers’ posttraumatic growth, as they experience more trauma in work, their posttraumatic growth is more impeded.²⁶ Accordingly it is possible to infer that such a difference was made by the fact that trauma experiences of nurses in emergency departments were more than those of the subjects in previous studies. Nevertheless, in this study, there was no difference in

posttraumatic growth depending on clinical career and nursing career in emergency departments. In the research on nurses in emergency departments, nursing career in emergency departments was not related to posttraumatic growth, and nurses with more than 11 years of clinical career had high posttraumatic growth.²⁰ The result of this study, posttraumatic growth of nurses in emergency departments was not different depending on their nursing career in emergency departments.

Given the definition of posttraumatic growth which is a qualitative change beyond a previous level of adaptation in an extremely stress situation,¹⁶ it is too bad to see the low posttraumatic growth of nurses

in emergency departments. Such nurses need to see patients with traffic accidents, falling accidents, and suicidal attempts as they are, and experience many conflicts with medical staff in the process of saving their life.⁶ Therefore, it is necessary to make an active effort to find a plan for changing their experience in a desirable direction beyond their stress disorder.

In this study, customer orientation influenced only emotional modulation efforts in profession. This result shows that nurses' effort to assess patients' requests and provide proper nursing leads to the positive direction of emphasizing patients with professional attitudes as nurse and expressing their emotions properly depending on situations, rather than the direction of suppressing or pretending emotions. Previous studies reported that customer orientation was related to the achievement of hospital goal, a qualitative improvement in nursing service, and work performance.^{4,18} As patients and their caregivers demand better medical service, the importance of customer orientation is emphasized in a clinical setting.³ However, since customer orientation increases nurses' job stress⁴ and lowers their job engagement,²² it is hard to emphasize customer orientation of individual nurses. Given the point that customer orientation positively influences deep acting effective at alleviating burnout²⁷, this study result is meaningful in the aspect of nursing organization operation.

Customer orientation was an influential factor on posttraumatic growth, and emotional modulation efforts in profession had the partial mediating effect on the relation between two variables. It means that in the same level of customer orientation, posttraumatic growth can be different depending on emotional modulation efforts in profession. According to the research on school nutritionists, as they accepted and reacted others' emotions in the cognitive analysis process, their deep acting was able to improve²⁸. Therefore, it is necessary to find relations between nurses' empathy, emotional modulation efforts in profession, and posttraumatic growth, and to analyze the effect of an empathy improvement program.

This study is meaningful in the aspect that it found relations between customer orientation and posttraumatic growth and analyzed the role of emotional modulation efforts in profession among the attributes of emotional labor in relations between customer orientation and posttraumatic growth, which has not been studied in

previous studies.

Conflict of Interest: No conflict of interest.

Source of Funding: Deagu Catholic University

Ethical Clearance: Obtaining the Institutional Review Board of D university (CUIRB-2017-0022)

REFERENCE

1. Saxe R, Weitz BA. The SOCO scale: A measure of the customer orientation of salespeople. *Journal of Marketing Research*. 1982; 19(3): 343-351.
2. Kotler, P. *Marketing Management*. 11ed, N.J: Prentice-Hall, Inc; 2003.
3. Hudak PL, McKeever P, Wright JG. The metaphor of patients as customer: implications for measuring satisfaction. *J Clin Epidemiol*. 2003;56(2):103-108.
4. Yeo, AR, Lee H, Jin H, Factors of associated with customer orientation and nursing productivity. *J Korean Acad Nurs Adm*. 2014;20(2):167-175.
5. Ko JJ, Suh YH, Kim YH. The impact of physician and nurse customer-orientation on customer psychological anxiety. *Korean journal of Business Administration*. 2005; 18(4):1789-1806.
6. Ha JH, Park HS, An ethnography on daily lives of nurses in emergency departments. *J Korean Acad Fundam Nurs*. 2016;23(4):448-459.
7. Kim YO, Yi YJ. Influence of verbal abuse on job stress for special unit nurses and general ward nurses in general hospitals. *J Korean Acad Nurs Adm*. 2017;23(3):323-335.
8. Hong JY. Development and validation of the emotional labor scale. [dissertation]. [Seoul]. Ewha Womans University;2016
9. Kim SH, Ham Y. A meta-analysis of the variables related to the emotional labor of nurses. *Journal of Korean Academy Nursing Administration*. 2015;21(3):263-276.
10. Kim JS, Jeong SY, Kim SH, Kim JO, Predictors of emotional labor and job stress on burnout of nurses in long-term care hospitals. *J Korean Gerontol Nurs*. 2014;16(2):130-140.
11. Liang HY, Tang FI, Wang TF, Lin KC, Yu S, Nurse characteristics, leadership, safety climate, emotional labour and intention to stay for nurses:

- a structural equation modelling approach. *J Adv Nurs*. 2016;72(12):3068–3080.
12. Morris JA, Feldman DC. The dimensions, antecedents, and consequences of emotional labor. *Academy of Management Review*. 1996;21(4):986-1010.
 13. Park SK, A effect of emotional labor strategy on job satisfaction, organizational citizenship behavior and turnover intention in hospital female nurses. [*Journal of Marketing Studies*. 2016. 24(2), 21-41. dx.doi.org/10.21191/jms.24.2.02
 14. Hwang YY, Park Y, Park S. Experience of workplace violence among intensive care unit nurses. *Korean J Adult Nurs*. 2015;27(5):548-58.
 15. Tedeschi RG, Calhoun LG. The posttraumatic growth inventory: Measuring the positive legacy of trauma. *Journal of Traumatic Stress*. 1996;9(3):455-472.
 16. Tedeschi RG., Calhoun LG. Posttraumatic growth: conceptual foundations and empirical evidence. *Psychological Inquiry*. 2004;15:1-18.
 17. Gountas S, Gountas J. How the ‘warped’ relationships between nurses’ emotions, attitudes, social support and perceived organizational conditions impact customer orientation. *J Adv Nurs*. 2016;72(2):283-293.
 18. Oh HS, Wee H, Self efficacy, organizational commitment, customer orientation and nursing performance of nurses in local public hospitals. *J Korean Acad Nurs Adm*. 22(5), 2016.12, 507-517.
 19. Kim JK, Chang HA. Research on posttraumatic growth in Korea: trends and future directions. *Cognitive Behavior Therapy in Korea*. 2014;14(2):239-265.
 20. Han KA, Predicting model for post-traumatic growth(PTG) among emergency room nurses [dissertation]. [Seoul]. Hanyang University;2016.
 21. Yeo HJ, The structural analysis of variables related to posttraumatic growth among psychiatric nurses. [dissertation]. [Daegu]. Daegu Catholic University; 2016
 22. Song S, Lee H, Park J, Kim K. Validity and reliability of the Korean version of the posttraumatic growth inventory. *Korean Journal of Health Psychology*. 2009;14(1):193-214.
 23. Li Y, Cao F, Cao D, Liu J. Nursing students’ post-traumatic growth, emotional intelligence and psychological resilience. *J Psychiatr Ment Health Nurs*. 2015;22:326-332.
 24. Zerach G, Shalev TB-I. The relations between violence exposure, posttraumatic stress symptoms, secondary traumatization, vicarious post traumatic symptoms growth and illness attribution among psychiatric nurses. *Arch Psychiatr Nurs*. 2015;29(3):135–142.
 25. Yoon MS, Park EA. Posttraumatic growth among mental health social workers. *Mental Health & Social Work*. 2011;39(12):61-99.
 26. Ko CM, Lee AY. The mediating effect on emotional dissonance in the relationship between emotional labor and burnout among clinical nurses. *J Korean Acad Nurs Adm*. 2013;19(5),647-657.
 27. Cho WJ, Yang I, Choi HS, Lee HY. The effects of individual emotional characteristics on emotional labor of school dietitians. *Korean J Community Nutrition*. 2011;16(5):592-601.

Control of Hazardous Chemical as an Effort for Compliance Criteria of OHS Management System : A Cross-Sectional Study at PT. X Surabaya, Indonesia

Fransisca Anggiyostiana Sirait¹, Abdul Rohim Tualeka¹, Indriati Paskarini¹, Samsul Arifin¹

¹Department of Occupational Health and Safety, School of Public Health, Airlangga University, Indonesia

ABSTRACT

Background: OHS is a condition that must be realized in the workplace with all efforts based on science and deep thinking to protect the workforce, people, work and culture through the application of accident prevention technology that is done consistently in accordance with applicable laws and standards. The purpose of this study was to determine the appropriate control of hazardous chemicals as an effort to fulfill the criteria in the OHS management system in the welding workshop at PT. X Surabaya, Indonesia.

Method: The research method was cross sectional study. Primary data obtained from the observation with the review of compliance criteria in OHSMS and direct interviews to HSE officer. Secondary data was obtained from corporate documents, including company policies, commitments and Standard Operating Procedures. Data analysis was completed with presentation in the form of tables and explanations.

Result: The results showed that on the principle of monitoring and performance evaluation there are 3rd element with 46 criteria are fulfilled and 1 criterion was not fulfilled the category of minor findings, namely criteria 9.3.5, and the calculation of achievement level was 97,87%.

Conclusion: The conclusion of this study was that the control of hazardous chemicals in the company still not fulfilled the criteria in OHS management system, while the appraisal rate was in satisfactory category.

Keywords: Hazardous Chemical, OHS Management System, OHS Performance, Risk Management.

INTRODUCTION

The rapid advancement of technology boosts every sector of the industries to use the modern technology in doing any of their job. The competition of the industry that becomes more competitive demands every company to optimize the whole resource they have, some of them are financial, physical, human, and technology. Human as the resource becomes one of the keys from the success of a development. One of the way to boost the

quality of the human resources is by guaranteeing the Occupational Health and Safety (OHS) of every worker, whether for the worker with the lowest risk of work up to those who needs a lot of concentration and great deal of physical power.

The data of International Labor Organization (ILO) mentioned that at 2010 is noted that in each year, more than 2 million people died for the work accident and disease caused by the workplace, and it happened that about 270 million of work accident per year in the world^[6]. In Indonesia, the number of work accident indicates a worrying outcome. This thing is based on the result of research of ILO that Indonesia get the 52nd spot from 53rd in how lacking the management of OHS. The cost that will be spent by the company will be massive, if there is any accident in workplace.

Corresponding author :

Abdul Rohim Tualeka

Lecturer in Occupational Health and Safety
Department, Public Health Faculty, Airlangga
University, Surabaya, 60115, Indonesia
Tel: +62 31 5920948/ +6281333519732
Fax: +62 31 5924618E-mail: inzut.tualeka@gmail.com

The theory of Domino according to H.W. Heinrich that the cause of work accident, 88% of it is due to unsafe action, 10% of it is because of unsafe condition and 2% of it is unavoidable occurrence ^[2]. One of the attempt to reduce the unsafe action and the unsafe condition is by doing the risk management. The risk management of OHS related to the danger and the risk that exist in the workplace that can cause loss by the company. If this thing happened beyond control, then it can threaten the continuity of the business or the development process ^[6].

OHS stands for Occupational Health and Safety, abbreviated as OHS. OHS is a condition that must be realized in the workplace with all efforts based on science and deep thinking to protect the workforce, people, work and culture through the application of accident prevention technology that is done consistently in accordance with applicable laws and standards. Safety is the safety associated with machinery, tools, materials and processing, platform and environment ^[8].

The Law Number 1 of 1970 about The Work Safety mentioned that every worker has the rights on protection upon the safety in doing the work for the prosperity and increasing production, as well as the national productivity ^[9]. Based on that, then the company must guarantee the safety and health of the workers when working and when is located in the workplace. While, the Article Number 87 of Law Number 13 year 2003 about The Employment mentioned that every company must apply the occupational health and safety management system (OHSMS) that is integrated with the management system of the company ^[10].

OHS management system guided by the applicable regulation in Indonesia. Based on Article Number 5 Government Regulation or Peraturan Pemerintah (PP) of Republic Indonesia Number 50 of 2012 about the Application of OHSMS mentioned that every company must apply the OHS management system in its company ^[5]. The application of OHSMS in companies has the aim to increase the effectiveness of the protection of OHS, as well as the comfort and efficient in pushing the productivity. The number of work accident happened is big enough on the company that can not apply the OHS management system, while the company that has already apply the OHSMS is proven to experience a reduction in the number of work accident.

The result of risk scoring in working process in PT. X Surabaya, Indonesia, that generally the danger is in

the category of risk in the level of II, III, and IV. For example, the working in height, operational of forklift, install/dismantling scaffolding, cutting, welding, and grinding. On the process of welding, there is the use of chemical that is acetylene and lubricant oil.

PT. X has applied OHS management system integrated with the management system of this company. The application of OHS management system was done in every process of the work, while monitored by the division named OHS and environment (OHS&E). HSE of PT. X has socialized the programs of OHS&E to all of the workers. There was the HSE plan that functions to increase work and the commitment of application management system in the company, as well as there is the practice of internal audit from that division, as well as the external audit. Therefore, the further research was needed about the control of hazardous chemicals as the attempt to fulfill the criteria based on the Government Regulation of Republic Indonesia Number 50 of 2012 ^[5]. While the purpose from the practice of this research is to find out the correct control of hazardous chemicals as the attempt to fulfill the criteria in OHSMS.

MATERIAL AND METHOD

The location for this research was in the workshop of the welding of PT. X Surabaya, Indonesia. The time of this research was on February until March of 2017. The method used the descriptive study. This was intended because the result will give the clear and correct picture about the control of the hazardous chemicals as the attempt of fulfilling the criteria of OHS management system based on the Government Regulation of Republic Indonesia Number 50 of 2012 ^[5].

The primary data in this research was gained from the result of the observation and interview directly. The data obtained by doing some review on the practice of monitoring and evaluation of the work of OHS in company and based on the document related that occur in the workshop of welding of PT. X, as well as adjusted with the condition on site or in workplace. Observation done by using the checklist sheets of criteria upon the application of OHSMS based on Government Regulation of Republic Indonesia Number 50 of 2012 ^[5]. The direct interview done by using the instrument in the form of structured guideline of interview that composed based on the Attachment II of this Government Regulation that was to the HSE officer. The secondary data obtained

from the archive documented by this company, such as the organization structure, company policy and commitment of the leader, Standard Operating Procedure (SOP), company management system, and the related documents.

FINDINGS/RESULTS

The elements found in the principles of monitoring and evaluation of work of OHS were the monitoring

standard; reporting and repairing of lacks; material processing and its mobility; the data collection and usage; as well as the checking or audit of the OHS management system. The fulfilling criteria that occurs inside each of the elements on the practice of monitoring and evaluation for the work of OHS at PT. X Surabaya, Indonesia, presented in Table 1 below.

Table 1. Result of Fulfillment of Criteria in the Practice of Monitoring and Evaluation for the Work of OHS in PT. X Surabaya, Indonesia, 2017

No.	Element	Sub-Element	Criteria	
			Fulfilled	Not Fulfilled (Minor)
	Monitoring Standards	7.1 Checking for danger	7 criteria	-
		7.2 Monitoring/measuring the workplace	3 criteria	-
		7.3 Tools Checking/Inspection, measuring and testing	2 criteria	-
		7.4 Monitoring upon the health of Employee	5 criteria	-
	Reporting and repairing for the lacks	8.1 Reporting of danger	1 criteria	-
		8.2 Reporting of accident	1 criteria	-
		8.3 Checking and study of accident	6 criteria	-
		8.4 Handling of problem	1 criteria	-
	Material management and displacement	9.1 Handling manually and mechanically	4 criteria	-
		9.2 Transporting system, storage and disposal	3 criteria	-
		9.3 Controlling upon the hazardous chemicals	4 criteria	1 criteria
	Data collection and usage	10.1 Note of OHS	4 criteria	-
		10.2 Data and Report of OHS	2 criteria	-
	Checking of SMK3	11.1 Internal audit	3 criteria	
Total			46 criteria	1 criteria

Based on Table 1 above, it can be found out that from 47 criteria of scoring in practice of monitoring and evaluating the work of OHS PT. X has fulfilled 46 criteria and 1 criteria has not fulfilled with the minor category, that was in the criteria number 9.3.5. The data of the result upon the study indicated that from the five elements in the principles of monitoring and evaluating the work of OHS, there were 46 criteria that is fulfilled

and 1 criteria that was not fulfilled (minor category). Then the calculation upon the level of achievement for the practice of monitoring and the evaluating the work of OHS at PT. X was as follows:

$\frac{46 \text{ criteria fulfilled}}{47 \text{ criteria}} \times 100\% = 97,87\%$
--

Based on the calculation above, then the score achieved in the practice of monitoring and evaluating the work of OHS is 97,87%. Therefore, PT. X was in the classification of “Satisfactory” in term applying the criteria.

DISCUSSION

The monitoring and the evaluating the works of OHS is the requirement in applying the OHSMS that can be used to ensure the practice of OHS in the company works properly and according to the planning. Ramli argued that the principle of monitoring and evaluation of OHS can be used to find out if there is any unwanted violation so that later can be repaired immediately ^[6]. In the principle of monitoring and evaluating the work of OHS, there are 5 elements with 14 sub-elements, and the total criteria are 47 points.

PT. X has the total employees of more than 200 persons and there are some jobs with relatively high risk of practice so that the scoring upon the practice OHSMS is needed by scoring the monitoring and the evaluation of the work of OHS in every activity and working program that is used. Based on the result of interview with the HSE officer, it was found out that the HSE has done the monitoring upon the practice of all program of OHS&E regularly in every month.

Bird and Germain in the theory of Loss Caution Model focuses on the importance of the role of to prevent and controlling the accidents, that possibly seen as uncontrollable in a complex situation by using the advancing technology ^[1]. This theory is more prioritizing the direct relationship between the management with the cause and effect from the accident and the multilinear interaction from the order of factors of cause and effect. This theory also explained that the failure in control also influences the occurrence of work accident, including inside is the lack of strength upon the policy and standard of working program. If the policy, rules, and standard do not working well, then unsafe action and unsafe condition might still happen frequently.

The identification of unsafe action and unsafe condition was done through the Hazard Observation (HO), safety patrol, and inspection. The checking or inspection upon the working place and the way employees work was done by the competent safety officer that was properly assigned to and was able to identify danger. This action was done regularly at least monthly.

There was a schedule and procedure of operation for the inspection, including the 5R, HO, and JHA. PT. X has kept records of expiration and safe placement as a requirement in the fulfillment of OHSMS on criteria about the control of damaged or expired materials Besides, there also the document of Material Safety Data Sheets that discuss about the safety of materials and how to handle it according to the rules of the constitution, as well as supplemented with clearly tagged label on the hazardous chemicals.

The criteria 9.3.5 in the fulfilling of implementation of SMK3 based on the Government Regulation of Republic Indonesia Number 50 of 2012 ^[5] that is included in the element of material processing and its mobility, stated that the handle of hazardous chemicals is done by the competent and authorized officer. The handling of the hazardous chemicals in PT. X has done by the competent officer who is a graduate from the chemistry study program. However, this officer has not yet acquire the license or the certificate of expertise for example the certificate of expert chemist so that in this case was a minor category finding in that certain criteria.

The scoring category for the fulfillment of the implementation of SMK3 based on the Government Regulation of Republic Indonesia Number 50 of 2012 ^[5]. In which the level of achievement of 0-59% is classified in the achievement of “Lacking”, the score of 60-84% is classified as “Good”, and the score of 85-100% is classified as “Satisfactory”.

Based on the result of the study, it can be concluded that the score of OHS implementation is 97.87%, it means that the PT. X has implement SMK3 in the level of “Satisfactory”. One of the goal of implementing OHSMS based on the Government Regulation of Republic Indonesia Number 50 of 2012 is to prevent and reduce the number of work accident as well as the sickness due to the work ^[5]. The consistent implementation of SMK3 can be useful as the protection for the workers. PT. X has applied management system of occupational safety and health to achieve zero accident. However, it is undeniable that there are still some danger potential and risks in each processes of work or production.

CONCLUSION

Based on the result of the study, then the following conclusions can be drawn:

The minor finding in the scoring of the practice of monitoring and evaluating the work of OHS is in the criteria 9.3.5, that is the welding workshop of PT. X has acquired the procedure of storage, handling, and the mobility of hazardous chemical, as well the marking system or the tag labelling done by the authorized officers that is competent with the chemistry educational background, yet the officer has not acquired any special certificate (expert of OHS in chemistry).

Based of the calculation upon the level of achievement of the practice of monitoring and evaluating the work of OHS that PT. X was in the category of "Satisfactory".

REKOMENDATION

Assign or point one or more officers in handling the hazardous chemicals and giving the training upon the danger and the way to handle or control that, as well as planning the certification program for the specific skill that is suitable that is the OHS experts in chemistry and the OHS of chemistry officers based on the Decree of the Minister of Employment of Republic Indonesia Number Kep.187/MEN.1999^[4] about the control of hazardous chemicals in workplace. This is related to the use of acetylene in the welding working process and the lubricant oil used in the workshop.

Conflict of Interest: All authors have no conflicts of interest to declare.

Source of Funding: This is an article "Control of Hazardous Chemical As An Effort For Compliance Criteria of OHS Management System: A Cross-Sectional Study at PT. X Surabaya, Indonesia" that was supported by School of Public Health, Airlangga University, Indonesia, 2017.

Ethical Clearance: Taken from Public Health Faculty Committee of Airlangga University, Indonesia.

REFERENCES

1. Bird Jr., E. Frank dan Germain L. George. 1992. Practical Loss Control Leadership. Atlanta: International Loss Control Institute, Inc.
2. Heinrich, H.W. 1980. Industrial Accident Prevention. New York: Mc. Graw Hill Book Company.
3. Fausiyah, K. 2012. Penerapan Sistem Manajemen K3 (SMK3) dan Gambaran Unsafe Action Selama Tahun 2011 di PT Kertas Leces (PERSERO) Probolinggo. Surabaya: Fakultas Kesehatan Masyarakat Universitas Airlangga.
4. Menteri Tenaga Kerja Republik Indonesia. 1999. Keputusan Menteri Tenaga Kerja Republik Indonesia Nomor Kep.187/Men/1999 Tentang Pengendalian Bahan Kimia Berbahaya Di Tempat Kerja. Jakarta.
5. Presiden Republik Indonesia. 2012. Peraturan Pemerintah Republik Indonesia Nomor 50 Tahun 2012 Tentang Penerapan Sistem Manajemen Keselamatan dan Kesehatan Kerja. Jakarta.
6. Ramli, S. 2010. Manajemen Resiko Keselamatan dan Kesehatan Kerja. Dian Rakyat. Jakarta.
7. Ramli, S. 2013. Smart Safety Panduan Penerapan SMK3 yang Efektif. Dian Rakyat. Jakarta.
8. Tarwaka. 2008. Keselamatan dan Kesehatan Kerja "Manajemen dan Implementasi K3 di Tempat Kerja". Harapan Press. Surakarta.
9. Presiden Republik Indonesia. 1970. Undang Undang Nomor 1 Tahun 1970 Tentang Keselamatan Kerja. Jakarta.
10. Presiden Republik Indonesia. 2003. Undang Undang Nomor 13 Tahun 2003 Tentang Ketenagakerjaan. Jakarta.

Balanced Nutrition Menu Intervention for Toddlers in Children Daycare Center

Dhini¹, Munifa¹, Ismi Rajjani²

¹Department of Nutrition, Poltekkes Palangka Raya, Indonesia,

²Department of Business Administration, STIAMAK Barunawati Surabaya, Indonesia

ABSTRACT

Background: Children Daycare Centers are alternatives for parents to entrust their children. However, children at the golden age of must be fulfilled their nutritional intake as experiencing lack of food at that time will have a serious impact. This way, efforts should be made to ensure that Children Daycare Centers or in Indonesia is known as *Tempat Penitipan Anak* (TPA), are able to provide the best services to children, both in terms of care and provision of food intake. The research aims at providing intervention needed to change the situation in the site so that the implementation of meals served have a good impact on the children.

Method: This is a pre experimental one group pretest posttest observing children aged 4-6 years. Interventions provided in the form of balanced nutrition food 1 menu cycle for 30 days in accordance with the nutritional adequacy of lunch and snacks. The analysis used was the T- test.

Results: There was a relationship between energy intake and children's nutritional status (P -value 0.024), there was a difference in nutritional status between before and after the intervention (P -value 0.004) .

Conclusion: Childcare places need to apply balanced nutritional food in an effort to maintain and improve the nutritional status of children. The application of a suitable diet is very necessary so that food intake in children becomes optimal. Modification of types of food that can be adjusted to the child's desires based on the nutrition adequacy rate for children.

Keywords-: *Children Daycare , Balanced Nutrition, Nutritional Status, Intervention*

INTRODUCTION

Children daycare, known in Indonesia as *Tempat Penitipan Anak* (TPA), is an alternative for parents to entrust their children for family replacement for a certain period of time for children during parents work as well as the implementation of educational programs (including care) against children from birth to 6 years of age ⁽¹⁾. Children aged 0-6 years are in the golden and critical period. Toddler raised by parents with care for other than parents showed differences in the

development where the children cared for by parents become better than children being cared by others than parents ⁽²⁾. Therefore parenting and organizing meals in children daycare are one of the factors in child development.

For every food administration, both performed non-commercially and commercially such as in the daycares, completeness and the adequacy of nutrients in the food served must be in accordance with the guidelines in the preparation of the food menu being served. In fact, in the city of Palangkaraya, the results of research ⁽³⁾ on food remaining analysis using the Comstock method indicated that the energy served on the first, third and sixth day are meeting the standard ($\geq 80\%$) while the second day, fourth and fifth is not appropriate ($< 80\%$). Proteins served on the first, second, third, fifth and

Corresponding author:

Dhini

Department of Nutrition, Poltekkes Palangkaraya,
Indonesia, Email: andendhini@yahoo.com

sixth days are fitted (80%) while the fourth day is not suitable (<80%). For leftover food remnant based on 6 days of lunch served on the second day is that the remaining food staple is 48.86%, vegetable side dish is 48.86%, vegetable is 56.82%, fruit is 31.82% and on the sixth day, the animal side dish is 51.04%. Thus, it is concluded that the energy and protein served do not meet the standards. These results also blatantly indicated that the availability and the intake of children nutrition in the daycare is less than the nutritional adequacy rate. Based on the aforementioned matters, the authors are interested in conducting a research on the intervention of a balanced nutrition menu in the daycares located in Palangkaraya, the capital of central Kalimantan Province, Indonesia.

METHODOLOGY

This research uses quantitative methodology with design *pre-experiment one group pretest posttest*, held in September 2017 in Darussalam Child Daycare Center Palangkaraya, Indonesia. Interventions are given in the form of a balanced nutritional food cycle which is calculated using the nutrition adequacy rate based on age. Balanced nutrition food is given at lunch 30 times in 30 days. The average adequacy of nutritional substances for children lunch each cycle consists of energy = 358.29 Kcal and protein of 12.18 gr. The nutritional content is made in a portion of food consisting of lunch and dessert snacks. Every 1 week children are given six times lunch on Monday to Saturday, with different menus every day. The intervention of the effectiveness of the provision of a balanced nutrition diet is measured by assessing the child's weight between before and after the intervention. In addition, the child's intake of balanced nutrition is

also measured in the form of percentage of intake.

The sample size to be analyzed is 18 samples. Univariate analysis is used to analyze data by describing the results of research on each variable studied. Percentage value is used to display data on children's food intake as well as the mean, standard deviation, confident interval and minimum-maximum for numerical data on children's weight. Bivariate analysis is used to analyze the relationship between two variables. Statistical test of *paired t-test* analyzed the difference in average body weight between before and after the intervention as well as the difference in average body weight between adequate intake and poor intake based on nutrients, the degree of significance using α (alpha) = 0.05.

RESULTS

Food nutrition in children is converted into a percentage of intake by comparing nutrient intake with standard intake for the children generating the results of 72.2% of energy intake which is $\geq 75\%$, and 44.4% protein intake which is also $\geq 75\%$.

Table 1 shows that children with $\geq 75\%$ energy intake have an average of Z-Score 0.207, while energy intake < 75% has Z-Score -1.09. Both of these Z-Score values in anthropometric standards assess the nutritional status of children is still in the range of good nutrition. There is a significant difference in the mean score of Z-Score between energy intake $\geq 75\%$ and energy intake < 75%. Table 1 also shows that children with a protein intake of $\geq 75\%$ had an average of Z -Score 0.126, while protein intake < 75% had an average of Z-Score -0.38. There was no significant difference in the average Z-score value between protein intake $\geq 75\%$ and protein intake < 75%.

Table 1. Average Difference Analysis on Nutritional Status of Children

Variable	Intake	Mean Weight / Age	SD	Levene Test	Difference	P Value
Z-Score (Weight / Age)	$\geq 75\%$ Energy Intake (n = 13)	13	0.69	0.121	1.305	0.024
	Energy intake < 75% (n = 5)	-1.09	1.57			
Z-Score (Weight / Age)	Protein intake $\geq 75\%$ (n = 8)	0.126	0.37	0.005	0.507	0,507
	Protein Intake <75% (n = 10)	-0.38	1.48			

Table 2. Analysis of Differences in Body Mass Index (BMI) of Children Before and After Intervention

Age	Variable	Description	Mean	Min - Max	Score Correlation Value (R)	Difference	P- Value
4-6 years	BMI Z Score (Body weight / Age)	Before	- 0.43	-2.72 - 1.39	0.951	0.280	0.004
		After	-0.15	-2.5 - 1.58			

The average Z score before intervention was - 0.43 while after the intervention the average Z score is -0.15. The difference in knowledge scores after treatment is an increase of 0.28. Statistically there are differences in the average Z score before treatment and after treatment with p -value = 0.004. The correlation value (r) square produced 95.1. This shows that the provision of balanced nutritional food and eating regulations play a role of 95.1% in improving the nutritional status of children in child daycare while the rest is caused by other factors.

DISCUSSIONS

Organizing meals is a series of activities ranging from menu planning to distribution of food to consumers, including recording, reporting and evaluation activities aimed at achieving optimal health status through proper feeding. Based on its function, organizing meals can be divided into two, namely commercial and non-commercial. The organization of meals at Darussalam Child Daycare is a non-commercial operation, namely the provision of food that is not profitable. Looking at the conditions as in the results of the study, it is concluded that the food administration program still does not follow the standard pattern of service management and technical instructions. This is stated in the results of the study that food management depends on the available funds and menu planning and there are no standard portions or prescription standards.

Results showed that children's energy intake was mostly > 75%. Children's energy intake is derived from modification of food that has been provided for 30 times, namely in the form of food types which has been processed in such a way as to increase children's interest in consuming it. The results also showed that there were differences in the average nutritional status between energy intake $\geq 75\%$ and <75%. There was a significant relationship between energy intake and nutritional status in children.

Food substances needed by the human body include carbohydrates, proteins, fats, vitamins, minerals and water. Food consumed by children is metabolized by the body so that it becomes energy and is useful for child growth and development. Energy in the human body arises due to the burning of carbohydrates, proteins and fats. Thus, in order to fulfill their energy needs, it is necessary to consume enough food substances into the body. Childhood age 4-6 years is a time when children are very active in carrying out various activities together with their peers ⁽⁴⁾. When a child has more energy than is consumed, it can cause weight loss. If the child has a lack of energy, it will have an impact on physical growth, mental and endurance ⁽⁵⁾. This research is in line with the previous research results showing that 91.7% of adequate energy consumption has nutritional status will not experience underweight ⁽⁶⁾. Another research also shows that there is a significant relationship between energy intake and nutritional status of children ⁽⁷⁾. Further, children with less chance of energy intake is 2.43 times to experience less nutrition compared to children with adequate energy intake ⁽⁸⁾. From the results of the study it is concluded that adequate energy intake affects the nutritional status of toddlers better.

Results showed that there was no difference in the average nutritional status between children with protein intake $\geq 75\%$ and <75%. Children with an intake of $\geq 75\%$ are 8 people and <75% are 10 people, if it is nearly equal it is 1: 1.25. The results of this study are in line with the results which showed no relationship between protein intake and nutritional status ⁽⁹⁾. Also another study showed no relationship between protein intake and nutritional status ⁽¹⁰⁾ and no correlation between protein intake and nutritional status ⁽¹¹⁾.

In fact, proteins chemically have atoms that are the same as fat and carbohydrates, only the difference is the element of nitrogen. One of the important food substances for the body is protein. Protein is a part of

living cells and is the largest part after water. Enzymes, hormones, nutrient transporters and blood are proteins. The main function of protein is to build and maintain body tissues. Protein is also the same source of energy as carbohydrates. If the body is in a state of lack of energy zumber such as carbohydrates and fats, the body will use protein to form energy and exclude its main function as a building agent. In children this condition can have an impact on growth disorders. Consumption of adequate protein intake will have an impact on good growth the body's immune system increases, creativity increases and has a strong mentality ⁽¹²⁾ supporting previous research that children with good food intake, as many as 75% were in the category of good nutrition as well ⁽¹³⁾ and children with less protein intake is 2.63 times risk of experiencing poor nutritional status compared to children with adequate protein intake ⁽¹⁴⁾.

Protein intake in the child daycare is a protein intake as long as the children receives a balanced nutrition food modification intervention. Protein intake in the landfill during part of the study was good enough > 75% . The protein is derived from animal protein so that it can provide a fairly good intake. The absence of a relationship between protein and children's nutritional status was due to the average nutritional status of children at both < 75% and > 75% intake. In this study, food directly affects the nutritional status of children. This is because the researchers have since sampled the samples by selecting research locations in child care centers so that other confounding variables can be minimized. Balanced nutrition foods that have been modified have an effect on the nutritional status of children, indicated by the difference in Z score value of 0.280. Nutritional status is a balance between food intake and body needs (output). Children with inadequate food intake both in terms of the amount of intake and in terms of nutritional value will weaken their endurance and easily suffer from pain. If a child experiences a weak immune system, it will certainly affect the child's nutritional status ⁽¹⁵⁾.

Previous research also showed that feeding patterns affect the nutritional status of children. The feeding pattern in question is from the type of food, amount of food (nutritional adequacy) and meal schedule ⁽¹⁶⁾. Children with the right diet were 122 children (89.7%) had nutritional status in the normal category . Food consumption affects a person's nutritional status. Good nutritional status or optimal nutritional status occurs when the body produces enough nutrients that are

used efficiently so as to enable physical growth, brain development, work ability and general health at the highest level possible.

CONCLUSION

Child Care Centers in Central Kalimantan Indonesia does not apply a balanced nutritional food in an effort to maintain and improve the nutritional status of children. This may due to lack of the knowledge and feeding toddler may be considered as a social activity only. The Daycare unit should apply a suitable diet is needed so that food intake for children is optimal by modifying types of food that can be adjusted to the child's desires, still based on the nutrition adequacy rate in children.

Ethical Clearance: The Ministry of Health Polytechnic approved this research in Central Kalimantan, Indonesia. Ethical clearance was obtained from the Faculty of Medicine Palangkaraya University, Indonesia. A research permit was requested from the local health authorities. We also wish to thank all the participants who contributed to this study.

Conflict of Interest: Nil.

Source of Funding: The Ministry of Health Polytechnic Palangkaraya, Indonesia.

REFERENCES

1. Kementerian Pendidikan dan Kebudayaan. Norma, Standar, Prosedur dan Kriteria Petunjuk teknis Penyelenggaraan taman Penitipan Anak. Republik Indonesia. 2012.
2. Fristi, W., Indriati, G. and Erwin. Perbandingan Tumbuh Kembang Anak Toddler yang Diasuh Orangan Tua dengan yang Diasuh Selain Orang Tua. Riau. Program Studi Ilmu Keperawatan Universitas Riau. 2008.
3. Chintia, Yunita. Analisis Sisa Makanan Menggunakan Metode Comstock yang Disajikan di TPA Darussalam Palangka Raya. Palangka Raya. Jurusan Gizi Poltekkes Kemenkes Palangka Raya. 2014.
4. Isjoni. Model Pembelajaran Anak Usia Dini. Bandung. Alfabeta, 2011.
5. Whitney, E and Rolfes, S. R. Understanding Nutrition 12th edition. Canada. Wadsworth. 2007.
6. Jati, D.K. and Nindya, T.S. Asupan Energi dan

- Protein Berhubungan dengan Gizi Kurang Pada Anak Usia 6-24 Bulan . *Amerta Nutrition Jurnal*: 124-32. 2017.
7. Handono, N.P. Hubungan Tingkat Pengetahuan Pada Nutrisi, Pola Makan dan Energi Tingkat Konsumsi Anak Usia Lima Tahun di Wilayah Kerja Puskesmas Selogiri, Wonogiri. *Jurnal Keperawatan*: 1-7. 2010.
 8. Diniyyah, S.R. and Nindya, T.S. Asupan Energi, Protein dan Lemak dengan Kejadian Gizi Kurang Pada Balita 24-59 Bulan di Desa Suci Gresik. *Jurnal Amerta Nutrition*. 2017: 341-50.
 9. Adani, Virnanda, Pengastuti, Dina Rahayuning and Rahfiludin, M. Zen. Hubungan Asupan Makanan (Karbohidrat, Protein dan Lemak) dengan Status Gizi Bayi dan Balita (Studi pada Taman Penitipan Anak Lusendra Kota Semarang). Semarang : *Jurnal Kesehatan Masyarakat Universitas Diponegoro*.2016: 261—71.
 10. Muchlis, Novayeni, Hadju, Veni and Jafar, Nurhaedar. Hubungan Asupan Energi dan Protein dengan Status Gizi Balita di Kelurahan Tamamaung Makassar . *Program Studi Imi Gizi FKM Universitas Hasanuddin Makassar*. 2011.
 11. Maradesa, Eirene, Kapantow, Nova H. and Punuh, Maureen I. Hubungan Antara Asupan Energi dan Protein dengan Status Gizi Anak Usia 1-3 tahun di Wilayah Kerja Puskesmas Walantakan Kecamatan Langowan. *Fakultas Kesehatan Masyarakat Universitas Sam Ratulangi*,2014.
 12. Salawati L, Imran I, Husnah H, Nurjannah N. Pengaruh Asupan Protein Terhadap Perbaikan Status Gizi Balita yang Menderita Infeksi Saluran Pernapasan Akut. *Jurnal Kedokteran Syiah Kuala*. 2014;14(2):67-75.
 13. Nurapriyanti, Ima. Faktor Faktor yang Mempengaruhi Status Gizi Balita di Posyandu Kunir Putih 13 Wilayah Kerja pUskesmas Umbulharjo I Kota Yogyakarta. Yogyakarta . *Sekolah Tinggi Ilmu Kesehatan Aisiyah*. 2015.
 14. Helmi, Rosmalia. Faktor Faktor Yang Berhubungan Dengan Status Gizi pada Balita di Wilayah Kerja Puskesmas Mergototo Kecamatan Metro Kibang Kabupaten Lampung Timur . Tanjung Karang . *Jurnal Kesehatan Poltekkes Kemenkes Tanjung Karang*, 2013.
 15. Purwaningrum, S. and Wardani, Y. Hubungan Antara Asupan Makanan dan Status Kesadaran Gizi Keluarga dengan Status Gizi Balita di Wilayah Kerja Puskesmas Sewin I Bantul. Yogyakarta . *Jurnal Kesehatan Universitas Ahmad Dahlan*. 2012.
 16. Suberkah, T., Nursalam and Rachmawati, P.D. Pola Pemberian Makanan Terhadap Peningkatan Status Gizi Anak Usia 1-3 Tahun. *Pendidikan Ners Fakultas Keperawatan Universitas Airlangga*. 2016.

The Effectiveness of Acupressure at LI 4 and SP 6 Point on Uterine Contraction in the First Stage of Labor on Primiparous Women

Christi Kusuma Wardani,¹ Melyana Nurul Widyawati,¹ Suryono Suryono²

¹Postgraduate Applied Science Program in Midwifery, Poltekkes Kemenkes Semarang, Indonesia,

²Departement of Physics, Diponegoro University, Semarang, Indonesia

ABSTRACT

Background: Maternal Mortality Rate is still dominated by causes such as uterine contractions, prolonged labor. Cesarean section and labor induction are still an effort to prevent these complications. Meanwhile, these solutions have complications such as infection risk, hypertonic contraction, fetal trauma, etc. In this study, acupressure technique is one of the answers to increase uterine contractions so that cesarean section and labor induction can be avoided. Acupressure is a non-pharmacological, non-invasive uterine stimulation technique, which is simple, safe, effective, and without serious side effects. This study aims to analyze the increase of uterine contractions in the first stage of normal labor with acupressure treatment

Method: This study is a randomized controlled trial on 39 primiparous mothers during the active phase of the first stage of normal labor were equally assigned to two intervention groups [acupressure on LI 4 (n = 13) or SP 6 (n = 13)] and a control group (n = 13). The intervention group received routine labor care and acupressure in LI 4 or SP 6 point bilaterally for 20 minutes; control group just received routine labor care.

Results : There were significant differences between the three study groups at the frequency (p = 0.000), duration (p = 0.000) and interval of the uterine contraction (p = 0.000). After post hoc test, the mean of frequency, duration, and interval uterine contraction most significant increased between SP 6 and control group (p = 0.000).

Conclusion: Acupressure on LI 4 and SP 6 point are effective in increasing uterine contraction compared with the control group with the most significant result in acupressure at SP 6 point.

Keywords- *Acupressure, first stage of labor, uterine contraction*

INTRODUCTION

Maternal Mortality Rate is still dominated by causes such as uterine contractions, prolonged labor. Cesarean section and labor induction are still an effort to prevent these complications ⁽¹⁾ but these solutions produce complications such as infection risk, hypertonic contraction, fetal trauma, etc ⁽²⁾ . Acupressure technique

is one of the answers to increase uterine contractions so that cesarean section and labor induction can be avoided.

Acupressure is a non-invasive, non-pharmacological, simple, safe, effective without dangerous side effect method which is used to augment labor, provide labor pain relieve, and shorten the first stage of labor duration ⁽³⁾ . Many studies have proven that acupressure can increase uterine contractions. From 7 reviews on the effects of acupressure on the length of labor, 5 studies showed the results of the period of the first stage of labor were shorter acupressure compared to those not given acupressure. A variety of acupoints are useful to increase

Corresponding author:

Christi Kusuma Wardani

email: wardhani_christy@yahoo.com

uterine contraction and shorten the first stage of labor duration, are LI 4 and SP 6 points ⁽⁴⁾

Research on acupressure for the advancement of childbirth has been widely studied, but until now the results of the study have not calculated and recorded the frequency, duration, and interval in detail through the detailed recording is essential to assess the progress of labor. Further, most of the research results are only focussed on the duration of labor and the frequency of uterine contractions just. In this study, uterine contractions were calculated and recorded in detail and analyzed for the increase between the point acupressure intervention group LI 4, SP 6 point, and the control group.

METHOD

Setting and Participants

This randomized controlled trial posttest only design was carried out on primiparous women in 11 community health center at Semarang, Central Java, Indonesia from 22 May to 22 July 2018. The inclusion criteria were : primiparous women in normal labor, age range of 20 – 35 years, term pregnancy (37 - 42 weeks of gestation), fetal vertex presentation, and being inactive phase of first-stage labor with cervical dilatation of ≥ 4 cm and presence of at least three uterine contractures within 10 min, mother and fetal were health (not suffering from diseases that cause labor complications), singleton pregnancy, Body Mass Index (BMI) 18.5 -25.0, mother eats before delivery. The exclusion criterion was: mother get labor augmentation using uterotonics, having coitus in the last 24 hours, there are wounds on the SP-6 and LI-4 acupressure points, delivery time > 24 hours or prolonged labor, patients fall on early membranes rupture.

Randomization and intervention

The first step of the trial is randomized of 11 community health center in Semarang (cluster sampling) to assign the locations into three groups. The primiparous women who were admitted for regular delivery to the community health centers and met the inclusion criteria were selected and then were assigned to three groups based on cluster sampling of 11 community health center in Semarang. Three groups included: a group that received acupressure on LI4 point, a group that received acupressure on SP 6 points, and the control group.

Before beginning the intervention, cervical dilatation and uterus contractions were checked. Acupressure was applied bilaterally during the contraction on Hugo point (LI4), which is located on the medial midpoint of the first metacarpal within the skin of the thumb and the index finger or on San Yin Jiao Point (SP 6) which is located on the three *cun* above the medial malleolus.

The respondents of LI 4 group were asked to lie down in supination position, and the researcher sat in beside them. The researcher applied pressure to the LI 4 point of both hands by her both thumbs. To prevent any discomfort, the pressure was applied with *Pu* technique which is pressing the spot gently. At the beginning it must be done lightly then gradually the strength of the emphasis is added until it feels a light sensation but does not hurt. The focus with a clockwise circular massage. Applying pressure was stopped by the end of each contraction and was started again by the beginning of another contraction. This was repeated for 20 minutes.

The respondents of SP 6 group were asked to lie down in supination position, and the researcher sat in front of their leg. The researcher applied pressure to the SP 6 point of both legs by her both thumbs. The pressure technique and duration of giving acupressure were the same as the group above. For the control group, the researcher attended the bedside of the respondents and performed all the routine labor care but did not apply acupressure. The researcher just conducted the palpation examination to measure the frequency, duration, and interval of uterine contraction.

Outcome measurement

The assessment of the respondent's age, education, and occupation have used a questionnaire. To keep the confidentiality of respondents, we use codes to identify replacing the respondent's name. The frequency, duration, and interval of uterine contraction were measured by palpation examination at respondent's abdomen during the first stage of labor. The WHO's partograph is used to record the frequency of uterine contraction and cervical dilatation. The duration and interval of uterine contraction were recorded in the observation sheet.

Statistical Analysis

The minimum number of sample size for each group was determined to be 9. Considering the possibility of missing some cases, the sample size for each group

was determined to be 13. Chi-square test was used to determine the difference of respondent's education and occupation among three groups. ANOVA was used to determine the mean difference of respondent's age, also to learn the difference of interval and followed by Bonferroni post hoc test to determine which group that had the most significant result compared with control group. Kruskal-Wallis Test was used to compare obstetric characteristics, frequency, and duration of uterine contraction between three groups of study, because of lack of normal distribution and followed

by Mann-Whitney test. For all analyses, the statistical significance was defined as $P < 0.05$.

RESULT

Demographic and obstetric characteristics

All 39 women completed the study. As presented in Table 1, there was no significant difference in demographics (age, education, and occupation) and obstetric (gestational age, cervical dilatation) characteristics among the groups.

Table 1. Comparison of demographic and obstetric characteristics among the three groups

Variables	LI 4 (n = 13)	SP 6 (n = 13)	Control (n = 13)	P
Age (mean ± SD) years	23.6 ± 1.8	22.7 ± 1.8	23.4 ± 2.1	0.865 ^a
Education n (%)				0.516 ^b
Elementary	1 (7.7)	0 (0)	0 (0)	
Junior High	2 (15.4)	5 (38.5)	2 (15.4)	
Senior High	9 (69.2)	8 (61.5)	10 (76.9)	
College or above	1 (7.7)	0 (0)	1 (7.7)	
Occupation n (%)				0.777 ^b
Housewife	3 (23.1)	4 (30.8)	1 (7.7)	
Employed	5 (38.5)	6 (46.1)	7 (53.8)	
Gov. employee	2 (15.4)	1 (7.7)	1 (7.7)	
Entrepreneur	3 (23.1)	2 (15.4)	4 (30.8)	
Gestational Age (mean ± SD) weeks	39.9 ± 0.8	39.9 ± 0.9	39.9 ± 0.9	0.966 ^c
Cervical Dilatation (mean ± SD) cm	4.5 ± 0.7	4.8 ± 0.8	4.8 ± 0.7	0.362 ^c

ANOVA

^bChi Square

Kruskal Wallis

Uterine Contraction

Table 2 presents the difference between mean uterine contraction (frequency, duration, and interval) among

groups. Kruskal Wallis test demonstrated a significant difference in the rate of uterine contraction between LI 4, SP 6 and the control group ($p = 0.000$). Kruskal Wallis also attested significant difference in duration of uterine contraction between LI 4, SP 6 and control group ($p = 0.000$). ANOVA test proved a significant difference in the interval of uterine contraction between LI 4, SP 6 and the control group ($p = 0.000$).

Table 2. Comparison of uterine contraction among the three groups

Variables	LI 4 (n = 13)	SP 6 (n = 13)	Control (n = 13)	P
Frequency (mean ± SD) times/10 minutes	3.5 ± 0.2	3.7 ± 0.1	3.4 ± 0.1	0.000 ^a
Duration (mean ± SD) seconds	43.8 ± 0.9	47.8 ± 1.4	42.7 ± 0.7	0.000 ^a
Interval (mean ± SD) minutes	3.3 ± 2.5	2.9 ± 0.2	3.5 ± 0.1	0.000 ^b

^aKruskal Wallis^bANOVA

Table 3 presents a comparison of uterine contraction (frequency, duration, and interval) between the three groups. The efficacy of frequency of uterine contraction from the view of the women was significantly higher in LI4 and SP 6 groups compared with controls, with the most significant difference in SP 6 group ($p = 0.000$). The difference of duration of uterine contraction from the view of the women was significantly higher in LI4 and SP 6 groups compared with controls, with the most significant difference in SP 6 group ($p = 0.000$). The difference of interval of uterine contraction from the view of the women was significantly greater in LI4 and SP 6 groups compared with controls, with the most significant difference in SP 6 group ($p = 0.000$).

Table 3. Post hoc test of uterine contraction among the three groups

Variables	Group	Group	Mean Difference	Sig.
Frequency	LI 4	Control	0.1	0.065 ^a
	SP 6		0.3	0.000 ^a
Duration	LI 4	Control	1.1	0.199 ^a
	SP 6		5.1	0.000 ^a
Interval	LI 4	Control	0.2	0.018 ^b
	SP 6		0.5	0.000 ^b

^aMann Whitney^bBonferroni

DISCUSSION

In this randomized controlled trial, we investigated and compared the effect of LI 4 and SP 6 acupressure with the control group on uterine contraction inactive phase of the first stage of labor. In the present study, the significant increase of frequency and duration of uterine contraction, also the substantial decrease in the interval of uterine contraction, between intervention and control group supports the effectiveness of applying pressure to LI4 and SP 6 points in increasing uterine contraction. This result also showed that acupressure on SP 6 points is more effective than on LI4 point in increasing uterine

contraction.

The results of this study are in line with the research conducted by Ozgoli ⁽⁶⁾ on the effects of acupressure LI 4 and BL 32 on delivery outcomes, one of which is the result of the acupressure effect of uterine contractions. The results of this study confirm our findings concerning the stimulation of LI 4 point. But the result of these study is not showed significant different because applied unilateral pressure. In this study researcher applied bilateral pressure, that probably responsible for its higher effectiveness in comparison with applying unilateral pressure.

This study is also in line with the randomized controlled trial study conducted by Mafetoni and Shimo ⁽⁷⁾ about the effects of acupressure on the progress of labor

and the incidence of cesarean section. The results of this study indicate that mothers who were given acupressure therapy at SP point 6 duration of labor were significantly different compared to placebo and control groups. The results of this study confirm our findings concerning the stimulation of SP 6 point. In this study, acupressure at point SP 6 was shown to increase the hormone oxytocin which can facilitate labor.

Acupressure is a non-invasive therapy for labor and makes parturients stay comfortable during labor. Experimental studies of the effects of acupressure on the duration of the 1st stage of labor have been widely performed in Asia. In these studies, the acupressure point that gives the most significant results is the SP 6 point, then the point LI 4^(8,11). The results of this study confirm our results concerning stimulation of SP 6 point.

Acupressure at point SP 6 has a strong influence on the reproductive organs. Stimulation at this point can increase the concentration of yin energy that can initiate labor. The effect of acupressure Yin energy can increase uterine contraction because it has been shown to increase the oxytocin hormone⁽¹²⁾. During labor, there is a blockage of the meridian which causes the flow of meridians to flow through the body. Stimulus at point SP 6 or LI 4 can open blockages and facilitate meridian flow. This also makes the mother calmer during labor. Stimulus at this point can also increase the hormone oxytocin from the pituitary gland which causes an increase in uterine contractions during labor^(13,14).

CONCLUSION

This study showed that both LI 4 and SP 6 acupressure significantly increased the frequency and duration of uterine contraction, also significantly decreased the interval of uterine contraction in the first stage labor with the most significant result in acupressure at SP 6 point. Our study was one of the few limited studies that were performed to determine the effect of acupressure on uterine contraction. We presented information that could be confirming the physiologic process of acupoints function.

The weaknesses of our study are the factors that influence labor contractions such as psychological factors (fear, anxiety, tension, stress) have not been controlled. Assessment of uterine contractions has not used biomarkers (biophysical or biochemical markers). Further trials are needed to control the psychological

factors and using biomarkers to get a more valid result. The results of this study can be useful in the planning of programs promoting the care of women in labor.

Conflict of Interest: We have no conflicts of interest to the material of this manuscript.

Ethical Clearance: The trial was approved by the Ethics Committee of Health Polytechnic Semarang, Indonesia.

Source of Funding: Nil

REFERENCES

1. Rhoades JS, Cahill AG. Defining and Managing Normal and Abnormal First Stage of Labor. *Obstetrics and Gynecology Clinics*. 2017 Dec 1;44(4):535-45.
2. Suryati T. (Analisis Lanjut Data Riskesdas 2010) Persentase Operasi Caesaria Di Indonesia Melebihi Standard Maksimal, Apakah Sesuai Indikasi Medis?. *Buletin Penelitian Sistem Kesehatan*. 2013 May 13;15(4 Okt).
3. Modlock J, Nielsen BB, Uldbjerg N. Acupuncture for the induction of labour: a double-blind randomised controlled study. *BJOG: An International Journal of Obstetrics & Gynaecology*. 2010 Sep 1;117(10):1255-61.
4. Mollart LJ, Adam J, Foureur M. Impact of acupressure on onset of labour and labour duration: A systematic review. *Women and Birth*. 2015 Sep 1;28(3):199-206.
5. Hartono RI. *Akupresur untuk berbagai penyakit*. Yogyakarta: Rapha Publishing. 2012.
6. Ozgoli G, Mobarakabadi SS, Heshmat R, Majd HA, Sheikhan Z. Effect of LI4 and BL32 acupressure on labor pain and delivery outcome in the first stage of labor in primiparous women: a randomized controlled trial. *Complementary therapies in medicine*. 2016 Dec 1;29:175-80.
7. Mafetoni RR, Shimo AK. Effects of acupressure on progress of labor and cesarean section rate: randomized clinical trial. *Revista de saude publica*. 2015 Feb 27;49:9.
8. World Health Organization. *World health statistics 2016: monitoring health for the SDGs sustainable development goals*. World Health Organization; 2016 Jun 8.

9. Chang SB, Park YW, Cho JS, Lee MK, Lee BC, Lee SJ. Differences of cesarean section rates according to San-Yin-Jiao (SP6) acupressure for women in labor. *Journal of Korean Academy of Nursing*. 2004 Apr 1;34(2):324-32.
10. Chung UL, Hung LC, Kuo SC, Huang CL. Effects of L14 and BL 67 Acupressure on Labor Pain and Uterine Contractions in the First Stage of Labor. *Journal of nursing research*. 2003 Dec 1;11(4):251-60.
11. Lee MK. Effects of San-Yin-Jiao (SP6) acupressure on anxiety, pulse and neonatal status in women during labor. *Korean Journal of Women Health Nursing*. 2003 Jun 1;9(2):138-51.
12. Yamamura Y. *Acupuntura tradicional: a arte de inserir*. Editora Roca; 2001.
13. van Haaren-ten Haken TM, Hendrix MJ, Nieuwenhuijze MJ, de Vries RG, Nijhuis JG. Birth place preferences and women's expectations and experiences regarding duration and pain of labor. *Journal of Psychosomatic Obstetrics & Gynecology*. 2018 Jan 2;39(1):19-28.
14. Smith CA, Levett KM, Collins CT, Armour M, Dahlen HG, Suganuma M. Relaxation techniques for pain management in labour. *Cochrane Database of Systematic Reviews*. 2018(3).

Soft Tissue Dental Lasers

Prabhu Manickam Natarajan¹, Mohamed Said Hamed², Sura Ali Ahmed Fuoad Al-Bayati³,
Dusan Surdilovic⁴, Pooja Narain Adtani¹

¹Assistant Professor, ²Dean, ³Associate Dean -Academics, ⁴Associate Professor,
College of Dentistry, Gulf Medical University, UAE

ABSTRACT

The term LASER stands for Light amplification by stimulated emission of radiation. Nowadays numerous types of laser systems are available for use in the Dental field. The Dental practitioner should be familiar with these devices and should be aware of the possibilities and limitations of each type of Laser. In this paper, the different types of Lasers and their applications in Dentistry, and precautions to be taken when using lasers are discussed.

Keywords: Laser, soft tissue, Laser safety, Diode Laser, Laser hazards.

INTRODUCTION

One of the most exciting developments in medical technology is the laser. Dentists have not been slow in examining lasers for possible use in their own field. Initial results met with a mixed success, but the last few years have been much more promising.

In one generation lasers have moved out of the realm of fantasy into everybody's life from outer space to laser printers and copiers in office. Lasers do have far reaching potential for application to various fields. The laser effect is undoubtedly one of the major breakthroughs of this century.

Lasers are an impressive potential treatment modality for a variety of clinical conditions. Recent advances and developments have led to an increased acceptance and research of this technology by both practitioners and general public.

A *laser* (from the acronym of **Light Amplification by Stimulated Emission of Radiation**) is an optical source that emits photons in a coherent beam¹.

Corresponding author:

Dr. Prabhu Manickam Natarajan MDS,PhD,
College of Dentistry, Gulf Medical University,
Ajman, United Arab Emirates.
Email: prabhuperio@gmail.com

COMMON LASER TYPES USED IN DENTISTRY²:

Laser type	Medium	Wavelength in nanometers	Delivery system
Argon	Gas laser	488,515	Optical fibre
KTP	Solid state	532	Optical fibre
Helium-neon	Gas laser	633	Optical fibre
Diode	Semi conductor	635,670,810, 830,980	Optical fibre
Nd: YAG	Solid state	1064	Optical fibre
Er: YAG	Solid state	2940	Optical fibre, wave guide, articulated arm
CO ₂	Gas laser	9600,10600	Waveguide, articulated arm

LASER TISSUE INTERACTION

Each tissue type has a specific energy absorption pattern. Laser absorbed by tissues are strictly frequency and tissue dependent. Because of the limitations of laser physics and tissue biophysics, one laser cannot be applied to all the various tissue types with complete efficacy.

When laser strikes tissue it is absorbed, reflected, scattered or transmitted in various degrees and combinations. Absorption results in energy from the photons being transferred to the tissue, causing a thermal or non-thermal reaction depending on the wavelength and the energy of the incident photons in the beam. Consequently, energy absorbed at deeper levels may be greater than that in the superficial layers. Tissue absorption is low with Nd: YAG lasers; has optical scattering with deeper and uniform penetration within tissue.

Lasers are highly pigment-specific and the addition of a pigment to a non-pigmented area will result in increased absorption. Since tissues are composed of specific cells and molecules, the radiation may be absorbed superficially or at depth, depending on the radiation and the concentration of these cells and molecules³.

Non-thermal effects can be grouped into **photochemical** and **photodecomposition**. Photochemical effects are poorly understood but involve irradiation with laser powers measured in mill watts, producing little or no temperature effect, with the energy absorbed producing instant changes in chemical and physical properties of atoms and molecules. Photochemical processes can change to photothermal effects if energy densities are increased. **Photodecomposition** effects include **photoablation** and **photodisruption**. Photoablation breaks up atomic and molecular bonds of the target tissue with no damage to the adjacent tissue. Only excimer lasers (those operating in the ultraviolet range) are capable of emitting radiation with energies high enough to dissociate atomic and molecular bonds in this manner. Photodisruption involves the use of very high energy and very short pulse duration lasers to produce *plasma* (a cloud of ionized particles the overall charge of which is neutral), which destroys tissue mechanically by the generation of a secondary shock wave³.

CO₂ lasers have the most absorption, with basically negligible scattering followed by the argon laser.

Diode laser

The diode soft tissue laser is a highly effective and predictable new device for simple recontouring of tissue, requiring only a topical anesthetic. Its wavelength is between 800 and 980 nm, appropriate for removing

soft tissues due to their pigmentation and hemoglobin content. Energy from the laser is converted in a photo thermal reaction making it possible to paint away targeted soft tissue in a controlled and focused manner without unwanted side effects on the surrounding teeth^{1,4}.

The diode laser is activated with a foot pedal. The operator gently moves the fiberoptic wand over the target tissue using a light brush stroke to paint away the desired amount of tissue. Care should be taken to avoid excessive contact, which might cause unwanted collateral damage. After laser procedure, cotton balls soaked in hydrogen peroxide is used to debride the area of charred tissue.

Advantages:

Single appointment procedure using topical anesthetic with little pain or bleeding.

Cost effective.

Reduces treatment time.

Vastly improves esthetic results.

FOR GINGIVAL RECONTOURING AND SCULPTING

Uneven tissue levels are recontoured successfully with Lasers. The tissues will normally adjust to the reconstituted bone heights once the appliances are removed, gingival swelling subsides and oral hygiene improves. Occasionally the tissue levels will not align properly due to the distance of tooth movement, periodontal response or poor hygiene.

Sculpting or reshaping the tissue once swelling has subsided can create a more pleasant smile and improve periodontal health where residual gingival hypertrophy exists. Diode lasers can be used for recontouring the gingival margin resulting in enhanced esthetics⁴.

FRENECTOMY

Frenectomies requires the removal of fibrous interseptal tissue which can be done successfully with the use of a diode laser.

Diode and Er: YAG lasers in labial frenectomy in infants⁵

Different high power lasers: diode (810 nm) and Er: YAG (2940 nm) are used. The diode laser has high

absorbance by pigmented tissues with hemoglobin, melanin, and collagen chromophores. For this reason, this wavelength is well indicated for surgery in soft tissue (vaporization, incision, coagulation and hemostasis). It is not properly absorbed, however, and should never be used in contact with hard tissues (bone).

The Er: YAG laser has high absorbance to water and mineral apatite, making this wavelength useful and safe for the ablation of hard tissues. In the labial frenectomy clinical procedure, a combined technique is suggested: using the diode laser in soft tissues and the Er: YAG laser in periosteal bone tissues and for removal of final collagen fibers.

ACCESS GINGIVECTOMY⁶

When a tooth resists eruption with a thin layer of tissue covering its surface, treatment can be delayed for months. Diode laser can be used for removal of tissue covering unerupted teeth.

Removal of such tissue should be performed carefully so that tooth is exposed only to the extent needed to place a bracket. The laser vaporizes the tissue without bleeding, allowing the tooth to be etched, sealed and bonded. This allows for easier and faster alignment of tooth into the arch.

GINGIVECTOMY OF HYPERTROPHIC TISSUE⁷

Hypertrophic tissue can swell around orthodontic brackets, inhibiting oral hygiene and slowing tooth movement. Even prodigious tooth brushing may not be enough to make this excess tissue recede and the orthodontists have few options short of appliance removal.

The diode laser can quickly and easily remove swollen tissue without undue patient discomfort. The removal of the appliance until the swollen gingival tissue recedes results in unnecessary delay in the treatment leading to increased treatment time.

OPERCULUM REMOVAL

Operculum covering the unerupted teeth especially in the third molar areas creates pain and discomfort to the patients. The operculum around the unerupted tooth also poses a problem for the Orthodontist especially during treating mixed dentition patients. This comes in the way of band and bracket placement resulting in unnecessary

gingival bleeding, gingival injury and increase in the treatment time⁸.

Diode lasers can be used for the removal of the operculum covering erupting teeth. This tissue can be easily removed with the diode laser without any patient discomfort thereby preventing delay in treatment time⁸.

Lasers can also be used for veneer placement, treatment of aphthous ulcers and herpetic lesions⁹.

Laser Hazards:

The laser produces an intense, highly directional beam of light. The most common cause of laser-induced tissue damage is thermal in nature, where the tissue proteins are denatured due to the temperature rise following absorption of laser energy.

The human body is vulnerable to the output of certain lasers, and under certain circumstances, exposure can result in damage to the eye and skin. Research relating to injury thresholds of the eye and skin has been carried out in order to understand the biological hazards of laser radiation. It is now widely accepted that the human eye is almost always more vulnerable to injury than human skin. The intensity of laser radiation is often such that exposure can result in serious and permanent injury to skin and eyes¹⁰.

Laser Classification based on hazards¹¹

Lasers and laser systems are classified by their ability to cause biological damage to the eye or skin during use

Class I Lasers

Lasers or laser systems incapable of producing damaging radiation during intended use are Class I lasers. These lasers are exempt from any controls or administrative requirements during normal use.

Class II Lasers

Class II lasers (low power) are lasers emitting radiation in the visible portion of the spectrum. Even though the power of these lasers is such that they will normally be protected by a physiological aversion response (blink reflex), personnel should wear laser eyewear for protection.

Class III Lasers

Class III lasers and laser systems (medium power) produce radiation that can cause eye damage when viewed directly, or when a specular reflection is viewed. A diffuse reflection is usually not a hazard.

Class IV Lasers

Class IV lasers and laser systems (high power) produce radiation that may be dangerous to the eye even when viewing a diffuse reflection. The direct beam can produce skin damage and can also be a fire hazard.

Eye Injury^{10,11}

The site of injury following laser exposure depends on the wavelength. Ultraviolet with wavelengths from 0.2 to 0.215 mm and infrared with wavelengths of 1.4 mm or greater are absorbed in the cornea. Wavelengths from 0.78 to 3 mm are also partially absorbed in the lens. Visible light of 0.4 to 0.78 mm is transmitted to the retina. Some light with wavelengths from 0.78 to 1.4 mm will also be transmitted to the retina.

Acute exposure of the cornea can cause corneal burns, or photokeratitis (welder's flash). Lens opacities (cataracts) are associated with chronic exposure of the lens. Chronic exposure of the retina may also result in retinal injury.

Objects in the center of the field of vision are focused on an area of the retina called the fovea. This area of the retina is the most sensitive and is responsible for most of our visual activity. Injury of the fovea may result in permanent blindness in the injured eye. If the peripheral areas of the fovea are injured, the effect on vision is less serious. In some cases the effects are not noticeable or distracting.

Skin Injury^{10,11}

Skin burns are caused by radiation from high-powered lasers in the infrared. Exposure to the skin in all wavelengths may result in erythema, skin cancer, skin aging, dry skin effects, and photosensitive reactions in the skin.

Thermal effects

Temperature rise of more than 6°C can cause irreversible pulpal reaction and temperature in excess of 11°C may cause necrosis of pulp. Temperature of this

magnitude is known to occur during cavity preparation with uncooled burs (or) during polishing and finishing of restorations.^{1,31}

If the insult to the pulp is great enough, burn lesions can present as coagulation necrosis and often develop intra-pulpal abscesses. Abscess formation appears to occur quite early and may remain indefinitely. Resolution of a large burn area can occur with the entire area involved first filling in with granulation tissue. This tissue then undergoes reorganization by stimulated odontoblasts with resultant reparative dentine formation. However, if healing is not successful, a large expanding abscess will develop¹².

LASER SAFETY MEASURES¹³:

- a. Training of operators and personnel working on or near lasers (on site or general).
- b. Posting and labeling of rooms and equipment, to include a warning light in the hallway or access entrance.
- c. Protective eyewear and clothing.
- d. Engineering controls such as beam stops, curtains, and enclosures.

The exact combination of these control measures depends on the power and type of laser, laser environment and procedures conducted with laser equipment.

- Eye Protection is important for the operator, staff, and the patient. Different lasers require different safety glasses.

- CO2 laser protection can be afforded with clear safety glasses, such as those that are normally worn during dental procedures. The patient wears clear safety glasses as well and as a back up measure, wet gauze sponges are placed over the patient eyes.

- For protection from Nd: YAG laser energy, both the doctor and staff need to wear green safety glasses.

- For the argon laser, orange safety glasses.

It is very important that all anesthetic gases be removed from the room. They are explosive, and could be ignited by a laser beam. The dentist must also suction off vaporized soft tissue, and the smoke, or laser "plume," emitted during procedures¹⁴.

Instruments that are highly reflective or that have mirrored surfaces should be avoided, as there could be reflection of the laser beam.

Lasers are now part of our lives in many ways. They are in our computer printers and compact disc players, they light up rock concerts, and they guide weapons and measure distances between planets. Lasers have also revolutionized many surgical procedures minimizing bleeding, swelling, scarring, and pain. And now they're beginning to blaze a new trail in Dentistry.

There are innumerable uses of lasers in Dentistry. Right from cast analysis to record maintenance, from diagnosis to treatment planning, from etching to debonding, from increasing rate of tooth movement to controlling growth, from welding to painless removal of inflamed tissues anything could be achieved by using laser technology.

Careful understanding of the uses of lasers can result in painless, faster, easier and better treatment. Along with it's numerous and ever growing uses the clinicians should also have knowledge about their disadvantages, hazards and more importantly safety measures. Without this knowledge dentists can indirectly cause more damage to their patients than good.

We the dentists should balance our eagerness to apply these promising new tools with an appropriate measure of caution. The relatively high cost of laser systems will undoubtedly limit the extent of their implementation. Laser therapy is a potent but emerging science which opens a very promising path for investigation that may lead to revolutionary changes in the field of Dentistry^{13,14}.

The continued development of dental lasers helps dentistry to provide the best care for our patients. The science surrounding dental lasers continues to support their current use and shows promise for future applications of lasers in dentistry. Safe use of lasers also must be the underlying goal of proposed or future laser therapy. With the availability and future development of different laser wavelengths and methods of pulsing, much interest is developing in this growing field¹⁵.

Despite the slow evolution of lasers in dentistry, researchers say the day will indeed come when a variety of lasers play a more prominent role in maintaining a healthy mouth. And it won't be just one laser that will do all dental procedures. Researchers are envisioning a

laser unit in which you can switch on or off different types of lasers depending upon the procedure¹⁵.

The past several years have seen rapid advances in laser technology especially in size reduction, cost effectiveness, simplicity of operation and safety. However, a large gap will exist for sometime before the lasers can evolve to meet some of the demanding requirements of safe, routine intra-oral use.

Source of Support: Self.

Conflict of Interest: Nil

Ethical approval: Not applicable

REFERENCES

1. LJ Walsh. The current status of laser applications in dentistry: Australian dental journal: 2003: 48(3): 146-155.
2. Sanjeev Kumar Verma, et al. Laser in dentistry: An innovative tool in modern dental practice. Natl J Maxillofac Surg. 2012 Jul-Dec; 3(2): 124-132.
3. M. Midda, P. Renton-Harper, et al. Lasers in dentistry. British dent J. 1991: 170(9): 343-346.
4. Daniel Ortega-Concepción, The application of diode laser in the treatment of oral soft tissues lesions. A literature review. J Clin Exp Dent. 2017 Jul; 9(7): e925-e928.
5. Panagiotis Kafas, et al. Upper-lip laser frenectomy without infiltrated anaesthesia in a paediatric patient: a case report. Cases J. 2009; 2: 7138.
6. B Shiva Shankar et al. Chronic Inflammatory Gingival Overgrowths: Laser Gingivectomy & Gingivoplasty. J Int Oral Health. 2013 Feb; 5(1): 83-87.
7. Sawai MA. 810 nm diode laser: A reliable tool for periodontal surgeries. J Dent Lasers 2016;10:19-22
8. Khan MA, Agrawal A, Saimbi CS, Chandra D, Kumar V. Diode laser: A novel approach for the treatment of pericoronitis. J Dent Lasers 2017;11:19-21
9. Hersheal Aggarwal, et al. Efficacy of Low-Level Laser Therapy in Treatment of Recurrent Aphthous Ulcers – A Sham Controlled, Split Mouth Follow Up Study. J Clin Diagn Res. 2014 Feb; 8(2): 218-221.
10. Penny J. Smalley Laser safety: Risks, hazards, and control measures. Laser Ther. 2011; 20(2): 95-106.

11. Howard Bargman, Laser Classification Systems. *J Clin Aesthet Dermatol.* 2010 Oct; 3(10): 19–20.
12. D.H.Sliney. Risk assessment and laser safety. Volume 27, Issue 5, October 1995, Pages 279-284
13. S. Parker. Laser regulation and safety in general dental practice. *BDJ* volume 202, pages 523–532
14. Sweeney C. Laser safety in dentistry. *Gen Dent.* 2008 Nov-Dec; 56(7): 653-9.
15. Howard Bargman, Laser Safety Guidelines. *J Clin Aesthet Dermatol.* 2010 May; 3(5): 18–19.

The Efficiency of Conducting Pregnancy Session toward Reducing the Level of Anxiety to Deliver Baby

Oktaviani¹, Heti Ira Ayue¹

¹Midwifery Program, Poltekkes Kemenkes Palangka Raya, Central Kalimantan Indonesia

ABSTRACT

Background: Maternal mortality rate has a significant implication on the success level of health effort on various levels. Approaches have been developed to ensure the availability of excellent health service quality as well as its accessibility to the community. One of such access towards the health improvement is pregnancy class, on which woman, who had 20 -32 weeks of pregnancy given accesses to knowledge related to antepartum to postpartum. This research was aimed to study the pregnancy class efficiency on mothers' level of anxiety to face childbirth in Pahandut Community health center, Central Kalimantan, Indonesia.

Method: The study was quasi-experimental with concurrent embedded designs. The population is mothers with a pregnancy period of 24-26 weeks, and get antenatal care at the Pahandut Health Center, with or without participation in classes of pregnant women. The sample was 30 pregnant women who were 24-26 weeks' gestation. The sample was determined using quota sampling. To assess anxiety level, the Hamilton Anxiety Rating Scale (HARS) scale was employed. Data were analyzed using independent t-test.

Results: The results showed that pregnant women who were given class treatment for pregnant women had an anxiety level score (8.77; 95% CI 7.64 - 9.89) lower than the anxiety level score (15.5; 95% 12.41-14,59) pregnant women who are not.

Conclusion: The pregnancy session class applies to assign to women before delivering birth, so they don't experience a high level of anxiety when delivering the babies.

Keywords: *Pregnancy class, Anxiety level, Childbirth.*

INTRODUCTION

The success of maternal health efforts, among which can be seen from the indicator of Maternal Mortality Rate (MMR). The decline in MMR in Indonesia occurred from 1991 to 2007, from 390 to 228. However, the 2012 IDHS showed a significant increase in MMR, which was 359 maternal deaths per 100,000 live births. The MMR again showed a decline to 305 maternal deaths per 100,000 live births based on the results of the 2015 Intercensal Population Survey⁽¹⁾.

Strategies that can be carried out to improve access and quality of health services for mothers, newborns, and children, are carried out using the continuum of care approach starting from pre-pregnancy, pregnancy, childbirth, infants, toddlers, to adolescents (men and women of age fertile). During pregnancy, the program is intended to maintain the health of the mother and fetus in the womb, and if there are complications or risk factors can be detected early and intervened⁽²⁾.

Pregnancy and childbirth are physiological processes and cause pain. Some pregnant women who feel pain during labor are affected by feelings of panic and stress. Mothers' fears of birth are related to maternal emotions that affect the delivery process. Labor anxiety is an unpleasant feeling or psychological condition due to physiological changes that cause instability in

Corresponding Author:

Oktaviani

Email: oktaviani@poltekkes-palangkaraya.ac.id

mental states. To eliminate stress, cooperation must be planted between patients and health workers ⁽³⁾. One of the efforts made so that pregnant women are ready to face childbirth is through classes of pregnant women. Class of pregnant women is a study group of pregnant women with a gestational age between 20 weeks to 32 weeks with a maximum number of participants of 10 people. Through class, pregnant women are expected to increase the knowledge and skills of mothers regarding pregnancy, care for pregnancy, childbirth, postpartum care, newborn care, myths, infectious diseases and birth certificates ⁽⁴⁾. With assistance during pregnancy through classes, pregnant women are expected to reduce anxiety, fear of childbirth so that the processes can run smoothly and do not experience complications.

Based on the health profile of Palangka Raya City, in 2015 the number of cases of maternal deaths was 3 cases. The number of cases of maternal death slightly decreased compared to 2014 as many as 4 examples. The cause of maternal death in 2015 was due to bleeding and co-morbidities in the mother (asthma and heart). The community health center with maternal mortality cases were Pahandut Health Center, Panarung Health Center and Kereng Bangkirai Health Center, each with 1 case ⁽⁵⁾. The Pahandut Health Center is one of the basic emergency obstetric services and inpatient health centers, one of which serves delivery assistance and has many targets for pregnant women. The health center has implemented a class program for pregnant women conducted in the community health center room which is prepared to facilitate the activities of the pregnant women. Thus, the research was aimed to study the effectiveness of the class among pregnant women on reducing the level of anxiety facing childbirth.

METHODOLOGY

This research is a quasi-experimental study, which aims to analyze the class effectiveness of pregnant women on the level of anxiety facing delivery of pregnant women in the working area of Pahandut Health Center. The population in this study were all pregnant women who were 24-26 weeks gestational age and received antenatal care at the Pahandut Health Center in April 2017. Case samples in this study were 30 pregnant women who were 24-26 weeks gestational age and received ANC and attended classes for pregnant women at least 4 times. The control sample was 30 pregnant women 24-26 weeks gestational age getting

antenatal services at least 4 times but not taking classes for pregnant women. The sample selection was chosen using quota sampling ⁽⁶⁾. The instrument for assessing variables in this study using an anxiety questionnaire refers to the Hamilton Anxiety Rating Scale (HARS) scale. Data analyzed using independent t-test. Normality and homogeneity employed Shapiro-Wilk, and Levene tests.

RESULTS

Based on the results of the study, many pregnant women were not at risk, in the treatment group at 80% (24) and the control group at 76.7% (23). In the treatment group amounted to 90% (27) pregnant women with primary and secondary education and in the control group amounted to 96.7% (29) pregnant women were with primary-secondary education. The employment status of pregnant women in the treatment group who did not work was 86.7% (26) and in the control group who did not work 60% (18). The results of the study are shown in Table 1 below:

Table 1. Sample characteristics in control and treatment

Variable	Treatment		Control	
	n	%	n	%
Age group risk				
No Risk	24	80	23	76,7
Risk	6	20	7	23,3
Education level				
High	3	10	1	3,3
Elementary - Secondary	27	90	29	96,7
Occupation				
Working	4	13,3	12	40
Not Working	26	86,7	18	60

The level of anxiety of pregnant women in the control group (not given a class intervention of pregnant women), is 8 the lowest and 23 the highest. The average rating of anxiety level in the control group was 14.13, with a standard deviation of 3.76. Using a 95% confidence level, the anxiety level scores in the population that were not given a class intervention of

pregnant women (control group) were between 12.73 – 15.54.

The anxiety level of 30 pregnant women in the treatment group before being given a class intervention of pregnant women was 4 the lowest score and 24 the highest. The average rating of anxiety level in the treatment group was 12.03, with a standard deviation of 5.41. Using a 95% confidence level, the anxiety level score in the population is between 10.01 – 14.06.

Table 2. The level of the anxiety of pregnant women before intervention

Groups	n	Min – Max	Mean	SD	95% CI Mean
Control	30	8 – 23	14.13	3.76	12.73-15.54
Treatment	30	4 – 24	12.03	5.41	10.01-14.06

The level of anxiety of pregnant women in the control group (not given a class intervention of pregnant women), the lowest score of 9 and the highest score of 19. The average rating of anxiety levels in the control group was 13.5, with a standard deviation of 2.91. Using a 95% confidence level, researchers believe that anxiety level scores in the population not given class intervention by pregnant women (control group) between 12.41 – 14.59.

The anxiety level of 30 pregnant women in the treatment group after being given class intervention of pregnant women, the lowest score was 3, and the highest score was 15. The average rating of the anxiety level in the treatment group after being given classes of pregnant women was 18.77, with a standard deviation of 3.01. Using a 95% confidence level, researchers believe that anxiety level scores in the population after being given a class intervention of pregnant women between 7.64 - 9.89.

Table 3. The level of the anxiety of pregnant women after intervention

Group	N	Min – Max	Mean	SD	95% CI Mean
Control	30	9 - 19	13.5	2.91	12.41 – 14.59
Treatment	30	3 – 15	8.77	3.01	7.64 – 9.89

Classes of Pregnant Women Against Differences in Anxiety Levels of Mother Facing Labor

The results of this study found that pregnant women who were given class treatment for pregnant women had an anxiety level score (8.77; 95% CI 7.64 - 9.89) lower than the anxiety level score (15.5; 95% 12.41 - 14.59) pregnant women who are not given class treatment for pregnant women.

Table 4. Comparisons between level anxiety facing childbirth between two group

	Mean Skor (95% CI)	SD	Levene Test	Difference 95% CI	P-Value
Level of anxiety control (n=30)	13.5 (12.41 – 14.59)	2.91	0.934*	4.73 (3.2 – 6.26)	0.005
Level of anxiety intervention (n=30)	8.77 (7.64 – 9.89)	3.01			

Remarks :

Normality test: *Shapiro Wilk*; Homogeneity test: Levene test.

Table 5. Score comparisons before and after of anxiety level on the treatment group

	Mean Skor (95% CI)	SD	R	difference 95% CI	P- Value
Level of anxiety before treatment (n=30)	12.03 (10.01-14.06)	5.41	0.446 ^a	3.26 (1.44 – 5.09)	0.001
Level of anxiety after treatment (n=30)	8.77 (7.64 – 9.89)	3.01			

The average score of the level of anxiety of pregnant women before pregnancy classes were 12.03 with 95% confidence interval 10.01 to 14.06. Meanwhile, after the intervention, the average anxiety level score was 8.77 with a 95% confidence interval of 7.64 to 9.89. The difference in the value of anxiety of pregnant women after treatment was a decrease of 3.26, with a 95% confidence interval of 1.44 to 5.09. There is a difference in the average score of anxiety levels before treatment and after treatment value <0.05 .

The results showed that there were differences in scores on the level of anxiety of pregnant women before and after being given classes for pregnant women. With a significant value of 0.001 (<0.05). The coefficient of determination value is 19.8% indicating that the class of pregnant women plays a role of 19.8% in decreasing anxiety level scores, while other factors cause the rest.

DISCUSSIONS

The results of the study showed that the age of respondents mostly not at risk as many as 46 people (76.6%). Since maternal age determines physiological and psychological status during pregnancy and childbirth, the age of 20-35 years is the optimal or safe reproductive age to undergo pregnancy and childbirth⁽⁷⁾. In Table 1, the results showed that most of the respondents' education level was elementary-secondary education as many as 56 people (93%). Education is a basic need that is very much needed for self-development and intellectual maturity. Education can also instill a real understanding that changes the mother's personality. The coping mechanism is more consistently formed and modified due to the right adaptive response to maternal anxiety⁽⁶⁾. The results showed that most of the mothers did not work (homemakers), namely 44 people (73%). Work is a busy life that must be done primarily to support their lives and family life. In general, mothers who work their time-consuming activities can distract anxiety. However, mothers who work can also eliminate feelings of fear because of the attention and support of their husbands and families.

This study found that pregnant women who were given class treatment for pregnant women had an anxiety level score (8.77; 95% CI 7.64 - 9.89) lower than the anxiety level score (15.5; 95% 12.41-14, 59) pregnant women who are not given class treatment for pregnant women. These results indicate that by following the

implementation of the maternal class, the level of anxiety of pregnant women is lower in the face of childbirth. This is because, the course of pregnant women aims to increase knowledge, change maternal attitudes and behavior so that they understand about prenatal care so that mothers and fetuses are healthy, childbirth is safe, delivery is comfortable, mothers are safe, babies are healthy, prevention of physical and mental illness, nutritional disorders and complications pregnancy, and childbirth so that mothers and babies are healthy, care for newborns so that optimal growth and development, and physical activity of pregnant women. Maternal class activities help in carrying out pregnancy, be ready to face childbirth and childbirth safely, comfortably, healthily and safely similar to previous findings^(8,9).

Anxiety can arise from a person's reaction to pain that will increase the activity of the sympathetic nerve and increase catecholamine secretion. Excessive catecholamine secretion will cause a decrease in blood flow to the placenta so that it limits oxygen supply and decreases the effectiveness of uterine contractions which can slow the labor process.

The results also found that pregnant women after being given the class treatment of pregnant women scores lower anxiety levels compared to scores of anxiety levels of pregnant women before being given the class treatment of pregnant women⁽¹⁰⁾.

As suggested⁽¹¹⁾, it is essential for pregnant women to get information about the process of pregnancy, baby care and self-confidence in preparing to be a parent. Through the classes of pregnant women, health workers are more aware of the health problems of pregnant women and their families and are closer to pregnant women family and community making the mother is ready to undergo pregnancy and face childbirth⁽⁴⁾.

CONCLUSION

Pregnant women who are given class treatment scores lower in anxiety levels compared to the rating of those who are not given class treatment. Also, pregnant women after being given the class treatment score lower in anxiety levels compared to scores of anxiety levels of pregnant women before being given the class treatment of pregnant women.

Ethical Clearance: Ethical clearance was obtained from the research ethics committee of Padjadjaran

University, Bandung, Indonesia.

Conflict of Interest: Nil.

Source of funding: The Ministry of Health Polytechnic Palangkaraya, Indonesia.

REFERENCES

1. Kementerian Kesehatan RI. Profil kesehatan Indonesia. Jakarta. 2015.
2. Kementerian Kesehatan RI. Pedoman Umum Program Indonesia sehat dengan pendekatan keluarga. Jakarta. 2016.
3. Simkin, P. Kehamilan, Melahirkan dan Bayi; Panduan Lengkap, Jakarta : Arcan. 2007.
4. Kementerian Kesehatan RI. Modul Pelatihan bagi pelatih fasilitator kelas Ibu. Direktorat Jendral Bina Gizi dan kesehatan Ibu dan Anak. Jakarta. 2015.
5. Dinkes. Profil Kesehatan Kota Palangka Raya. Palangka Raya. 2015.
6. Sopiudin DM. Besar sampel dan cara pengambilan sampel. Jakarta: Salemba Medika. 2010.
7. Hidayat S dan Sumarni. Kecemasan Ibu Hamil dalam Menghadapi Proses Persalinan. *Jurnal Kesehatan Wiraja Medika*. 2013.
8. Bahrami Nosrat, Simbar M, Bahrami S. The Effect of Prenatal Education on Mother's Quality of Life During First Year Postpartum among Iranian Women: A Randomized Controlled Trial. *International Journal of Fertility and Sterility*. 2013; 7(3).
9. Koehn, M. Contemporary Women's Perceptions of Childbirth Education. *The Journal of Perinatal Education*. 2008; 17(1):11-18.
10. Kartini, Syafar M, Arsin A, Bahar Burhanuddin, Fitriyani, Farming. The Influence of Education Using Modification Module on Knowledge, Attitude, and Behavior of Pregnancy Care in Kendari, Indonesia. *Public Health of Indonesia-YCAB Publisher*. 2016 ; 2(2).
11. Maimburg RD, Vaeth M, Durr J, Hvidman L, Olsen J. Randomised trial of structured antenatal training sessions to improve the birth process. *BJOG*. 2010; 117(8): 921-928.

Determination of the Safe Duration of Benzene Non-Carcinogenic Exposure in Motor Workshop Area

Ramdhoni Zuhro¹, Abdul Rohim Tualeka¹, Ratna Ayu Harsetianingrum¹

¹Department of Occupational Health and Safety, Public Health Faculty, Airlangga University, Surabaya

ABSTRACT

Workers in motor workshop area who working more than 3 years were at risk of exposure to benzene from improved emissions of vehicles in their work environment. The objectives of this study were to measure the duration of safe exposure to benzene in the work environment of motor workshops and to know Risk Quotient (RQ) due to exposure to benzene (non-carcinogenic).

This type of research was an analytical study by using Environmental Health Risk Analysis design, which was used to assess and predict what would happen due to hazardous substances exposure. In this case, benzene was used as one component in fuel oil. The sample population was 15 people from all workers in a motor workshop area in Surabaya. Data analysis was using manual data calculation to know the benzene intake, the Risk Quotient (RQ) on worker and the duration of safe exposure of benzene in motor vehicle workshop area.

It was found that the average intake of benzene in motor workshop area in Surabaya was 0.01631 mg/kg/day, the average of RQ was was 1.91882 mg/Kg/day or $RQ > 1$, indicating that workers in motor workshop area had health risk due to benzene exposure) and the safe duration of benzene exposure for workers in the motor workshop area was 5.43 years. Therefore, it was necessary to control the work environment to reduce effect of the benzene exposure on workers. It was concluded that workers in the motor workshop area were at a risk of benzene exposure but could work safely for 5.43 years. It was depend on the food intake and the condition of each body of workers in the motor workshop environment. Recommendations were by consuming CYP2E1 enzyme contained in cow liver and salmon to lower benzene levels in the body.⁸

Keywords: Benzene, Risk Quotient, Safe Duration, Workers, Motor Workshop

INTRODUCTION

Everyone can be exposed to small amounts of benzene every day. Benzene exposure can occur in workplace, outside environment or at home. The main sources of benzene are cigarette smoke, motor vehicle emissions and emissions of industrial activities. Motor vehicle emissions produce Benzene, Toluene and

Xylene (BTX) which are carcinogenic chemicals. One of the places that has a lot of motor vehicle emissions is motor workshop area. Workers in motor workshop area who working more than 3 years were at risk of exposure to benzene from improved emissions of motor vehicles in their work environment.

BTX is a Volatile Organic Compound (VOC), a carbon-containing compound that has a high vapor pressure at room temperature. The most commonly known VOCs are solvents, and other VOCs are widely used such as monomers and fragrances.¹² BTX is a chemical classified as toxic to health, whether carcinogenic and increases oxidative stress.^{2,3,9,14} Besides BTX non-carcinogenic can affect the hematopoietic system, central nervous system and reproductive system.

Corresponding author:

Abdul Rohim Tualeka

Lecturer in Occupational Health and Safety
Department, Public Health Faculty, Airlangga
University, Surabaya, 60115, Indonesia
Tel: +62 31 5920948/ +6281333519732
Fax: +62 31 5924618, E-mail: inzut.tualeka@gmail.com

The toxic nature of BTX in high-level exposure leads to neurotoxic symptoms. Continuous exposure in high levels of BTX can affect damage to the human bone marrow, DNA in mammalian cells and immune system. Light exposure of BTX causes irregular heartbeats, headaches, dizziness, nausea and even fainting if the exposure continued for a long time. Early manifestations of its toxicity are anemia, leukocytopenia, and thrombocytopenia.¹¹

Benzene as one member of BTX is a compound that is non polar because it does not have a pair of free electrons. The chemical structure of benzene has 3 double bonds. The existence of double bonds on benzene makes this compound harmful to humans and other living things because it is carcinogenic. Benzene is non polar compound that insoluble in water, but soluble in organic solvents such as diethyl ether, carbon tetrachloride or hexane.¹ Benzene is an aromatic hydrocarbon compound having an enclosed carbon chain with 6 hydrogen atoms having unsaturated properties with C₆H₆ chemical formula.

Several agencies in the field of health and safety such as WHO (World Health Organization), and the Agency for Toxic Substances and Disease Registry (ATSDR) have determined that Benzene is a substance that can cause cancer. In addition, acute effects can be eye irritation, respiratory tract, dizziness and loss of consciousness.¹ The Indonesian government through the labor department has categorized Benzene as carcinogenic according to Permenakertrans No.13/MEN/X/2011 in 2011.⁷

The results of Haen and Oginawati⁴ showed that there is a significant relationship between benzene concentration in breathing zone with hemoglobin, erythrocytes and also eosinophils. It could be related to bone marrow, because the formation of blood cells occurs in the bone marrow. Robbins and Kumar said that benzene can cause myeloid stem cell failure resulting in reduced production of hemoglobin and red blood cells. If red blood cell deficiency occurs for a long time, it can cause aplasti anemia.¹⁰ A study conducted by Lan et al in 2004 concluded that in benzene-exposed workers with relatively low concentrations (<1 ppm) there was a haematological effect. In the study also found that benzene exposure also has a significant relationship with eosinophils. The number of abnormal eosinophils is one of the hematopoietic disorders that can cause

eosinophilia. Eosinophilia is a response to a disease. If a foreign material enters the body it will be detected by lymphocytes and neutrophils, which will release the material to attract the eosinophils to the area. Then eosinophils will release substances that can kill parasites and also destroy abnormal cells.

Based on the research previously about benzene in work environment, those have not been conducted research about safe duration (Dt Safe) for workers to work safely in work environment that has benzene exposure yet. Motor workshop area as the work environment that has benzene exposure, the workers and the owner of motor workshop have safe duration for wokers to work safely in motor workshop area. This is done to prevent health problems (non-carcinogen) caused by benzene exposure.

Therefore, based on the explanation above, we would like to measure the safe duration of benzene (non-carcinogen) in motor workshop area and to know workers characteristic, concentration of benzene exposure, respiration rate, intake and Risk Quotient (RQ) of benzene exposure (non-carcinogen).

MATERIAL AND METHOD

This type of research was an analytical study by using Environmental Health Risk Analysis design, which was used to assess and predict what would happen due to hazardous substances exposure. In this case, benzene was used as one component in fuel oil.

The design of study started from collecting secondary data that related to the work process which included the concentration of benzene in the air and the number of operators involved. Moreover, the study conducted primary data collection that associated with operators weight, exposure time, exposure frequency and exposure duration of benzene chemicals.

The sample population was 15 people from all workers in a motor workshop area in Surabaya with age between 19 years until 46 years and work period from 7 months until 20 years. Data analysis was using manual data calculation to know the benzene intake, the Risk Quotient (RQ) on worker and the duration of safe exposure of benzene in motor vehicle workshop area. Measurements of Benzene concentrations in the work environment were carried out using Minipump and Carcoal sample media. The reference used was NIOSH

1501 sampling and analysis.

The data was obtained through primary data by filling out questionnaires about age, weight and working period. Data of complete blood examination on respondents and benzene exposure in the workplace assisted by experts which is nurses from UPTK3 Hiperkes in East Java, Indonesia.

The variables studied were workers characteristics (age, weight and working period), concentration of benzene exposure, respiration rate, intake, Risk Quotient (RQ) and safe duration (Dt Safe) of benzene exposure (non-carcinogenic) in motor workshop area. Data analysis in this study was conducted by using quantitative data analysis to determine the concentration of safe exposure of Benzene to workers.

FINDINGS

A) Workers Characteristics

The workers characteristics in this study included age, weight and working period of 15 worker respondents in motor workshop area. Based on Table 1. in weight distribution, it was known that the most weight group of workers was group 54-62 Kg as much as 6 respondents (40,0%), while the highest weight of 78 Kg and the lowest weight of 45 Kg. In age distribution, it was known that the largest group of workers was aged between 19 years to 25 years as many as 7 respondents (46,7%), and groups of workers with age between 40 to 46 years was at least 2 respondents (13.3%). In working period distribution, the working period of the worker respondents was categorized into two that was the working period less than 3 years and the working period more than 3 years. It was known that the largest group of workers had working period more that 3 years in motor workshop area as much as 9 respondents (60,0%).

Table 1. Distribution of Workers Characteristics in Motor Workshop Area

Workers Characteristic	N	%	
Weight (Kg)	45-53	5	33.3
	54-62	6	40.0
	63-71	3	20.0
	72-80	1	6.7
Total	15	100.0	

Cont... Table 1

Age (Years Old)	19-25	7	46.7
	26-32	3	20.0
	33-39	3	20.0
	40-46	2	13.3
Total		15	100.0
Working Period (Years)	<3	6	40.0
	≥3	9	60.0
Total		15	100,0

B) Concentration of Benzene Exposure

Based on the measurement of benzene concentration in Table 2., the result of concentration of exposure centered on reparation section of motor workshop with benzene level concentration was 0,3974 ppm.

Table 2: Measurement of Concentration of Benzene Exposure in Motor Workshop Area

Measurement Location	Benzene Level (ppm)
Reparation Section of Motor Workshop	0.3974
Administration Section of Motor Workshop	-

Based on the measurement results by Balai Hiperkes Surabaya, the concentration of benzene in the motor workshop area was 0.3974 ppm or 1.267 mg/m³. The Concentration of Benzene was above the Minimum Risk Level (MRL), level of benzene inhaled exposure assigned by ATSDR¹, for acute exposure (≤14 days) = 0.009 ppm, moderate exposure (15-364 days) = 0.006 ppm, and chronic exposure (≥365 days) = 0.003 ppm. The concentration of benzene based on TLV value specified in Peraturan Menteri Tenaga Kerja dan Transmigrasi Nomor Per.13/MEN/X/2011 in 2011 about Threshold Limit Value (TLV) of physical factors and chemical factors in workplace, it was still below the TLV (1.59 mg/m³).⁷

C) Respiration Rate

Based on the calculation of the respiration rate on the worker respondents, the highest respiration rate of workers was 0.69 m³/hour, the lowest respiration rate of worker respondents was 0.55 m³/hour and the average respiration rate of worker respondents was 0.61 m³/hour.

D) Intake

The formula used to determine the intake of benzene toxin in the body is:

Notes:

$$\text{Intake Benzene Non - Carcinogen} = \frac{C \times R \times tE \times fE \times Dt}{Wb \times Tavg}$$

C = Benzene Concentration (mg/m³)

R = Respiration Rate (m³/hour)

t_E = Time of exposure (hour/day)

f_E = Frequency or Average exposure in year (day/year)

Dt = Duration of Exposure (year)

W_b = Weight (Kg)

T_{avg} = Average Exposure of Benzene (non-carcinogen)

→ 30 years x 365 day/year

Table 3. Intake, Risk Quotient (RQ) and Safe Duration (Dt Safe) of Benzene Exposure (Non-Carcinogenic) in Motor Workshop Area

Respondents	Benzene Intake (mg/Kg/day)	Risk Quotient (RQ) (mg/Kg/day)	Safe Duration (Years)
1	0.00807	0.94941	5.43
2	0.00797	0.93764	5.43
3	0.04197	4.93764	5.43
4	0.00148	0.17411	5.43
5	0.00175	0.20588	5.43
6	0.00920	1.08235	5.43
7	0.01238	1.45647	5.43
8	0.03319	3.90470	5.43
9	0.00760	0.89411	5.43
10	0.00960	1.12941	5.43
11	0.00269	0.31647	5.43
12	0.01050	1.23529	5.43
13	0.02169	2.55176	5.43
14	0.04798	5.64470	5.43
15	0.02867	3.37294	5.43
Average	0.01631	1.91882	5.43

It was known that the exposure concentration (C) was 1,267 mg/m³, the frequency or average exposure (f_E) of Benzene was 288 days/year and the average exposure of benzene (non-carcinogenic) (T_{avg}) was 30 x 288 days. Table 3 below describes the results of Intake Benzene calculations on workers, Risk Quotient (RQ) and Safe Duratin (Dt Safe) in the work environment. It was known that the maximum intake received by the worker is 0.04798 mg/Kg/day.

The intake value is directly proportional to the chemical concentration value, the frequency of exposure, and the duration of exposure, which can be interpreted the greater the value the greater the intake of a person. Intake is inversely proportional to the weight value, ie the greater the weight the smaller the health risk.

E) Risk Quotient (RQ)

The formula used to calculate the RQ is:

$$\text{Risk Quotient (RQ)} = \frac{\text{Intake}}{RfC}$$

The risk characteristics are intended to determine whether a toxin exposure has a risk or not to the human body. Risk Quotient (RQ) is the result of comparison between the value of Intake with reference dose of a Reference of Concentrate (RfC) exposure. The RfC value for benzene based on US-EPA was 0,0085 mg/Kg/day.¹³ Based on the calculation data in Table 3., it was known that the RQ in the average worker was 1.91882 mg/Kg/day and the highest RQ was 5.64470 mg/Kg/day. This showed that the exposure of benzene to workers motor workshop area had a risk of health problems. Based on the data distribution, there were 9 worker respondents with high risk of health disorder (RQ>1) and 6 worker respondents with RQ<1. This was known that most of workers have potential health problems from non-carcinogenic effects of benzene exposure in motor workshop area.

There is actually no value for the lowest safe limits on exposure to these chemical compounds to risk leukemia at all exposure levels. WHO warns that any benzene exposure of 1 pg/m³ would have an additional 4 to 8 cases of leukemia per million population during life.⁶ The IARC stated that hematologic neoplasms such as myelogenous acute leukemia have been documented to occur at chronic exposure with low concentrations (10 ppm).⁵

Safe Duration (Dt Safe)

Safe Duration (Dt Safe) is safely associated with duration at work for a day and duration (in years) to work. It is important to set Dt safe in the workplace because it is related to safety. Determinants for safe duration involve good work rotation and ventilation in the workplace if working in a workplace that is chemically related. The formula used to calculate the safe Dt is:

Based on the calculation data in Table 3., it was known that the safe duration of worker respondents for work was 5.43 years. It means the worker in motor workshop area could work safely for 5.43 years depending on food intake and body condition respectively.

CONCLUSION

It was concluded that workers in the motor workshop area were at a risk of benzene exposure (non-carcinogenic) but could work safely for 5.43 years. It was depend on the food intake and the condition of each body of workers in the motor workshop environment. Recommendations were by consuming CYP2E1 enzyme contained in cow liver and salmon to lower benzene levels in the body.⁸

Conflict of Interest: All authors have no conflicts of interest to declare.

Source of Funding: This is an article “Determination of The Safe Duration of Benzene Non-Carcinogenic Exposure in Motor Workshop Area” of Occupational Health and Safety Department that was supported by Activity Budget Plans 2018, Faculty of Public Health, Airlangga University.

Ethical Clearance: The study was approved by the institutional Ethical Board of the Public Health, Airlangga University.

REFERENCES

1. ATSDR. Toxicological profile for benzena. US: U.S. Department of Health and Human Service; 2007.
2. Bae S, Pan XC, Kim SY, Park K, Kim YH, Kim H, Hong YC. Exposures to particulate matter and polycyclic aromatic hydrocarbons and oxidative stress in school children. *Environ Health Perspect.* 2010; 118(4): p. 579–83.
3. Gammon MD, Santella RM. PAH, genetic susceptibility and breast cancer risk: an update from the long island breast cancer study project. *Eur J Cancer.* 2008; 44(5): p. 636–640.
4. Haen MT, Oginawati K. Hubungan pajanan senyawa benzena, tolena dan xylen dengan sistem hematologi pekerja di kawasan industri sepatu. *Journal Teknik Sipil dan Lingkungan ITB.* 2012; 8(7): p. 1-4.
5. IARC. Diesel engine exhaust carcinogenic. In *Iarc monographs on the evaluation of carcinogenic risks to humans.* International Agency for Research on Cancer Lyon, France; 2012. p. 105.
6. Larbey RI. Issues surrounding the use of lead in-economic and environmental. *Science Total Environment.* 1994; 19: p. 146-147.
7. Menteri Tenaga Kerja dan Transmigrasi RI. Permenakertrans No.13/MEN/X/2011 tentang nilai ambang batas faktor fisika dan faktor kimia di tempat kerja. Jakarta: Kementrian Tenaga Kerja dan Transmigrasi RI; 2011.
8. Nirmawati S, Tualeka AR, Adi AN. Effect of food containing high Fe (iron) intake to urinary trans, trans-muconic acid (Tt-ma) levels on workers exposed to benzene. *Indian Journal of Public Health Research & Development.* 2018; 9(1): p. 53-57.
9. Reid BC, Ghazarian AA, DeMarini DM, Sapkota A, Jack D, Lan Q, Winn DM, Birnbaum LS. Research opportunities for cancer Associated with indoor air pollution from solid-fuel combustion. *Environ Health Perspect.* 2012; 120: p. 1495–1498.
10. Robbins, Kumar. *Buku ajar patologi 1.* Edisi 4. Jakarta: EGC; 1995. p. 290- 293.
11. Singh AK, Tomer N, Jain CL. Monitoring, assessment and status of benzene, toluene and xylene pollution in the urban atmosphere of Delhi, India. *Res. J. Chem. Sci.* 2012; 2(4): p. 45-49.
12. Tunsaringkarn T, Siriwong W, Rungsiyothin A, Nopparatbundit S. Occupational exposure of gasoline station workers to BTEX compounds in Bangkok, Thailand. *The International Journal of Occupational and Environmental Medicine.* 2012; 3(3): p. 117-25.
13. US-EPA. Benzene (CASRN 71-43-2). Washington, DC: Irish, US EPA; 2015.
14. White A, Teitelbaum SL, Stellman SD, Beyea J, Steck SE, Mordukhovich I, McCarty KM, Ahn J, Jr PR, Santella RM, Gammon MD. Indoor air pollution exposure from use of indoor stoves and fireplaces in association with breast cancer: A case-control study. *Environ Health.* 2014; 13 (108): p. 1-12.

A Short Review about Electrophysiology and Bioimpedance: History and Perspectives

Luigi Santacroce¹, Donato D'Agostino², Ioannis Alexandros Charitos³, Lucrezia Bottalico¹, Andrea Ballini⁴

¹*Ionian Dept.*, ²*DETO, Sect. of Cardiac Surgery*, ³*SEU 118, Apulian Emergency Service*,
⁴*SMBNOS Dept., University of Bari, Italy*

ABSTRACT

During the 18th century, in the scientific world emerged two personalities that greatly influenced medicine and science: Luigi Galvani e Alessandro Volta.

The theories and inventions of these scientists were the starting point for the knowledge of excitable tissue physiology and for the development of electrical and electronic instruments that are now widely used in the biomedical field, such as the ECG and biomedical chips. Currently, different techniques are available for different patients and scopes, but some issues regarding both hardware and software need to be solved, for example electrode position, spatial resolution and, moreover, standardization of reference values for specific populations and conditions.

The purpose of this short review is to highlight how Volta's and Galvani's studies allowed the development of impedenziometric instruments, which are increasingly used for non-invasive diagnostics in many health and illness conditions.

Keywords: *Electrophysiology, Bioimpedenziometric Analysis (BIA), Virtual biopsy, History of medicine*

THE ORIGINS OF ELECTROPHYSIOLOGY

Luigi Galvani (1737-1798) was an anatomist and physiologist physician that discovered the “*animal electricity*”, and his observations opened to the electrophysiology. He exposed his theories in the “*De viribus electricitadis in motu musculari commentarius*” (meaning “Commentary on the forces of electricity in the muscular movement”) based on the observation that the stimulation of a nerve causes the contraction of the associated muscle in frogs, demonstrating that in animal tissues exist bioelectric forces. ^[1,2]

Alessandro Volta (1745-1827) was a physics and the inventor of the battery. Jean François Dominique

Arago, a french physics and astronomist (1786-1853), in his eulogy of Alessandro Volta defined the electric battery as “*il più meraviglioso strumento che mai fosse inventato dagli uomini, senza eccettuare il telescopio e la macchina a vapore*” (that means: “the most wonderful instrument created by the mind of men, even not excluding the telescope or steam engine”) ^[3]

Because the discoveries of the two scientists were in contrast with the standard scientific models of the time, they did not succeed. A famous, strong polemic debate between Volta and Galvani began in 1792. Thanks to the theoretical dispute that they provoked at that time within their contemporary scientific community, they stimulate a number of researches and applications in physics and biomedicine leading to several biomedical applications, much of them has been developed during the 20th century^[4].

At that time, a protagonist of the debate on medical science was John Brown (1735-1788), a professor at the Scottish University of Edinburg, that exposed his

Corresponding author:

Luigi Santacroce

Ionian Dept. University of Bari, Address: Policlinico
Consortziale, p.zza G. Cesare, 11, 70124 Bari, Italy
Email: luigi.santacroce@uniba.it, Tel: +390805478486

neuropathology theory and the concept of “excitability” in his “*Elementa Medicinae*”. Excitability was a kind of vital force within the brain and neuromuscular fibers, defined as the basic quality of living matter and consisting in receiving stimuli from the outside and to react to them. According to this theory, health would be determined by a balance between external stimuli and excitability, while diseases should be attributable to a deficiency in stimulation intensity [5]. Such idea recall the theories of Epicurus and moreover Asclepiades about the modification of the health status based on the equilibrium of atoms and their reciprocal distances [6].

Another protagonist of the time was the swiss Albrecht von Haller (1708-1777), who was professor of anatomy, surgery and botany at University of Göttingen. His research was also focused on the nervous system, whose knowledge at the time was limited to the effects of nerve resection and cortical lesions, thinking that the nervous system was governed by vital spirits that, through the “*phlegma*”, circulates from the brain to the spinal cord and reach the nerves of the entire body through thin tubules. He performed a series of animal experiments, observing that mechanical, electrical, or chemical stimulation induced contraction in some areas of the body and pain in other. Based on these results he subdivided body structures into two groups: the irritable ones found in muscles, and the sensitive ones identifiable with the nerve fiber. These intuitions led to fundamental discoveries in neurology from the beginning of the new century up to our time [7].

Electrophysiological studies and clinical practice

The discoveries of electrical activity of human body, as well as its conductivity and resistance to the passage of electric waves in cells and tissues, allowed to point out a large series of technical instruments used in daily clinical practice. For example, electrocardiography (ECG), electroencephalography (EEG) and bioimpedenziometric analysis (BIA) are communly used to evaluate the health status and clinical conditions of millions of people worldwide.

The first ECGs were recorded in 1880 by Augustus Desirè Waller in human and animals adapting some capillary electrodes, although artifacts were possible due to noise interferences from the environment [8,9]. Clinical application in humans became widely possible at the beginning of the 20th century, thanks to the availability

of new sensitive electric galvanometers allowing to record, non invasively, the micropotentials generated during heart activity. An important contribution for the ECG evolution was the confirm of the existence of cell membranes by Höber, which also calculated their thickness by bioimpedance [10-12].

Bioimoe dance (BIA) affirmed its utility for the determination of body composition during the 80s of the 20th century [13,14]. Such test was based on a large number of experimental and clinical studies started by Thomasset and others [15-18].

After these pionieristic studies the BIA has been widely used to assess the nutritional status in both healthy subjects (e.g., children, sportsmen, pregnant women, etc.) [19-23], also comparing such technique with other well established (i.e., skinfold measurement) [24], and patients with various different clinical conditions (e.g., obesity, sports injuries, etc) [25-27].

The first studies about the electrical impedance of the human body started in the late 1950s, when Nyboer devised a technique for the study of blood flow based on impedance measurement, based on the principle that changing the conductive volume, an alteration of the impedance of the conductor is constantly observed [28,29].

The conceptual basis of the the BIA is that the human body is an electrical circuit enclosed within a cylinder, whose volume is obtained adding the volumes of arm, trunk and legs. It is possible assuming that human tissues have different conductivity depending on specific features of the body districts [30,31].

CONCLUSION

During the last decades, a number of impedenziometric systems have been developed to obtain non invasive devices for rapid diagnosis and monitoring of common conditions, also obtaining a tomographic analisys of specific districts [32-35].

Such instruments are possible alternative tools for a wide range of clinical problems and have been applied in different fields as surgery, hepato-gastroenterology and oncology [36-39], pneumology and cardiology [40-44], nephrology [45-51], as well as for HIV [52-53]. More recently, some authors have reported the possibility of performing electronic biopsies for diagnosis of cancers, but only a few paper are dedicated to the possible use of bioimpedance to differentiate preneoplastic lesions and

cancers [54-55].

Conflict of Interest: All authors declare no conflict of interest.

Funding: No financial support for this paper

Ethical Clearance: This study not involved humans or animals

REFERENCES

- Cajavilca C, Varon J, Sternbach GL, Luigi Galvani and the foundations of electrophysiology, Resuscitation, Volume 80, Issue 2, 2009, Pages 159-162, <https://doi.org/10.1016/j.resuscitation.2008.09.020>.
- Bresadola M, La biblioteca di Luigi Galvani (last accessed on Nov. 25, 2017) http://www.cisui.unibo.it/annali/01/testi/fonti_frameset.htm
- Arago JFD, in P.A.M. Descrizione pittoresca del cielo, della terra e de' suoi abitatori. 1843, Vol. II, p. 136 Tommaso Fontana Tipografo, Venezia
- Dunlison R, Forbes J, Tweedie A, Conolly J. The cyclopaedia of practical medicine: comprising treatises on the nature and treatment of diseases, materia medica and therapeutics, medical jurisprudence, etc., etc, 1849-59 Vol 2, p. 287-292 Philadelphia: Blanchard and Lea
- Overmier JA. John Brown's Elementa Medicinae: An Introductory Bibliographical Essay . Bulletin of the Medical Library Association. 1982;70(3):310-317.
- Santacroce L, Bottalico L, Charitos IA: Greek medicine practice at ancient Rome: the physician molecularist Asclepiades. 2017 Medicines (*in press*)
- Conti AA. Albrecht von Haller: an encyclopaedic cosmopolite in the history of Swiss medicine. Clin Ter. 2013;164(5):e445-448. doi: 10.7417/CT.2013.1625.
- Cope Z. Augustus Desiré Waller (1856-1922). Med Hist. 1973 Oct;17(4):380-5.
- Besterman E, Creese R. Waller--pioneer of electrocardiography. Br Heart J. 1979 Jul;42(1):61-4.
- Höber R. Ein zweites Verfahren die elektrische Leitfähigkeit im Innern von Zellen zu messen. Pflugers Arch. 1912;148:189-221. doi: 10.1007/BF01680784.
- Höber R. Eine Methode, die elektrische Leitfähigkeit im Innern von Zellen zu messen. Pflugers Arch. 1910;133:237-253. doi: 10.1007/BF01680330
- Höber R. Messungen der inneren Leitfähigkeit von Zellen. Pflugers Arch. 1913;150:15-45. doi: 10.1007/BF01681047.
- Ackmann J J and Seitz MA. Methods of complex impedance measurements in biologic tissue Crit. Rev. Biomed. Eng. 1984; 11: 281-311
- Lukaski HC, Bolonchuk WW, Siders WA, Hall CB. Body composition assessment of athletes using bioelectrical impedance measurements. J Sports Med Phys Fitness 1990; 30:434 - 440.
- Thomassett A. Bioelectrical properties of tissue. Lyon Med 1963; 22: 1325 - 1352.
- Geddes, L. and L. Baker, The specific resistance of biological material—a compendium of data for the biomedical engineer and physiologist. Medical and biological engineering, 1967. 5(3): p. 271-293.
- Salinari S, Bertuzzi A, Mingrone G, Capristo E, Scarfone A, Greco AV, Heymsfield SB. Bioimpedance analysis: a useful technique for assessing appendicular lean soft tissue mass and distribution. J Appl Physiol (1985). 2003 Apr;94(4):1552-6
- Bayford, R. and A. Tizzard, Bioimpedance imaging: an overview of potential clinical applications. Analyst, 2012. 137(20): p. 4635-4643.
- Soulsby, C.R., A; Yerworth, R; Horesh, L; Evans, D; Holder, D, Extending the range of test meals for EIT of gastric emptying by optimisation of the applied frequency. Conf. Biomed. Appl. Elec. Impedance Tomography, 6th, London, UK, 2005.
- Van Loan MD, Lori EK, King JC, Wong WW, Mayclin PL. Fluid changes during pregnancy: use of bioimpedance spectroscopy. J Appl Physiol 1995;78:1037-42.
- Heymsfield SB, Gonzalez MC, Lu J, Jia G, Zheng J. Skeletal muscle mass and quality: evolution of modern measurement concepts in the context of sarcopenia. Proc Nutr Soc. 2015 Nov;74(4):355-66. doi: 10.1017/S0029665115000129. Epub 2015 Apr 8.
- Gutin B, Litaker M, Islam S, Manos T, Smith C, Treiber F. Body-composition measurement in 9-11-y-old children by dual-energy X-ray

- absorptiometry, skinfold-thickness measurements, and bioimpedance analysis. *Am J Clin Nutr.* 1996 Mar;63(3):287-92. .
23. Gray DS, Bray GA, Gemayel N, Kaplan K. Effect of obesity on bioelectrical impedance. *Am J Clin Nutr* 1989; 50: 255 – 260.
 24. Nescolarde L, Yanguas J, Lukaski H, Alomar X, Rosell-Ferrer J, Rodas G. Localized bioimpedance to assess muscle injury. *Physiol Meas.* 2013 Feb;34(2):237-45. doi: 10.1088/0967-3334/34/2/237. Epub 2013 Jan 28.
 25. Nescolarde L, Yanguas J, Lukaski H, Rodas G, Rosell-Ferrer J. Localized BIA identifies structural and pathophysiological changes in soft tissue after post-traumatic injuries in soccer players. *Conf Proc IEEE Eng Med Biol Soc.* 2014;2014:3743-6. doi: 10.1109/EMBC.2014.6944437.
 26. Nyboer, J. *Electrical Impedance Plethysmography.* 1959. Springfield, Ill.: Charles C Thomas.
 27. Thomasset, A. Bio-electrical properties of tissue impedance measurements. *Lyon Med.* 1962; 207:107–118.
 28. Hoffer EC, Meador CK, Simpson DC. Correlation of whole-body impedance with total body water volume. *J Appl Physiol.* 1969 Oct;27(4):531-4.
 29. Lukaski HC, Methods for the assessment of human body composition: traditional and new. *Am J Clin Nutr.* 1987 Oct;46(4):537-56.
 30. Anzimirov VL, Gasanov IaK, Kutin VA. Correlation between the circulation of the hemispheres and brain stem regions, the peripheral circulation and bioelectrical activity of the brain in the dynamics of the acute period of cranio-cerebral injury. *Vopr Neurokhir.* 1976 Mar-Apr;(2):11-8.
 31. Brown, B.H., Medical impedance tomography and process impedance tomography: a brief review. *Measurement Science and Technology,* 2001. 12(8): p. 991.
 32. Brazovskii KS, Pekker JS, Umanskii OS. Modelling the Ability of Rheoencephalography to Measure Cerebral Blood Flow *J Electr Bioimp,* vol. 5, pp. 110–113, 2014 doi:10.5617/jeb.962
 33. Romsauerova, A., A. McEwan, L. Horesh, R. Yerworth, R. Bayford, and D.S. Holder, Multi-frequency electrical impedance tomography (EIT) of the adult human head: initial findings in brain tumours, arteriovenous malformations and chronic stroke, development of an analysis method and calibration. *Physiological measurement,* 2006. 27(5): p. S147.
 34. Haemmerich, D., D.J. Schutt, A.S. Wright, J.G. Webster, and D.M. Mahvi, Electrical conductivity measurement of excised human metastatic liver tumours before and after thermal ablation. *Physiological measurement,* 2009. 30(5): p. 459.
 35. Gersing E, Kelleher DK, Vaupel P. Tumour tissue monitoring during photodynamic and hyperthermic treatment using bioimpedance spectroscopy. *Physiol Meas.* 2003 May;24(2):625-37.
 36. Toso S, Piccoli A, Gusella M, Menon D, Crepaldi G, Bononi A, Ferrazzi E. Bioimpedance vector pattern in cancer patients without disease versus locally advanced or disseminated disease. *Nutrition.* 2003 Jun;19(6):510-4.
 37. Gatta L; Study group on the application of extracellular bioimpedance tomography (Gastro-Mida(x)) in the diagnosis of colorectal diseases. The clinical role of extracellular bioimpedance tomography (Gastro-Mida(x)) in the diagnosis of colorectal diseases. *Minerva Med.* 2004 Dec;95(6):541-56.
 38. Gielerek G, Krzesiński P, Piotrowicz E, Piotrowicz R. The usefulness of impedance cardiography for predicting beneficial effects of cardiac rehabilitation in patients with heart failure. *Biomed Res Int.* 2013;2013:595369. doi: 10.1155/2013/595369. Epub 2013 Aug 26
 39. Gujjar AR, Muralidhar K, Banakal S, Gupta R, Sathyaprabha TN, Jairaj PS. Non-invasive cardiac output by transthoracic electrical bioimpedance in post-cardiac surgery patients: comparison with thermodilution method. *J Clin Monit Comput.* 2008 Jun;22(3):175-80. doi: 10.1007/s10877-008-9119-y. Epub 2008 Apr 17.
 40. Sathyaprabha TN, Pradhan C, Rashmi G, Thennarasu K, Raju TR. Noninvasive cardiac output measurement by transthoracic electrical bioimpedance: influence of age and gender. *J Clin Monit Comput.* 2008 Dec;22(6):401-8. doi: 10.1007/s10877-008-9148-6. Epub 2008 Nov 13.
 41. Gujjar AR, Muralidhar K, Bhandopadhyaya A, Sathyaprabha TN, Janaki P, Mahalla BK, Gupta R, Banakal S, Jairaj PS. Transthoracic electrical

- bioimpedance cardiac output: comparison with multigated equilibrium radionuclide cardiography. *J Clin Monit Comput.* 2010 Apr;24(2):155-9. doi: 10.1007/s10877-010-9225-5. Epub 2010 Mar 13.
42. Wolf GK, Arnold JH, Noninvasive assessment of lung volume: respiratory inductance plethysmography and electrical impedance tomography. *Critical care medicine*, 2005. 33(3): p. S163-S169.
43. Wu TJ, Huang JJ, Lin CY. Effects of fluid retention on the measurement of body composition using bioelectric impedance. *J Formos Med Assoc.* 1994 Nov-Dec;93(11-12):939-43.
44. de Fijter CW, de Fijter MM, Oe LP, Donker AJ, de Vries PM. The impact of hydration status on the assessment of lean body mass by body electrical impedance in dialysis patients. *Adv Perit Dial.* 1993;9:101-4.
45. Wong Vega M, Srivaths PR. Air Displacement Plethysmography Versus Bioelectrical Impedance to Determine Body Composition in Pediatric Hemodialysis Patients. *J Ren Nutr.* 2017 Nov;27(6):439-444. doi: 10.1053/j.jrn.2017.04.007.
46. Kim CR, Shin JH, Hwang JH, Kim SH. Monitoring Volume Status Using Bioelectrical Impedance Analysis in Chronic Hemodialysis Patients. *ASAIO J.* 2017 Jun 24. doi: 10.1097/MAT.0000000000000619. [Epub ahead of print]
47. El-Kateb S, Davenport A. Changes in Intracellular Water Following Hemodialysis Treatment Lead to Changes in Estimates of Lean Tissue Using Bioimpedance Spectroscopy. *Nutr Clin Pract.* 2016 Jun;31(3):375-7. doi:10.1177/0884533615621549. Epub 2015 Dec 18.
48. Knap B, Arnol M, Romozi K, Marn Pernat A, Gubenšek J, Ponikvar R, Buturović-Ponikvar J, Večerić-Haler Ž. Malnutrition in Renal Failure: Pleiotropic Diagnostic Approaches, Inefficient Therapy and Bad Prognosis. *Ther Apher Dial.* 2016 Jun;20(3):272-6. doi: 10.1111/1744-9987.12436.
49. Oei EL, Fan SL. Practical aspects of volume control in chronic kidney disease using whole body bioimpedance. *Blood Purif.* 2015;39(1-3):32-6. doi:10.1159/000368953. Epub 2015 Jan 20.
50. Ott M, Lembcke B, Fisher H, Jager R, Polat H, Geier H, Rech M, Staszewski S, Helm EB, Caspary WF. Early changes of body composition in human immunodeficiency virus infected patients: tetrapolar impedance analysis indicates significant malnutrition. *Am J Clin Nutr* 1993; 57: 15 – 19.
51. Carrie P. Earthman , James R. Matthie , Phyllis M. Reid , Ingeborg T. Harper , Eric Ravussin , Wanda H. Howell. A comparison of bioimpedance methods for detection of body mass cell change in HIV infection. *J Appl Physiol* 2000; 88: 944 – 956.
52. Åberg P, Nicander I, Holmgren U, Geladi P, Ollmar S. Assessment of skin lesions and skin cancer using simple electrical impedance indices. *Skin Res Technol* 2003; vol. 9: 257-261.
53. González-Correa CA, Brown BH, Smallwood RH, Kalia N, Stoddard CJ, Stephenson TJ, Haggie SJ, Slater DN, Bardhan KD. Virtual biopsies in Barrett's esophagus using an impedance probe. *Ann N Y Acad Sci.* 1999 Apr 20;873:313-21.
54. Tatullo M, Marrelli M, Amantea M, Paduano F, Santacroce L, Gentile S, Scacco S. Bioimpedance Detection of Oral Lichen Planus Used as Preneoplastic Model. *J Cancer.* 2015 Aug 20;6(10):976-83. doi: 10.7150/jca.11936. eCollection 2015.
55. Knabe M, Kurz C, Knoll T, Velten T, Vieth M, Manner H, Ell C, Pech O. Diagnosing early Barrett's neoplasia and oesophageal squamous cell neoplasia by bioimpedance spectroscopy in human tissue. *United European Gastroenterol J.* 2013 Aug;1(4):236-41. doi: 10.1177/2050640613495198.

The Use of IUD, Passive Smoker and the Risks of Cervical Cancer: A Cross-Sectional Study at Female Workers in Surabaya City, Indonesia

Abdul Rohim Tualeka¹, Febi Dwirahmadi², Arief Wibowo³, Fransisca Anggiyostiana Sirait¹

¹Departement of Occupational Health and Safety, School of Public Health, Airlangga University, Indonesia,

²Centre For Environmetal and Population Health, School of Medicine, Griffith University, Queensland, Australia,

³Departement of Biostatistics and Population, School of Public Health, Airlangga University, Indonesia

ABSTRACT

Background: The number of cases of cervical cancer in the world increased every year. IUD users also increased as they feel more secure using IUDs. The purpose of this study was to determine the level of cervical cancer risk for IUD users.

Method: The research method was cross sectional study. Total respondents were 11 people who were career women with 6 respondents of IUD users and 5 respondents were not users of IUD. Cervical cancer risk test used IVA method. Independent variables studied were IUD users, passive smokers The dependent variables studied were cervical cancer risk through IVA status and IUD aging complaints.

Result: Based on the results of the study, IUD users had a cervical cancer risk of 3.33 times compared to non-IUD users, IUD users always bleed 2.125 times compared with non-IUD users. IU-female passive smokers bleed 1.5 times compared with non-IUD users.

Conclusion: The conclusion of this study was that IUD can cause cervical cancer risk. Passive smoking can warn of cervical cancer risk.

Keywords: IUD, Cervical Cancer, Passive smoker.

INTRODUCTION

Cancer has become a global problem. According to the World Health Organization (WHO) in 2012, there are 14 million new cases and 8.2 million people died from cancer. Cervical cancer and breast cancer is a disease with the highest prevalence in Indonesia with 0.8 % and 0.5 %^[12]. Every year there are about 15 thousand new cases of cervical cancer in Indonesia. WHO placed

Indonesia as the country with the largest number of cervical cancer patients in the world. Cervical cancer also ranked first female killer in Indonesia. According to data Balitbang Ministry of Health in 2013 there are 347.792 people or about 1.4 % of the total population of Indonesia suffering from cancer^[6].

From various research reports, cervical cancer is closely related to the use of Intra Uterine Device (or hereinafter abbreviated as IUD). The results of the research by Sipra Bagchi, et al, about the effect of 33% of IUD users with 33.7% Cu have not been normal for cervical cytology to lead to cervical cancer^[7]. Based on research by Lassise DL, et al (1991) on Invasive cervical cancer and intra uterine device use, the use of IUD contraceptives can increase the incidence of cervical cancer since the introduction of IUDs in the early 1990s^[1].

Corresponding author :

Abdul Rohim Tualeka

Occupational Health and Safety Department, School of Public Health, Airlangga University, Kampus C, Jalan Mulyorejo, Surabaya, 60115, Indonesia, Tel: +62 31 5920948 / +62 81 336 617 187, Fax: +62 31 5924618
E-mail: inzut.tualeka@gmail.com
fransiscaanggi@gmail.com

Research has been conducted by U. J. Koch on the effects of copper IUDs on cervical cytology and influences on trans-migration sperm migration, concluded that all IUDs acting as foreign bodies in the intrauterine cavity caused a sterile inflammatory response to the endometrium as long as the IUD remained [11]. This reaction is similar to other foreign body reactions. The typical symptoms of this reaction are leukocytosis in the fluid cavity of the uterus and cervix. Based on the results of the research Lekovich's, et al, on the Comparison of Human Papillomavirus Infection and Cervical Cytology in Women Using Copper-Containing and Levonorgestrel-Containing Intrauterine Devices against 36 IUD users found vaginal cleansing 70% of respondents containing copper with 95% confidence level (CI) 53.6 - 86.4% [2].

Based on research results Onur, et al, on the impact of copper-containing and levonorgestrel-releasing intrauterine contraceptives on cervicovaginal cytology and microbiological flora: A prospective study that colonization by Candida spp. and mycoplasma infection was diagnosed significantly more frequently after one year of use of Cu-IUD than in the baseline [5]. During the study period, women taking Cu-IUD complained significantly more frequently with vaginal discharge, pelvic pain, and increased menstrual flow.

In addition to the use of IUDs, an increased risk of cervical cancer is also triggered by cigarette smoke. Cigarette smoke contains chemicals such as CO, Cd, benzene can increase stress in women and increase the number of free radicals in the body. In the home environment, women as passive smokers have a risk of stress due to the dangers of cigarettes [9]. Stress in women using IUD will increase the acidity of the vagina thus increasing the Cu corrosion that allows Cu to react with glutathione, as well as free radical reactions with DNA as a trigger for cervical cancer.

From the development of research on cervical cancer, which has not been done is a study that looks at how IUD users are at risk of developing cervical cancer by analyzing the chemical mechanisms in the body. Also, factors that may increase the risk of cancer for IUD users such as exposure to secondhand smoke. This study will assess the level of cervical cancer risk for IUD users. Also examined the effect of passive smoking factor with cervical cancer risk on IUD users.

MATERIAL AND METHOD

IUD cancer risk research used cross sectional method. The number of respondents 11 people consisting of 6 users of IUD and 5 people used other types of contraception. Respondents were career women working in both formal and informal sectors. The variables studied include independent variables and dependent variables. The independent variables include the use of IUD, passive smoking and the habit of cleaning the sex organs. The dependent variables studied were cervical cancer risk through IVA status and IUD user complaints.

Methods of data collection by interviewing respondents to know the toxicity using IUD, status as a passive smoker and complaints that were felt like vaginal bleeding. Cancer risk is known by using IVA method. Data analysis used statistic method Odd Ratio. From Odd ratio method with 2 x 2 cross tabulation can be known level of cancer risk of respondents who use IUD as well as variables that have contribution increase cervical cancer risk that was status of respondent as passive smoker.

FINDINGS/ RESULTS

Based on the research method, the results of the research can be described below.

Relation of IUD usage with status IVA

Table 1. Relationship of IUD Usage with Status IVA

Using IUD	Status IVA		Total
	Positive	Negative	
Yes	4 (66,7%)	2 (33,3%)	6 (100,0%)
No	0 (0,0%)	5 (100,0%)	5 (100,0%)
Total	4 (36,3%)	7 (66,7%)	11 (100,0%)

From the table above those who used IUD after tested IVA 66.7% have a positive IVA compared with respondents who do not use IUD. Based on the results of Odd ratio analysis obtained value 3.33 means IUD users suffer cervical cancer risk 3.33 times compared with respondents who do not use IUD.

Table 2. Relationship of IUD Use with Vaginal Bleeding

Using IUD	Vaginal bleeding		Total
	Yes	No	
Yes	3 (50,0%)	3 (50,0%)	6 (100,0%)
No	0 (0,0%)	5 (100,0%)	5 (100,0%)
Total	3 (27,3%)	8 (72,7%)	11 (100,0%)

From the table above those who used 50% IUD mentioned frequent vaginal bleeding and complaints around the vagina, compared with those who did not use no IUD (0.0%) mentioning bleeding and complaints around the vagina. Based on the results of Odd ratio analysis obtained value of 2.125, means IUD users suffer risk of complaints and bleeding 2.125 times compared with respondents who do not use IUD.

Table 3. The relationship of Passive Smokers to Vaginal Complaints and Bleeding

Passive smoker	Vaginal bleeding		Total
	Yes	Sometimes	
Yes	1 (33,3%)	2 (67,7%)	3 (100,0%)
No	2 (25,0%)	6 (75,0%)	8 (100,0%)
Total	3 (27,3%)	8 (72,7%)	11 (100,0%)

In the table above IUD users who live with smokers' families so that they become passive smokers 33.3% say that experiencing complaints and bleeding in the vagina, while 25% of respondents who are not passive smokers experience complaints and bleeding around the vagina. Based on Odd Ratio analysis results obtained a value of 1.5 which means IUD users as passive smokers have a risk of vaginal bleeding 1.5 times compared with those who do not use IUD.

DISCUSSION

a. IUD and IVA

IUD users experienced a positive risk of IVA 3.33

times compared with respondents who did not use IUD. Material IUDs are composed of polyethylene and copper plastics. Planting IUDs in the cervix to prevent the entry of sperm cells into the female ovum. Copper includes positively charged and polar metals [9]. During menstruation the level of blood acidity will increase, so also when the woman stress the acidity level of blood will also increase. As the level of blood acidity increases it will be able to corrode copper so that copper can be corroded and dissolved in blood or fluid in the uterus.

Based on the results of Lekovich's research, et al, on the Comparison of Human Papillomavirus Infection and Cervical Cytology in Women Using Copper-Containing and Levonorgestrel-Containing Intrauterine Devices against 36 IUD users found vaginal cleansing 70% of respondents containing copper with 95% confidence level (CI) 53.6 - 86.4% [2]. From the results of this research indicates that the blood and the results of vaginal cleansing contain Cu which is the corrosion of Cu metal that is planted in the womb.

Cu can finally passively diffuse into the blood and is distributed to the body's cells including the cervical cells. Copper can eventually bind to glutathione in the body producing GSCu which causes a decrease in glutathione concentration in the body. Reaction mechanism as follows:



Note: GSH = The formula of glutathione chemical compounds

Based on the results of Lekovich's research, et al, on the Comparison of Human Papillomavirus Infection and Cervical Cytology in Women Using Copper-Containing and Levonorgestrel-Containing Intrauterine Devices against 36 IUD users found vaginal cleansing 70% of respondents containing copper with 95% confidence level (CI) 53.6 - 86.4% [2]. From the results of this research indicates that the blood and the results of vaginal cleansing contain Cu which is the corrosion of Cu metal that is planted in the womb.

The decreasing of glutathione concentration in cervical cells causes decreased glutathione function in cervical cells. The occurrence of decreased glutathione function in the cervical cells will cause free radicals

(ROS), which every day to attack the body, including in the cervical cells, both entering through food, drink and air will be free to react with DNA in the cervical cells. Sehigga, causing DNA adduct in vaginal uterine cells as the forerunner of cervical cancer. The chemical reaction mechanism of adduct DNA is shown below:



The chemical mechanism of cervical cancer due to Cu above is reinforced by several reports of cervical cancer IUD research results. Based on the results of Sipra Bagchi's research, et al, about the effect of 33% of IUD users with an unusual 33.7% Cu in cervical cytology to cervical cancer [7]. Based on the findings of Lassise DL, et al, on Invasive cervical cancer and intrauterine device use, the use of IUD contraceptives to increase cervical cancer has been considered since the introduction of IUDs in the early 1900s [1].

Based on research results published in the journal AKPERGSH LPPM Nursing Academy Giri Satriya Husada Wonogiri obtained research results that IUD users respondents 33.34% cervical cancer [3]. Based on the results of the study Octava Prima Arta, et al, published in the journal Nexus published by the Faculty of Medicine, State University of Sebelas Maret entitled "The Relationship between the Use of Intrauterine Device (IUD) and the incidence of Cervical Cancer in Dr.Moewardi Hospital" concluded that the users of IUD has a cervical cancer risk of 12.7 times compared with those not using an IUD [4].

b. IUD and Complaints and Bleeding

IUD users experienced the risk of complaints and bleeding 2,125 times compared with respondents who did not use the IUD. Materially, the IUD is composed of polyethylene and copper type plastic. Planting IUDs in the cervix to prevent the entry of sperm cells into the female ovum. However, with frequent friction-friction on the cervix so that menyebabkan inflammation and bleeding. Based on the results of Onur E, et.al, on the impact of copper-containing and levonorgestrel-releasing intrauterine contraceptives on cervicovaginal cytology and microbiological flora: A prospective study that colonization by *Candida* spp. and mycoplasma infection was diagnosed significantly more frequently after one year of use of Cu-IUD than in the baseline [5].

c. Passive Smokers With Bleeding

Based on Odd ratio analysis results obtained a value of 1.5 which means IUD users as passive smokers experience the risk of complaints and bleeding 1.5 times compared with those who do not use IUD. Passive smokers, ie people who do not smoke but have to inhale cigarette smoke. This condition can increase stress on them. This is because they are uncomfortable, stress is in one room with smokers.

In people who are increasingly stressed, it will cause their hormones higher cortisol which will affect the higher the level of blood acidity. With the higher acidity of the blood to add acidity to the cervical cells so that the more strongly mengkorosi the copper in the womb cells. The stronger the corrosion it will cause more inflammation in the uterus IUD users.

Based on research results Onur, et al, on the impact of copper-containing and levonorgestrel-releasing intrauterine contraceptives on cervicovaginal cytology and microbiological flora: A prospective study that colonization by *Candida* spp. and mycoplasma infection was diagnosed significantly more frequently after one year of use of Cu-IUD than in the baseline [5].

CONCLUSION

Based on the discussion then the conclusions obtained from this research is First, IUD can cause cervical cancer with level 3,33 times compared with that do not use IUD. Secondly, the use of IUD can cause various health complaints and bleeding with risk level 2,125 times compared to non IUD users. Third, Passive smokers participate in increased risk of IUD users experiencing complaints and bleeding with a risk level of 1.5 times compared with non-passive smokers.

REKOMENDATION

Further research is needed to reduce the risk of cancer due to IUD use. It is important to do risk communication to patients who want to use IUD as their contraceptive choice. Awareness needs to be made to the public so that smoking is not done in the house so as not to give exposure to cigarette smoke to other family members who do not smoke.

Conflict of Interest: All authors have no conflicts of interest to declare.

Source of Funding: This is an article “The Use of IUD, Passive Smoker and The Risks of Cervical Cancer: A Cross-Sectional Study at Female Workers in Surabaya City, Indonesia” that was supported by School of Public Health, Airlangga University, Indonesia, 2017.

Ethical Clearance: Taken from Public Health Faculty Committee of Airlangga University, Indonesia..

REFERENCES

- Lassise DL, Savitz DA, Hamman RF, Barón AE, Brinton LA, Levines RS. 1991. Dec. Invasive cervical cancer and intrauterine device use. *Int J Epidemiol.* 865-70. NCBI. USA.
- Lekovich, Jovana P. MD; Amrane, Selma MD; Pangasa, Misha MD; Pereira, Nigel MD; Frey, Melissa K. MD; Varrey, Aneesha MD; Holcomb, Kevin MD. 2015. May. Comparison of Human Papillomavirus Infection and Cervical Cytology in Women Using Copper-Containing and Levonorgestrel-Containing Intrauterine Devices. *Obstetrics & Gynecology: May 2015 - Volume 125 - Issue 5 - p 1101–1105.* USA.
- Mintarsih, A. 2016. Hubungan Pemakaian IUD dan Kanker Servik, *Jurnal AKPERGSH LPPM.* Wonogiri.
- Octa P.A. 2012. Hubungan Pemakaian Alat Kontraversi dalam Rahim dan Kejadian Kanker Servik di RSUD Dr. Mawardi. UNS. Solo.
- Onur Erol, Serap Simavli, Aysel Uysal Derbent, Aylin Ayrim & Hasan Kafalı. 2014. The impact of copper-containing and levonorgestrel-releasing intrauterine contraceptives on cervicovaginal cytology and microbiological flora: A prospective study. *Journal The European Journal of Contraception & Reproductive Health Care Volume 19, 2014 - Issue 3.* USA.
- Riset Kesehatan Dasar. 2013. Badan Litbangkes Kementerian Kesehatan RI & Data Penduduk Sasaran, Pusdatin. Kementerian Kesehatan RI: Jakarta.
- Sipra Bagchi, Shanti Sah , Tanu Agrawal. 2016. Effect of intrauterine copper device on cervical cytology and its comparison with other contraceptive methods. *International Journal of Reproduction.* 2016 Aug; 5(8): 2795-2798. Available from www.ijrcog.org.India. 2017.
- Tualeka, A.R. 2013. Toksikologi Industri. Graha Ilmu Mulia. Surabaya.
- Tualeka, A.R. 2014. Analisis Risiko. Graha Ilmu Mulia. Surabaya.
- Tualeka, A.R. 2015. Toksikologi Industri Logam Berat. Graha Ilmu Mulia. Surabaya.
- U. J. Koch. 1985. Effects of copper IUDs on cervical cytology and influences on transtubal sperm migration. *Biomedical Aspects of IUDs* pp 25-44. USA.
- WHO. 2015. Cancer. <http://www.who.int/mediacentre/factsheets/fs297/en/> (Accessed on November 10, 2017).

A Proposed Monitoring and Evaluation Conceptual Framework for the Management of South African Private Sector HIV-AIDS Programmes

Shayhana Ganesh¹, Renitha Rampersad²

¹Faculty of Management Sciences, ²Faculty of Management Sciences,
Durban University of Technology, South Africa

ABSTRACT

Human Immunodeficiency Virus (HIV)-Acquired Immunodeficiency Syndrome (AIDS) in South Africa is a prominent health concern as more people are living with HIV-AIDS than any other country in the world. As such South Africa hosts the largest HIV-AIDS programmes globally³. Appropriate management of HIV-AIDS treatment and wellness programmes are vital to ensure operational efficiency and cost effectiveness, hence ensuring optimal patient management. Integral to HIV-AIDS treatment and wellness programmes is programme monitoring and evaluation. Although monitoring and evaluation research has been conducted in the public HIV-AIDS health care sector with a variety of proposed tools/framework in existence; a substantial gap exists with similar HIV-AIDS programmes in the private healthcare environment. As it is not necessary to reinvent tools or frameworks for this environment, this article reveals how current smart practises from contextually relevant environments may be adapted to be implemented in private sector HIV-AIDS programmes. The treatment and management of HIV-AIDS is a continually changing process informed by state of the art international randomised controlled trials, global operational programme dynamics set against global, national and local ethical, regulatory requirements. It is inherent that HIV-AIDS wellness providers reengineer their service delivery so as to adapt industry standards to achieve best treatment and patient outcomes.

Keywords: *monitoring and evaluation, conceptual framework, HIV-AIDS*

INTRODUCTION

HIV - AIDS places a significant burden of disease on HIV-AIDS service providers in South Africa due to the increasing HIV prevalence and incidence in the region. These HIV service providers which offer HIV wellness, treatment and care and include the Department of Health facilities, non-governmental organisations, organisations; faith based organisations, civil organisations and selected private organisations. HIV-AIDS service delivery is paramount to ensure that all citizens receive access to appropriate and relevant treatment and care in order to curb the incidence of HIV-AIDS related disease mortality and morbidity. Current challenges with these HIV-AIDS programmes are suboptimal treatment outcomes, lack of proper fiscal management, lack of effective monitoring and evaluation systems and drug shortages⁴. These challenges

often lead to inappropriate treatment and management of HIV-AIDS patients in the South African private, public and parastatal sectors. Urgent reviews and investigations into these programmes need to be undertaken to assess gaps in programme delivery and present solutions to enhance optimal service delivery. This paper reports on a study that was conducted at a private managed healthcare provider of HIV-AIDS services in South Africa. The HIV-AIDS programme was reviewed, investigated and analysed in order to provide tangible solutions to enhance HIV-AIDS service delivery across this and similar programmes. Data was reviewed from several multi-sectoral HIV-AIDS providers and will be used to inform the HIV-AIDS field regarding optimising monitoring and evaluation of HIV-AIDS programmes to enhance clinical management of patients. As the HIV-AIDS epidemic matures into its third decade of

existence, monitoring and evaluation of the epidemic becomes critical to ensure HIV-AIDS service delivery targets and goals are being met within budget constraints. This data will be shared with public sector facilities and non-governmental organisations to ensure that HIV-AIDS treatment and wellness programmes are optimally managed to allow for greater public health impact.

LITERATURE REVIEW

South Africa has the largest ARV programme globally, with 48 % of adults on the programme². South Africa's national public sector response to HIV-AIDS is spearheaded by the South African National AIDS Council (SANAC). The council has made and continues to make bold strides toward the prevention and ultimate elimination of HIV-AIDS in South Africa. SANAC's key initiative is the development of the South African National Strategic plan for HIV, TB and AIDS (NSP). The plan addresses the key components of the HIV-AIDS and TB epidemics. This plan also explores key initiatives towards the improvement of service delivery through the various district levels within the country. The NSP 2012–2016 is driven by a long-term vision for the country with respect to the HIV-AIDS and TB epidemics. The South African Department of Health has adapted the three zeros proposed by UNAIDS to suit the local context⁴. The South African vision is: “ zero new HIV-AIDS and TB infections; zero new infections due to vertical transmission; zero preventable deaths associated with HIV-AIDS and TB; and zero discrimination associated with HIV-AIDS, STIs and TB”⁷.

RESEARCH METHODOLOGY

The central objective of this article is to: “*To propose a conceptual monitoring and evaluation framework derived from quality management systems for the management of HIV-AIDS private sector programmes that can be used in both public and private healthcare sectors through the analysis of current conceptual frameworks in HIV-AIDS healthcare and HIV-AIDS programmes within the South African context of HIV-AIDS healthcare provision*”.¹

Based on the imminent themes that emerged from the data review and analysis, this monitoring and evaluation framework is a synthesis of consensus-based international recommendations for monitoring HIV-AIDS treatment and care. The purpose of this conceptual framework for the monitoring and evaluation of HIV-

AIDS private sector programmes is to allow management to plan the programme initiatives, implement the service offering and measure patient and healthcare responses to the service provision through monitoring efforts. Through evaluation, it is aimed that the programme will be reviewed and reports generated for relevant stakeholders to then improve and adapt the programme based on patient needs and best treatment practices.

RESULTS AND DISCUSSION

Several monitoring and evaluation frameworks across the various sectors have evolved in response to the HIV-AIDS epidemic. The global HIV-AIDS field utilises the Joint United Nations Programme on HIV-AIDS (UNAIDS) and United States Agency for International Development (USAID) monitoring and evaluation frameworks for HIV-AIDS programmes based on their versatility and relevance to the civil healthcare sector, public healthcare sector and para-statal healthcare sector. The South African Department of Health has developed a South African National monitoring and evaluation HIV-AIDS Framework for use nationally in South Africa. The UNAIDS and USAID/Global Fund frameworks are the most widely used and accepted HIV-AIDS monitoring and evaluation frameworks globally and hence were chosen to be reviewed. These frameworks track important global milestones in the global battle against HIV-AIDS. The UNAIDS and USAID HIV-AIDS monitoring and evaluation frameworks recognise the need for a broader-based, expanded response to the epidemic in sectors ranging from health to economic development and the need to provide leadership and better-coordinated streamlined service delivery. These global frameworks offer support to countries regarding HIV-AIDS-related global activities, programme development and coordination, global HIV-AIDS surveillance and resource mobilization. The South African National monitoring and evaluation HIV-AIDS Framework builds on the above and is relevant to the South African HIV-AIDS epidemic.

Currently, monitoring and evaluation frameworks assessing HIV-AIDS programmes have been developed for sector-specific responses and span different national and international arenas. The South African private managed healthcare sector manages HIV-AIDS specific programmes offering comprehensive HIV-AIDS treatment, wellness and care to selected patients on medical insurance. There is a current lack

of a contextually relevant, sector appropriate monitoring and evaluation HIV-AIDS framework for this sector, heralding an urgent need for development of such a framework.

Proposed monitoring and evaluation system

This proposed monitoring and evaluation system will be based on results as a powerful management tool in helping this healthcare organization demonstrate impacts and outcomes to their respective stakeholders. This programme will feature a results-based monitoring and evaluation system, emphasising outcomes and impacts of the programme while also examining programme implementation through programme inputs, activities and outputs. This monitoring and evaluation system will provide important feedback about the progress as well as the success or failure of the programme and will serve as an avenue for continuous learning, training and development.

The proposed conceptual monitoring and evaluation HIV-AIDS framework comprises:

Technical specifications of the indicators

Indicators offer a consistent and standardised evaluation of effectiveness when adapted for use in HIV-AIDS healthcare programmes. With specific reference to the private healthcare sector, indicators need to have a tailor-made feature correlating with health risk in order to ensure appropriate mitigation and high organisational impact. For this proposed conceptual framework for monitoring and evaluation of HIV-AIDS, private sector programme indicators will be sensitive and provide an early warning thereby enabling proactive decision-making. Indicators will also provide a retrospective view on risk events, so lessons can be learned from the past. Indicators will also provide a real-time actionable intelligence to decision makers and health risk managers. Risk management in healthcare is potentially more important than in any other industry. Risk rating of indicators is a key consideration for HIV-AIDS management.

iii. Digital automation

This article proposes that the conceptual framework be digitally automated to assist staff and management at the healthcare programme concerned. This can be easily achieved with programme developers and rigorous testing with application designers with integrating

layout and analytics. New features can be updated based on alpha and beta testing. Considering the way in which mobile applications are continually changing the world with remarkable new applications being developed every day, this can be rolled out to monitoring and evaluation frameworks for HIV-AIDS. Health and hospital applications represent an area of incredible innovation, as healthcare workers are able to manoeuvre for education, learning and awareness. These apps can save time and provide useful information to the end-user.

A digitally automated conceptual framework will ease data collection as it will be automated; will allow for real time data trending; and provide daily, weekly and monthly reports on programme activities and programme targets. Access to data management will be controlled through managerial authorisations only in order to allow data integrity with minimal chance of data manipulation. Data reports can be generated based on the priority of indicators and can also be set up for alert functions to managers and programme decision makers. Functionality can also be set up to ensure snapshot dashboard and framework monitoring on smartphones and tablets at any time.

iv Mobile application development

Mobile applications are becoming very popular, spanning usage amongst all age groups and also across all sectors such as health, gaming, food, nutrition and fashion. Mobile applications also offer convenience and accessibility to all users and offer enhanced modes of mobile communication and collaboration. Given that mobile applications are revolutionising the way people think, live and learn, the researcher proposes that an added advantage of a digitally automated HIV-AIDS conceptual framework will be to develop a mobile application for intended users.

Following the necessary research and goal development, a wireframe and storyboard is created. In this phase, ideas and features fuse into a clearer picture. Wire framing is the process of creating a prototype of the application. Following wire framing, prototype testing occurs. The development of back end and front end processes occur next. Back end processes encompass how the developer customizes the user's experience. Following this, access control and data control occur, with data storage then considered. Data integration which allows users to access from and publishes data

to third party users occurs next. Front end processes encompass storing data locally to speed up load time, thereby allowing for synchronisation which enables off-line usage. Finally, the user interface design and development process occurs, which leads to the testing process. Testing should be done with different groups of people over several time frames in order to ensure that all errors are excluded and data integrity assured.

The development of a mobile application for the monitoring and evaluation an HIV-AIDS conceptual framework for a private sector HIV-AIDS programme will give a programme a competitive edge over other HIV-AIDS providers in the industry. A mobile application of this nature will allow for real-time data collection, collation and results provision. Data can be colour-coded and risk rated and provide a snapshot of whether the programme is in the red (danger) zone, yellow (caution) zone or green (good to go) zone. This will allow timeous interventions to be undertaken in real-time to address issues as they occur. Security measures can be installed to allow data integrity verification with all users, either getting read access or the ability to edit as well. Digital automation of this monitoring and evaluation HIV-AIDS conceptual framework is an example of an innovative health solution bridging the gap between HIV-AIDS healthcare and technological advancement

V Dashboard

Dashboards often provide at-a-glance views of key performance indicators relevant to a particular programme or project. The use of a dashboard as part of the proposed conceptual framework for the monitoring and evaluation of HIV-AIDS private sector programmes was proposed which could be used in both public and private healthcare sectors. Based on the literature review conducted for this research study, it is evident that no HIV-AIDS programmes in South Africa in the private sector are utilising dashboard functionality as part of the monitoring and evaluation conceptual framework to assess programme performance indicators was then proposed. The use of an HIV-AIDS dashboard structured according to a set of indicators based on risk stratification. Indicators can be triaged based on risk and programme outcome and mission. Triageing can be colour coded as red (severe); yellow (moderate); green (mild) and depending on the population of indicators, can be color coded to provide a visual measure of performance to gauge overall programme status as well

as the problematic component.

CONCLUSION AND RECOMMENDATIONS

This article revealed the importance of methodological combinations for a better understanding of results and the mechanisms of changes in the evaluation of HIV-AIDS private sector activities. This HIV-AIDS monitoring and evaluation framework could help to homogeneously assess HIV-AIDS prevention, treatment and wellness activities currently being implemented by HIV-AIDS programmes within South Africa. In addition, the indicator matrix could help healthcare workers improve their HIV-AIDS monitoring and evaluation activities. The indicator matrix enables the detection of gaps in intervention levels in order to generate strategies that may enhance HIV- AIDS programmes in the future. The above proposed digitally automated conceptual framework provides a clear roadmap to HIV-AIDS programme planning; monitoring and evaluation. It delineates clear pathways to programme goals and objectives and defines relationships between programme inputs, processes, outputs and outcomes. It describes how programme factors interact with external and internal environmental factors. The dashboard and automation functionality allows real-time assessment of programme measures in a novel, innovative and user-friendly manner. Given that South Africa has a well-established multi sectoral response to HIV-AIDS with various public, private and NGO programmes dedicated to the on-going prevention, treatment and wellness of HIV-AIDS, there is a need to develop common tools which are imperative to HIV-AIDS operational research activities to streamline work activities and to attain the best results possible from HIV-AIDS programmes

A proposed framework such as this is not only relevant to the private HIV-AIDS sector, but can be adapted for use in other sectors to ensure a multi-sectoral response to the HIV-AIDS epidemic. The innovative computerised technique allows this conceptual framework ease of use and offers a competitive edge over its counterparts,

Ethical Clearance- was gained from the Faculty Research Committee of the Durban University of Technology as part of the primary author's doctoral thesis.

Source of Funding- Durban University of Technology as part of the primary authors doctoral

thesis.

Conflict of Interest - NIL

REFERENCES

1. Ganesh, S. 2017. Management of an HIV/AIDS wellness programme: A Case Study of the HIV Your life programme
2. National Department of Health. 2013. Clinical Guidelines for the Management of HIV and AIDS in Adults and Adolescents. South Africa. Website <http://www.doh.gov.za/docs/> 6 June 2013
3. UNAIDS, 2013. The Gap Report: UNAIDS Information Production Unit. Available at:<http://www.unaids.org/sites/default/files/media_asset/2016-gap-report_en.pdf>[Accessed 30 AUGUST 2013].
4. SANAC. National strategic plan on HIV, STIs and TB 2012-2016. Pretoria SANAC. Global Response Progress Report 2012, Republic of South Africa .Pretoria: SANAC; 2012

Logistic Management Analysis of Medical Equipment in Padang Port Health Office

Magdalena¹, Rizanda Machmud², Hardisman²

¹*Pursuing Masters Degree Program in Public Health Andalas University, Indonesia,*

²*Lecturer in Public Health Sciences in Faculty of Medicine in Andalas University, Indonesia*

ABSTRACT

The objective of this study is to know the process of storage, distribution, maintenance and control on logistic management of medical equipment at Padang Port Health Office. This research uses qualitative approach. The result of the study shows that the policy is guided by the Guidelines of Medical Device Management in Health Facilities in 2015 and regulations related to the management of state property but the existing policy has not been socialized to all health equipment managers and has not been downgraded in the form of technical guidelines or standard operating procedures. Human resources are less in terms of quality and quantity. The budgets are still lacking primarily. Infrastructure are still lacking mainly for the storage of medical equipment and warehouses. Implementation of storage, distribution, maintenance and control of health equipment logistic has not been implemented properly. The function test for 357 medical devices obtained 45 units (12,60%) of medical equipment can not be functioned, 3 units (0,84%) of health equipment can not be tested because there is no officer available and 21 units (5,88%) unknown health equipment.

Index Terms— *Analysis, Distribution, Logistic Management, Medical Equipment, Planning, Procurement, Storage.*

INTRODUCTION

World Health Organization (WHO) in 2015, states that more than 50% of health equipment in developing countries is not functioning or cannot be used optimally due to lack of maintenance efforts. WHO also estimates that 95% of medical equipment in developing countries is imported, most of which do not meet the needs of national health services and are not used effectively and efficiently ^{1,2,3}.

Padang Port Health Office (PHO) is one of 49 Port Health Office in Indonesia. Padang PHO has been awarded as the best manager of State Property in all of PHO in Indonesia in 2014 and implementing logistics management system especially health equipment in order to achieve excellent service. However in the subsequent execution of whether this system is retained to date in accordance with regulations relating to logistics management ⁴.

Based on preliminary survey results, there are still many health tools that are stacked in some storage

places, even some health equipment stored in the home office. Based on the review of documents from the State Property Report of Padang PHO in 2016 from 357 units of existing health equipment, 311 units (87.11%) of good health equipment, 5 units (1.40%) health equipment in damaged condition lightweight and 41 units (11,48%) health equipment in a state of severely damaged. The amount of equipment that is in a state of damage is closely related to the process of maintaining the tool.

In addition to the accumulation of goods, the problem found in the Padang Port Health Office is still there were health equipment that is not given the code number of goods. According to Decree of the Minister of Finance No. 29 / PMK.06 / 2010 of 2010 concerning the classification and verification of State Property, User of Goods / Proxy of Users of Goods must register and record State Property (BMN) into List User / List of User Power of Attorney according to and goods codification in order to realize the orderly administration and support the orderly management of State Property.

The results of the interviews that researchers conducted in the initial survey with the officer of BMN management on March 07, 2017 revealed that there are several items of medical equipment that has not been known to exist with the total initial value of IDR 4.791.477.250, - (four billion seven hundred ninety one million four hundred seventy seven thousand two hundred and fifty rupiah). The equipment is Blood Chemistry Analysis, Stethoscope, Defibrillator and Pacer Analyzer / tester, Pressure Transducer for NIBD and Filter Compressor. Besides, there is also a mutation of medical equipment without the knowledge of BMN managers.

Based on the above description, we need to conduct research on analysis of logistics management of health equipment at the Port Health Office of Padang.

METHOD

This type of research is qualitative research and data were analyzed with Miles and Huberman model through data reduction, Data Presentation and Verification. This study was conducted from January to December 2017 at Port Health Office of Padang.

Technique of taking informant in this research by purposive sampling that is sampling technique with certain consideration made by researcher based on characteristic or characteristic of population which have been known. Data collection in this research was conducted in several ways such as observation (observation), in-depth interview (Indepth Interview), and document review ⁵.

RESULTS

Policy

The policy for managing medical devices at Padang PHO is carried out based on the rules relating to the management of BMN such as the Regulation of the Minister of Finance of the Republic of Indonesia Number: 181 / PMK.06 / 2016 concerning Administration of State Property, Minister of Finance Decree Number 29 / PMK.06 / 2010 in 2010 concerning classification and codification of State property, Republic of Indonesia Minister of Finance Regulation No. 244 / PMK.06 / 2012 concerning Procedures for Implementation of BMN Supervision & Control, Minister of Home Affairs Regulation No. 17 of 2007 concerning Technical Guidelines for Regional Property Management and Tool

Management Guidelines Health at the Health Facility and the user guide for each tool. Besides that, the manager of medical devices who work in the work area does not get a decree from the Head of the Padang PHO and the task as manager of the medical device is not included in the job description in employee work goals of each management officer.

Resources

The results of the study found that personnel in the implementation of medical logistics management in the Padang PHO in terms of quantity were not enough. Padang PHO should have as many as 6 electromedical personnel while the Padang PHO has only one electromedical staff. Existing electromedical technicians have not been fully involved in the management of medical devices because they are deemed not to understand the equipment available in the PHO and the other reason is that there is no electromedical technical function in the PHO position map. In terms of quality it is still lacking because the officers have never received training or socialization about the management of medical devices in addition to multiple positions.

Tools

Padang PHO does not yet have facilities and infrastructure in accordance with the standards set by the Indonesian Minister of Health as outlined in the Guidelines for Standardization of Human Resources, Facilities and Infrastructure in the Port Health Office Number 1314 / MENKES / SK / IX / 2010 Year 2010. Cabinets and shelves storage is still not good at the main office or in several regional offices.

Storage

The storage process begins with the acceptance stage carried out by electromedical personnel, BMN users and managers. The acceptance process is carried out through three stages, namely physical examination, function test and tool testing. Then the recording of the tool is done with the Application for BMN and tool labeling. Then the tool is submitted to the head of the section (user) using the Handover Minutes. Tools received by the user are then stored or distributed to the work area office. Tool storage is carried out according to the function of the tool. Tools that function to diagnose diseases are stored in polyclinics or blood chemistry laboratories. Tools for vector control and sanitation are stored in

vector laboratories and sanitation and warehouses for equipment and pesticides. Small tools are placed on the floor and large tools are placed on shelves or on the floor. Similar items but various sizes are grouped together by sorting from the smallest to the largest size.

Distribution

The process of distributing of medical devices in Padang PHO is carried out according to BMN rules, namely Minister of Home Affairs Regulation No. 17/2007 concerning Technical Guidelines for Regional Property Management and Guidelines for Management of Medical Devices in Health Facilities. The activity begins with a request for medical devices to the head section, after being approved for a physical examination, a functional test and a tool test. Transportation facilities for shipping medical devices and drivers are available. The process of physical expenditure of goods, transportation processes and demolition processes is pursued as best as possible to avoid damage during the shipping process. Some things that are not yet in line are the Minutes of Examination of distributed Goods and reports on the realization of medical devices distributed to working area is not been found yet. This happens because technical instructions and standard operating procedures on how to distribute medical devices at PHO are not yet available. Besides, medical officers have never received training or socialization.

Maintenance

The process of maintaining medical devices in Padang PHO has not been carried out in accordance with the Guidelines for Management of Medical Devices in Health Facilities because preventive maintenance and inspection activities have not been carried out. Maintenance activities carried out in the form of corrective maintenance carried out by each section without involving electromedical personnel except for maintenance of ambulance cars. There is no record book of corrective actions including the length of time for repairs and no reports of maintenance, in addition to the number of uncalibrated ales.

Control

The process of controlling medical devices at the Class II Padang Health Office has not been fully in accordance with Minister of Home Affairs Regulation No. 17 of 2007 concerning Technical Guidelines for

Management of Regional Property. Control is carried out by the section head through bookkeeping / records checking.

DISCUSSION

Policy

According to the researchers' assumptions, seeing the many problems related to this policy indicate that health equipment management activities have not been a priority either by the Director General of Disease Prevention and Control of the Ministry of Health of the Republic of Indonesia the Padang Port Health Office. Whereas in carrying out medical device management activities at the Padang PHO, the first and fundamental step that must be carried out is to make the operational policies themselves from activities in real terms. This operational policy will move the organization to meet the management needs of medical devices in Padang PHO. Although nationally there are guidelines and regulations related to BMN as a reference, but in its implementation at the Padang PHO, technical guidelines and standard operating procedures need to be made in accordance with the characteristics of the Padang PHO so that implementation of standardized medical equipment management activities can be evaluated. Implementers of policies should be given a decree so that in carrying out their duties they have a legal basis for all actions that are used as legal aspects to determine or maintain something that is decided. It is recommended that the Head of the Padang PHO make a standard operating procedures for the management of medical devices so that the medical administrators in implementing management activities become more clear, systematic and standardized so that they can implement them appropriately.⁷

Resources

The quality of human resources involves two aspects as well, namely physical aspects, and non-physical aspects that involve the ability to work, think, and other skills. Therefore, efforts to improve the quality of human resources can also be directed to both aspects. To improve physical quality can be pursued through health and nutrition programs. Whereas to improve the quality or non-physical abilities, education and training efforts are the most needed.⁸

The implementation of logistic management of medical devices can run well should electromedical

personnel be added to 6 people in accordance with the Joint Regulation of the Minister of Health and Head of State Personnel Agency Number 46 of 2014 and Number 23 of 2014 concerning Implementation Guidelines for the Minister of Administrative Reform and Bureaucratic Reform of the Republic of Indonesia Number 28 of 2013 concerning the Functional Position of Electromedical Technical and Credit Numbers states that the number of electromedical personnel in the Class II Port Health Office environment is electromedical personnel of 6 people, consisting of; skilled 4 (four) people and experts 2 (two) people. In order for each work area to have one electromedical staff to manage medical devices that are available throughout the work area of the Padang PHO, the technical officers are more focused on working on their activities. Besides that, the electromedical personnel available are given roles according to their educational background. It is recommended that the Director General of Disease Prevention and Control as the main unit of the PHO add electromedical functional positions to the PHO position map.

Tools

Means are tools to facilitate and facilitate work. In the business world to achieve better results, besides human beings who are experts in their fields, materials / materials are needed as a means because material and means cannot be separated. Support for facilities such as workplaces, tools, transportation and funds is important for smooth work. The facilities used for logistics management of medical devices include cabinets, shelves and operational vehicles. Facilities that are available at this time should be maintained both in terms of quality and quantity because the facilities are very important to support the implementation of good health equipment management activities. It is expected that the Padang PHO can budget funds for the purchase of shelves or cabinets for the main office or regional office.⁹

Storage

Storage can be interpreted as an activity and business to carry out management, organization and arrangement of inventory items in the storage room. The process of storing medical devices in the Padang PHO is carried out based on BMN rules and Guidelines for the Management of Medical Devices in Health Facilities.¹⁰

DISTRIBUTION

The logistics distribution activity is basically

a continuation of the process of storing or storing logistics or empirically is one part of the logistics warehousing activity itself. It is better if the manager of the medical device makes a Minutes of Examination of the Distributed Goods and reports on the realization of medical devices that are distributed to working are. In addition, officers need to be given training or outreach on ways of distributing good medical devices..

Maintenance

Maintenance of health equipment is a series of preventive and corrective activities carried out to maintain quality medical equipment, safe and usable). It is better if the manager of the medical device keeps a schedule of preventive inspections and maintenance and records corrective actions including the length of time for repairs. Electromedical power is involved in the maintenance of medical devices. For this reason, all medical personnel management is given training in maintaining good medical devices.

Control

In the control process, the delivery of the minutes of the results of the inspection to the manager of medical devices is very important to do as feedback from control activities. The delivery of this minutes will be a correction for managers to improve the process of managing medical devices at the next Padang PHO. The results of this examination need to be submitted to the Head of Padang PHO to be a note for policy makers in determining the steps to improve the management of logistic equipment in Padang PHO.

It is hoped that these control activities will be carried out by all section heads to all work areas. The results of the examination are poured into the Minutes of Examination Results. The event news is sent to the manager of medical devices and sent to the Head of Padang PHO. Training and outreach should be given to implementers of logistical control equipment in Padang PHO.

CONCLUSION

The logistics management policy for medical devices at the Port Health Office in Padang is guided by regulations relating to the management of State Property and Guidelines for Health Equipment Management in Health Facilities of the Directorate General of Health Efforts of the Ministry of Health, but the policies have

not been disseminated to all medical administrators and have not been revealed in the form of Technical Guidelines and Standard Operating Procedures that are specific to Padang Port Health Office. Managing staff in logistics equipment management activities at the Padang Port Health Office in terms of quantity and quality are still lacking. Funds and facilities for logistics equipment management activities are still lacking. The implementation of logistics equipment management activities at the Padang Port Health Office has not been implemented properly so that not all available medical devices are available in ready-to-use conditions.

Ethical Clearance: Not required.

Source of Funding: Ministry of Health Scholarship.

Conflict of Interest: Nil.

REFERENCES

1. Ministry of Health RI. Ministry of Health's Strategic Plan Year 2015-2019. Jakarta; 2015.
2. Ministry of Health RI. Indonesia Health Profile 2014. Jakarta; 2015.
3. WHO. Regional Office for the Eastern Mediterranean, Technical discussions; Medical devices in contemporary health care systems and services, <http://apps.who.int/medicinedocs/documents/s17667en/s17667en.pdf> [accessed 25 June 2017].
4. Padang City Health Office. Health Profile of Padang City Health Office 2015. Padang; 2015.
5. Sugiyono. Quantitative Research Methods, Qualitative and R & D. Bandung: Alfabeta; 2014.
6. Agustino L. Fundamentals of Public Policy. Bandung: Revised Edition, Alfabeta; 2016.
7. Winarno D. Public Policy Theory, Process, and Case Studies. Yogyakarta: CAPS; 2012
8. Notoatmodjo S. Health Promotion and Behavioral Science. Jakarta: Rineka Cipta; 2007.
9. Ayuningtyas D. Health Policy Principles and Practices. Jakarta: Rajawali Pers; 2014
10. Bustami. Quality Assurance of Health Service & Acceptability. Padang: Erlangga Press; 2011.

The Effects of Extract Andaliman Fruit (*Zanthoxylum acanthopodium Dc*) to CAMP mRNA expression and Bacterial Load in Mice Balb-C after *Gardnerella vaginalis* Infection

Lenny Irmawaty Sirait^{1,2}, Muh Nasrum Massi³, Mochammad Hatta⁴, Prihantono⁵

¹Midwifery Program of Medistra Health Higher School, Jakarta, Indonesia, ²Post Graduate School, Faculty of Medicine, Hasanuddin University, Makassar, Indonesia, ³Department of Microbiology, Faculty of Medicine, Hasanuddin University, Makassar, Indonesia, ⁴Molecular Biology and Immunology Laboratory for Infectious Diseases, Faculty of Medicine, Hasanuddin University, Indonesia, ⁵Department of Surgery, Faculty of Medicine, Hasanuddin University, Makassar, Indonesia

ABSTRACT

This study aims to analyze the effects of extract Andaliman Fruit / *Zanthoxylum Acanthopodium Dc* (EZA) to CAMP mRNA expression and bacterial load in Mice Balb-C before and after *Gardnerella vaginalis* infection. Experiment to Balb-c mice consists of three groups; Control groups, given EZA 5 days groups and EZA 7 days groups prior *Gardnerella vaginalis* inoculation. Bacterial number and colonies, mRNA CAMP expression, were examined 3 and 5 days after inoculation of *Gardnerella vaginalis*. Data showed that administration of EZA extract for 7 days before *Gardnerella vaginalis* inoculation had a significant effect both on the decrease in bacterial number and bacterial colonies as well as in enhancing CAMP mRNA expression. The five-day EZA extract reduced the number of bacteria and increased mRNA expression significantly but was less effective in reducing the number of bacterial colonies. Controls group that was not given anything had significant increases in bacterial numbers and colonies, and increased CAMP expression was higher compared to another group. Conclusion: this study found Extract of *Zanthoxylum acanthopodium DC* (EZA) indicated as a potential anti-bacterial and immunomodulator especially to *Gardnerella Vaginalis* infection.

Keywords: Andaliman Fruit, CAMP mRNA expression, *Gardnerella vaginalis*.

INTRODUCTION

Indonesia has many natural ingredients that are often used as herbal medicine for various types of diseases.^{1,2} Andaliman fruit or *Zanthoxylum acanthopodium Dc* is a species of the citrus family, Rutaceae that widely found in the area of North Sumatra, Indonesia which at the same time become the spice on food that is very liked by the community. This fruit is unique because its acidity is often used as an ingredient for traditional food made from raw fish.³

The family of Rutaceae family such as *Zanthoxylum armatum* has been extensively studied but the benefits of *Zanthoxylum acanthopodium Dc* still rarely studied. One of the benefits that have been studied is its ability to inhibit angiogenesis in breast cancer cells.⁴⁻⁹

One of the problems in Indonesia is bacterial vaginosis such as *Gardnerella vaginalis* (GV). This bacterium is very risky in pregnancy and can also cause inflammation of the pelvis. This bacterial can be replaced by vaginal lactobacillus and its characterized with low vaginal acidity.¹⁰⁻¹² Antibiotic treatments for this bacterial infection are not recommended because it is potential become a resistant or reoccurrence infection. It is suggested to try to find natural anti-microbial from plant or a non-pathogenic organism, recommended natural ingredients that affect bacteria while enhancing immune status.¹³

Natural ingredients that affect bacteria while enhancing immune status is supposed as good herbal medicine. Andaliman fruit has a flavonoid content that enables it to increase immune status as well as affect the

bacteria, but this is still an assumption that needs to be proven. One marker host defense to bacterial infection include *Gardnerella vaginalis* is cationic antimicrobial peptides (CAMPs).¹⁴

This study aims to analyze the effects of Andaliman Fruit extract *Zanthoxylum acanthopodium* Dc (Eza) to CAMP mRNA expression and bacterial load in Mice Balb-C before and after *Gardnerella vaginalis* infection.

MATERIALS AND METHOD

Andaliman Fruit Extraction.

The andaliman fresh fruit was obtained from an altitude of Lake Toba region, namely in the village Buttumalasang North Sumatra Indonesia. Andaliman fresh fruit as much as 2.5 kg dried in the hot sun and dry andaliman freezer into fruit (1.8 kg). The extraction was done in the laboratory of Research Institute for Medicinal and Aromatic Plants (Balitro) with the following steps: preparation of a test (extract) beginning of the drying process using the oven for five days to simplicia. Simplicia (1500 grams) smoothed using a grinder with the fineness of 3-4 mm into a coarse powder, then soaked in a steel boiler using solvent 96% ethanol as much as 7500 ml (concentration of 1: 5 liter).

Extraction technique maceration was mixer / stirring for 3 hours, left to soak for 24 hours and is filtered using a filter paper to separate the residue and filtrate. Results filtrate in-rotavator or evaporation to separate the solvent to obtain a thick extract Andaliman fruit (fruit preparations andaliman ethanol extract yield 7%).

Animal.

Mice (*Mus musculus*) strain Balb-c female adults age 8-12 weeks weighing 18-20gram used as a test dose of the experimental animals. Animals are given standard feed ad libitum and be treated according to conventional cages.

Protocol Intervention.

Animals *Balb-C* female, healthy, age 8-12 weeks, weighing 18-20 grams are from Bogor PT.INDOANILAB adapted for seven days in the laboratory animal faculty of medicine Hasanuddin University with standard cages and feeding according to the standard laboratory indefinitely. Animal weighing eight days and then divided into three cages at random (random) with mean

weight of not more than 20% of each group consisted of four tail as replication. K1: a control group (non Eza) CMC1% treatment by administering a dose of 0.1 ml / 10 grams of BB / as long as seven days by gavage, the 8th day of inoculation GV. K2: Eza group 5 days of treatment with 2% Eza administration dose of 0.1 ml / 10 g BW / day by gavage for five days, the 6th day of inoculation GV. K3: group Eza 7 days of treatment with 2% Eza administration dose of 0.1 ml / 10 g BW / day by gavage for seven days, the 8th day of inoculation GV.

GV Bacteria from the Laboratory of Microbiology UNHAS Makassar, a method of induction in mice that intravaginal inoculation concentration of 3×10^4 @ 10 μ l (Sirait et al.2017). Blood samples for the measurement of CAMP gene mRNA in mice each performed three times, namely: before treatment, after treatment and three days after inoculation GV. CAMP gene mRNA expression was identified using real-time PCR. Sampling vaginal secretions using a vaginal swab for bacterial load measurement is performed three times: before treatment, 24 hours after inoculation GV and GV 3 days after inoculation. The bacterial load is identified by microscopic examination per 10 fields of view and culture PCA colony counting.

Statistical analysis

Data were analyzed using paired t-test and considered as significant if probability value (p-value) <0.05. Data were presented as a mean and standard deviation.

RESULTS

The data showed that mice given Eza for 7 days before inoculation with GV showed a higher bacterial decline (-27.0) than others and this decrease was statistically significant (p<0.001). Results also showed that mice were given Eza for five days before GV inoculation also showed a significant decline (-26.8) post-inoculation GV but lower than that of 7 days (p<0.001). Control groups that were not given Eza did not experience a decrease in the number of bacteria instead had a significant increase (p=0.004) in the number of bacteria (+25.0) (Table 1).

TABLE 1: Effect Extract Zanthoxylum acanthopodium Dc (Eza) to the number of bacteria

Group	Total bacteria Mean±SD			P*
	day 1	day 3	Change	
Control	48.3 ±6.8	73.3±1.9	+25.0	0.004
EZa (5 days)	41.0±6.1	14.30 4.6	-26.8	<0.001
EZa (7 days)	34.5±5.2)	7.5±2.1	-27.0	<0.001

*Paired T-Test

+Increase

-Decreased

The data showed that after three days GV inoculation, mice were given EZa for seven days before injection with GV showed a higher number of bacterial colonies decline (-12.25) than others and this decrease was statistically significant (p<0.000). Results also showed that mice were given EZA for five days before GV inoculation did not show the number of bacterial colonies decline even increasing (+1.25) although not significant (p=0.312). Control groups that were not given EZa did not experience a decrease in the number of bacteria instead had a significant increase (p<0.001) in the number of bacteria (+54.75) (Table 2).

TABLE 2: Effect EZA to the number of bacterial colonies

Group	Total bacteria Mean±SD			P*
	day 1	day 3	Change	
Control	45.00 ±3.74	100.75 4.65	+54.75	<0.001
EZa (5 days)	22.50± 1.29	23.75(1.71)	+1.25	0,312
EZa (7 days)	18.50±1.91	6.25(2.22)	-12.25	<0.000

Paired T-Test

+Increase

-Decrease

The data showed that mice given EZa for seven days before inoculation with GV showed a significant increasing (p=0.016) of CAMP gene mRNA expression (+0.79). Results also showed that mice were given EZA for five days before GV inoculation showed a significant (P<0.001) increase of CAMP gene mRNA expression (+1.52) post-inoculation GV but lower than the control group increased. Control groups that were not given EZa showed a higher increasing in the number of CAMP gene mRNA expression (p<0.001) in the CAMP gene mRNA expression (+2.93) than that mice given EZa for seven days before inoculation with GV (Table 3).

TABLE 3: CAMP mRNA expression three days after inoculation GV

Group	CAMP gene mRNA Expression Mean±SD			P*
	day 1	day 3	Change	
Control	5.25 (0.14)	8.18 (0.09)	+2.93	<0.001
EZa (5 days)	5.10 (0.12)	6, 62 (0.14)	+1.52	<0.001
EZa (7 days)	5.06 (0.05)	5.86 (0.34)	+0.79	0,016

Paired T-Test

+Increase

-Decrease

DISCUSSION

Data showed that administration of EZa extract for seven days before GV inoculation had a significant effect both on the decrease in bacterial number and bacterial colonies as well as in enhancing CAMP mRNA expression. The five-day EZa extract reduced the number of bacteria and increased mRNA expression significantly but was less effective in reducing the number of bacterial colonies. Controls group that was not given anything had significant increases in bacterial numbers and colonies, and increased CAMP expression was higher compared to another group.

Extract of the *Zanthoxylum acanthopodium DC* (EZa) indicated to have potential as an anti-bacterial and immunomodulator especially to *Gardnerella vaginalis* infection. Some previous studies used in vitro and this study is relatively new because it uses invivo studies.

The content of the fruit of andaliman is quercetin and terpenoids; quercetin could induce CAMP, an Antimicrobial peptide (AMP) is very useful for bacterial elimination.^{3, 15, 16} Attention to AMP including CAMP began to increase along with increased bacterial resistance to antibiotics; it is also interesting because this AMP has a broadspectrum activity.¹⁷⁻¹⁹ EZa is potential as antimicrobial through its ability to induce CAMP. This assumption has been proven with a decreasing number of bacterial number and colonies due to EZa intervention.

CONCLUSION

Extract of the *Zanthoxylum acanthopodium DC* (EZa) indicated to have potential as an anti-bacterial and immunomodulator especially to *Gardnerella vaginalis* infection.

Ethical Clearance - Taken from Hasanuddin University Ethics Committee. Register Number: UH16010034. No. 1624/H4.8.4.5.31 / PP36-KOMETIK / 2016. Dated January 8, 2016.

Source of Funding - Self Funding

Conflict of Interest – The author declares no conflict interest regard this research

REFERENCES

1. Sulistyowati, E. et al., Indonesian herbal medicine prevents hypertension-induced left ventricular hypertrophy by diminishing NADPH oxidase-dependent oxidative stress. *Oncotarget*, 2017. 8(49): p. 86784-86798.
2. Usman, A.N., et al., The Effect of Giving Trigona Honey and Honey Propolis Trigona to the mRNA Foxp3 Expression in Mice Balb/c Strain Induced by Salmonella Typhi. *American Journal of Biomedical Research*, 2016. 4(2): p. 42-45.
3. Wijaya, C.H., et al., A review of the bioactivity and flavor properties of the exotic spice “andaliman” (*Zanthoxylum acanthopodium DC.*). *Food Reviews International*, 2018: p. 1-19.
4. Harahap, U., et al., Antimigration Activity of an Ethylacetate Fraction of *Zanthoxylum acanthopodium DC*. *Fruits in 4T1 Breast Cancer*

- Cells. *Asian Pac J Cancer Prev*, 2018. 19(2): p. 565-569.
5. Gilani, S.N., A.U. Khan, and A.H. Gilani, the Pharmacological basis for the medicinal use of *Zanthoxylum armatum* in gut, airways and cardiovascular disorders. *Phytother Res*, 2010. 24(4): p. 553-8.
 6. Singh, T.D., et al., Anticancer properties and enhancement of therapeutic potential of cisplatin by leaf extract of *Zanthoxylum armatum* DC. *Biol Res*, 2015. 48: p. 46.
 7. Alam, F., Q. Najum Us Saqib, and A. Waheed, Cytotoxic activity of extracts and crude saponins from *Zanthoxylum armatum* DC. against human breast (MCF-7, MDA-MB-468) and colorectal (Caco-2) cancer cell lines. *BMC Complement Altern Med*, 2017. 17(1): p. 368.
 8. Singh, G., et al., the Anthelmintic efficacy of an aqueous extract of *Zanthoxylum armatum* DC. Seeds against *Haemonchus contortus* of small ruminants. *J Parasit Dis*, 2016. 40(2): p. 528-32.
 9. Rynjah, C.V. et al., Evaluation of the antidiabetic property of aqueous leaves extract of *Zanthoxylum armatum* DC. Using in vivo and in vitro approaches. *J Tradit Complement Med*, 2018. 8(1): p. 134-140.
 10. Baruah, F.K. et al., Role of *Gardnerella vaginalis* as an etiological agent of bacterial vaginosis. *Iran J Microbiol*, 2014. 6(6): p. 409-14.
 11. Ralph, S.G., A.J. Rutherford, and J.D. Wilson, Influence of bacterial vaginosis on conception and miscarriage in the first trimester: cohort study. *Bmj*, 1999. 319(7204): p. 220-3.
 12. Leppaluoto, P.A., Bacterial vaginosis: what is physiological in vaginal bacteriology? An update and opinion. *Acta Obstet Gynecol Scand*, 2011. 90(12): p. 1302-6.
 13. Dover, S.E., et al., NATURAL ANTIMICROBIALS AND THEIR ROLE IN VAGINAL HEALTH: A SHORT REVIEW. *Int J Probiotics Prebiotics*, 2008. 3(4): p. 219-230.
 14. LaRock, C.N. and V. Nizet, Cationic antimicrobial peptide resistance mechanisms of streptococcal pathogens. *Biochim Biophys Acta*, 2015. 1848(1 Pt B): p. 3047-54.
 15. Ruth Elenora Kristanty, J.S., Cytotoxic and Antioxidant activity of Petroleum Extract of Andaliman Fruits (*Zanthoxylum acanthopodium* DC.) *International Journal of PharmTech Research*, 2014. Vol.6(No.3): p. pp 1064-1069.
 16. Chen, M.M. et al., Quercetin promotes neurite growth through enhancing the intracellular cAMP level and GAP-43 expression. *Chin J Nat Med*, 2015. 13(9): p. 667-72.
 17. Hancock, R.E. and H.G. Sahl, Antimicrobial and host-defense peptides as new anti-infective therapeutic strategies. *Nat Biotechnol*, 2006. 24(12): p. 1551-7.
 18. Kruse, T. and H.H. Kristensen, Using antimicrobial host defense peptides as anti-infective and immunomodulatory agents. *Expert Rev Anti Infect Ther*, 2008. 6(6): p. 887-95.
 19. Zhang, L. and T.J. Falla, Potential therapeutic application of host defense peptides. *Methods Mol Biol*, 2010. 618: p. 303-27.

Effect of Bibliotherapy on Self-Concept in Children with Mental Retardation in SLB

Nursalam Nursalam¹, Kartika Harsaktiningtyas², Iqlima Dwi Kurnia³, Harif Fadhillah⁴, Ferry Efendi³

¹Professor, Faculty of Nursing, Universitas Airlangga, Surabaya, ²Nursing Student, Faculty of Nursing, Universitas Airlangga, Surabaya, ³Lecturer, Faculty of Nursing, Universitas Airlangga, Surabaya, ⁴Lecturer, Faculty of Nursing, Universitas Muhammadiyah Jakarta, Indonesian National Nurses Association

ABSTRACT

Introduction: Children with mental retardation are children with special needs with a level of intelligence > 70. The self-concept of a child with mental retardation is influenced by their pattern of care as well as their environment. Rejection by the environment and deviations in care adjustments can cause the child to be unwilling to communicate and interact, to form a bad perception of development and self-concept. Thus, the researchers were interested in studying the effect of bibliotherapy on the self-concept of children with mental retardation in SLB. The purpose of this study was to investigate whether bibliotherapy had any influence on self-concept.

Method: This study was a quasi-experimental research study which involved 42 respondents as its population. The population was made up of 24 students of SLB Sasanti Wiyata and 18 students of SLB AKW Kumara II Surabaya. The sample of this study was made up of 36 respondents according to the inclusion criteria, gathered using a purposive sampling technique. The independent variable was bibliotherapy. The dependent variable was self-concept. The instruments used were the Robson Self-Concept Questionnaires. The data analysis used a Manova test in SPSS with a significant value $\alpha < 0.05$.

Result: The results showed, in the treatment group via a Manova test, 0.005 for self-image, 0.033 for personal identity, 0.001 for self-esteem, 0.004 for self-ideal, 0.198 for role. With partial eta squared, the results indicated that bibliotherapy can affect self-esteem with a value of 0.302. The provision of bibliotherapy in this research was found to have a positive influence and improved self-concept in children with mental retardation in SLB.

Discussion: Bibliotherapy can improve self-concept in children mental retardation in SLB. With bibliotherapy, children will learn and also imagine according to circumstances and desires. Moreover, one of the session in bibliotherapy encourage the children express their feelings.

Keyword: *self-concept, bibliotherapy, mental retardation, children.*

INTRODUCTION

Children with intellectual disability or mental retardation are children with special needs due to their low intelligence. There are two causes of intellectual disability in children, which are clinical and biological reason^{1,2} The self-concept of mentally disabled children

is influenced by parenting and their environment. Children with an intellectual disability who go on to go to the same school as normal children will tend to get a low number of academic achievements, especially in relation to comprehending numbers, concepts, and language. This makes children with intellectual disability get more commonly rejected by their friends when socialising²⁻⁴.

Corresponding author:

Prof Nursalam

Faculty of Nursing, Universitas Airlangga, Indonesia

According to the data from the Ministry of Social Services of the Republic of Indonesia in 2011, the number of people with intellectual disability was

4,783,275. The Indonesian Ministry of Health's Data and Information Center in 2014 also published the number of children with mental retardation in Indonesia as having reached 6.6 million people, or three percent of Indonesians themselves⁵. In East Java, the prevalence of children with mental retardation is 125,190. Community Service Institution (*LPKM*) stated that the number of children with mental disabilities in Surabaya reached 10% and up to 20% in the lower grade of Schools for Exceptional Children (*Sekolah Luar Biasa/SLB*)². Intellectual disability or mental retardation in children below 18-year-olds in developed countries has increased by 3-4 new cases per 1,000 children over the last 20 years⁴.

There are three causes of intellectual disability in children; prenatal, perinatal and postnatal¹²⁰. The cognitive ability of children with mental retardation affects two areas of adaptive function, which are conceptual (language and memory competences) and social (intrapersonal communication competence and the ability to make friends)^{6,7}. Self-concept is developed from self-perception and positive experiences. Involving children in the various activities existing around them will help them to gain confidence and help them to improve their ability to interact with others^{8,9}.

The abilities possessed by children with intellectual disability causes them to tend not to have friends. Thus, they will have a low sense of self-concept. They will also find obstacles to their mentality in term of attention, emotion, and self-expression^{10,11}. As a result of the obstacles, children will find difficulty in the context of social relations, which is stressful^{12,13}. Individual psychological changes in the form of anxiety, depression and crying, as well as extending to changes in their eating habits, sleep, and daily activities¹⁴.

This study was conducted in order to improve the self-concept, self-identity, self-esteem, self-ideal and role of children with mental retardation. Self-concept can be seen in a child's behaviour in their visualisation of feeling optimistic and taking care of themselves. Self-identity can be seen in their ability to accept themselves and their behaviour, such as not isolating themselves and not avoiding others. Self-esteem can be seen in their confidence and their ability to respect others. Self-ideal is their ability to do the task well and to not to depend on others. The role is related to being able to express themselves and socialise with their peers^{15,16}.

MATERIALS AND METHOD

The design of this study was quasi-experimental with 42 respondents from 2 different SLB's for its population. The number of samples taken was 36. The samples were selected using the inclusion criteria. The samples of this study were children with mental retardation aged 8-15 years old. The technique used in the sampling process was purposive sampling¹⁷.

The questionnaire was used as the instrument of this study. The questionnaire was in the form of a list of questions related to the characteristics of the research subjects. The instrument used to scale independent and dependent variables was *Robson Self-Concepts Scale* questionnaire adopted from Humaira's study (2017)¹⁸. The questionnaire used was tested for its validity and reliability by the experts in accordance to the objective of this study. The item in that instrument was considered to be valid and relevant if $r \text{ count} > r \text{ table} = 0.3961$, with 25 respondents.

There were 30 questions used to describe self-esteem, role, identity, self-ideal, and self-image. The questionnaire consisted of 14 positive questions and 15 negative questions. There were 5 questions for self-image, 6 questions for identity, 6 questions for self-esteem, 7 questions for self-ideal, and 6 questions for role. Before they were asked to fill out the questionnaire, the respondents were asked to agree on the inform consent form. Privacy and confidentiality were maintained in this study. This study used the statistical test Manova with $\text{sig } \alpha \leq 0,05$ on SPSS version 21.

The data was collected between the control group and the experimental group, in which the researcher gave an intervention in the form of bibliotherapy for 30 minutes in accordance to the SOP used¹⁹. In this study, additional mentors were needed to help with the intervention in as many as 3 people. In the treatment group, there were 18 children divided into 2, placed in a different location. From the 9 children in each school, they were all divided into two groups. Thus, there were 4-5 children in each group. On the first day of the first week, a group introduction was conducted. On the second day, the children watched two videos entitled "Teruslah Maju Menggapai Mimpi" and "Tunjukkan Bahwa Kita Sama". On the third day, the activity conducted was colouring. The researchers implemented the characteristics stage here, where the children could express their emotions

safely through art^{10,20}.

On the fourth-day in-depth concept, the stage was conducted by doing a discussion with children with mental retardation regarding what they felt when watching the video and colouring. On the fifth day, all of the three activities (watching a video, colouring, and a discussion) were conducted to ascertain the influence of the therapy given to the children²¹. In the second week, the same therapy was given. In the control group, the

researchers did not provide any intervention besides the existing program from the school. After two weeks with 10 meeting-treatments, the post-test was held³.

RESULTS

According to the data from Table 1 regarding the respondents' characteristics, most of the respondents were 11-12 years old. There were 8 children aged 11-12 years old in the experimental group and there were 7 children within this age group in the control group.

Table 1 - Respondents' Characteristic Distribution

Respondents' Characteristics	Experimental Group		Control Group		Homo-geneity Test
	Total	Percentage	Total	Percentage	
Age:					p = 0.002
8-10 years old	4	22.23%	5	27.78%	
11-12 years old	8	44.44%	7	38.89%	
13-15 years old	6	33.33%	6	33.33%	
Total	18	100%	18	100%	
Gender:					p = 0.000
Male	11	61.11%	11	61.11%	
Female	7	38.89%	7	38.89%	
Total	18	100%	18	100%	
Father's Educational Background:					p = 0.000
Junior High School	5	27.78%	1	5.56%	
Senior High School	11	61.11%	11	61.11%	
College/ University	0	0%	3	16.67%	
No School	0	0%	1	5.56%	
Died	2	11.11%	2	11.11%	
Total	18	100%	18	100%	

A statistical test was conducted to show that the respondents' characteristics in this study were not homogenous. The data was considered homogeneous if the results of the statistical test showed $\alpha > 0.05$. The results of this study showed that the score for age was $p=0.002$, gender was $p= 0.000$, and father's educational background was $p=0.000$.

Table 2 - Mean and Standard Deviation of Bibliotherapy on Self-Concept

Variable	Experimental Group				Control Group				Sig.	Partial Eta Square
	Pre		Post		Pre		Post			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Self-Picture	9.17	1.200	10.17	1.681	8.56	1.542	8.61	1.501	0.005	0.208
Self-Identity	10.94	1.259	12.67	1.782	11.22	1.003	11.50	1.339	0.033	0.127
Self-Esteem	11.44	1.381	13.50	0.389	11.06	1.211	11.389	0.389	0.001	0.302
Self-ideal	14.00	0.970	16.11	0.412	14.67	14.14	14.333	0.412	0.004	0.127
Role	12.06	1.434	12.44	0.534	12.44	1.947	12.389	0.534	0.006	0.203

The statistical test in this study showed the mean and standard deviation. The results were analysed by the Manova test to ascertain the significant influence of bibliotherapy on the self-concept of children with mental retardation. The significant value of each variable was self-picture $p=0.005$, self-identity $p=0.033$, self-esteem $p=0.001$, self-ideal $p=0.004$ and role $p=0.006$. The results showed that bibliotherapy significantly influenced self-concept ($p=0.302$; $\alpha > 0.05$).

DISCUSSION

This study showed a significant improvement in the children's self-esteem. The result of the multivariate test proved that p -value < 0.05 . Thus, the significance level of self-esteem could be seen from the 95% level of confidence. Self-esteem improvement was also proven by partial eta square in the Manova test with a result of 0.302. The results of the observation also showed the significant improvement in their self-esteem. This improvement was visualised by the ability of the children with mental retardation to complete the task, to be confident, to answer the questions, and to state or mention their dreams. In short, bibliotherapy influenced the self-esteem of children with mental retardation²². It increased their confidence, which made them believe that they had the same abilities as other children.

Age was a factor which influenced how long they had undergone self-concept education, especially from their family and the school. This is in accordance with a study conducted by Alesi Rappo², in which age was able to change the children's self-esteem and behaviour. From the results of the observation conducted by the researchers during bibliotherapy for 10 days, the children's understanding was a bit difficult. Thus, each facilitator had to accompany them in order to facilitate their imagination. Moreover, by accompanying the children, the children's understanding and concentration, as well as their trust in the facilitators, increased.

The respondents' parents' level of education was mostly high school and junior high school graduates. There were also some parents who had no educational background. The parents' level of education was a factor which led to a low self-concept in their children. The researchers argued that the family environment, in this case, the parents, influenced the children in their self-concept development. During the child's development, their environment could determine the child's understanding level. The parents' background influenced not only the child's self-concept, but also their behaviour. The higher parents' level of education means that a better quality of parenting was given to

their child, especially in relation to guiding their children in understanding self-concept, for children with mental retardation.

There were more parents of children with mental retardation who were private employees/entrepreneurs compared to parents who were jobless. This condition forced the parents to rarely take care of their children because they needed to meet the economic needs of the family. The busier the parents, the less often the parents provided a good example of behaviour and monitored their child's development. From the obtained data, there were children with mental retardation who had no parents. This caused the children to be insecure because they felt that they were unlucky and isolated themselves.

There was a significant improvement in the self-esteem observed in this study. This is in accordance with the study conducted by Zipora Shechtman²³, which stated that bibliotherapy could increase self-esteem. Another study showed that bibliotherapy is useful for children in identifying and exploring their emotions in order to control their child's reactions in difficult situations²². Bibliotherapy was found to be effective when used to improve the children's enthusiasm and motivation. Through bibliotherapy, children can learn and imagine as they wish. In bibliotherapy, there is the discussion method in which the children can express their feelings.

CONCLUSION

This study found that bibliotherapy was able to improve the self-picture, self-identity, self-esteem, self-ideal, and self-role of children with mental retardation. The results of the partial eta squared via the Manova test showed that self-esteem was the most influencing variable in bibliotherapy.

Ethical Clearance: This study has passed the institutional review board from Faculty of Nursing, Universitas Airlangga, Surabaya number 966-KEPK.

Source of Funding: This study is self-funded research project.

Conflict of Interest: None.

REFERENCES

1. Wikasanti E. Mengupas Therapy Bagi Para Tuna Grahita: Retardasi Mental Sampai Lambat Belajar. [Peeling Therapy for the Mentally Disabled: Mental to Slow Learning Retardation]. Jogjakarta PT Redaksi Maxima. 2014;

2. Alesi M, Rappo G, Pepi A. Self-esteem at school and self-handicapping in childhood: comparison of groups with learning disabilities. *Psychol Rep.* 2012;111(3):952–62.
3. Romdhoni MFR. Mentally Disabled Students 'Concepts Are In Extraordinary Schools Conscience of Cimahi City (Descriptive Study of Mentally Disabled Students' Self Being in Extraordinary Schools Conscience of Cimahi City in Interacting with Their Environment). Thesis: Universitas Telkom. 2013.
4. Sularyo TS, Kadim M. Retardasi mental. [Mental retardation]. *Sari Pediatri.* 2016;2(3):170–7.
5. Abdullah H. Strategi Pemberdayaan Anak Penyandang Tunagrahita Pada Unit Pelaksana Teknis Dinas (Uptd) Pondok Sosial Kalijudan Kota Surabaya. [Strategy for Empowering Children with Disabilities in the Technical Implementation Unit of the Kalijudan Social Cottage in Surabaya City]. *Publika.* 2014;2(3).
6. Association AP. Diagnostic and statistical manual of mental disorders (DSM-5®). American Psychiatric Pub; 2013.
7. Stuart GW. Principles and Practice of Psychiatric Nursing-E-Book. Elsevier Health Sciences; 2014.
8. Setiawati D. Faktor Faktor Yang Mempengaruhi Kemampuan Perawatan Diri Pada Lansia Di Desa Windujaya Kecamatan Kedungbanteng Kabupaten Banyumas. [Factors Affecting the Ability of Self Care in the Elderly in Windujaya Village, Kedungbanteng District, Banyumas Regency]. Universitas Muhammadiyah Purwokerto; 2016.
9. Sari NPRD. Perbedaan Tingkat Kecemasan Masa Depan Karir Anak Ditinjau Dari Selfconcept Dan Persepsi Dukungan Sosial Pada Ibu Anak Tunarungu Di SMALB-B Karya Mulia Surabaya. [Differences in Anxiety Levels of Child Career Future Viewed from Self-concept and Perceptions of Social Support for Deaf Children at SMALB-B Karya Mulia Surabaya Character]. *J Peneliti Psikologi.* 2013;2(1).
10. Mousavi M, Sohrabi N. Effects of art therapy on anger and self-esteem in aggressive children. *Procedia-social Behav Sci.* 2014;113:111–7.
11. Potter PA. Fundamental keperawatan. [Nursing fundamentals]. Elsevier; 2010.
12. Foley-Nicpon M, Rickels H, Assouline SG, Richards A. Self-esteem and self-concept examination among gifted students with ADHD. *J Educ Gift.* 2012;35(3):220–40.
13. Nida FLK. Membangun Konsep Diri Bagi Anak Berkebutuhan Khusus. [Building Self-Concepts for Children with Special Needs]. *ThufuLA J Inov Pendidik Guru Raudhatul Athfal.* 2014;2(1).
14. Nursalam N, Armini NKA, Fauziningtyas R. Family Social Support Reduces Post Judgegemental Stress in Teenagers. *J Ners.* 2017;4(2):182–9.
15. Roy C. The Roy adaptation model.(3. uppl.). New Jersey: Pearson Education; 2009.
16. Friedman MM. Keperawatan Keluarga Teori dan Praktek. [Family Nursing Theory and Practice]. Jakarta: EGC; 2003.
17. Nursalam N. Metodologi Penelitian Ilmu Keperawatan Pendekatan Praktis. [Nursing Science Research Methodology Practical Approach]. Jakarta: Salemba Medika; 2016.
18. Novianty DHA. Realita Konseling Kelompok untuk Meningkatkan Konsep Diri Remaja dari Keluarga Broken Home. [Reality Group Counseling to Improve Adolescent Self-Concept from Broken Home Family]
19. Trihantoro A, Hidayat DR, Chanum I. Pengaruh Teknik Biblioterapi Untuk Mengubah Konsep Diri Siswa (Studi Kuasi Eksperimen Pada Siswa Kelas VIII SMP Negeri 2 Tangerang). [The Influence of Bibliotherapy Techniques to Change Students' Self-Concepts (Quasi-Experimental Study on Class VIII Students of SMP Negeri 2 Tangerang)]. *INSIGHT J Bimbingan dan Konseling.* 2016;5(1):8–14.
20. Béres J. Bibliotherapy and Creative Writing. *Horizontok II A pedagógusképzés reformjának Folyt Pécs PTE BTK Nevel Intézet.* 2015;189–94.
21. Apriliawati A. Pengaruh biblioterapi terhadap tingkat kecemasan anak usia sekolah yang menjalani hospitalisasi di Rumah Sakit Islam Jakarta. [The influence of bibliotherapy on the anxiety level of school-age children undergoing hospitalization at the Jakarta Islamic Hospital]. *Progr Magister Ilmu Keperawatan Peminatan Keperawatan Anak Fak Ilmu Keperawatan Univ Indones NPM.* 2011;906594223.
22. Montgomery P, Maunder K. The effectiveness of creative bibliotherapy for internalizing, externalizing, and prosocial behaviors in children: A systematic review. *Child Youth Serv Rev.* 2015;55:37–47.
23. Betzalel N, Shechtman Z. The impact of bibliotherapy superheroes on youth who experience parental absence. *Sch Psychol Int.* 2017;38(5):473–90.

Gender Differences in Relationship between Commuting and Health Outcomes in Jakarta Metropolitan Area, Indonesia

Milla Herdayati¹, Tris Eryando¹

¹Department Population and Biostatistics, Faculty of Public Health, Universitas Indonesia (FPH-UI)

ABSTRACT

Jakarta is the center of business and economy in Indonesia causing commuting workers to Jakarta every day become a common phenomenon. They pack Jakarta for working in the morning and return to their residence in the afternoon. This study aims to analyze the link between commuting and health and whether these relationships differ by gender. The study used a cross-sectional design of 4,533 commuters using the mode of transportation except walking/cycling. The findings of this study show that commuting has a physical impact only on male commuters, whereas the psychic influenced women and men, but has no impact on social outcomes. Public transportation has a lower health risk than cars and motorcycles, especially where the duration journey above 60 minutes. The findings of this study contribute to the academic field in urban development studies, including public transportation system, to minimize the impact of commuting for public health. The transition from private to public transportation should be encouraged to increase the benefits for the health of the commuter community.

Keywords: *commuting, health outcomes, gender*

INTRODUCTION

Jakarta is a megapolitan city and one of the largest cities in Southeast Asia and becomes the centre of economic growth in Indonesia and accounts for 80% of Indonesia's GDP¹. This position has resulted in high mobility of people every day from sub-urban around to Jakarta. This kind of people group are known as commuters. The commuter movement from and to Jakarta becomes a common phenomenon every day. Generally they head to Jakarta for work purpose but reside in a sub-urban area known as Bodetabek area (Bogor, Depok, Tangerang, and Bekasi). This is due to the high price/rent of house and living cost in Jakarta. In 2014 from 28 million people aged five years and over in Jabodetabek areas, as many as 3.6 million (13%) were commuters and the majority of them were for work purpose (82%)².

Jakarta is known as one of the most jammed cities in the world. This condition has influenced the duration of commuting. In Indonesia 2011-2014, some commuters spent more than 60 minutes (25%) in a single trip³. Some studies show that commuting gave impact on physical health, mental, social, and even commuter's quality of life. These impact on health are explained in three ways. First, commuting is associated with a variety of physiological responses, such as increased blood pressure and musculoskeletal disorders⁴, increased risk of myocardial infarction and increased urine catecholamine⁵. Longer commuting time reduce physical activity, which positively associated with the hypertension, waist circumference and Body Mass Index (BMI)⁶. Physical activity is a risk factor for type 2 diabetes, cardiovascular, osteoporosis, and risk of metabolic syndrome⁷. Other studies have also reported that commuters have sleeping disorders and high fatigue^{4,8,9}. Second, the commuters experience stress exposure, therefore increasing negative mood causing anxiety, low tolerance, frustration^{8,10,11} and unhappiness^{12,13}. Third, long commuting also gave impact on the social aspect. Commuting has limited individual's leisure time for recreational and social activities¹⁴.

Corresponding author:

Milla Herdayati

FPH-UI, A Building, 2nd Floor, Depok-Indonesia.

E-mail: millaherdayati@gmail.com

The commuting effect correlates with commuting time and mode of transport¹⁴. Car users have lower health and satisfaction and higher BMIs than those who use public transport. However, the use of public transport for more than 30 minutes actually decreases the level of life satisfaction, happiness and raises the level of anxiety¹⁵. Commuting travel patterns differ by gender^{16,17}. Women, although they have a shorter trip distance than men, but they tend to use public transport, and have multi-purpose/destination trips such as working, shopping¹⁸. In addition, safety and security trip are important issues affecting women greatly, including become victims of sexual abuse^{1,18}.

This study aims to analyze the relationship between commuting both duration and mode of transport with health and whether the relationship differs by gender.

MATERIALS AND METHOD

This study analyzes secondary data of the Jabodetabek Commuter Survey in 2014 from CBS Indonesia. The area coverage survey consisted of 13 regions in Jakarta, Bogor, Depok, Tangerang and Bekasi (Jabodetabek). The sample of this study is the commuter who commute for work with exclusion criteria: commuter by walking/cycling. Final sample were 4533 persons.

Outcome variable is health outcomes include physical, mental/psychological and social aspects. These aspects are represented by the variables such as; physical; psychological/mental (feel stress, have had bad experiences such as accidents and sexual harassment); and social (involvement in community activities and refreshing). Alternative answers to these questions consist of two categories (yes and no).

Exposure variable consists of commuting time and mode of transportation. Commuting time is derived from the “long trip from house to place of activity (single journey)”. The transportation mode is taken from the question of “the main mode of transportation commonly used”. For analysis purpose, time and commuting modes are combined into one exposure variable, and classified into: 1) motorcycle > 60 min as *reference*; 2) motorcycle ≤ 60 min; 3) car ≤ 60 min; 4) car > 60 min; 5) public ≤ 60 min; and 6) public > 60 min. The covariates consist of socio-demography, family situation, and commuting patterns. Statistical analysis used binary logistic regression and Odds Ratio (OR) with 95% confidence intervals (CI) were estimated from the models.

FINDINGS

This study has shown if male commuters were older than female, married person were more, and only one-third were highly educated, while half of female were highly educated. All commuters work in the formal sector with the same average income between men and women. The majority of male commuters are the primary wage earner, and live with children (<13 years old) more in number compared to female commuters.

Commuting patterns have shown a difference between women and men. Women commuters have a shorter distance, commute less than five days a week, the numbers of modes of transportation were more than one type, and the transportation costs spent greater than that of men. Women commuters chose public transport and motorcycle for duration less than 60 minutes, while motorcycle becomes the main choice for men.

Table 1. Characteristics of commuters (%)

Variables	Female (n=1220)	Male (n=3313)	All (n=4533)	Difference of significance
Socio Demography				
Age (years)				
12-20	8.4	3.3	4.7	0.001*
21-30	39.3	25.3	29.1	
31-40	25.8	31.1	29.7	
41-50	18.2	25.3	23.4	
51-75	8.2	15.0	13.2	
Married				
Never	43.1	23.7	28.9	0.001*
ever married	56.9	76.3	71.1	

Cont... Table 1. Characteristics of commuters (%)

Education level				
≤ junior high school	9.5	16.9	14.9	0.001*
Senior high school	41.2	50.7	48.2	
University	49.3	32.4	36.9	
Type of worker				
Formal	96.2	91.9	93.1	0.001*
Informal	3.8	8.1	6.9	
Income (in rupiah/months)				
≤ 2.400.000	31.7	31.4	31.5	0.015*
2.400.001 - 3.000.000	24.9	23.3	23.8	
3.000.001 - 5.000.000	27.7	25.6	26.1	
> 5.000.000	15.7	19.7	18.6	
Family Situation				
Primary wage earner				
Yes	38.6	76.1	66.0	0.001*
no	61.4	23.9	34.0	
<i>Number of productive household members</i>				
1 - 2	10.2	8.6	9.0	0.031*
3 - 4	46.0	50.1	49.0	
> 4	43.9	41.3	42.0	
<i>Living with child <13 years old</i>	46.1	60.1	56.3	0.001*
<i>Living with elderly</i>	2.2	2.3	2.3	0.919
Commuting pattern				
<i>The main mode and duration of commuting (minutes)</i>				
public ≤ 60	27.4	7.2	12.6	0.001*
public > 60	22.7	9.5	13.1	
car ≤ 60	6.5	8.1	7.6	
car > 60	6.0	6.7	6.5	
motor ≤ 60	29.1	49.5	44.0	
motor > 60	8.4	19.0	16.1	
<i>Distances (km)</i>				
< 10	32.5	27.2	28.6	0.001*
10-20	29.6	30.7	30.4	
21-30	22.2	21.5	21.7	
> 30	15.7	20.6	19.3	
<i>Frequency of commute (days/week)</i>				
≥ 5	33.0	42.7	40.1	0.001*
< 5	67.0	57.3	59.9	
<i>Number of mode of transport</i>				
> 1 mode	40.7	14.2	21.3	0.001*
1 mode	59.3	85.8	78.7	
<i>transport cost per income</i>				
≥ 11	41.5	34.9	36.7	0.001*
< 11	58.5	65.1	63.3	

* significant at level 5%

Low physical health is felt by men and women with a prevalence of 22-37%. Physical complaints are the majority perceived by motorcycle users. Commuting is associated with low physical health for men only. Car's users have lower physical health risks compared to motorcycle users with <60 minutes, where public transport users have the same risks as motorcycle's users.

Table 2. Commuting and low physical outcome by gender

Variables	Physical outcome					
	Female (n=1220)			Male (n=3313)		
	n	Prev (%)	OR (95%CI)	n	Prev(%)	OR (95%CI)
Unadjusted:						
Public ≤60 min	334	37.1	1.13 (0.71-1.80)	238	37.8	0.97 (0.71-1.31)
Public >60 min	277	37.2	1.13 (0.70-1.82)	316	36.7	0.92 (0.70-1.22)
car ≤ 60 min	79	25.3	0.65 (0.34-1.25)	267	21.7	0.44 (0.32-0.62)
car >60 min	73	23.3	0.58 (0.30-1.15)	223	29.1	0.65 (0.47-0.91)
Motorcycle ≤60 min	355	38.0	1.18 (0.74-1.86)	1640	36.7	0.92 (0.76-1.11)
Motorcycle>60 min	102	34.3	1.00	629	38.6	1.00
Adjusted:						
Public ≤60 min			1.11 (0.63-1.94)			0.74 (0.49-1.11)
public>60 min			1.40 (0.77-2.54)			0.71 (0.46-1.09)
car ≤ 60 min			0.90 (0.43-1.88)			0.45 (0.31-0.66)
car >60 min			0.88 (0.41-1.88)			0.69 (0.47-1.00)
Motorcycle ≤60 min			1.06 (0.64-1.74)			0.87 (0.70-1.08)
Motorcycle>60 min			1.00			1.00

***Bold text:** significance at the 5% level. Low physical outcomes: any three or more complaints in last months. Prev: Prevalence

Psychological problems in commuting were higher than physical problems. The condition is felt both in men and women. For female commuters, low psychological risk is felt by users of public transport and motorcycle with duration less than 60 minutes compared

to motorcycle's users with duration of more than 60 minutes, while other mode users are not significant. For male, the psychological impact correlated with commuting except on the car users with duration of more than 60 minutes. Similar to female, low risk men also appeared for public transport users, car users and motorcycle users with duration of less than 60 minutes compared to motorcycle users with duration of more than 60 minutes.

Table 3. Commuting and Low physiological outcome by gender

Variables	Mental outcome					
	Female (n=1220)			Male (n=3313)		
	n	Prev (%)	OR (95%CI)	n	Prev (%)	OR (95%CI)
Unadjusted						
Public ≤60 min	334	52.7	0.40 (0.25-0.65)	238	48.7	0.31 (0.23-0.43)

Table 3. Commuting and Low physiological outcome by gender

public>60 min	277	67.5	0.75 (0.45-1.24)	316	57.0	0.44 (0.33-0.58)
car ≤ 60 min	79	63.3	0.62 (0.33-1.17)	267	60.7	0.51 (0.38-0.69)
car >60 min	73	64.4	0.65 (0.34-1.25)	223	73.1	0.90 (0.63-1.27)
Motorcycle ≤60 min	355	56.1	0.46 (0.28-0.75)	1640	61.0	0.52 (0.42-0.63)
Motorcycle>60 min	102	73.5	1.00	629	75.2	1.00
Adjusted						
Public ≤60 min			0.30 (0.17-0.54)			0.32 (0.21-0.48)
public>60 min			0.56 (0.30-1.02)			0.39 (0.25-0.59)
car ≤ 60 min			0.68 (0.34-1.39)			0.46 (0.32-0.65)
car >60 min			0.72 (0.35-1.49)			0.74 (0.50-1.10)
Motorcycle ≤60 min			0.47 (0.28-0.79)			0.59 (0.47-0.74)
Motorcycle>60 min			1.00			1.00

***Bold text:** significance at the 5% level. Low physiological outcome: any three or more complaints during commuting

Table 4 shows the prevalence of commuters with low social outcomes in women 20-41% while in males 13-35%. Car user commuters have the lowest social outcomes. However, it turns out that commuting is not related to social outcomes in both men and women.

Table 4. Commuting and Low social outcomes by gender

Variables	Social outcomes					
	Female (n=1220)			Male (n=3313)		
	n	Prev (%)	OR (95%CI)	n	Prev (%)	OR (95%CI)
Unadjusted						
public≤60 min	334	40.7	1.21 (0.76-1.91)	238	35.3	1.67 (1.21-2.30)
public>60 min	277	22.0	0.50 (0.30-0.81)	316	29.4	1.28 (0.94-1.73)
car ≤60 min	79	20.3	0.45 (0.23-0.88)	267	13.5	0.48 (0.32-0.71)
car >60 min	73	23.3	0.53 (0.27-1.05)	223	14.3	0.51 (0.34-0.78)
motorcycle≤60 min	355	26.5	0.63 (0.40-1.01)	1640	25.1	1.03 (0.83-1.27)
Motorcycle>60 min	102	36.3	1.00	629	24.6	1.00
Adjusted						
public≤60 min			1.28 (0.72-2.28)			1.28 (0.72-2.28)
public>60 min			0.60 (0.32-1.13)			0.60 (0.32-1.13)

Cont... Table 4. Commuting and Low social outcomes by gender

car ≤60 min			1.22 (0.55-2.69)			1.22 (0.55-2.69)
car >60 min			1.17 (0.53-2.57)			1.17 (0.53-2.57)
motorcycle ≤60 min			0.63 (0.38-1.06)			0.63 (0.38-1.06)
Motorcycle >60 min			1.00			1.00

***Bold text:** significance at the 5% level. **Low social outcomes:** commuter did not perform social activities & refreshing in the last month.

The study show that commuting is related to health outcomes and differs by gender. Physical effects felt by men, while the psychological impact felt both by men and women. The impact of commuting correlated with the mode and duration of commuting. The public transport users have a health risk lower than car and motorcycle users. The study findings support the previous studies that public transport is positively correlated with health^{12,15,16,19}. Switching commuters from private cars to public transport can provide health benefits as well as active commuting (walking/cycling). This situation becomes a potential factor for increasing energy expenditure and reducing body fat because the public transport user performs physical activity in the form of walking towards public transit^{20,21}. In addition, public transport users have lower stress levels than car users¹¹ and they have time to relax such as reading, listening to music, and socializing²². In this study, quite a lot of commuters choose a motorcycle as a mode of commute, whereas a high risk compared to other modes especially if the duration of commuting more than 60 min. Motorcycle has a high risk of accidents because it depends on distance, speed, and frequency of uses²³.

The analysis of this study has considered some confounder variables, but other variables that substantially act as confounder are not available such as commuter compensation (job satisfaction/housing quality), gender roles in households, and contextual variables (traffic jam level/public transportation system). The study also used a cross-sectional design, so the researcher cannot conclude that commuting has a causal effect on health, there may be other causes of health problems and daily life of commuters that affect commuting.

Although this study has its limitations, this study has an important contribution to understanding the complex relationship between commuting and health by gender. Future studies are expected to use longitudinal study and consider other covariates thus strengthen the results of this study.

CONCLUSION

This study concludes that there is a commuting relationship with commuter health, and the relation is different according to gender. The impact is greater on car and motorcycle users especially on long durations than public transport users. These findings may become the basis of consideration for the government in urban development to minimize the impact of commuting. The biggest challenge is to encourage commuters to switch to public transport, which has benefits for public health. This effort is certainly accompanied by improvements of the quality of public transport from aspects of affordability, convenience, and security especially for women.

Ethical Clearance: This study approval and received ethical clearance from the Committee of Public Health Research Ethics of FPH-UI.

Source of Funding: This study done by self-funding from the authors.

Conflict of Interest: the authors declare that they have no conflict interests.

REFERENCES

1. Rachmad, S. H., Adji, A. & Handiyatmo, D. Gendered patterns of urban commuting with better connectivity in Jakarta megapolitan area. in Gender, Roads and Mobility in Asia (ed. Kusakabe, K.) 135–145 (Practical Action Publishing, 2012).
2. BPS/CBS. Statistik Komuter Jabodetabek: Hasil Survei Komuter Jabodetabek 2014 (Statistics

- Commuter Jabodetabek 2014). (BPS, 2014).
3. BPS/CBS. Statistik Mobilitas Penduduk dan Tenaga Kerja 2015 (Labor and Population Mobility Statistic 2015). (Badan Pusat Statistik, Jakarta-Indonesia, 2015).
 4. Koslowsky, M. & Reich, A. N. K. M. *Commuting Stress: Casues, Effcets, and Methods of Coping.* (Springer Science & Bisnis Media, LLC, 1995). doi:10.1007/978-1-4757-9765-7
 5. Hoehner, C. M., Barlow, C. E. & Allen, P. Commuting Distance, Cardiorespiratory Fitness, and Metabolic Risk. *Am. J. Prev. Med.* 42, 571–578 (2012).
 6. Cetinbas, S. et al. Comparative analysis of the health status in commuting and non commuting rural population in the periphery of Mumbai. *Indian J. Public Heal. Res. Dev.* 5, 244–250 (2014).
 7. Wijndaele, K. et al. Sedentary behaviour, physical activity and a continuous metabolic syndrome risk score in adults. *Eur. J. Clin. Nutr.* 63, 421–429 (2009).
 8. Frumkin, H., Frank, L. & Jackson, R. *Mental Health. Urban Sprawl and Public Health: Designing, Planning, and Building for Healthy Communities.* (Island Press, 2010).
 9. Urhonen, T., Lie, A. & Aamodt, G. Associations between long commutes and subjective health complaints among railway workers in Norway. *Prev. Med. Reports* 4, 490–495 (2016).
 10. Lytton, B. Long Commutes May be Hazardous to Health. 1–3 (2012). doi:10.1016/j.amepre.2012.02.020
 11. C. Rissel, N. Petrunoff, LM. Wen, M. C. Travel to work and self-reported stress : Findings from a workplace survey in south west. *J. Transp. Heal.* 1, 50–53 (2014).
 12. Stutzer, A. & Frey, B. S. Stress that Doesn ’ t Pay : The Commuting Paradox. *Scand. J. Econ.* 110, 339–366 (2008).
 13. Stutzer, A. & Frey, B. S. Commuting and Life Satisfaction in Germany. *Inf. Raumentwickl.* 2, 1–11 (2007).
 14. Sandow, E. On the road: Social aspects of commuting long distances to work. (2011).
 15. Künn-nelen, A. Does Commuting Affect Health? (2015).
 16. Roberts, J., Hodgson, R. & Dolan, P. ‘ It ’ s driving her mad ’ : Gender differences in the effects of commuting on psychological health. *J. Health Econ.* 30, 1064–1076 (2011).
 17. Mcquaid, R. W. & Chen, T. Commuting times - The role of gender, children and part-time work. *Transp. Econ.* 34, 66–73 (2012).
 18. Kusakabe, K. Introducton: Gender, roads, and mobility in Asia. in *Gender, Roads and Mobility in Asia* (ed. Kusakabe, K.) 1–15 (Practical Action Publishing, 2012).
 19. Hansson, E., Mattisson, K., Björk, J., Östergren, P. & Jakobsson, K. Relationship between commuting and health outcomes in a cross-sectional population survey in southern Sweden. *BMC Public Health* 11, 834 (2011).
 20. Morabia, A. et al. Potential health impact of switching from car to public transportation when commuting to work. *Am. J. Public Health* 100, 2388–2391 (2010).
 21. Besser, L. M. & Dannenberg, A. L. Walking to Public Transit. *Am. J. Prev. Med.* 29, 273–280 (2005).
 22. Cranston, K. T. How Long Car Commutes Impact Mental Health.
 23. Oxley, J. et al. Commuter motorcycle crashes in Malaysia : An understanding of contributing factors Saraswathy Venkataraman , Prame Kumar Nair. in *57th AAAM Annual Conference Annals of Advances in Automotive Medicine* September 22-25, 2013 45–54 (2013).

Ventilation with Risk Quotient (RQ) Benzene Non-Carcinogen in the Shoes *Home Industry* of Romokalisari, Surabaya

Ratna Ayu Harsetianingrum¹, Abdul Rohim Tualeka²

¹Department of Occupational Health and Safety, ²Public Health Faculty, Airlangga University, Surabaya

ABSTRACT

The objectives of this study were to identify the presence of ventilation, Risk Quotient (RQ) of benzene non-carcinogen and the relationship between them in the shoes home industry of Romokalisari, Surabaya. Type of study was observational, cross sectional analytics with 10 workers as total population.

Data analysis was using cross tabulation to know the frequency of ventilation and Risk Quotient (RQ), that obtained from the value of Intake benzene non karsinogen (Ink), benzene concentration in work environment (C), inhalation rate (R), length of work/day (tE), working frequency/year (fE), duration of work (Dt), worker's weight (Wb) and average time period (t_{avg}). Analysis relationship between ventilation with Risk Quotient (RQ) of benzene non carcinogen was using Chi-Square Test and Prevalence Risk (PR).

The results obtained most of the workplace were not ventilated (9 places (90%)). Concentrations of benzene in the environment 0.04 mg/m³-2.91 mg/m³. Inhalation rate (R) 0.5 m³/hr-0.7 m³/hr. Length of work per day (tE) 8 hours/day-15 hours/day. Frequency of work per year (fE) 312 days/year-365 days/year. Duration of work (Dt) 14 years-43 years. Weight of worker (Wb) in 8 people (80%) ≤70 Kg. RfC benzene 0.03 mg/m³. Risk Quotient (RQ) > 1, indicating that there was a possibility of non-carcinogenic health risks. P-value was 0.035, meaning there was relationship between the existence of ventilation with the Risk Quotient (RQ) benzene non-carcinogen in workers. Prevalence Risk (PR) was 9.000, meaning that the absence of ventilation has a risk 9 times greater for the risk of non-carcinogen health effects. Recommendations were by making good ventilation in the workplace and consuming CYP2E1 enzyme contained in cow liver and salmon to lower benzene levels in the body.¹³

Keywords : Benzene, Ventilation, Risk Quotient, Workers, Shoes Home Industry

INTRODUCTION

Benzene is widely used as a good organic solvent for various industrial processes such as rubber industry, shoes, paint solvents, components in motor fuel, components in detergents, pesticides and pharmaceutical manufacturing.³ The US-EPA has classified benzene

as a carcinogenic substance against humans (GrupA), so now the use of benzene as a solvent is increasingly constrained.²⁰

In general, people can smell benzene from concentrations of 60 ppm to 100 ppm and to feel benzene in water at concentrations of 0.5 to 4.5 ppm.⁷ Based on Permenakertrans Nomor Per.13/MEN/X/2011 about Threshold Limit of Physical Factor and Chemical Factors at Work, maksimum benzene exposure is 1.59 mg/m³,¹² American Conference of Governmental Industrial Hygienists (ACGIH) states the limit of benzene exposure is 0.5 ppm with maximum exposure for 8 hours of work,¹ while the American Petroleum Institute (API) states that the absolute limit of safe exposure to benzene is zero.^{14,16}

Corresponding author:

Abdul Rohim Tualeka

Lecturer in Occupational Health and Safety
Department, Public Health Faculty, Airlangga
University, Surabaya, 60115, Indonesia
Tel: +62 31 5920948/ +6281333519732
Fax: +62 31 5924618, E-mail: inzut.tualeka@gmail.com

Continuous exposure to benzene and exceeding predetermined threshold values can cause adverse health effects, especially exposure through inhalation. The impacts that can arise from acute exposure to benzene can cause disruption of the nervous system, lack of oxygen supply to the brain, dizziness, rapid heartbeat, headache, tremors, confusion and fainting.^{18,19} Benzene toxicity to the central nervous system arises after exposure to benzene through inhalation/respiration with high concentrations (3,000 ppm for 5 minutes) or 30 to 60 minutes via digestion.³

Based on the study previously about benzene and affect to the body have not been conducted study about effect ventilation to the risk quotient yet. As non formal Industry, shoes industry should to know effect ventilation to RQ worker for preventing disease by benzene.

The shoes home industry of Romokalisari, Surabaya is a small shoes manufacturing sector in Surabaya. In the production process in the shoes home industry of Romokalisari, Surabaya there is the process of gluing shoes with the use of glue materials in which there is a chemical content of benzene. In addition, the presence of ventilation in the shoes home industry of Romokalisari, Surabaya allegedly can affect the level of exposure of benzene in the workplace. Therefore, the study aims to determine the existence of ventilation, Risk Quotient (RQ) of benzene non-carcinogen and the relationship between the existence of ventilation with Risk Quotient (RQ) benzene non-carcinogen in home industry shoes Romokalisari, Surabaya.

MATERIALS AND METHOD

This study was an observational study with cross sectional analytical design in home industry of shoes Romokalisari Surabaya with total population counted 10 workers. This study was conducted at home industry of shoes Romokalisari, Surabaya in October 2017.

Variables in this study were the presence of ventilation and Risk Quotient (RQ) of benzene non-carcinogen. Determination of Risk Quotient (RQ) of benzene non-carcinogen was calculated from Intake benzene non-carcinogen (I_{nk})/RfC. The value of Intake benzene non-carcinogenic was the result of calculation that was directly proportional to the value of benzene concentration in the working environment (C), inhalation rate of worker (R), length of work/day (tE), working frequency per year (fE), duration of work (Dt) and was

inversely proportional to the worker’s characteristic value (consisting of worker’s weight (Wb) and average time period (t_{avg})).

Primary data collection included the presence of ventilation data and worker characteristics (worker’s weight (Wb), length of work / day (tE), working frequency every year (fE), duration of work (Dt)). Secondary data collection included benzene concentration value data in work environment (C), worker inhalation rate (R) and average time period (t_{avg}) used for non-carcinogen intake benzene (I_{nk}) and RfC value used to calculate Risk Quotient (RQ).

Data analysis was using cross tabulation to know the frequency of the presence of ventilation and frequency of value to determine Risk Quotient (RQ) of benzene non-carcinogen that is result of calculation from Intake benzene non-carcinogen (I_{nk})/RfC. To determine the value of non-carcinogen intake benzene (I_{nk}), it was necessary to know the frequency of benzene concentration values in the work environment (C), inhalation rate of worker (R), length of work/day (tE), frequency of work each year (fE), working duration (Dt), worker’s characteristic value (consisting of worker’s weight (Wb) and average time period (t_{avg})). The relationship analysis of the presence of ventilation with Risk Quotient (RQ) of benzene non-carcinogen was using Chi-Square Test and to know the amount of risk was using Prevalence Risk (PR).

FINDINGS

The Presence of Ventilation

Based on Table. 1 below, it could be seen that most of the place workers to work in the shoes home industry of Romokalisari, Surabaya had no ventilation that was counted 9 places (90%).

Tabel 1. Distribution of The Presence of Ventilation at Worker’s Place in The Shoes Home Industry of Romokalisari, Surabaya

The Presence of Ventilation	N	%
Yes	1	10,0
No	9	90,0
Total	10	100,0

Based on Peraturan Menteri Kesehatan Republik Indonesia No. 48 in 2016 about Occupational Safety

and Health Standards in Office, it said that one of the requirements of building safety and security was the availability of ventilation for circulation and air exchange needs, especially when there were equipment that used solvent such as benzene. In addition, based on Keputusan Menteri Kesehatan Republik Indonesia Nomor 1405/MENKES/SK/XII/2002 in 2002 about the Health Working Environment Requirements in the Office and Industry, it said that every office space and industry had to had air/ventilation holes. Standard air exchange was 0.283 m³/min/person with ventilation rate of 0.15 to 0.25 m/s. For non-cooling working rooms should had a ventilation hole at least 15% of the floor area by applying a cross ventilation system.¹¹

LEED¹⁰, ASHRAE², and ICC⁹, suggested that additional ventilation at the end of construction would

reduced VOC concentrations (including benzene) to acceptable levels. In indoor environmental studies, BRE reported that seasonal variation in indoor air concentrations was due to higher concentrations of exterior air infiltrated to buildings, and a greater effect of indoor sources during the winter than in the summer months. This was because the available ventilation at a low/bad level.⁴ VOC concentrations including benzene are reduced when the level of ventilation and material emission standards were met.⁸

Risk Quotient (RQ) of Benzene Non-Carcinogen

The following on the below were data of benzene concentration, inhalation rate, worker characteristics, non-carcinogenic benzene intake and Risk Quotient (RQ) in the shoes home industry of Romokalisari, Surabaya.

Tabel. 2 Data of Benzene Concentration, Inhalation Rate, Workers Characteristic, Intake Benzene Non-Carcinogen and Risk Quotient (RQ) of Benzene Non-Carcinogen in The Shoes Home Industry of Romokalisari, Surabaya

No. Workers	C mg/m ³	R m ³ /jam	tE Jam/hari	fE Hari/Tahun	Dt Tahun	Wb Kg	t _{avg} Hari	I _{nk} mg/Kg/hari	RQ mg/Kg/hari
1.	1.12	0.5	13	312	43	42	10950	0.2285	26.8785
2.	1.12	0.6	9	312	43	52	10950	0.1390	16.3475
3.	0.06	0.6	14	312	36	50	10950	0.0099	1.1686
4.	0.06	0.6	8	312	40	48	10950	0.0065	0.7608
5.	1.27	0.7	10	350	27	70	10950	0.1019	11.9865
6.	1.27	0.6	8	365	20	50	10950	0.0781	9.1863
7.	1.27	0.7	8	312	14	80	10950	0.0345	4.0540
8.	1.27	0.6	15	365	23	53	10950	0.1624	19.1039
9.	2.91	0.7	10	312	25	85	10950	0.1691	19.8992
10.	0.04	0.7	15	365	20	70	10950	0.0037	0.4375
Average								0.0933	10.9823

In Table. 2 above, the value of Intake benzene non-carcinogenic (I_{nk}) can be calculated using the following formula:

$$\text{Intake Benzene Non - Carcinogen} = \frac{C \times R \times tE \times fE \times Dt}{Wb \times Tavg}$$

Based on the calculation of Intake benzene non-carcinogen (I_{nk}) value above, it was known that the maximum intake value received by workers in the shoes

home industry Romokalisari Surabaya was 0.2285 mg/Kg/day).

$$\text{Risk Quotient (RQ)} = \frac{\text{Intake}}{RfC}$$

Risk Quotient (RQ) of benzene non-carcinogen determines benzene exposure having non-carcinogenic risks in the worker's body or not. The value of Risk Quotient (RQ) is calculated using the following formula:

It was known that the non-carcinogenic benzene RfC values established by US-EPA²¹ are 0.03 mg/m³ or 0.0085 mg/Kg/day. Based on the calculation table above, the average value of Risk Quotient (RQ) on workers in the shoes home industry of Romokalisari, Surabaya was 10.9823 mg/Kg/day and the highest RQ was 26.8785 mg/Kg/day. This showed that RQ>1, meaning that there was a possible indication of the risk of non-carcinogenic health effect and the need for control measures.¹⁵

This was in accordance with the results of study that conducted by Edokpolo, Yu and Conneli⁵ on the Health Risk Assessment for Exposure to Benzene in Petroleum Refinery Environments, found that RQ>1 for scenarios 2A and 3A indicating possible health risks for groups exposed to benzene. A study conducted by Fahrudi⁶ on the Risks of Cancer and Non-Cancer at Benzene

Exposure Workers in Home Industry Shoe Kelurahan Oso Wilangun Surabaya, found that benzene levels measured in the workplace air ranged from 0.04 mg/m³ to 7.44 mg/m³, RQ≤1 was counted 8 people (40%), RQ>1 was counted 13 people (60%) and ECR calculation got all workers with ECR value>10⁻⁵ was counted 20 people (100%).

The Presence of Ventilation with Risk Quotient (RQ) of Benzene Non-Karsinogen

In the bivariate analysis of the relationship between the presence of ventilation with Risk Quotient (RQ) of benzene non-carcinogen, the Risk Quotient (RQ) variable was made in 2 values, that were RQ≤1 and RQ> 1 in the Prevalence Risk (PR) calculation. The following below was relationship between the presence of ventilation with Risk Quotient (RQ) of Benzene Non-Carcinogen.

Tabel. 3 Relationship between The Presence of Ventilation with Risk Quotient (RQ) of Benzene Non-Carcinogen The Shoes Home Industry of Romokalisari, Surabaya

The Presence of Ventilation	Risk Quotient (RQ)				Total		p-value	Prevalence Risk (95%CI)
	RQ≤1		RQ>1					
	N	%	N	%	N	%		
Yes	1	10.0	0	0.0	1	10.0	0.035	9.000 (1.418-57.1117)
No	1	10.0	8	80.0	9	90.0		
Total	2	20.0	8	80.0	10	100.0		

Based on the results in Table. 3 above, it was found that the p-value of the relationship between the presence of ventilation with Risk Quotient (RQ) of benzene non-carcinogen was 0.035 and when compared with α that was 0.005 then p-value 0.035 was smaller than α so it could be seen that there was a relationship between the presence of ventilation with Risk Quotient (RQ) of benzene non-carcinogen in the shoes home industry of Romokalisari, Surabaya.

Prevalence Risk (PR) showed 9.000, meaning that the absence of ventilation was 9 times greater risk for non-carcinogen health effects (RQ>1) to workers in the shoes home industry of Romokalisari, Surabaya and there was a significant relationship between the presence of ventilation and the value Risk Quotient (RQ) to worker in the shoes home industry of Romokalisari, Surabaya which could be seen from PR value does not pass 1 (1,418-57,1117).

These results were consistent with the theory expressed by LEED¹⁰, ASHRAE², and ICC⁹, suggesting

that additional ventilation at the end of construction would reduce VOC concentrations (including benzene) to acceptable levels. VOC concentrations including benzene were reduced when ventilation levels and material emission standards were met.⁸ According to the Tokyo National Institute of Technology and Evaluation, indoor benzene concentrations were usually higher than in the open air which could be caused by the entry and accumulation of benzene from external sources and the presence of dominant benzene sources indoors.¹⁷

CONCLUSION

The result of study found out that most of places (90.0%) for workers to work did not had ventilation. The most of worker in the shoe home industry of Romokalisari, Surabaya had Risk Quotient (80.0%) more than 1. There was a significant relationship between the presence of ventilation with Risk Quotient (RQ) of benzene non-carcinogen in the shoes home industry of Romokalisari, Surabaya (p-value = 0.035, Prevalence Risk = 9.000). Recommendation were by making

ventilation in a good workplace and by consuming CYP2E1 enzyme contained in beef liver and salmon that serves to lower benzene levels in the body.¹³

Conflict of Interest: All authors have no conflicts of interest to declare.

Source of Funding: This is an article “Ventilation with Risk Quotient (RQ) Benzene Non-Carcinogen in The Shoes Home Industry of Romokalisari, Surabaya” of Occupational Health and Safety Department that was supported by Activity Budget Plans 2018, Faculty of Public Health, Airlangga University.

Ethical Clearance: The study was approved by the institutional Ethical Board of the Public Health, Airlangga University.

REFERENCES

1. ACGIH. Threshold limit values for chemical substances and physical agents and biological exposure indices. Cincinnati: American Conference of Governmental Industrial Hygienists; 2014. p. 1–13.
2. ASHRAE. Standard for the design of high-performance green buildings (ASHRAE 189.1-2014). US: ASHRAE and US Green Building Council; 2014.
3. ATSDR. Toxicological profile for benzene. USA: U.S. Department of Public Health and Human Services; 2007.
4. Crump DR. Indoor air pollution. In: Davison G, Hewitt CN, eds. Air pollution in the United Kingdom. Cambridge, UK: The Royal Society of Chemistry; 1997.
5. Edokpolo B, Yu QJ, Conneli D. Health risk assessment for exposure to benzene in petroleum refinery environments. *Int. J. Environ. Res. Public Health*. 2015; 2: p. 595-610.
6. Fahrudi H. Risiko menderita kanker dan non-kanker pada pekerja terpapar benzene di home industry sepatu Kelurahan Oso Wilangun Surabaya. *The Indonesian Journal of Occupational Safety and Health*. 2017; 6(1): p. 68-77.
7. Fessenden R, Fessenden J. Kimia organik, 3rd edition. Jakarta: Penerbit Erlangga; 1991. p. 122-124.
8. Hult E, Willem H, Price P, Hotchi T, Russell M, Singer B. Formaldehyde and acetaldehyde exposure mitigation in U.S. Residences: In-home measurements of ventilation control and source control. Indoor air. Wiley Online Library. 2014; 25(5): p. 523-535.
9. ICC. International green construction. Washington, DC: ICC; 2013.
10. LEED. Rating system selection guide. Washington, DC: U.S. Green Building Council; 2016.
11. Menteri Kesehatan RI. Keputusan menteri kesehatan republik indonesia nomor 1405/MENKES/SK/XII/2002 tentang persyaratan kesehatan lingkungan kerja perkantoran dan industri. Jakarta: Kementerian Kesehatan RI; 2002.
12. Menteri Tenaga Kerja dan Transmigrasi. Peraturan menteri tenaga kerja dan transmigrasi nomor Per.13/MEN/X/2011 tahun 2011 tentang nilai ambang batas faktor fisika dan faktor kimia di tempat kerja. Jakarta: Kemenakertrans RI; 2011.
13. Nirmawati S, Tualeka AR, Adi AN. Effect of food containing high Fe (iron) intake to urinary trans, trans-muconic acid (Tt-ma) levels on workers exposed to benzene. *Indian Journal of Public Health Research & Development*. 2018; 9(1): p. 53-57.
14. Pudyoko S. Hubungan pajanan benzene dengan kadar fenol dalam urine dan gangguan sistem hemopoetic pada pekerja instalasi BBM. Thesis. Semarang: Universitas Diponegoro; 2010.
15. Rahman A. Public health assessmen. Model kajian prediktif dampak lingkungan dan aplikasinya untuk manajemen risiko kesehatan. Depok: Pusat Kajian Kesehatan Lingkungan dan Industri FKM UI; 2007.
16. Ramon A. Analisis paparan benzene terhadap profil darah pada pekerja industri pengolahan minyak bumi. Thesis. Semarang: Magister Kesehatan Lingkungan Universitas Diponegoro Semarang; 2007.
17. Tokyo National Institute of Technology and Evaluation. Development of initial risk assessment method for chemical substances and preparation of the initial risk assessment. Annual report. Tokyo: National Institute of Technology and Evaluation; 2003.
18. Tunsaringkarn T, Prueksasit T, Kitwattanavong M, Siriwong W, Sematong S, Zapuang K, Rungsiyothin A. Cancer risk analysis of benzene, formaldehyde and acetaldehyde on gasoline station workers. *Journal of Environmental Engineering and Ecological Science*. 2012; p. 1-6.
19. Udonwa NE, Uko EK, Ikpeme BM, Ibanga IA, Okon

- BO. (2009). Exposure of petrol station attendants and auto mechanics to premium motor sprit fumes in Calabar, Nigeria. *J. Environ. Public Health*. 2009; p. 1-5.
20. US-EPA. Carcinogenic effects of benzene: An update. Prepared by the national center for environmental health, office of research and development. Washington, DC: US EPA; 1998.
21. US-EPA. Benzene (CASRN 71-43-2). Washington, DC: Irish, US EPA; 2015.

Call for Papers / Article Submission

The editor invites scholarly articles that contribute to the development and understanding of all aspects of Public Health and all medical specialities. All manuscripts are double blind peer reviewed. If there is a requirement, medical statistician review statistical content. Invitation to submit paper: A general invitation is extended to authors to submit papers papers for publication in IJPHRD.

The following guidelines should be noted:

- The article must be submitted by e-mail only. Hard copy not needed. Send article as attachment in e-mail.
- The article should be accompanied by a declaration from all authors that it is an original work and has not been sent to any other journal for publication.
- As a policy matter, journal encourages articles regarding new concepts and new information.
- Article should have a Title
- Names of authors
- Your Affiliation (designations with college address)
- Abstract
- Key words
- Introduction or back ground
- Material and Methods
- Findings
- Conclusion
- Acknowledgements
- Interest of conflict
- References in Vancouver style.
- Please quote references in text by superscripting
- Word limit 2500-3000 words, MSWORD Format, single file

All articles should be sent to: **editor.ijphrd@gmail.com**

Send all payment to :

Institute of Medico-Legal Publications

Logix Office Tower, Unit No. 1704, Logix City Centre Mall

Sector- 32, Noida - 201 301 (Uttar Pradesh)

Mob: 09971888542, Ph. 0120- 429 4015, E-mail: editor.ijphrd@gmail.com,

Website: www.ijphrd.com



Indian Journal of Public Health Research & Development

CALL FOR SUBSCRIPTIONS

About the Journal

Print-ISSN: 0976-0245 **Electronic - ISSN:** 0976-5506, **Frequency:** Monthly

Indian Journal of Public Health Research & Development is a double blind peer reviewed international Journal. The frequency is **Monthly**. It deals with all aspects of Public Health including Community Medicine, Public Health, Epidemiology, Occupational Health, Environmental Hazards, Clinical Research, Public Health Laws and covers all medical specialities concerned with research and development for the masses. The journal strongly encourages reports of research carried out within Indian continent and south east Asia.

The journal has been assigned international standards (ISSN) serial number and is indexed with Index Copernicus (Poland). It is also brought to notice that the journal is being covered by many international databases.

Journal Title	Print Only
Indian Journal of Public Health Research & Development	INR 9000

NOTE FOR SUBSCRIBERS

- Advance payment required by cheque/demand draft in the name of **"Institute of Medico-Legal Publications"** payable at New Delhi.
- Cancellation not allowed except for duplicate payment.
- Claim must be made within six months from issue date.
- A free copy can be forwarded on request.

Our Contact Info:

Institute of Medico-Legal Publications

Logix Office Tower, Unit No. 1704, Logix City Centre Mall
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Mob: 09971888542, Ph. 0120 429 4015, E-mail: editor.ijphrd@gmail.com

Website: www.ijphrd.com

Published, Printed and Owned : Dr. R.K. Sharma

Printed : Printpack Electrostat G-2, Eros Apartment, 56, Nehru Place, New Delhi-110019

Published at: Institute of Medico Legal Publications Pvt. Ltd., Logix Office Tower, Unit No. 1704, Logix City Centre Mall Sector- 32,
Noida - 201 301 (Uttar Pradesh) Editor : Dr. R.K. Sharma, Mobile: + 91 9971888542, Ph. No: +91 120- 429 4015



Indian Journal of Public Health Research & Development

An International Journal

SCOPUS IJPHRD CITATION SCORE

Indian Journal of Public Health Research and Development
Scopus coverage years: from 2010 to 2017 Publisher:
R.K. Sharma, Institute of Medico-Legal Publications
ISSN:0976-0245E-ISSN: 0976-5506 Subject area: Medicine:
Public Health, Environmental and Occupational Health
CiteScore 2015- 0.02
SJR 2015- 0.105
SNIP 2015- 0.034



Website:

www.ijphrd.com

Indian Journal of Public Health Research & Development

EXECUTIVE EDITOR

Vidya Surwade

Associate Professor, Dr Baba Saheb Ambedkar, Medical College & Hospital Rohinee, Delhi

INTERNATIONAL EDITORIAL ADVISORY BOARD

1. **Dr Abdul Rashid Khan**, B. Md Jagar Din, (*Associate Professor*)
Department of Public Health Medicine, Penang Medical College,
Penang, Malaysia
Consulting Physician, Mount View Hospital, Las Vegas, USA
2. **Basheer A. Al-Sum**, Botany and Microbiology Deptt, College of Science,
King Saud University, Riyadh, Saudi Arabia
3. **Dr Ch Vijay Kumar**, (*Associate Professor*),
Public Health and Community Medicine, University of Buraimi, Oman
4. **Dr VMC Ramaswamy**, (*Senior Lecturer*), Department of Pathology,
International Medical University, Bukit Jalil, Kuala Lumpur
5. **Kartavya J. Vyas**, (*Clinical Researcher*), Department of Deployment
Health Research,
Naval Health Research Center, San Diego, CA (USA)
6. **Prof PK Pokharel**, Community Medicine,
BP Koirala Institute of Health Sciences, Nepal
7. **Sajjad Salim Issa AL-Musawi**,
Supervisor for student of the Arab board in family medicine
8. **Prof. Dr. Ayad F. Alkaim**, (*Professor*)
Surface chemistry and applications of nano-materials, Babylon
University, Iraq
5. **Dr. Santosh Kumar Mulage**, (*Assistant Professor*), Anatomy,
Raichur Institute of Medical Sciences Raichur (RIMS), Karnataka
6. **Dr Gouri Ku. Padhy**, (*Associate Professor*),
Community and Family Medicine, All India Institute of Medical Sciences,
Raipur
7. **Dr Ritu Goyal**, (*Associate Professor*), Anaesthesia,
Sarswathi Institute of Medical Sciences, Panchsheel Nagar
8. **Dr. Anand Kalaskar**, (*Associate Professor*), Microbiology
Prathima Institute of Medical Sciences, AP
9. **Dr. Md. Amirul Hassan**, (*Associate Professor*), Community Medicine
Government Medical College, Ambedkar nagar, UP
10. **Dr. N. Girish**, (*Associate Professor*), Microbiology,
VIMS&RC, Bangalore
11. **Dr BR Hungund**, (*Associate Professor Pathology*),
JNMCC, Belgaum.
12. **Dr Sartaj Ahmad**, (*Associate Professor*),
Medical Sociology, Department of Community Medicine,
Swami Vivekananda Subharti University, Meerut, Uttar Pradesh, India.
13. **Dr Manoj Kumar Tripathi**, (*Associate Professor*),
Political Science and public administration,
Swami Vivekananda Subharti University, Meerut, Uttar Pradesh, India.
14. **Dr Sumeeta Soni**, (*Associate Professor*),
Microbiology Department, B.J. Medical College, Ahmedabad,
Gujarat, India

NATIONAL EDITORIAL ADVISORY BOARD

1. **Prof. Sushanta Kumar Mishra**, Community Medicine, GSL Medical
College – Rajahmundry, Karnataka
2. **Prof D.K. Srivastava**, Medical Biochemistry,
Jamia Hamdard Medical College, New Delhi
3. **Dr Sunil Mehra**, Paediatrician & Executive Director,
MAMTA Health Institute of Mother & Child, New Delhi
4. **Prof M. Sriharibabu**, General Medicine,
GSL Medical College, Rajahmundry, Andhra Pradesh
5. **Prof Pankaj Datta**, Principal & Prosthodontist,
Indraprastha Dental College, Ghaziabad
6. **Prof Samarendra Mahapatro**, Pediatrician,
Hi-Tech Medical College, Bhubaneswar, Orissa
7. **Dr Abhiruchi Galhotra**, (*Additional Professor*),
Community and Family Medicine, All India Institute of Medical Sciences, Raipur
8. **Prof Deepti Pruthvi**, Pathologist,
SS Institute of Medical Sciences & Research Center. Davangere, Karnataka
9. **Prof G S Meena**, (*Director Professor*),
Maulana Azad Medical College, New Delhi
10. **Prof Pradeep Khanna**, Community Medicine,
Post Graduate Institute of Medical Sciences, Rohtak, Haryana
11. **Dr Shailendra Handu**, (*Associate professor*),
Pharma, DM (Pharma, PGI Chandigarh)
12. **Dr. A.C. Dhariwal**, (*Directorate*)
National Vector Borne Disease Control Programme,
Dte. DGHS, Ministry of Health Services, Govt. of India, Delhi.

NATIONAL SCIENTIFIC COMMITTEE

1. **Dr Anju Ade**, (*Associate Professor*),
Navodaya Medical College, Raichur, Karnataka
2. **Dr. E. Venkata Rao**, (*Associate Professor*), Community Medicine,
Institute of Medical Sciences & SUM Hospital, Bhubaneswar, Orissa.
3. **Dr. Amit K. Singh**, (*Associate Professor*), Community Medicine,
VCSG Govt. Medical College, Srinagar – Garhwal, Uttarakhand
4. **Dr R G Viveki**, (*Prof n head*),
Dept of Community Medicine, BIMS Belgavi

Print-ISSN: 0976-0245; Electronic-ISSN: 0976-5506,
Frequency: Quarterly (Four issues per volume)

Indian Journal of Public Health Research & Development is a double blind peer reviewed international journal. It deals with all aspects of Public Health including Community Medicine, Public Health, Epidemiology, Occupational Health, Environmental Hazards, Clinical Research, and Public Health Laws and covers all medical specialties concerned with research and development for the masses. The journal strongly encourages reports of research carried out within Indian continent and South East Asia.

The journal has been assigned International Standards Serial Number (ISSN) and is indexed with Index Copernicus (Poland). It is also brought to notice that the journal is being covered by many international databases. The journal is covered by EBSCO (USA), Embase, EMCare & Scopus database. The journal is now part of DST, CSIR, and UGC consortia.

Website : www.ijphrd.com

©All right reserved. The views and opinions expressed are of the authors and not of the Indian Journal of Public Health Research & Development. The journal does not guarantee directly or indirectly the quality or efficacy of any product or service featured in the advertisement in the journal, which are purely commercial.

Editor

Dr. R. K. Sharma
Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Printed, published and owned by

Dr. R.K. Sharma
Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Published at

Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida-201 301 (Uttar Pradesh)



Indian Journal of Public Health Research & Development

www.ijphrd.com

Contents

Volume 9, Number 11

November 2018

118. Application of Different Controllers and their Evaluation for Super Heater Temperature Control in Thermal Power Plant 639
A. Yasmine Begum, M. Balaji, G V Marutheeswar
119. Design of Low Power Johnson Counter using Lector Technique Using 50nm Technology 648
M. Balaji, N. Padmaja
120. Parallel Hardware Architecture for Implementation of High Speed MAC 655
M Govinda Raju, Roopa J, Amit M Ugargol
121. Smart Med-Minder 661
Shradha Sapra, Madhurima Hooda, Anshul Chhabra, Saru Dhir
122. Providing Cyber Security using Machine Learning for Social Networks 667
Sheba Pari N., Majjaru Chandrababu, Senthil Kumar K.
123. A new Dimensions in Era of Science on Nano Materials 671
K. Srishailam, P. Venkata Ramana Rao, E. Purushotham, P. Nagabrahmam
124. A Review on Computational Fluid Dynamics Projects 675
Swamy Reddy, R. Archana Reddy, G. Ravi Kiran, B. Saritha, S. Srinivas
125. A Study on Pattern Matching Intrusion Detection System for Providing Network Security to Improve the Overall Performance of Security System 683
Goje Roopa, M. Sampath Reddy
126. A Study on the Aspect of Nanomaterials towards Sustainable Energy 688
P. Venkata Ramana Rao, K. Srishailam, K. Devender, L. Radha Krishna
127. A Study on the Comparison of Various Retrieval Methods based on the Measured Accuracy 693
M. Ayyavaraiah, Bondu Venkateswarlu
128. A Study on the Significant Difference between the Students of General Category and Reserved Category in their Achievement in English 698
C. Goverdhan, D. Santhosh, Katyayani Sangam, S. Shailaja, D. Mahesh
129. A Study on the Synthesis of Polypyrrole Nanocomposites for their Morphological Studies 702
E. Purushotham, K. Devender, P. Venkata Ramana Rao, S. Satyavani
130. An Enhanced Study of Computational Fluid Dynamics 706
Ravi Kiran, G. Anusha, G. Swamy Reddy, C. Balarama Krishna, Ch. Sridevi
131. An Enhanced Study on the Challenges Encountered in Mathematical Modelling 712
Anusha, C. Balarama Krishna, G. Ravi Kiran, P. Ramchander Rao

132. A Review on Hetrocyclic Compounds in Synthetic, Agricultural and Industrial Applications	717
<i>K. Srivani, Veerati Radhika, E. Laxminarayana, S. Haripriya</i>	
133. An Overview of the Factors Affecting Handovers and Effective Highlights of Handover Techniques for Next Generation Wireless Networks	722
<i>Pramod Kumar P, CH Sandeep, Naresh Kumar S</i>	
134. Definite Aims and Objectives of Teaching English Language	726
<i>S. Shailaja, T. Satyanaraya, C. Goverdhan, A. Srinivas</i>	
135. Designing a Collaborative Detection System for Detecting the Threats to the Cyber Security in Big Data	730
<i>Goje Roopa, Dadi Ramesh</i>	
136. Identifying the Evolution of Ways towards Thinking about the Students Mathematical Learning Process	734
<i>R. Archana Reddy, G. Swamy Reddy</i>	
137. Impact of English Language Teaching in Technical Education	739
<i>D. Santhosh, C. Goverdhan, Katyayani Sangam, S. Shailaja, G. Roopa</i>	
138. Opportunities for Applying Deep Learning Networks to Tumour Classification	742
<i>Naresh Kumar S, Pramod Kumar P, CH Sandeep, Shwetha S</i>	
139. Security Challenges and Issues of the IoT System	748
<i>CH Sandeep, Naresh Kumar S, Pramod Kumar P</i>	
140. Relationship between Social Presence and Health Efficacy in VR Health Video	754
<i>Han-Jin Jang, Ghee-Young Noh</i>	
141. The Effect of Presence, Physical Environment and Human Service on Revisit Intention in VR Theme Park: Focusing on the Mediated Effect of Delight	761
<i>Young-Ku Hong, Munseok Cho, Joo-Sang Jeon</i>	
142. Psychometric Evaluation of Cost-Reduction Practice	769
<i>Miyoung Lee, Mi-Kyoung Lee, Mi Ok Choi, Youngshin Song</i>	
143. Periodontal Disease and CRP Relatedness in Korean Adults	775
<i>Jin-ho Chun, Jung-hwa Lee, Yu-hee Lee</i>	
144. Effect of Simulation-based Training for Neonatal Care on Critical Thinking, Critical Judgement, and Problem Solving Ability in Nursing	781
<i>Hyun A Nam, Ae Young Lee, Miok Kim</i>	
145. Moderating Effect of Depression on the Relationship between Subjective Health and Quality of Life in Patients with COPD	787
<i>Young-Sook Kwon</i>	
146. The Effect of Muscle Activity according to Pelvic Angle in Different Positions: Randomized Crossover Trial	795
<i>Sang-Pill Park, Hyeon-Ji Son, Dong-Yeop Lee, Ji-Heon Hong, Jae-Ho Yu, Jin-Seop Kim</i>	
147. The Changed of Muscle Activation During Different Visual Sign in Bridging Exercise: Randomized Controlled Trial	803
<i>Young-Hyen Lee, Bo-Eun Lee, Dong-Yeop Lee, Ji-Heon Hong, Jae-Ho Yu, Jin-Seop Kim</i>	

148. Comparison of Quadriceps Muscle Activities During Plyometric, Open and Closed Kinetic Chain Exercises	810
<i>Ji-hyeonKim(A), Ji-hyeonKim(B), Ju-yeon Kim, Dong Yeop Lee, Jae Ho Yu, Jin Seop Kim, Ji Heon Hong</i>	
149. The Relationship between Social Problem-Solving and Self-Regulation Abilities according to Clinical Practice Experience in Nursing Students	817
<i>Young-Hee Kim, Jung-Hee Jeon</i>	
150. A Study of Awareness and Preference for Oral Scanner of Dental Hygiene Students	822
<i>Yu-Ri Choi, Youn-Soo Shim, Sun-Ok Jang, Su-Young Park</i>	
151. A Reinforcement Method of Healthcare Information System	830
<i>Seong-Hoon Lee, Dong-Woo Lee</i>	
152. The Affects of Pulmonary Function after Gym Ball Exercise for Sedentary Behavior Students: Randomized Controlled Trial	837
<i>Hyuk-Goo Chung, Yong-Soon Kim, Dong-Yeop Lee, Ji-Heon Hong, Jae-Ho Yu, Jin-Seop Kim</i>	
153. Gene Expression of Pulp Cells from Supernumerary Tooth Through the Passages	844
<i>Seungwoo Shin, Jisun Shin, Jongsoo Kim, Younsoo Shim, Soyoun Park, Eunsuk Ahn, Jongbin Kim</i>	
154. Keyword Network Analysis for Creativity and Personality of Early Childhood Teachers: Focus on Big Data	850
<i>Byung-Man Kim, Jeong-Jin Youn, Su-Jeong Jeong, Kang-Hoon Lee</i>	
155. The Influence of Social Support on Stress Coping among Nursing Students	857
<i>MiJin Kim, Younghee Jeong</i>	
156. Antimicrobial Activity of Various Solvent Extracts of <i>Auricularia auricula-judae</i> Against Oral Bacteria	862
<i>So-Ra Han, Sang-Cheol Yu, Joo-Ho Lee, Sang-Hee Jung, Kun-Ok Lim, Tae-Jin Oh</i>	
157. The Effect of Oral Spray Mist Containing Pine Needle Extract in Reducing Halitosis and Compounds Inducing Halitosis	870
<i>Jung-Eun Park, Jong-Hwa Jang</i>	
158. Upper Arm Muscle Activation During Rowing Exercise According to Different Pulling Positions	876
<i>Da-HyeGu, Ayano Vargas, So-Yun Jin, Dong Yeop Lee, Jae Ho Yu, JinSeop Kim, Ji-Heon Hong</i>	
159. The Effects of Stepping Exercise on Body Composition and Blood Lipids of Female Obese Students	883
<i>Ki-Yeol Yang, Bum-Il Min, Seong-Gon Kim, Jong-Eon Kim, Hyun-Woo Kim</i>	
160. Academic Resilience, AcademicStress, Self-leadership of Korea Nursing Students	889
<i>Gye-Hyun Jung, Mi-Kyung Kang</i>	
161. The Effects of Smartphone Use on the Mechanical Properties of the Upper Trapezius Muscle and Craniovertebral Angle	896
<i>Jong-Hoon Moon, Sung-Jin Heo, Jin-Hwa Jung</i>	
162. Proposal for the Improvement of Service Quality of Caregivers	903
<i>Joo-Young Lee, Do-Young Lee</i>	
163. The Effects of Team-Based Learning Program on the Self-Directed Learning Capability, Learning Transfer and Learning Satisfaction of Nursing Students	908
<i>Joo-Young Lee, Do-Young Lee</i>	

164. The Relationship between Oral Health Awareness and Successful Aging in Middle-Aged Women 915
Eun-Sil Choi, Young-Soo Lee
165. Effects of Muscle Facilitation on Motor Activity and Tactile Perception 920
Sung-Hwa Hong, Yun-Tae Kim, Dong Yeop Lee, Jae Ho Yu, Jin Seop Kim, JiHeon Hong
166. An Empirical Study on the Comprehensive Information System for Reducing Physical Symptoms in Colon Cancer Patients 929
Seong-Ran Lee
167. A Case Study of Word finding Intervention for the Elderly with Alzheimer’s Dementia at Home 935
Soo-Jin Kim
168. The Structural Relationships among Professor’s Servant Leadership, Faculty Trust, Learning Flow, and Adjustment to College Life 941
Boo-Gil Seok, Hyun-Suk Park, Yong-Gun Lee, Hyung-Chul Joo
169. Development of Creativity Program using Disney Animation of Young Children 946
Rae-Eun Kim, Sang-Mee Koo
170. Analysis of the Influencing Factors on Life Satisfaction in College Students: A Structural Equation Modeling Approach 952
Jung-Hyun Choi
171. The Structural Relationship between Trust-Forming Factors, Leader Trust, University Trust, University Satisfaction, and Maintenance of Relationship in University Physical Education Courses 958
Kye-Sok Lee, Seung-Yong Kim
172. Factors Influencing on Dry Eye Symptoms of University Students Using Smartphone 964
Jung-hyun Choi, Kyung-sook Kim, Hee-jeong Kim, Se-jin Joo, Hye-gyeong Cha
173. Communication, Emotional Labor and Organizational Commitment among Nurses 970
, Sung-Yun Ahn
174. Application of Problem Based Learning (PBL) for Nursing Students’ Practicum in Handoff Communication 977
Eun-Kyung Lee, Sun Young Park
175. Health Perception and Wellness Behaviors of College Students Participating in Physical Education 982
Yeong-Gwon Jo, Chun-Ho Yang
176. Factors Affecting the Quality of Life of Male Workers According to the Type of Job 989
Myoung-Jin Kwon, Sung-Yun Ahn
177. The Relationship Between Eccentric Strength and Various Dynamic Balance Exercises in Male and Female 998
Su-Hyeon Cha, Yong-Min Ji, Dong-Yeop Lee, Ji-Heon Hong, Jin-Seop Kim, Jae-Ho Yu
178. A Study on the Aesthetic Cosmetic Surgery in Nursing Students: Q-Methodology 1006
Hanyi Lee, Sunyoung Jang
179. A Study on the Subjectivity Study of Single Mothers in Nursing Students : Q-Methodology 1014
Sunyoung Jang

180. Integrative Review of Studies of Service-Learning in Health-Related Disciplines	1022
<i>Youngshin Song, Miyoung Lee, Ancho Lim, Geumbo Ko</i>	
181. Differences in Nursing Students' Adaptation to College Life and Recognition of Death According to Their Degree of Adaptation to Field Practice	1026
<i>Nam Joo Je, Meera Park</i>	
182. The Effects of Computer-Based Cognitive Rehabilitation Program (CoTras) on the Verbal Fluency of Korean Patients with Mild Dementia	1033
<i>Haewon Byeon</i>	
183. Is the Combined Application of Tongue Pressure Training and Tongue Base Exercise More Effective in Improving the Strength of Tongue and Lips in Korean Patients with Flaccid Dysarthria	1041
<i>Haewon Byeon</i>	
184. A Study on General Hospital Nurses' Acceptance of New Medical Technology	1048
<i>Eunju Heo</i>	
185. Effect of Rest Interval on Total Work, Systolic Blood Pressure and Numerical Rating Scale during 65% 1RM Bench Press Exercise	1056
<i>Chul Yoon, Sung-SikKo, Chun-Ho Yang, Ki-Hong Kim</i>	
186. Factors Influencing Suicidal Ideation in Depressed Patients: Based on the 6Thkorea National Health and Nutrition Examination Survey	1063
<i>Kyongeun Lee</i>	
187. A Study on Information System Introduced to Improve Daily Living-Based Physical Function After Ovariectomy	1071
<i>Seong-Ran Lee</i>	
188. Effects of Participation in Dancesports Program on Age Identity, Existential Identity, and Ego Integrity of the Elderly in South Korea	1076
<i>Yoon-Mi Jong, Moon-Suk Lee, Jong-Kil Lee</i>	
189. Impact of Collaborative R&D Projects in Determining Innovative Performance	1080
<i>Richa Kumari, Inje Kang, Byeong-Hee Lee, Byeongjeong Kim, Kiseok Choi</i>	
190. Evaluation of Quality of Life in Patients Undergoing Orthodontic Treatment in Eastern India Population	1093
<i>Snigdha Pattanaik, Subhrajeeet Narayan Sahoo, Smruti Bhusan Nanda, Tusar Kanti Nayak</i>	
191. Comparative Study on Efficacy of Advanced and Conventional Methods Used for Detection of <i>Streptococcus mutans</i> in Saliva of Dental Caries Patients	1098
<i>Devi Prasad Mandal, Chandrasekhar Panda, Shakti Rath, Neeta Mohanty</i>	
192. Evaluation of Post Operative Soft Tissue Complications of Orthodontic Mini-Implants at Different Loading Times–An in-Vivo Study	1103
<i>Subhrajeeet Narayan Sahoo, Snigdha Pattanaik, Tusar Kanti Nayak, Smruti Bhusan Nanda</i>	
193. Study on Antimycobacterial Properties of Selected Ethnomedicinal Plants: An Alternative Therapeutic Choice Against Multidrug Resistant <i>Mycobacterium tuberculosis</i>	1108
<i>Shakti Rath</i>	
194. Oral Spindle Cell Carcinoma: A Rare Lesion Masquerading Many	1116
<i>Swagatika Panda, Ipsita Mohanty, Alkananda Sahoo, Neeta Mohanty</i>	

195. Oblique Mandibular Parasymphysis Fracture Treated with Cannulated Herbert Bone Screws: Case Reports	1121
<i>Harsh Mohan Pathak, Sobhan Mishra, Subrat Kumar Padhiary, Bijaylaxmi Panigrahi</i>	
196. Apicoectomy with Placement of Prf in Periapical Lesions: Case Reports	1127
<i>Subrat Kumar Padhiary, Harsh Mohan Pathak, Santosh Subudhi, Shibasis Biswas</i>	
197. A Complete Displaced Right Mandibular Body and Left Parasymphysis Fracture Operated Using Locking Miniplates: A Case Report	1133
<i>Santosh Kumar Subudhi, Satyabrata Pattanaik, Harsh Mohan Pathak, Sonu Sanyal</i>	
198. A Completely Intraosseous Circumferential Dentigerous Cyst in Close Vicinity of Mental Nerve Associated with Impacted Supernumerary Premolar in Mandible: A Rare Case Report	1137
<i>Harsh Mohan Pathak, Sobhan Mishra, Satyabrata Patnaik, Kalyan Sundar Pal</i>	
199. Oral Ornamentation an Upcoming Public Health Issue in India	1141
<i>Smita R Priyadarshini, Pradyumna Kumar Sahoo, Abhilash Mohapatra, Abhijita Mohapatra, Kajal Kiran Sahoo</i>	
200. Conscious Sedation in Pediatric Dentistry	1145
<i>Sthitiprajna Lenka, Karishama Rathor, Sashikant Sethy, Narottam Praharaj, Dharamashree. S, Rucha Varu</i>	
201. Recall Scheduling in Removable Prosthesis Patients	1149
<i>Debarchita Sarangi, Sitansu Sekhar Das, Abhilash Mohapatra</i>	
202. Soil Stabilization using Lime Precipitation Technique	1152
<i>Heeralal M, Pandu Kurre, G V Praveen</i>	
203. A Review on Permanent Deformation of Granular Material	1158
<i>Heera Lal M, Venkatesh Noolu, Rakesh J Pillai, Pandu Kurre, G. V. Praveen</i>	
204. A Study on Data Mining towards Cloud Computing	1166
<i>Komuravelly Sudheer Kumar, J. Bhavana</i>	
205. Exponential Spline Answer for Boundary Value Problems Employing an Unsure Parameter	1170
<i>C. Balarama Krishna</i>	
206. A Study on the Applications of IOT	1173
<i>Siripuri Kiran, Shoban Babu Sriramoju</i>	
207. A Study on the Enhanced Approach of Data Mining Towards Providing Security for Cloud Computing	1176
<i>J. Bhavana, Komuravelly Sudheer Kumar</i>	
208. A Study on Regression Testing towards Cost Optimization	1180
<i>T. Mahesh Kumar</i>	
209. An Overview of IOT towards Irrigation System	1184
<i>Swathi, Rajesh Mothe</i>	
210. A Study on using HWT towards the Quality Evaluation of Compressing the Colored Image	1188
<i>P. Sudarshan Ray, Ch. D. V. Subba Rao, Polem. Vemulamma</i>	
211. Enhanced Improvement in Dynamic Behavior of Hybrid Active Power Filter using PI Controllers and Fuzzy Logic	1192
<i>N. Madhuri, P. Chandra Sekhar, M. Suryakalavathi</i>	

212. Critical Success Factors of Contractor's Performance Appraisal System in Malaysian Construction Industry	1197
<i>Khairul Zahreen Mohd Arof, Syuhaida Ismail, Abd Latif Saleh</i>	
213. Graduating With Your First-Choice Degree: Does It Matter?	1207
<i>Lim Hock-Eam, Yip Chee-Yin</i>	
214. Financial Literacy among Malaysian Households in Managing Income	1213
<i>Noor Afza Amran, Norfaiezah Sawandi, Hasnah Shaari, Ram AlJaffri Saad, Abu Sufian Abu Bakar</i>	
215. The Impact of Board of Directors' Characteristics and Remuneration on Companies' Performance in Malaysia	1220
<i>Chua Mei Shan, Nazrul Hisyam Ab Razak, Aiwan bin Ismail Ali</i>	
216. Integrated Research Framework Approaches to the Control of Dengue Diseases for Achieving Sustainable Development Goals in Malaysia	1231
<i>Ahmad Firdhaus Arham, Muhammad Rizal Razman, Latifah Amin, Zurina Mahadi, Lee Khai Ern, Sharifah Zarina Syed Zakaria, Mazlin Mokhtar</i>	
217. Impacts of Online Social Media on Investment Decision in Malaysia	1241
<i>Shakerin Ismail, Radha K. Nair, Rohana Sham, Siti Norida Wahab</i>	
218. The Effects of Perceived Organizational Support, Supervisor Supports and Peer Supports on Transfer of Training	1247
<i>Fadillah Ismail, Adibah Abdul Kadir, Fazlulaini Mohd Yunus, Nur Hayatun Syamila binti Fauzi, Nur Amalina Mohd Rosli</i>	
219. Measuring Performance of Islamic Banks Using Maqasid Index	1256
<i>Siti Aida Sheikh Hussin, Siti FairuzKamaruzaman, Zalina Zahid, Siti Shaliza Mohd Khairi</i>	
220. Analysis of Critical Success Factors of Startups in Thailand	1262
<i>Sutthikarn Khong-khai, Hung-Yi Wu</i>	
221. Personality as Predictor of Life Satisfaction at Middle-Age Retirement among Army Veterans post-Resettlement Training in Malaysia	1269
<i>Aminatu Zahriah Mohd Ngamal, Ruslin Amir, Faridah Mydin Kutty, Khairul Anwar Mastor, Raja Rizal Iskandar Raja Hisham, Zaizul Ab Rahman, Harisson Harun</i>	
222. The Influence of Electronic Word of Mouth on Theory of Reasoned Action and the Visit Intention to the World Monument Fund Site	1277
<i>Abdul Hafaz Ngah, Mohd RahimiAbdul Halim, Norzalita Abd Aziz</i>	
223. Using Expectation and Confirmation Theory to Determine Customer Loyalty among Postpaid Users	1283
<i>Syukrina Alini Mat Ali, Wan Jamaliah Wan Jusoh, Abideen Adeyemi Adawale</i>	
224. The Role of E-Management in Achieving Sustainable Competitive Advantage: Field Study of Zain Telecom in Iraq	1294
<i>Khaled Abdulaah Ibrahim, Shatha Aboud Shaker, Waleed Khalid Abduljabbar</i>	
225. Work Family Conflict among Teachers: Evaluating Measurement Model Fit	1301
<i>R Zirwatul Aida R Ibrahim, Siti Nazilah Mat Ali, Azlina Abu Bakar, Mazidah Mohd Dagang, Khatijah Omar, Siti Sarawati Johar</i>	

226. Organ Donation Intention: The Influence of Attitude, Altruism and Spiritual Belief in Malaysia 1307
Noor 'ain Mohamad Yunus, Dilla Syadia Ab Latiff, Syukrina Alini Mat Ali, Noor Azzah Said, Sri Fatiany Abdul Kader Jailani
227. Measuring the Effectiveness of Hydroponics Technology Knowledge Transfer Program from Universiti Utara Malaysia-Coconut Island Resources on Rural Community: A Case Study in Jitra, Kedah 1315
Shri-Dewi Appanaidu, Roslina Kamaruddin, Rozana Samah
228. Tax Evasion, Tax Burden and Economic Development in Asean-5 Economies: A Mimic Model Analysis 1323
Badariah Haji Din, Muzafar Shah Habibullah, A. H. Baharom
229. Identifying Critical Crime Contribute Factors towards Improving University Facilities 1337
NurFaiza Hussin, Radzi Ismail, Mohd Nizam Mohd Yusof, Salman Riazi Mehdi Riazi
230. Items' Validity and Reliability Using Rasch Measurement Model for Factors that Influence Clothing Disposal Behaviour 1344
Arasinah Kamis, Farah Najwa Ahmad Puad, Suriani Mohamed, Ridzwan Che 'Rus, Baity Bujeng, Rodia Syamwil, Emy Budiastuti
231. Reflection on Teaching 'Statistics in Education' for Postgraduates Students 1354
Arsaythamby Veloo, Hariharan N Krishnasamy, Ruzlan Md. Ali
232. Scientific Imperatives in Entailing the Legitimacy for Harm Reduction Approach to Drug Use: Reduction of HIV Incidence 1363
Yusramizza Md Isa Yusuff, Mazita Mohamed
233. Linking Transformational Leadership to Firm Innovativeness 1370
Donny Abdul Latief Poespowidjojo, Azahari Ramli, Ahmed Mohammed Kamaruddeen, Muhammad Shukri Bakar, Khairunnisah Ahmad Shakir
234. A Process-Oriented Quality Assurance and Organizational Performance: A Conceptual Approach 1376
M. G. Hassan, M. D. Akanmu, A. Y. Bahaudin
235. Livelihood Assets and Food Security Achievement : An Empirical Study of the Coastal Fishermen in Northern Peninsular Malaysia 1383
Ahmad Zubir Ibrahim, Kalthum Hassan, Roslina Kamaruddin, Abdul Rahim Anuar
236. A Preliminary Insight into the Nature of Street-Level Bureaucracy amongst Front-Line Workers of the Malaysian Social Welfare Department 1391
Ahmad Shukri Abdul Hamid, Noor Azizah Ahmad, Norruzeyati Che Mohd. Nasir
237. Correctional Rehabilitation of Inmates: A Solution to Reduce Recidivism in Oke Kura Prison Kwara State, Nigeria 1397
Jamaludin Mustaffa, Kehinde Adekunle Aliyu
238. Towards Formulating a Specific Legislation on the Law of Presumption of Death in Malaysia 1404
Nor Azlina Mohd Noor, Ahmad Shamsul Abd Aziz, Akmal Hidayah Halim
239. The Restricted Autonomy of Will: The Disregarded Values in Shariah Based Contract 1410
Hakimah Yaacob, Selamah Maamor
240. The Homeless Life: A Profile Study in Penang 1417
Md Zawawi Abu Bakar, Rajwani Md Zain, Azlizamani Zubir Salim

241. The Matrimonial Property: Causes of Claim and Distribution Rate in the Alor Setar Syariah High Court 1423
Mohd Akram Bin Dato' Dahaman Dahlan, Khairani Bt Nawawi
242. The Green and Sustainable Care Facilities of Elderly Care Home: An Exploratory study of
Rumah Seri Kenangan Cheras, Selangor 1430
Hasif Rafidee Hasbollah, Mohd. Nazaruddin Yusoff, Mohd Nasrun Mohd Nawawi
243. Travel Motivation of Malaysian University Students 1440
Ahmad Edwin Mohamed, Kalsom Kayat
244. Development of Malaysian Women Fertility Index 1448
Shamshuritawati Sharif, Wan Aznie Fatimah, Adzmel Mahmud
245. Role of Brand Love and Brand Commitment in Establishing Word of Mouth Communication 1454
Sri Murni Setyawati, Donny Abdul Latief Poespowidjojon, Kristina Anindita Hayuningtias
246. Screening of Escherichia Coli O157:H7 Contamination and Nitrate Content on Butterhead Lettuce from
Market Outlets 1460
Siti Fairuz Yusoff^b, Mahmud Tengku Muda Mohamed, Farah Farhanah Haron
247. Effect of ESSZONE Establishment on Maritime Security and Economic Activity: A Case Study of
Tawau District 1467
Abdul Rahim Anuar, Rusdi Omar, Laila Suriya Ahmad Apandi, Dewi Natasha Rasid
248. Sustainable Property Development: A Challenge 1476
*Mohd Nazaruddin Yusoff, Hooman Abadi, Azlizan Talib, Mohd Nasrun Mohd Nawawi, Nurul Azita Salleh,
Md Azree Othuman Mydin*
249. Effective Leadership as the Mediator between Emotional Quotient and Teachers' Work Performance:
A Study in National Secondary School in Northern States of Peninsular Malaysia 1483
Azizi Abu Bakar, Siti Nur Zahirah Omar
250. Developing a Telehealth Readiness Assessment Framework and Tool for Least Developed Countries:
A case of Yemen 1489
Abdulrahman A Al-Fadhli, Marini Othman, Hussein M Abu Al-Rejal, Bassam A Al-Jamrh
251. Does Rural People Socially Mobile? Evidence from Northern Region of Malaysia 1499
Zalina Zainal, Mukaramah-Harun, Siti Hadijah Che Mat
252. The Preceding Role of Social: Innovation, Knowledge, Capital and Entrepreneurship as Mediating
Effects in Building Malaysian SME Business Performance 1509
Jamal Mohammed Esmail Alekam, Shahrina Othman, Mohd Rizam Md Ladin, Ahmad Said Alshuaibi
253. Examining Level of Spirituality among Malaysian Youth 1515
*Nik Safiah Nik Abdullah, Abdullah Abd Ghani, Selamah Maamor, Norazlina Abd Wahab, Mohd Shahril
Ahmad Razimi, Ahmad Bashir Aziz, Nor Hanim Elias*
254. Enhancing Construction Health and Safety through the Practices of Reuse and Recycle in
Waste Management among Malaysian Contractors 1521
*Mohd Nasrun Mohd Nawawi, Najuwah Mohd Nasir, Rahimi Abidin, Nurul Azita Salleh, Aizul Nahar Harun,
Wan Nadzri Osman, Md Fauzi Ahmad*
255. Readiness for Shared Services in Higher Learning Institution: A Pilot Study 1527
Juraifa Jais, Prashalini Naidu, Nor Hazlin Nor Asshidin, Maslinda Md Yusof

256. Doctrine of Good Faith in Contracts: A Comparison between Conventional and Islamic Laws 1534
Yusuf Sani Abubakar, Ahamad Faosiy Ogunbado, Mpawenimana Abdallah Saidi
257. Wireless Based Human Health Monitoring and Fall Detection Using GSM 1541
S. Vaishnodevi, S. Mathankumar, G. Ramachandran, A. Malarvizhi
258. Traditionalist and Pro-Tajdid Method of Argument in the Ahlus Sunnah Wal Jama'ah School of Thought in Malaysia 1545
ShukriAhmad, Mohd Akram Dahaman, SobihatunAbdul Salam, Mohamad Khadafi Rofie, KamarudinNgah
259. Vocational Schools Leadership Reinforcement Model 1549
Jumintono, Suyatno, Muhammad Zuharty, Hamdan Said
260. Estimating Optimal Resource Capacities in Emergency Department 1558
Ireen Munira Ibrahim, Choong-Yeun Liong, Sakhinah Abu Bakar, Norazura Ahmad, Ahmad Farid Najmuddin
261. A System Dynamics Model for Predicting Present and Future Demands in Emergency Department's Green Zone 1566
Nazhatul Sahima Mohd Yusoff, Choong-Yeun Liong, Abu Yazid Md Noh, Wan Rosmanira Ismail, Norazura Ahmad
262. The Perceptions of Residents toward Safeness of Living Vicinity of Telecommunication Base Station 1573
Norazmawati M. S., Muhammad Arkam C. M., Kai X T
263. Bayesian Spatial Survival Models for HIV/AIDS Event Processes in East Java 1586
Nur Mahmudah, Nur Iriawan, Santi Wulan Purnami
264. Survival Analysis of Chronic Kidney Disease Patients using Stratified Cox Regression in Arifin Achmad Hospital, Pekanbaru, Riau 1592
Muhammad Muhajir, Cynthia Hazirah Imanina
265. Principles of Skin Cancer Detection in Image Processing: Challenges and Techniques 1601
A. Omar Adil Dheyab, B Rahmatullah, C. M. Hashim
266. Workplace Stress Experienced by Contractor in Malaysian Construction Industry 1608
Roshartini Omar, Aina Mardia Sallehudin
267. The Effect of Living nearby Telecommunication Base Station: From the Residents' Feeling 1617
Norazmawati M. S., Muhammad Arkam C. M.², Kai X. T.
268. What Do Undergraduates Think About Green Investment? Empirical Evidence From A Developing Nation 1627
Kar Hoong Chan, Tuan Hock Ng, Almowallad Fadi
269. Commitment on Corporate Social Responsibility by the Government Link Companies in Malaysia 1633
Rozita Arshad, Zalinah Ahmad, Kalthum Hassan
270. GSM and GPS Based Solid Waste Mangement for Smart Cities 1641
A. Chaitanya krishna, K. Subramanyam Chary, K. Anil Kumar
271. Inter Region Minutiae Transitive Measure Based Finger Print Analysis for Forgery Detection in Health Care Systems 1646
Vinoth A, S. Saravana Kumar

272. Lempel-Ziv-Oberhumer Coding (LZOD) for Reducing Congestion in MANET 1654
N. Nisha Rosebel, E. Logashanmugam
273. The Development of Mypobes-PAF: A Health Education Program with Child-Friendly Approach to Prevent Obesity among Children 1661
A. M., Maziah, R., Saemah
274. The Use of Plants in Traditional Medicine among the Siamese Community in Kedah 1672
Salmah Omar, Rafidah Mohamad Cusairi
275. The Spread Area of Malaria Vector in Timor Island, East Nusa Tenggara Province 1682
Muhammad Kazwaini, Chatarina U. Wahyuni, Monika Noshirma
276. Developing Community Resilience as a Supporting System in the Care of People with Mental Health Problems in Indonesia 1687
Retno Lestari, Ah Yusuf
277. Effects of Knowledge of Vitamin D on Attitudes toward Sun Exposure among Middle-Aged and Elderly Indonesian Adults 1692
Rivan Virlando Suryadinata, Bambang Wirjatmadi, Merryana Adriani, Sri Sumarmi
278. The Effects of Age and Body Mass Index on Blood Glucose, Blood Cholesterol, and Blood Pressure in Adult Women 1697
Riza Fikriana, Shrimarti Rukmini Devy
279. The Antioxidant Activity and Organoleptic Properties of Soursoup Leaf Tea (*Annona Muricata* L.) and Moringa Leaf (*Moringa Oliefera* L.) in Combination with Guava Leaf (*Psidium Guajava*) 1703
Roy J. Irawan, Trias Mahmudiono
280. Parent Communication Regarding Sexual and Reproductive Health of Adolescent: A Qualitative Systematic Review 1708
Fransiska Imavike Fevriasanty, Oedojo Soedirham
281. Five Types of Personality and the Locus of Internal Control in relation to Preeclampsia Pregnancy 1714
Lusiana Meinawati, Kusnanto Kusnanto, Oedojo Soedirham
282. The Effect of Diabetes Self-Management Education, Based on The Health Belief Model, on the Psychosocial Outcome of Type 2 Diabetic Patients in Indonesia 1718
Rondhianto, Kusnanto, Soenarnatalina Melaniani
283. How does the Dayak Ngaju Community Treat Malaria? A Qualitative Study on the Use of Traditional Medicine in Central Kalimantan Province, Indonesia 1724
Trilianty Lestarisa, Soedjajadi Keman
284. The Effect of Young Coconut Water against Morning Sickness among Women in the First Trimester of Pregnancy 1729
Tri Ratna Ariestini, Windhu Purnomo
285. Factors Affecting the Incidence of Chronic Energy Deficiency among Pregnant Women Attending the Pulubala Community Health Centre 1734
Zuriati Muhamad, Sri Sumarmi
286. Implementation of Birth Preparedness and Complication Readiness (BPCR) in High Risk Pregnancies 1739
Ika Mardiyanti, Nursalam, Arief Wibowo

287. Access to Healthcare Facilities in Poor and Underdeveloped Areas in Nusa Tenggara Timur Province 1745
Yendris Krisno Syamruth, H. Kuntoro
288. The Effect of Doctor Professionalism on the Quality of Medical Services at a First Level Health Facility 1751
Febri Endra B. S., Stefanus Supriyanto, Rubayat Indradi, Aditya Rizka R
289. Self-Help Group Therapy: The Enhancement of Self-Care Ability and Quality of Life Among the Elderly in Bali, Indonesia 1757
I Wayan Suardana, Ah Yusuf, Windhu Purnomo
290. Healthy Nurses for a Quality Health Care Service: A Literature Review 1762
Dodi Wijaya, Nyoman Anita Damayanti
291. The Support of the Family toward Children with Autism Spectrum Disorder 1767
Siti Maemonah, Hamidah, Nyoman Anita Damayanti, Enung Mardiyana Hidayat, Aida Novitasari, Qorry Aina, Wina Tryas Fatima
292. Family Factors Associated with Quality of Life in Pulmonary Tuberculosis Patients in Surabaya, Indonesia 1772
Dhian Satya Rachmawati, Nursalam, Arief Wibowo, Astrida Budiarti, Riza Agustin
293. Parenting Style Based on the Mother's Personal Mastery and the Mother-Child Attachment in Relation to Child Feeding Disorders: A Qualitative Study 1777
Ni Putu Sudewi, Oedojo Soedirham, Ahmad Suryawan
294. Factors Associated with Onset to Hospital Delay among Stroke Patients in the Emergency Department 1782
Abdulloh Machin, Muhammad Hamdan
295. Analysis of The Influence of Hersey-Blanchard Leadership and Nurse Maturity on Caring Behaviour Performance Based on Patient Perception 1787
Minarni Wartiningsih, Stefanus Supriyanto, Sri Widati, Danoe Soesanto
296. The Relationship of Socio-Economic and Genetic Factors with Toddler Stunting at Kenjeran Public Health Center Surabaya 1792
Dwi Ernawati, Puji Hastuti, Dhian Satya Rachmawati, Ari Susanti, Christina Yuliastuti, Merina Widyastuti, Mieke Izzatul Mahmudah
297. Cultural Religiosity as the Determinant Factor of a Successful Healthy City in South Kalimantan, Indonesia 1797
Herawati, Shrimarti R. Devy
298. The Relationship between Response Time and Patient Survival with Emergency Treatment by the Code Blue Team 1803
Al Afik
299. The Influence of Nurse's Knowledge Level on Behaviour Changes, Attitude and 5 Moments of Hand Hygiene Compliance 1808
Danoe Soesanto
300. The Role of Posyandu Cadres in Improving the Growth and Development of Toddlers in RW VII Puskesmas Mojo, Surabaya 1813
Enung Mardiyana Hidayat, Rini Ambarwati, Indriatie
301. Analysis of the Implementation of Pregnancy-related Health Care Services Through the Continuum of Care Approach in Puskesmas Bukittinggi City 1818
Evi Hasnita, Armita Sri Azhari

302. Feeding Care Patterns of Mothers Working as Shellfish Peelers on Children's Nutritional Status at Integrated Health Posts in Coastal Areas 1823
Meiana Harfika, Zhakiyah Saraswati, Dya Sustrami, Lela Nurlela
303. The Relationship between Socioeconomic Status and Personality Type with Depression in Adolescents 1828
Oktavianis, Rahmi Sari Kasoema
304. Consumption Patterns, Energy Adequacy, and The Nutritional Status of Softball Players 1834
Ratna Candra Dewi, Bambang Wirjatmadi
305. Compliance with Smoke-Free Legislation and Associated Factors: A Serial Survey in Bali, Indonesia 1840
Ketut Suarjana, Artawan Eka Putra, Putu Ayu Swandewi Astuti, Ketut Hari Mulyawan, Djazuly Chalidyanto
306. The association of Pre-Pregnancy Body Mass Index (BMI) and Increased Maternal Weight in the Third Trimester of Pregnancy with Foetal Weight Estimation 1846
Siti Maimuna, Andina Firdaus Supriyanto
307. The Effectiveness of Bay Leaf Extract (*Syzygium Polyanthum*) in Inhibiting the Growth of *Candida Albicans* 1851
Suratih, Dewa Ayu Ketut Surinati, Dewa Made Ruspawan
308. The Presenting Symptoms as a Predictor of the Hospital Arrival Time Intervals of Patients with Acute Coronary Syndrome 1856
Tony Suharsono, Shynatry Ayu Andhika, Ahmad Hasyim Wibisono, Tina Handayani
309. Factors Influencing the Husband's Participation in Pregnancy Care in Surabaya City, Indonesia 1861
Nurul Fitriyah, Windhu Purnomo, Noviasari Reksohadi
310. Exploration of the Daughters' Feelings Related to Accepting their Mother's Condition of Having Breast Cancer in East Java, Indonesia 1866
Sirli Mardiana Trishinta, Retty Ratnawati, Septi Dewi Rachmawati
311. Mapping Customers: A Case Study of a University Hospital in Indonesia 1871
Purwaningsih, Nyoman Anita Damayanti, Nasronudin, Thini Nurul Rochmah
312. Structural Model of the Factors Related to the Family Resilience of Stroke Patients in Indonesia 1875
Nikmatul Fadilah, Kusnanto, Nursalam, Minarti³, Asnani
313. A Gender Analysis of Traditional Contraceptive Use in Sikka District, East Nusa Tenggara, Indonesia 1881
Rut Rosina Riwu, Sarci Magdalena Toy, Daniela L. A. Boeky, Conrad L. H. Folamauk
314. The Relationship between Sexual Behavior and the Prevalence of HIV/AIDS among Homosexual Men in Bukittinggi City, Indonesia 1887
Nurhayati, Wahyu Salendri
315. The Nutritional Status of Children Aged 1-3 Years Old Based on Food Processing Techniques in Surabaya 1892
Qori'ila Saidah, Yudi Handoko, Nur Chabibah, Sri Anik Rustini, Nuh Huda, Dwi Priyantini, Dini Mei Widayanti
316. Mammary Gland in Supporting the Lactation Process: A Review 1896
Thontowi Djauhari Nur Subchi, Merryana Andriani
317. The Safety and Efficacy of Ligasure using in Radical Cystectomy 1901
Ehab Jasim Mohammad

318. Tubal Patency and Pregnancy Rate Following Surgical and Medical Treatments of Ectopic Pregnancy 1906
Wassan R. Alkhafajy, Firas F. Alyaseen
319. The Possible Role of Interleukin-17A Elevation in the Development of Chronic Fatigue Syndrome ... 1911
Mohammed A. Jawad Kadhum
320. Evaluation of Seminal Plasma Anti-Mullerian Hormone Levels and Their Association with Sperms' Count and Activity in Infertile Males 1916
Thikra M. Muhammed, Hiba M. Saleem, Saleem O. Alkawla
321. Association of miR-499 Gene Polymorphism with Some Hormones in type 2 Diabetes Mellitus Patients 1921
Israa Harjan Mohsen, Haider Kamil Zaidan, Ishtar Munim Nassir, Ali Hmood Al-Saadi, Mona N. Al-Terehi, Methaq J. Al-Jboori
322. Outcome of Celiac Disease after Two Years of Gluten-Free Diet 1926
Abbas Mohammed Hussein Al-Shebani
323. Immunological Assessment for Children Infected with **Human Metapneumovirus** (hMPV) 1932
Venus H. AL-Safar, Mohammed A. K. Al-Saadi, Adnan H. Al-Jothery

Application of Different Controllers and their Evaluation for Super Heater Temperature Control in Thermal Power Plant

A. Yasmine Begum¹, M. Balaji², G V Marutheeswar³

¹Associate Professor, Department of Electronics and Instrumentation Engineering, ²Assistant Professor, Dept. of ECE, ³Professor, Dept. of Electrical Engineering, Sree Vidyanikethan Engineering College, Tirupati, India

ABSTRACT

Superheaters are heat exchangers that transfer energy from flue gas to superheated steam. Controlling of steam temperature at the superheater outlet is a very difficult task in thermal power plant. A superheater model and an appropriate optimal control strategy are the essential tools for improving the accuracy of this control system. Superheater is simulated as a unit of a control loop that generates steam of desired state values. To simulate the steam superheater on the computer, the heat exchanger assembly is described by sets of non-linear partial differential equations (PDE). The equations are then solved by modified finite difference method. A linearized model of the superheater is identified using system identification tool box in order to design optimal control strategies for Superheated Steam (SHS) temperature system. Then to tune Proportional Integral Derivative (PID) controller parameters optimally, different tuning schemes were applied to superheated steam temperature system. However, due to new challenges in keeping up with rapid changes in load demand and the transients, performance of the PID controller is far from being optimal. Hence a Model Predictive Controller (MPC) is designed for the superheated steam temperature regulation in a supercritical coal-fired power plant. Compared with the performance of the plant using a conventional PID controller, the steam temperature controlled by the MPC is found to be more optimal which leads to more efficient plant operation and energy saving.

Keywords: Superheater; Temperature Control; PID Tuning; MPC.

INTRODUCTION

One of the most challenging control loops is steam temperature control loop in a power plant boiler. The reason behind it is, highly non-linear and it has quite a long dead-time and time lag. Another challenge is that the steam temperature is affected by the boiler load, air flow rate, the amount of soot produced in the boiler tube and the combustion of burners in service. The thermal efficiency of the boiler-turbine unit is improved when the steam from the boiler drum is superheated. The steam temperature above 538 °c if left for even a shorter period brings damage by shortening the usable life of the boiler and the turbine. Therefore, the steam temperature has to be maintained constant to minimize the thermal stress on boiler-turbine unit.

LITERATURE SURVEY

Design of controller for a boiler-turbine unit has gained more popularity in the past years. Advanced

control strategies like Fuzzy control, Predictive control, LQG/LTR and H_∞ control are applied to improve the performance of a thermal power plant and the simulation studies shown by modern control techniques are encouraging compared with the PID controller ^[1]. PID controller can be implemented easily and quickly for any process in the industry.

To design a controller for a single variable stable system a FOPDT model is mostly preferred. The underlying theme is that a simple model is sufficient to study the essential dynamics of the system. Maffezzoni et al., 1997 proposed a simple model to tune controller for a boiler-turbine unit. Wen Tan et al., 2004 proposed a simple two-by-two model for a boiler-turbine unit and it captured the essential dynamics of the unit. In this model a PID control structure is derived and a tuning methodology for a simple two-by-two model of a boiler-turbine unit is proposed ^[2]. Tan et al., 1999 proposed a reduction procedure for a PID controller for a

centralized controller. He compared the performance of the final PI controller with the original loop-shaping H_∞ controller for a boiler-turbine unit and he showed that the performance of final PI controller did not degrade much with the original loop-shaping H_∞ controller^[3].

The Model Predictive Heuristic Control (MPHC) algorithm is first developed by Richalet et al., 1978^[4], which is followed later by a number of other such algorithms, including Dynamic Matrix Control (DMC), Quadratic Dynamic Matrix Control (QDMC)^[5], Generalized Predictive Control (GPC)^[6], and Shell Multivariable Optimizing Controller (SMOC)^[7]. All these algorithms make use of linear process models to predict the future moves of the control variables. It has been demonstrated that the predictions made via the linear model are effective in calculating the next values for the control variables. Fu et al., 2013^[8] proposed a DMC controller for steam temperature control and the proposed controller is tested in a power plant simulator and in a field operating coal-fired power plant having a drum boiler. Simulation tests showed that the DMC control strategy outperformed the PID controllers.

Sanchez et al., 2004^[9] developed a DMC and a Fuzzy controller to regulate the steam temperature in a 300 MW power plant. The controller performance is compared to an existing PID, and the test results showed tighter temperature control when advanced control strategies were used. Clarke et al., 1988^[10] developed MPC using GPC algorithm, which became popular both in academic studies and in industry applications.

Advantage of this algorithm is that it can be used with unstable and non-minimum phase plants. Here the GPC controller showed good performance against the existing PID controller for regulating the superheated steam temperature in a coal-fired thermal power plant. Lemos et al., 2010 developed a novel predictive controller called MUSMAR to a superheater which consist of single attemperator and two heat exchangers and he showed that performance of MUSMAR is better than the conventional controller^[11].

Hlava et al., 2011 designed a predictive control strategy for a complex superheater which consist of several superheaters, reheaters and several spray

type attemperators. The predictive controller strategy is based on switched linear models of a complex superheater. Simulation results proved that significant performance improvement is achieved using MPC when compared with the traditional controller. It is easy to implement a PID controller but the benefit of advanced control strategy is improvement in its performance. There is always a trade-off between ease to use and tune and cost to implement^[12].

MATHEMATICAL MODEL OF SUPERHEATER

For flue gas, the Reduced energy equation is expressed as

$$\frac{C_p \rho_2 F_2}{\alpha_{s2} O_2} \left[u_2 \frac{\partial T_2}{\partial x} + \frac{\partial T_2}{\partial t} \right] + (T_2 - T_s) = 0$$

From burned gases to steam via the wall, the Heat transfer equation is expressed as

$$\frac{\partial T_s}{\partial T} - \frac{T_1 - T_s}{C_s G} - \frac{T_2 - T_s}{\alpha_{s1} O_1} - \frac{T_2 - T_s}{\alpha_{s2} O_2} = 0$$

The continuity equation for steam is expressed as

$$\frac{1}{F_s} \left\{ F u_1 \left(\frac{\partial \rho_1}{\partial p_1} \frac{\partial p_1}{\partial x} + \frac{\partial \rho_1}{\partial T_1} \frac{\partial T_1}{\partial x} \right) + u_1 \rho_1 \left(\frac{\partial F}{\partial p_1} \frac{\partial p_1}{\partial x} + \frac{\partial F}{\partial T_1} \frac{\partial T_1}{\partial x} \right) + \rho_1 \left(\frac{\partial F}{\partial p_1} \frac{\partial p_1}{\partial t} + \frac{\partial F}{\partial T_1} \frac{\partial T_1}{\partial t} \right) \right\} + \frac{\partial u_1}{\partial x} = 0$$

Newton's equation for steam is expressed as [13]

$$\frac{\partial p_1}{\partial x} + \rho_1 u_1 \frac{\partial u_1}{\partial x} + \rho_1 \frac{\partial u_1}{\partial t} + \rho_1 g \sin(\theta) + \frac{\rho_1 \lambda_1 u_1 |u_1|}{2d_n} = 0$$

The Energy equation for steam is expressed as

$$\frac{\partial}{\partial t} \left\{ \rho_1 \left(C_1 T_1 + \frac{u_1^2}{2} \right) \right\} + \frac{\partial}{\partial x} \left\{ \rho_1 u_1 \left(C_1 T_1 + \frac{u_1^2}{2} \right) \right\} + \frac{\partial}{\partial x} \{ C_1 U_1 \} + \frac{\partial}{\partial x} \{ \rho_1 u_1 g z \} - \alpha_{1s} O_1 (T_s - T_1) \frac{1}{F} = 0$$

Table I: Relevant parameters for the superheater dynamic model

Parameters	Description
$T_1(x, t)$	Steam temperature, °c
$T_2(x, t)$	Flue gas temperature, °c
$T_s(x, t)$	Temperature of the wall of the heat exchanging surface of the superheater, °c
$P_1(x, t)$	Pressure of steam, Pa
$u_1(x, t)$	Velocity of steam, m/s

Conted...

$P_2(0,t)=P_2(x,t)$ $= P_2(L,t)$	Pressure of flue gas, Pa
$u_2(0,t)=u_2(x,t)$ $= u_2(L,t)$	Velocity of flue gas, m/s
X	the state variable along the active length of the wall of the heat exchanging surface of the superheater
T	time, sec
$c_1 = c_1(P,T)$	heat capacity of steam at constant pressure, J/kg/K
$c_2 = c_2(P,T)$	heat capacity of flue gas at constant pressure, J/kg/K
c_s	heat capacity of superheater's wall material, J/kg/K
d_n	diameter of pipeline, m
$F_1 = F_1(x)$	steam pass cross section, m ²
$F_2 = F_2(x)$	flue gas channel cross section, m ²
G	acceleration of gravity, m/s ²
$G = G(x)$	weight of wall per unit of length in x direction, kg/m
L	active length of the wall, m
$O_1 = O_1(x)$	surface of wall per unit of length in x direction for steam, m
$O_2 = O_2(x)$	surface of wall per unit of length in x direction for flue gas, m
$z = z(x)$	ground elevation of the superheater, m
αS_1	heat transfer coefficient between wall and steam, J/m ² /s/K
αS_2	heat transfer coefficient between the wall and flue gas, J/m ² /s/K
$\lambda_1(x)$	steam friction coefficient, l
θ	superheaters constructional gradient, l
$\rho_1 = \rho_1(P,T)$	density of steam, kg/m ³
$\rho_2 = \rho_2(P,T)$	density of flue gas, kg/m ³

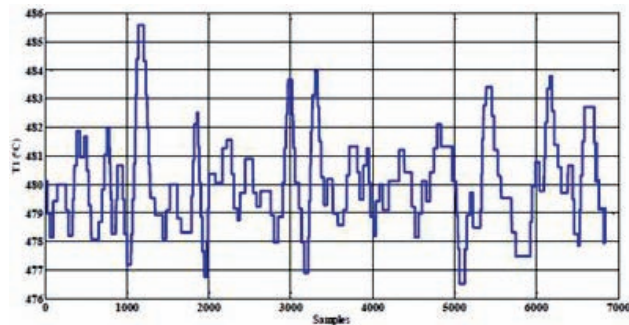


Figure 2: Steam temperature data at the mixer obtained from plant for simulation of the dynamic model of superheater

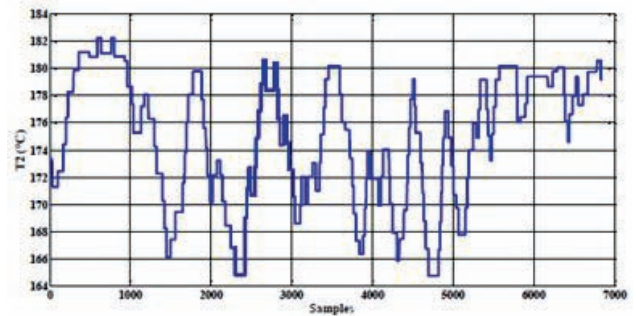


Figure 3: Water temperature data at the mixer obtained from plant for simulation of the dynamic model of superheater

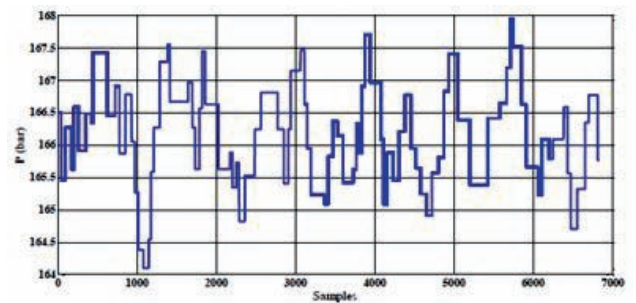


Figure 4: Steam pressure data at the mixer obtained from a plant for simulation of the dynamic model of superheater

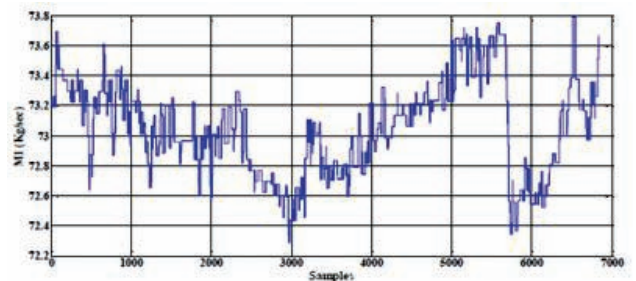


Figure 5: Steam quantity data at the mixer obtained from a plant for simulation of the dynamic model of superheater

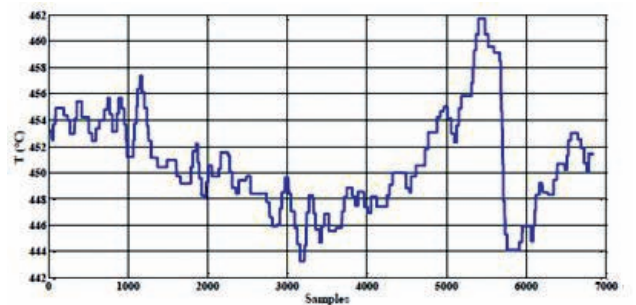


Figure 6: Steam temperature at the output of the mixer obtained from plant for simulation of dynamic model of superheater

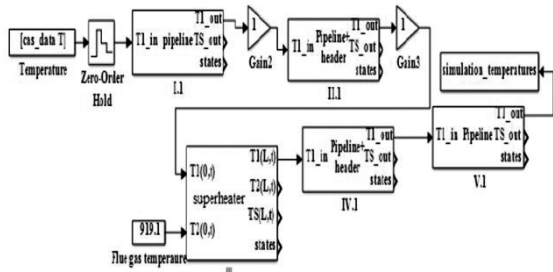


Figure 7: Mathematical modelling of superheater in MATLAB & simulink

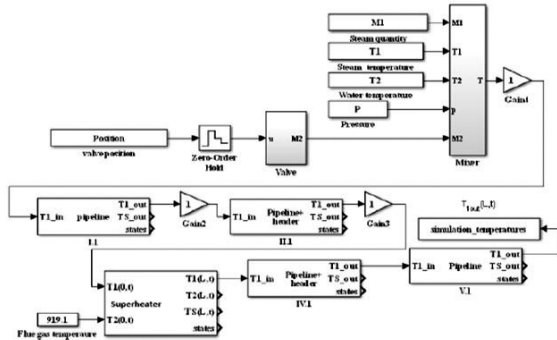


Figure 8: Open loop temperature control using MATLAB and simulink

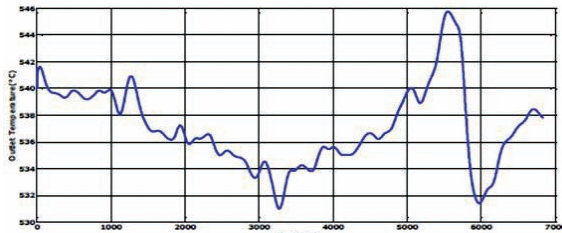


Figure 9: Simulated outlet temperatures at the open loop control system

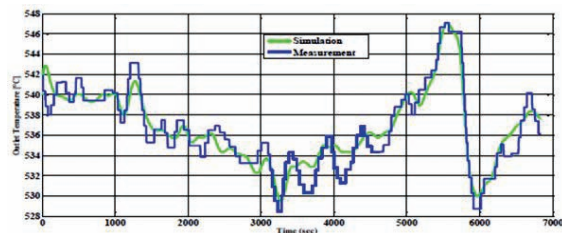


Figure 10: Comparison of measured and simulated outlet temperatures at the open loop control system

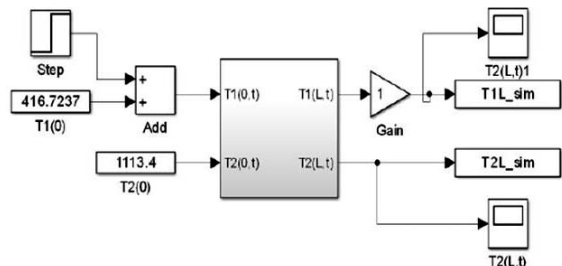


Figure 11: System identification using MATLAB and simulink scheme

The identified transfer function using system identification toolbox in MATLAB is given as

$$G_p(s) = \frac{0.8247}{54000s^3 + 4297s^2 + 113.7s + 1}$$

The identified FOPDT model using transfer function approach is given by

$$G_p(s) = \frac{0.8247}{65.7709s + 1} e^{-47.8911s}$$

Frequency Response based System Identification Algorithm

The First Order plus Dead-Time model for a given plant is represented by

$$G_p(s) = \frac{K}{Ts + 1} e^{-Ls}$$

Where, K is the process gain, T is the time constant and L is the dead-time.

The frequency response of a First Order Plus Dead-Time model is given by

$$G(j\omega) = \frac{K}{Tj\omega + 1} e^{-j\omega L}$$

The ultimate gain K_c is obtained at the crossover frequency ω_c . ω_c is determined from the first intersection of a Nyquist plot with the negative part of the real axis. The resulting equations are

$$\begin{cases} \frac{K(\cos \omega_c L - \omega_c T \sin \omega_c L)}{1 + \omega_c^2 T^2} = -\frac{1}{K_c} \\ \sin \omega_c L + \omega_c T \cos \omega_c L = 0 \end{cases}$$

where k is the gain of the system and it is calculated directly from the given transfer function. The two variables $x_1 = L$ and $x_2 = T$ is defined as [14]

$$\begin{cases} f_1(x_1, x_2) = kK_c(\cos \omega_c x_1 - \omega_c x_2 \sin \omega_c x_1) + 1 + \omega_c^2 x_2^2 = 0 \\ f_2(x_1, x_2) = \sin \omega_c x_1 + \omega_c x_2 \cos \omega_c x_1 = 0 \end{cases}$$

The Jacobian matrix J is denoted as

$$J = \begin{bmatrix} \frac{\partial f_1}{\partial x_1} & \frac{\partial f_1}{\partial x_2} \\ \frac{\partial f_2}{\partial x_1} & \frac{\partial f_2}{\partial x_2} \end{bmatrix}$$

The Jacobian matrix is calculated as

$$J = \begin{bmatrix} -kK_c \omega_c \sin \omega_c x_1 - 2\omega_c^2 x_2 - kK_c \omega_c & kK_c \omega_c^2 x_2 \cos \omega_c x_1 & \sin \omega_c x_1 \\ \omega_c \sin \omega_c x_1 - \omega_c \cos \omega_c x_1 & \omega_c^2 x_2 \sin \omega_c x_1 & \end{bmatrix}$$

The First Order plus Dead-Time model thus identified using the frequency response method is given by

$$G_p(s) = \frac{0.8247}{174s + 1} e^{-37s}$$

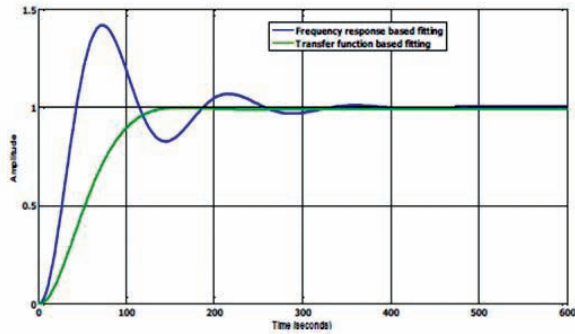


Figure 12: Closed loop step responses

The simulation results are shown in Fig.12. From the responses it is seen that although the PID controller designed with the transfer function identification algorithm looks better, but it does not exhibit overshoot characteristics of Ziegler-Nichols’ tuning method, mostly due to the inaccurately identified parameters of a First Order Plus Dead-Time model. Hence, FOPDT parameters identified by the frequency response based approach are used for tuning of controllers for superheater steam temperature system.

PID control schemes are widely used to satisfy the steam temperature control quality requirements in a thermal power plant. Controller plays a major role to achieve the desired response of the process. In order to reduce thermal stress on the boiler it is important to keep the steam temperature constant at the output of the superheater. Tuning is a process of adjusting controller gains to attain satisfactory control for the superheated steam temperature system. The PID controller is tuned using distinct tuning methods and thus, optimal controller parameters are identified based on the least value of the Integral Time weighted Absolute Error, as it amplifies the effect of even small errors in integral value.

TABLE II: Settings of PID controller tuning for SHS system using various tuning methods

Zeigler Nichol’s step Response method	$K_p = 1.2/L,$ $T_i = 2L,$ $T_d = L/2$
Zeigler Nichol’s Frequency response method	$K_p = 0.6KC,$ $T_i = 0.5TC$ $T_d = 0.12TC$
Chein-Hrones- Reswick settings for set point regulation with 0% overshoot	$K_p = 0.6/a,$ $T_i = T$ $T_d = 0.5L$

Conted...

Chein-Hrones-Reswick settings for set point regulation with 20% overshoot	$K_p = 0.95/a$ $T_i = 1.4T$ $T_d = 0.47L$
Chein-Hrones- Reswick settings for disturbance rejection with 0% overshoot	$K_p = 0.95/a$ $T_i = 2.4L$ $T_d = 0.42L$
Chein-Hrones- Reswick settings for disturbance rejection with 20% overshoot	$K_p = 1.2/a$ $T_i = 2L$ $T_d = 0.42L$
Cohen-Coon Algorithm	$K_p = \frac{1.35}{a} \left(1 + \frac{0.18\tau}{1-\tau} \right)$ $T_i = \frac{2.5-2\tau}{1-0.39\tau} L$ $T_d = \frac{0.37-0.37\tau}{1-0.81\tau} L$
Gain-Phase assignment Algorithm	$K_p = 0.509K_c$ $T_i = 0.051(3.302k+1)K_c$ $T_d = 0.125T_c$

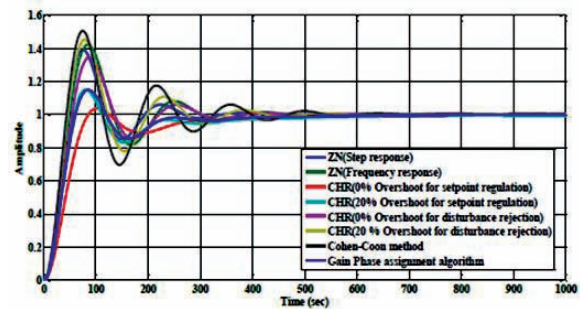


Figure 13: Step response of the SHS system with different tuning methods

The step response of the system tuned using different methods is shown in Fig. 13.

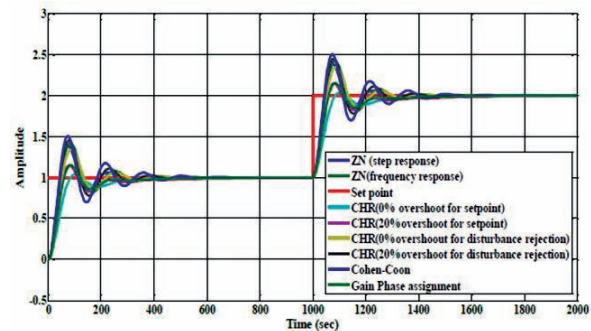


Figure 14: Servo response of the superheated steam temperature system with different tuning methods

MODEL PREDICTIVE CONTROLLER

MPC is an optimization-based control methodology which utilizes a dynamic mathematical model for the calculation of control signal by minimizing a cost function.

The aim of this research work is to replace the PID cascade control loop, which controls the steam temperature at the outlet of the final superheater with a Model Predictive Controller. The block diagram of the MPC based steam temperature control is illustrated in Fig. 15 where T_{set} is the set point temperature and T_{out} is the temperature at the final superheater outlet [15].

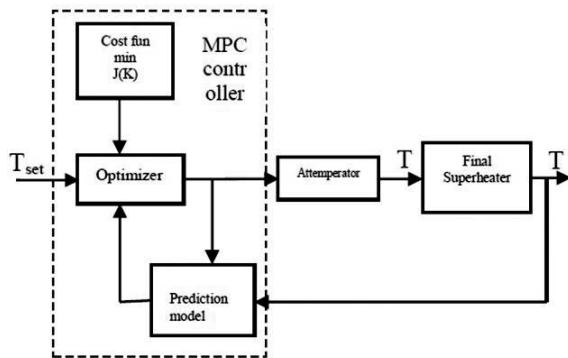


Figure 15: Superheater steam temperature control using MPC

Prediction of State and Output Variables: The sampling instant is taken as k_i , where $k_i > 0$. The state variable vector $x(k_i)$ gives the current plant information. The future control trajectory is given as

$$\Delta u(k_i), \Delta u(k_i + 1), \dots, \Delta u(k_i + N_c - 1)$$

Where N_c is referred as control horizon.

Keeping $x(k_i)$, the future state variables are estimated for N_p number of samples, where N_p is called prediction horizon. The optimization window length is defined as N_p . The future state variables are expressed by

$$x(k_i + 1|k_i), x(k_i + 2|k_i), \dots, x(k_i + m|k_i), \dots, x(k_i + N_p|k_i)$$

Where $x(k_i + m|k_i)$ the predicted state variable at with given current plant information. N_c should be chosen in such a way that it should be lesser than or equal to the prediction horizon.)

The FOPDT model is converted to state space model. Based on the state variables A, B, C, D the future state variables are estimated sequentially using the set of future control parameters.

$$\begin{aligned} x(k_i + 1|k_i) &= Ax(k_i) + B\Delta u(k_i) \\ x(k_i + 2|k_i) &= Ax(k_i + 1|k_i) + B\Delta u(k_i + 1) \\ &= A^2x(k_i) + AB\Delta u(k_i) + B\Delta u(k_i + 1) \\ x(k_i + N_p|k_i) &= A^{N_p}x(k_i) + A^{N_p-1}B\Delta u(k_i) + A^{N_p-2}B\Delta u(k_i + 1) \\ &\quad + \dots + A^{N_p-N_c}B\Delta u(k_i + N_c - 1) \end{aligned}$$

The predicted output variables based on predicted state variables is given as

$$\begin{aligned} y(k_i + 1|k_i) &= CAx(k_i) + CB\Delta u(k_i) \\ y(k_i + 2|k_i) &= CA^2x(k_i) + CAB\Delta u(k_i) + CB\Delta u(k_i + 1) \\ y(k_i + 3|k_i) &= CA^3x(k_i) + CA^2B\Delta u(k_i) + CAB\Delta u(k_i + 1) \\ &\quad + CB\Delta u(k_i + 2) \\ y(k_i + N_p|k_i) &= CA^{N_p}x(k_i) + CA^{N_p-1}B\Delta u(k_i) + CA^{N_p-2}B\Delta u(k_i + 1) \\ &\quad + \dots + CA^{N_p-N_c}B\Delta u(k_i + N_c - 1) \end{aligned}$$

All predicted variables are formulated in terms of current state variable information and the future control movement and where

$$\begin{aligned} y &= [y(k_i + 1|k_i) y(k_i + 2|k_i) y(k_i + 3|k_i) \dots y(k_i + N_p|k_i)]^T \\ \Delta u &= [\Delta u(k_i) \Delta u(k_i + 1) \Delta u(k_i + 2) \dots \Delta u(k_i + N_c - 1)]^T \\ Y &= Fx(k_i) + \Phi \Delta U \end{aligned}$$

Where

$$F = \begin{bmatrix} CA \\ CA^2 \\ CA^3 \\ \dots \\ CA^{N_p} \end{bmatrix}; \quad \Phi = \begin{bmatrix} CB & 0 & 0 & \Lambda & 0 \\ CAB & CB & 0 & \Lambda & 0 \\ CA^2B & CAB & CB & \Lambda & 0 \\ \dots & \dots & \dots & \dots & \dots \\ CA^{N_p-1}B & CA^{N_p-2}B & CA^{N_p-3}B & \Lambda & CA^{N_p-N_c}B \end{bmatrix}$$

Optimization of MPC: For the unit step signal $r(k_i)$ at sampling time k_i , within a prediction horizon the aim of the predictive control system is to bring the predicted output as close to the set point signal. The set point signal remains constant in the optimization window. Then to determine the ‘best’ control parameter vector ΔU in such a way that error between the set point and predicted output is minimized.

The vector that contains information about set point information is assumed as

$$R_s^T = [1 \ 1 \ \Lambda \ 1]^T r(k_i)$$

The cost function J which is the reflection of the control objective is expressed as

$$J = (R_s - Y)^T (R_s - Y) + \Delta U^T \bar{R} \Delta U$$

The first term in the cost function expression is linked to the objective of minimizing the errors between the predicted output and the set point signal. The second term in the cost function expression is linked to the size of ΔU . The objective function J i.e error is to be made as small as possible. The optimal ΔU which minimize J is given as

$$J = (R_s - Fx(k_i))^T (R_s - Fx(k_i)) - 2\Delta U^T \Phi^T (R_s - Fx(k_i) + \Delta U^T (\Phi^T \Phi + \bar{R})) \Delta U$$

The first derivative of the cost function J is denoted as

$$\frac{\partial J}{\partial \Delta U} = -2\Phi^T (R_s - Fx(k_i)) + 2(\Phi^T \Phi + \bar{R}) \Delta U$$

$$j = 0, 1, \dots, N_c - 1$$

The necessary condition of the minimum J is obtained as

$$\frac{\partial J}{\partial \Delta U} = 0$$

The optimal solution for the control signal is given as

$$\Delta U = (\Phi^T \Phi + \bar{R})^{-1} \Phi^T (R_s - Fx(k_i))$$

The matrix $(\Phi^T \Phi + \bar{R})^{-1}$ is called the Hessian matrix. R_s is expressed as

$$R_s = [1 \ 1 \ \Lambda \ 1]^T r(k_i) = \bar{R}_s r(k_i)$$

Where

$$\bar{R}_s = [1 \ 1 \ \Lambda \ 1]^T$$

The optimal solution of the control signal is linked to the set point signal $r(k_i)$ and the state variable $x(k_i)$ through the following equation

$$\Delta U = (\Phi^T \Phi + \bar{R})^{-1} \Phi^T (\bar{R}_s r(k_i) - Fx(k_i))$$

The following parameters of the MPC for the superheater steam temperature system were found to give the optimal performance

Prediction horizon NP = 20

Control horizon NC = 4

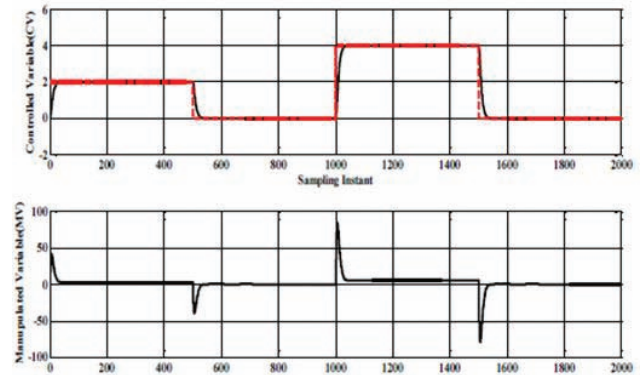


Figure 16: Servo response of the SHS system using Model Predictive Controller

Table III: Comparison of performance indices of various tuning methods

Performance Indices	Zeigler-Nichol's step response method	Zeigler-Nichol's frequency response method	Chein-Hrones-Reswick with 0% overshoot for set point regulation	Chein-Hrones-Reswick with 20% overshoot for set point regulation	Chein-Hrones-Reswick with 0% overshoot for disturbance rejection	Chein-Hrones-Reswick with 20% overshoot for disturbance rejection	Cohen-Coon Tuning algorithm	Gain Phase Assignment algorithm	MPC
Rise time (sec)	35.1027	37.3480	65.9352	45.2258	42.2161	36.0521	32.8126	45.5782	13.9
Settling time (sec)	310.3671	353.4316	445.6775	522.2486	353.5899	398.9422	504.3305	382.1922	23.3867
Settling Min	0.8496	0.8055	0.8873	0.8312	0.8514	0.7793	0.6773	0.8442	0.9011
Settling Max	1.3885	1.4410	1.0360	1.1481	1.3438	1.4505	1.5259	1.1641	1.0011
Overshoot (%)	38.8536	44.0963	3.6049	14.8077	34.3818	45.0507	52.5933	16.4095	0.1112
Peak Amplitude	1.3885	1.4410	1.0360	1.1481	1.3438	1.4505	1.5259	1.1641	1.0011
Peak time (sec)	74.4177	83.2922	102.7807	79.7777	87.0670	77.2940	73.8031	82.0887	36
ISE	26.37	31.38	31.79	26.28	29.82	31.02	34.1	26.95	---
IAE	55.47	68	63.3	64.34	61.88	69.16	80.89	57.6	---
ITAE	4063	6334	7531	10370	5132	6760	9961	6378	58.0269

RESULTS AND DISCUSSION

From the extensive simulation studies on the SHS system, we infer the following PID controller tuned using Zeigler-Nichols' step response method has 38.8536% overshoot, oscillations and ITAE is 4063. The SHS system took about 310.3671 seconds to reach the steady state. PID controller tuned using Zeigler-Nichols' frequency response method has oscillations, 44.0963% overshoot and ITAE is 6334. The SHS system took about 353.4316 seconds to reach the steady state. PID controller tuned using Chein- Hrones- Reswick settings for set point regulation with 0% overshoot has 3.6049% overshoot and ITAE is 7531. The SHS system took about 445.6775 seconds to reach the steady state. PID controller tuned using Chein-a Hrones- Reswick setting for set point regulation with 20% overshoot has 14.8077% overshoot and ITAE is 10370. The SHS system took about 522.2486 seconds to reach the steady state. PID controller tuned using Chein- Hrones-Reswick settings for disturbance rejection with 0% overshoot has 34.3818 % overshoot and ITAE is 5132. The SHS system took about 353.5899 seconds to reach the steady state. PID controller tuned using Chein-Hrones-Reswick settings for disturbance rejection with 20% overshoot has 45.0507% overshoot and ITAE is 6760. The SHS system took about 398.9422 seconds to reach the steady state. PID controller tuned using Gain Phase assignment algorithm has ITAE 6378 and it has 16.4095% overshoot. The SHS system took about 382.1922 seconds to reach the steady state.

The PID controller tuned using Chein-Hrones-Reswick settings for set point regulation with 0% overshoot has less overshoot when compared with other tuning methods. The design, development and implementation aspect of MPC for SHS system is discussed and its performance is studied through simulation. It was found out that MPC has achieved good set point tracking without overshoot, better dynamic response and the least value of ITAE and a good speed of response compared to the other control methods. It would be more appropriate to use this control method in boilers to control the superheater steam temperature with good precision at the optimum value and thereby increases the efficiency of the boiler and turbine.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Super Heater temperature control

REFERENCES

1. W. H. Kwon, S.W.Kim, P.G.Park, "On the multivariable robust control of a boiler-turbine system, *IFAC symposium on Power systems and Power plant control*, Seoul, Korea. (1989) 219-223.
2. Wen Tan, Jizhen Liu, Fang Fang, yanqiao Chen, Tuning of PID controllers for boiler-turbine units, *ISA Transactions*. 43 (2004) 571-583.
3. W. Tan, Y. G. Niu, J. Z. Liu, H ∞ control for a boiler-turbine unit, *IEEE Conference on Control Applications*, Hawaii. (1999) 807-810.
4. J. Richalet, A. Rault, J. Testud, J. Papon, Model predictive heuristic control: Applications to industrial processes, *Automatica*. 14(5) (1978) 413- 428.
5. C.E. Garcia, A. Morshedi, Quadratic programming solution of dynamic matrix control (QDMC), *Chemical Engineering Communications*. 46 (1-3) (1986) 73-87.
6. D. W. Clarke, C. Mohtadi, P. Tuffs, Generalized predictive control–Part I. The basic algorithm, *Automatica*. 23 (2) (1987) 137-148.
7. P. Marquis, J. Broustail, SMOC a bridge between state space and model predictive controllers: application to the automation of a hydro treating unit, *Proceedings of the IFAC Workshop on Model Based Process Control*. (1988) 37- 43.
8. X. Fu, D. Jiang, Y. Zhou, Model identification and predictive control of steam temperature in coal-fired power plant, *International Conference on Power, Energy and Control (ICPEC)*. (2013) 509-513.
9. A. Sanchez Lopez, G. Arroyo Figueroa, A. Villavicencio-Ramirez, Advanced control algorithms for steam temperature regulation of thermal power plants, *Electrical Power and Energy Systems*. 26 (2004) 779-785.
10. D.W. Clarke, Application of generalized predictive control to industrial processes, *IEEE Control system Magazine*. 8(1) (1988) 49-55.
11. J.M.Lemos, P.O.Shirley, R.Neves-Silva and B.A Costa, Adaptive predictive Control of Superheated

- Steam and Economic Performance, Power Plant Applications of Advanced Control Technique, *Process Engineering GmbH*. (2010) 17- 42.
12. J. Hlava, Model predictive control of the superheater temperature based on a piecewise affine model, *UKACC International Conference on Control*, IET. (2010) 1-10.
 13. Pavel Nevřiva, Stepan Ozana, Martin Pies, Modeling and Simulation of Power Plant Superheater in Simulink, In Proceedings of the *International Conference on Circuit Systems, Signals* (CSS'2010) Sliema, Malta. (2010) 180-183.
 14. Pavel Nevřiva, Stepan Ozana, Martin Pies, Simulation of power plant superheater using advanced simulink capabilities, *International journal of circuits, systems and signal processing*. 5(1) (2011) 86- 93.
 15. Mihai Draganescu, Shen Guo, Jacek Wojcik, Jihong Wang, Xiangjie Liu, Guolian Hou, Yali Xue, Qirui Gao, Generalized predictive Control for superheated steam Temperature regulation in a supercritical Coal-fired Power Plant, *CSEE Journal of Power and energy Systems*. 1(1) (2015) 69-76.

Design of Low Power Johnson Counter using Lector Technique Using 50nm Technology

M. Balaji¹, N. Padmaja²

¹Assistant Professor, ²Professor, Dept. of ECE Sree Vidyanikethan Engineering College, A. Rangampet, Tirupati

ABSTRACT

Power dissipation is an important consideration in the design of CMOS VLSI circuits. In the case of battery-powered application, high power consumption leads to reduction in the battery life and affects reliability, packaging and cooling costs. With technology processes advancing towards deep submicron and nano regimes, the scaling down of the threshold voltage levels in turn causes an exponential increase in sub threshold leakage currents leading to increase in leakage power. With the advance of each generation of the fabrication process a five-fold increase in leakage power dissipation is present. Leakage currents flow when the circuit is idle and so power is wasted. Efficient leakage power reduction techniques have become critical for the deep submicron and nanometre circuits. In this paper, a 4-bit Johnson counter is designed using LECTOR technique and is analyzed with different types of sleep techniques. We have used digital schematic editor (DSCH) for designing; simulation and layout generation is done using Micro wind Layout Editor.

Keywords: CMOS, Scaling, Leakage power, D flip-flop, Johnson Counter, Dual sleep, Dual stack, Stacked sleep, LECTOR

INTRODUCTION

Power consumption is one of the top issues of VLSI circuit design, for which CMOS is the primary technology. The power consumption of CMOS consists of dynamic and static components. During the switching of transistor, dynamic power is consumed and regardless of transistor switching static power is consumed. Previously, the dynamic power consumption was (at 0.18 μ technology and above) the single largest concern for low-power chip designers since it accounted for 90% or more of the total chip power. However, as the feature size shrinks, e.g., to 90nm and below, static power has become a great challenge for current and future technologies.^[11,12]

The scaling to nanometer regime has resulted in a rapid increase in leakage power dissipation. Hence, there is a great need to reduce static power dissipation during periods of inactivity. The power reduction has to be achieved without trading-off performance which makes it harder to reduce leakage during normal operation. There are several VLSI techniques to reduce leakage power. Scaling improves transistor density and functionality on a chip. Scaling will increase speed and frequency of operation and hence higher performance. As voltages scale downward with the geometries, threshold voltages should also decrease to gain the performance advantages of the new technology but leakage current increases exponentially. Power gating is one such well known technique where a sleep transistor is placed between actual ground rail and circuit ground (called virtual ground). This device is turned-off in the sleep mode to cut-off the leakage path. In this paper, we describe a new leakage power reduction technique called LECTOR (Leakage Control transistor) for designing 4-bit Johnson counter using CMOS technology. Previous techniques are summarized and compared with our new approach presented in this paper.^[13]

Corresponding Author:

M. Balaji

Assistant Professor, Dept. of ECE
Sree Vidyanikethan Engineering College,
A. Rangampet, Tirupati
Email: balajichaitra3@gmail.com

SLEEP TECHNIQUES

A. Dual Sleep Transistor Approach: Different types of methods are developed for leakage power reduction. One of such methods is dual sleep transistor approach (Fig.1). It uses two extra pull-up and two extra pull-down transistors in sleep mode either in OFF state or in ON state. The dual sleep portion can be made common to all logic circuitry.^[4]

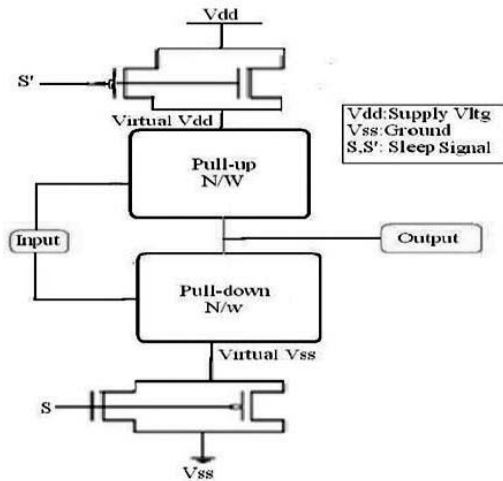


Fig. 1: Dual Sleep Transistor Approach

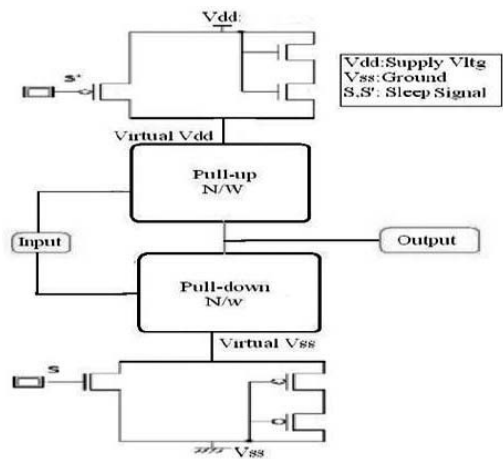


Fig. 2: Dual Stack Approach

B. Dual Stack Approach: In dual stack approach (Fig.2), 2 PMOS and 2 NMOS in the pull down network and pull-up network are used respectively in addition to the sleep transistors. The advantage is that NMOS degrades the high logic level, PMOS will degrade the low logic level.

C. Stacked Sleep Transistor Approach: In this technique, sleep transistor was getting stacked, which reduces the leakage current to great extent. This technique uses two stacked sleep transistors

in power supply rails and two stacked sleep transistor in ground. Thus leakage reduction takes place in two steps. Firstly, due to stack effect of sleep transistor and secondly due to sleep transistor itself. It is well known fact that NMOS are not efficient in passing the power supply. But in this technique, stacked sleep transistor will use PMOS in the power supply and NMOS in the ground for maintaining exact logic state of the circuit.^[1,2]

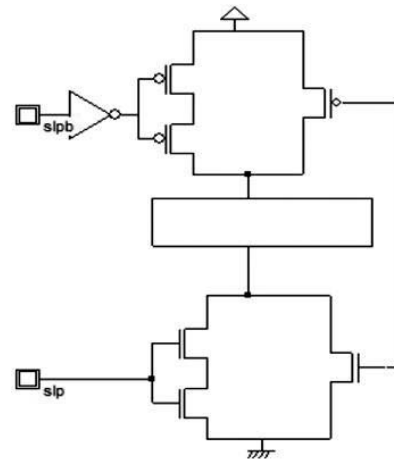


Fig. 3: Stacked Sleep Transistor Approach

PROPOSED TECHNIQUE

The proposed technique for leakage reduction in CMOS circuits is called LECTOR. It provides two Leakage Control Transistors (LCTs), a p-type and a n-type within the logic gate and the source terminal of each LCT controls the gate terminal of the other. LECTOR is effective in both idle and active states of the circuit results in better leakage reduction. Either one of the two LCTs is always “near its cut-off voltage” for any input vector combination, thus increasing the stacking effect without any additional control signals.

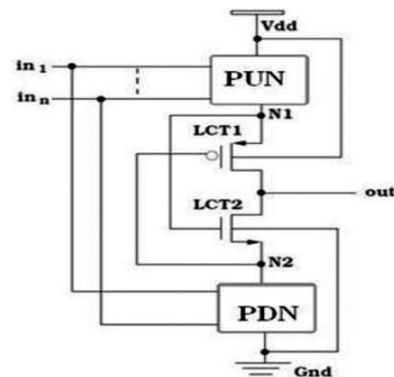


Fig. 4: Lector technique

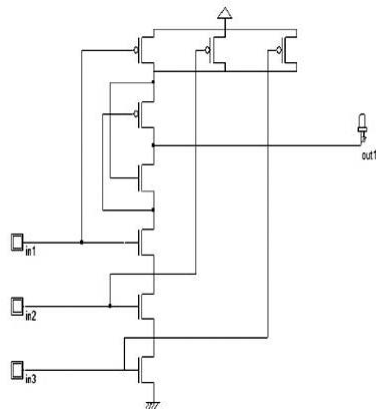


Fig. 5: 3-input NAND gate using Lector

It works based on the fact that a state with more than one transistor off in a path from supply voltage to ground is far less leaky than a state where only one transistor is off in any supply to ground path. The LCTs are self-controlled and do not require any control logic unlike in the popularly used sleep transistor method.[12]

PROPOSED TECHNIQUE

A. D flip-flop circuit: The D flip-flop with set/reset, shown in the figure is implemented using Digital schematic software (dsch2) for logic verification. It is then implemented using conventional CMOS technology, dual sleep approach, dual stack approach, stacked sleep approach and finally using LECTOR technique.

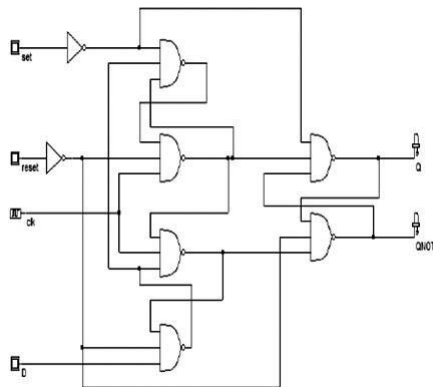


Fig. 6: D flip-flop

B. Johnson counter: Counter is a device that stores the number of times a particular event or process occurs often in relation to a clock signal. Counters are used in almost all the digital circuits for counting operations. Johnson counter also called as twisted ring counter is the modified form of a ring counter. It is implemented using storage

elements like D flip-flops. In Johnson counter output of the last stage is complemented and connected to the input of the first stage. A new schema symbol is made for the D flip-flop circuits and is used in the implementation of Johnson counter in dsch2 software.[17]

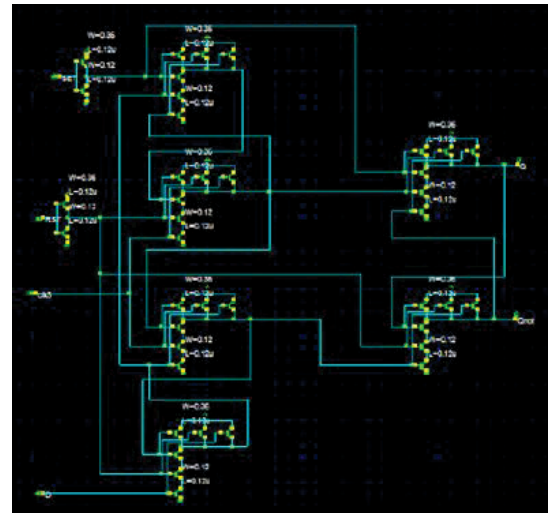


Fig. 1: D flip-flop using CMOS technology

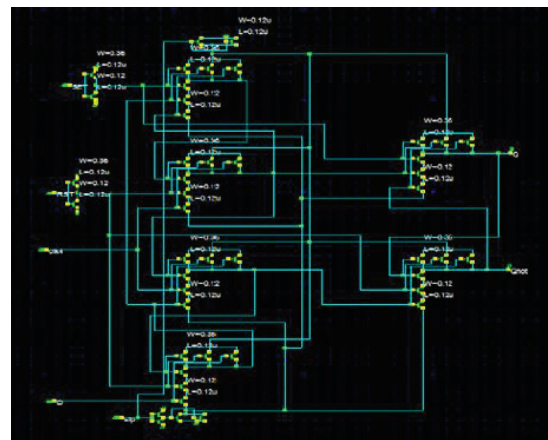


Fig. 2: D flip-flop using dual sleep

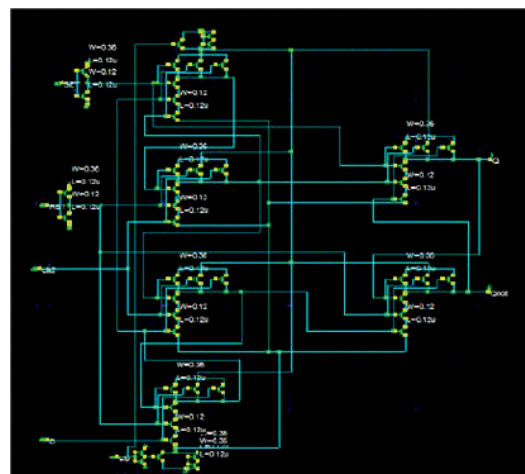


Fig. 3: D flip-flop using dual stack

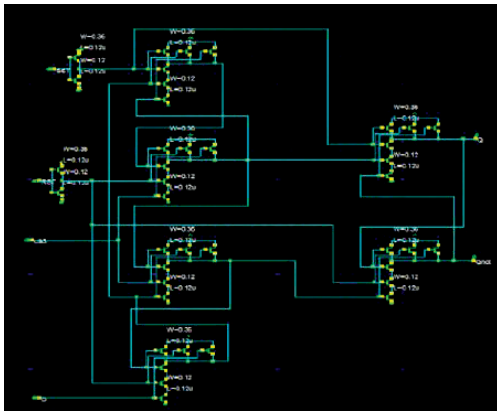


Fig. 4: D flip-flop using sleepy stack

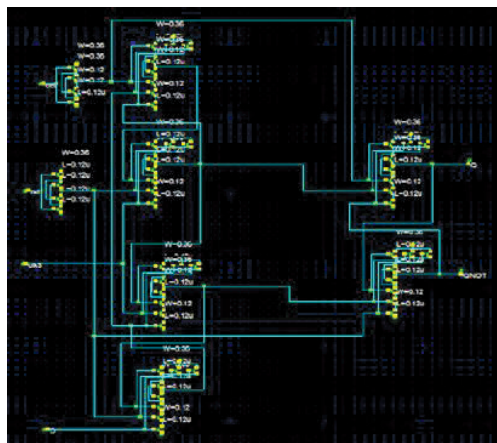


Fig. 5: D flip-flop using lector

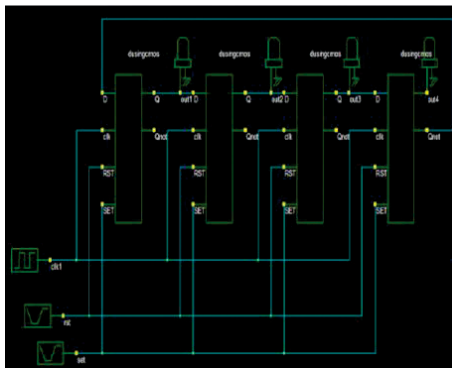


Fig. 6: Johnson counter using CMOS

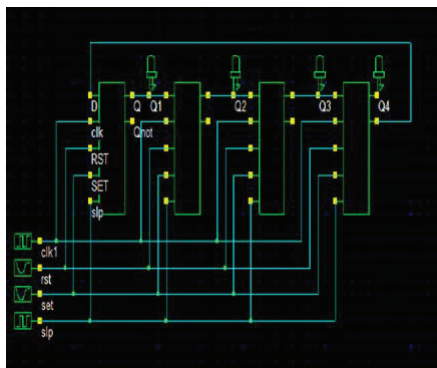


Fig. 7: Johnson counter using dual sleep

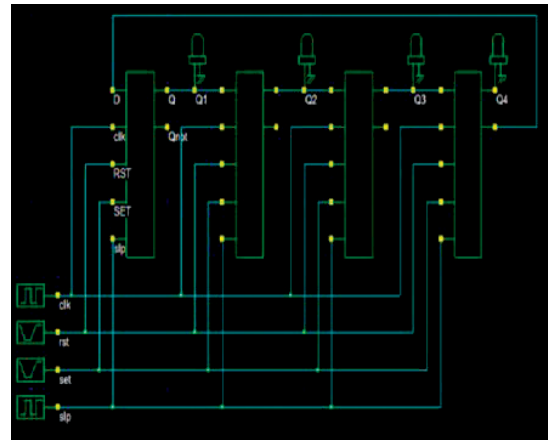


Fig. 8: Johnson counter using dual stack

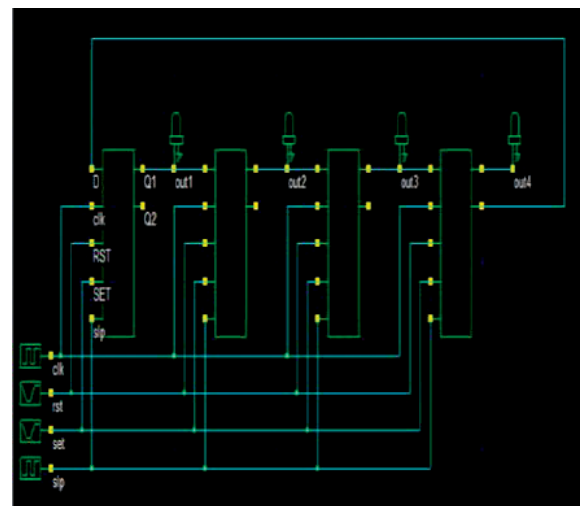


Fig. 9: Johnson counter using stacked sleep

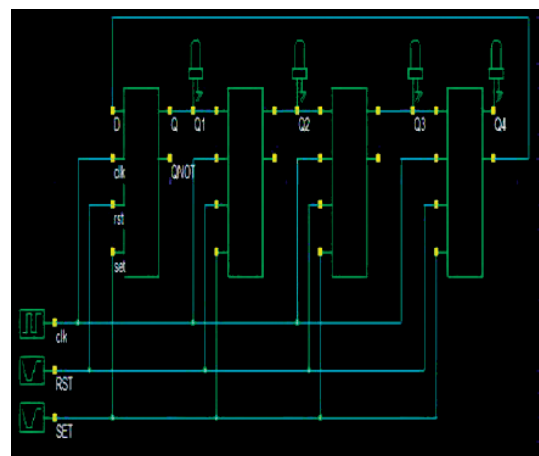


Fig. 10: Johnson counter using lector

SIMULATION RESULT

For circuit design and logic verification we use DSCH2 (Digital Schematic), for CMOS layout verification and power calculation of the circuit we use Microwind Layout Editor.

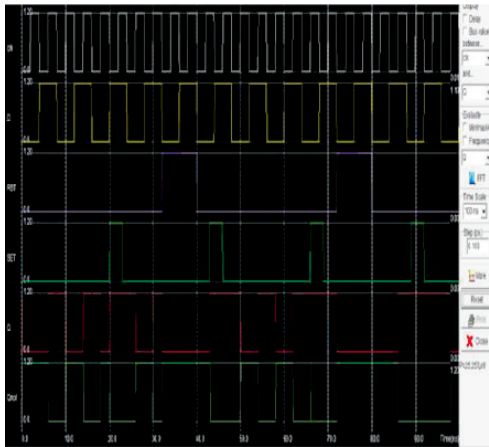


Fig. 11: D flip-flop using CMOS

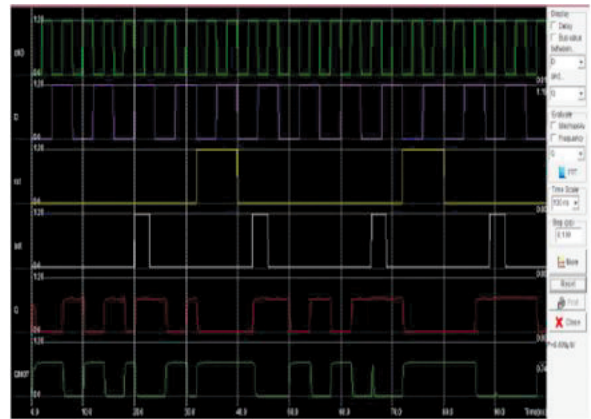


Fig. 15: D flip-flop using lector

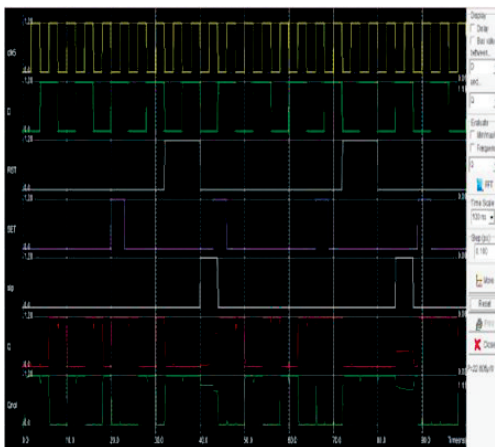


Fig. 12: D flip-flop using dual sleep

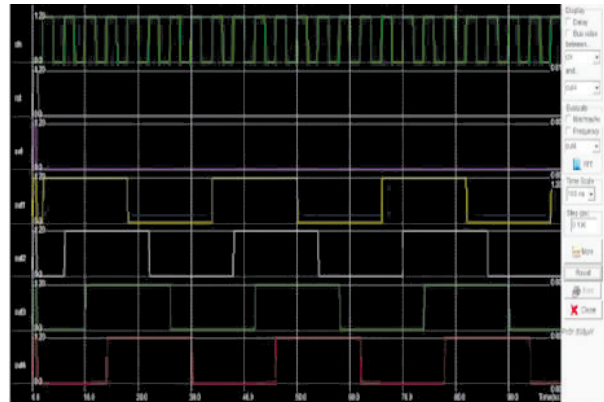


Fig. 16: Johnson counter using CMOS

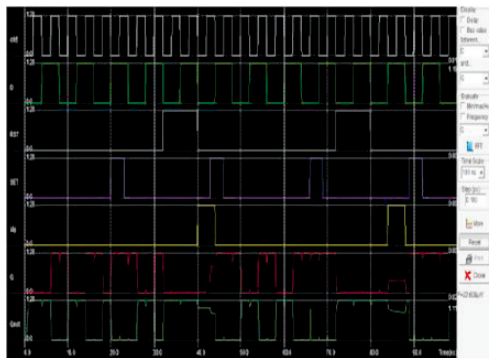


Fig. 13: D flip-flop using dual stack

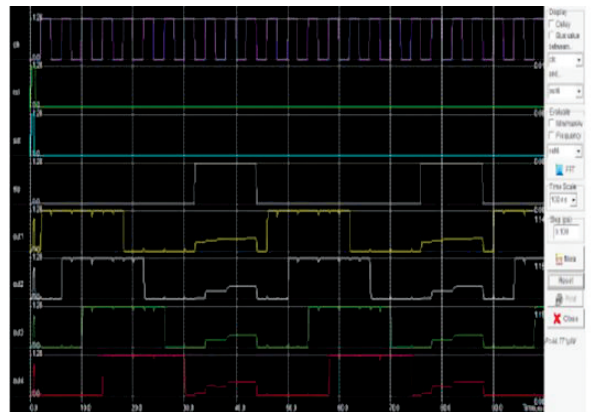


Fig. 18: Johnson counter using dual sleep

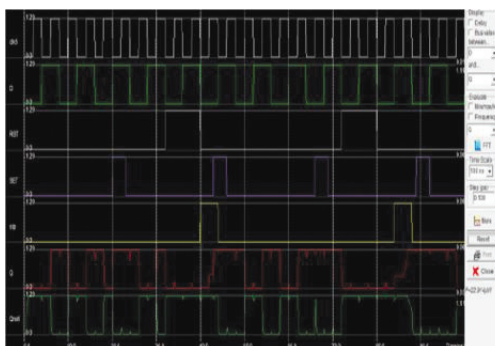


Fig. 14: D flip-flop using stacked sleep

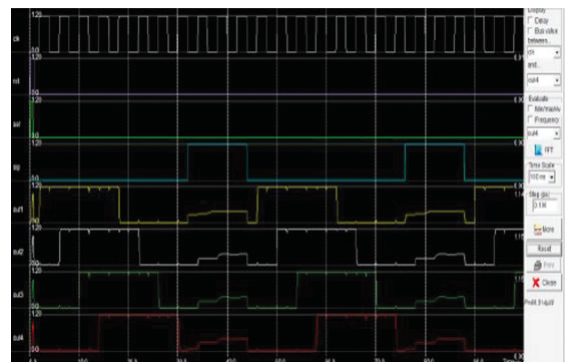


Fig. 18: Johnson counter using dual stack

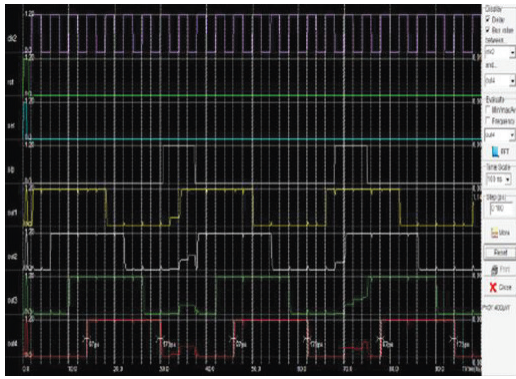


Fig. 19: Johnson counter using stacked sleep

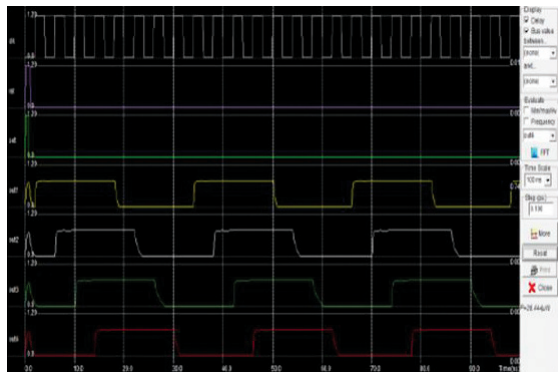


Fig. 20: Johnson counter using lector

We compare the LECTOR technique with different sleep techniques in terms of power consumption and the results are tabulated.

Table 1: Comparison of Lector technique with different sleep techniques in terms of power consumption for D-FlipFlop

	D Flip-Flop (μw)		
	120nm	90nm	70nm
Conventional CMOS	25.206	22.509	9.122
Dual Sleep	22.806	20.865	7.991
Dual Stack	22.609	21.053	8.357
Lector	9.609	6.982	3.640

Table 1: Comparison of Lector technique with different sleep techniques in terms of power consumption for Johnson Counter

Approach	Johnson Counter (μw)		
	120nm	90nm	70nm
Conventional CMOS	51.836	40.409	16.244
Dual Sleep	44.771	35.333	16.171
Dual Stack	44.514	35.146	16.273
Lector	25.111	19.237	10.540

CONCLUSION

Sub threshold leakage power consumption in nanoscale technology is great challenge to VLSI designers. Although there are several techniques to reduce leakage power, based upon the technology and design criteria the designer can choose the techniques. In this paper, Power consumption of 4-bit Johnson counter is reduced using different sleep methods and LECTOR technique. Unlike other leakage control techniques, LECTOR does not need any additional control circuitry to monitor the states of the circuit. Also the power consumption is greatly reduced using LECTOR technique with minimum possible area and this method can be used in several integrated circuits for power efficiency.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Lector Technique Using 50nm Technology

REFERENCES

1. M. Balaji, B. Keerthana & K. Varun. Low Power Dissipation of Ring Counter using Dual Sleep Transistor approach. *i-managers Journal of Electronics Engineering*, 2014; Vol.4, No.3.
2. Md. Asif Jahangir Chowdhury, Md. Shahriar Rizwan & M. S. Islam. An Efficient VLSI Design Approach to Reduce Static Power using Variable Body Biasing. *World Academy of Science, Engineering and Technology*, 2012; Vol. 64.1 Issue.2 pp:7-15
3. Rachit Manchanda & Rajesh Mehra. Low propagation delay design of 3-bit ripple counter on 0.12 micron technology. *IJRCAR*, 2013; Vol.1, Iss.2, pp. 7-15.
4. Ismail S. M, Rahman, A.B.M.S. ; Islam, F.T, Low power dissipation of Johnson Counter using clock gating, *Mil. Inst. of Sci. & Technol., Bangladesh Univ. of Professionals, Dhaka, Bangladesh*, Dec 2012; pp. 510-517.
5. S. Mutoh, T. Douseki, Y. Matsuya, T. Aoki, S. Shigematsu and J. Yamada, "1-V Power Supply High-speed Digital Circuit Technology with Multithreshold-Voltage CMOS," *IEEE Journal of*

- Solis-State Circuits, August 1995; vol. 30, no. 8, pp. 847-854.
6. N. Kim, T. Austin, D. Baauw, T. Mudge, K. Flautner, J. Hu, M. Irwin, M. Kandemir and V. Narayanan, "Leakage Current: Moore's Law Meets Static Power," IEEE Computer, December 2003; vol. 36, pp. 68-75.
 7. K.-S. Min, H. Kawaguchi and T. Sakurai, "Zigzag Super Cut-off CMOS (ZSCCMOS) Block Activation with Self-Adaptive Voltage Level Controller: An Alternative to Clock-gating Scheme in Leakage Dominant Era," IEEE International Solid-State Circuits Conference, February 2003; pp. 400-401.
 8. Z. Chen, M. Johnson, L. Wei and K. Roy, "Estimation of Standby Leakage Power in CMOS Circuits Considering Accurate Modeling of Transistor Stacks," Proc. of International Symposium on Low Power Electronics and Design, August 1998; pp. 239-244.
 9. N. Karmakar, M. Z. Sadi, M. K. Alam and M. S. Islam, "A novel dual sleep approach to low leakage and area efficient VLSI design" Proc. 2009 IEEE Regional Symposium on Micro and Nano Electronics (RSM2009), Kota Bharu, Malaysia, August 10-12, 2009, pp. 409-414.
 10. Neil H.E.Weste, David Harris & Ayan Banerjee. CMOS VLSI Design (pp. 129-132), 2006.
 11. International Technology Roadmap for Semiconductors (ITRS). Retrieved from the ITRS website: <http://www.itrs.net> (2005).
 12. Narender Hanchate, Nagarajan Ranganath-am LECTOR: A Technique for Leakage Reduction in CMOS circuits. IEEE Transactions on Very Large Scale Integration (VLSI) Systems, 2004; VOL. 12, NO. 2
 13. K. MariyaPriyadarshini, V. Kailash, M. Abhinaya, K. Prashanthi, Y. Kannaji Low Power State Retention Technique for CMOS VLSI Design, IJACR, 2014; Vol. 4, Issue.15
 14. S G. Narender & A. Chandrakasan. Leakage in Nanometer CMOS Technologies. New York: Springer- verlag (2006).
 15. M. Powell, S.-H. Yang, B. Falsafi, K. Roy and T. N. Vijaykumar, "Gated-Vdd: A Circuit Technique to Reduce Leakage in Deep submicron Cache Memories," Proc. of International Symposium on Low Power Electronics and Design, pp. 90-95, July 2000.

Parallel Hardware Architecture for Implementation of High Speed MAC

M Govinda Raju¹, Roopa J¹, Amit M Ugargol¹

¹Dept. of Electronics and Communication R V College of Engineering Bangalore, India

ABSTRACT

Multiply and accumulation (MAC) is basic function in most of the signal processing applications like video, image processing, pattern recognition. Multipliers corresponding to the MAC unit are designed using combinational logic circuits. Modern computers consist of dedicated MAC unit and multiplication is usually performed using serial hardware which is referred as a unit cell. This MAC unit cell as supported in many architectures fail to meet the real time response for high rate data applications. The rationale of this paper is to propose parallel architecture for multiply and accumulate operation with high throughput rate. The proposed architecture performs the multiplication of operands involved in the MAC unit parallelly and accumulates the result. The architecture also enables reusing of hardware for higher order taps based on the reusability factor. The functional units of the proposed architecture are developed at module level using RTL and behavior is simulated in Xilinx ISE 14.1 and synthesized on Virtex 7 family of FPGA. The obtained throughput for 128 taps is 16 MACs per cycle with reusability equal to 1 at clock frequency of 8.33 MHz for precision fixed to 8 bits.

Keywords: MAC, Real timer response, PHA, Throughput rate, Verilog HDL, Xilinx ISE 14.1, Vertex7 FPGA, Space and Time Complexity.

INTRODUCTION

Major operation in most of the Digital VLSI circuit is computation. To perform computation, arithmetic circuits consisting of multipliers and adders are used. The amount of power consumption and operating speed of these digital circuits is mainly decided by complexity of the multipliers. Multiply and accumulate operation is most common step used in digital signal processing application like image processing, pattern recognition, Fast Fourier Transform (FFT), Discrete Fourier Transform (DFT), convolution etc. It computes product of two numbers and adds that product to an accumulator. The unit that performs this operation is known as Multiplier – Accumulator (MAC) unit. The operation corresponding to this unit is known as MAC operation.

Consider basic MAC operation:

$$y = \sum_{k=1}^K A_k \cdot x_k \quad \dots(1)$$

Where $A_k := 1, 2, 3, \dots, K$ & $X_k : k = 1, 2, 3, \dots, K$ & are the input samples / operands involved in MAC operation, y is the output result. Where K is the length or number of coefficients corresponding to MAC operation.

MAC unit mainly consist of two major blocks namely multiplier and accumulator as shown in figure 1. The figure shows that, the output of the register is fed back as one of the input to adder, so that output of the multiplier corresponding to each clock cycle will be added with previously accumulated value. Multipliers corresponding to the MAC unit designed using combinational logic. Modern computers consist of dedicated MAC unit to perform this operation. Based on application speed requirement, different multipliers are used. For low speed application serial multipliers are preferred, whereas for high speed application parallel multipliers are preferred. Several attempts have been done by many researchers in designing the architecture to perform MAC operation, such that it gives high computational performance.

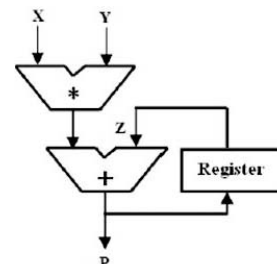


Fig. 1: Regular MAC architecture [2]

The implementation of MAC operation using serial hardware as supported in many architectures fail to support high sampling rate to achieve high data rate. However, parallel hardware could be designed to perform the MAC operation at considerable higher rate. In this work, the Parallel Hardware Architecture is proposed for implementation of MAC operation. It uses the partial product generator blocks in parallel to perform the MAC operation. The blocks of the proposed architecture are designed using the Verilog HDL at module level and behavior is simulated in Xilinx ISE 14.1. The space and time complexity of the proposed architecture is done by simulating the design on vertex7 FPGA board

DISTRIBUTED ARITHMETIC

Distributed arithmetic is one technique used for faster implementation of MAC for fixed coefficients. It makes use of LUTs extensively to reduce multiplication operation. Distributed arithmetic is based on distribution of arithmetic operations involved in MAC across its architecture. It consists of look up tables (LUTs), adders & shifters.

A. Formulation of Distributed Arithmetic:

Distributed arithmetic is multiplication-less technique. It involves pre computation of all possible inner products and their storage in look up table (LUT). The individual bits of the different input samples used as pointer for these memory locations. Based on the different inputs bits combination, value has been read and same will be accumulated. The process will be continued till all the bits of input sample covers/ processed. When sign bit of all the input samples arrive the corresponding value is read from the LUT must be subtracted from the accumulator value. The final result will represent MAC operation corresponding to the applied inputs.

Considering coefficient vector as A and input sample as x each of length K. Where these input samples are expressed using N-bit two's compliment binary representation.

For kth sample,

$$|x_k| < 1$$

$$x_k: \{b_{k0}, b_{k1}, b_{k2}, \dots, \dots, b_{k(N-1)}\}$$

Where b_{k0} the sign bit, b_{k(N-1)} is the least significant bit. It can be expressed as

$$x_k = -b_{k0} + \sum_{n=1}^{N-1} b_{kn} \cdot 2^{-n} \quad \dots(2)$$

Substituting equation (2) in (1)

$$y = \sum_{k=1}^K A_k \left[-b_{k0} + \sum_{n=1}^{N-1} b_{kn} \cdot 2^{-n} \right] \quad \dots(3)$$

Equation (3) can be rewritten as,

$$y = - \sum_{k=1}^K (b_{k0} \cdot A_k) + \sum_{k=1}^K \left[\sum_{n=1}^{N-1} (b_{kn} \cdot A_k) 2^{-n} \right] \quad \dots(4)$$

On expanding the magnitude part of equation (4) and after combining the terms corresponding to the same magnitude position, the new expression can be rewritten as,

$$y = - \sum_{k=1}^K A_k \cdot (b_{k0}) + \sum_{n=1}^{N-1} \left[\sum_{k=1}^K A_k \cdot b_{kn} \right] 2^{-n} \quad \dots(5)$$

The equation (5) has following terms:

$$\sum_{k=1}^K A_k \cdot b_{kn} \quad \text{has } 2^K \text{ possible values} \quad \dots(6)$$

$$\sum_{k=1}^K A_k \cdot (-b_{k0}) \quad \text{has } 2^K \text{ possible values} \quad \dots(7)$$

For fixed coefficients A, memory size required for implementation of LUT to realize the possible multiplication is 2 * 2^K words. The size of memory required to store inner product terms is dependent on length of coefficient vector (A_K). Distributed arithmetic completely eliminates use of multipliers to achieve product operation. The multiplication of MAC is converted into memory accessing operation to read LUT.

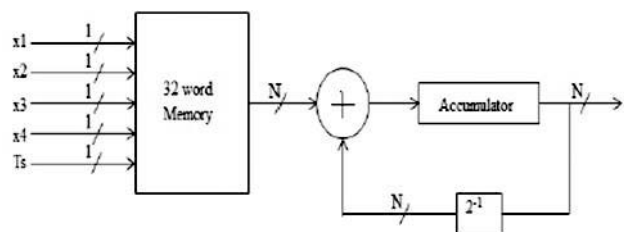


Fig. 2: Block diagram of 4-tap DA with 32-word LUT [4]

B. Memory Reduction: From the equation (6), it can be shown that for large values of K the memory size grows too large to be practical. However, the memory requirements can be reduced by a factor of 2 with a slight modification to the adder in figure. 2. If the adder is changed to an adder/

subtractor, the lower half of the memory table can be removed. The memory size will be 2^K . Further, additional reduction in memory requirements can be achieved through the use of offset binary coding (OBC) to achieve memory size to 2^{K-1} .

Drawbacks of the distributed arithmetic:

- Size of the memory required to store pre-computed terms grows exponentially with length (K).
- For larger value of length (K) memory reduction techniques failed to control increase in memory size.

PARALLEL HARDWARE ARCHITECTURE

Parallel hardware architecture replaces LUT by partial product generator and summation block. This architecture exhibits linear dependency of memory on taps. Parallel hardware architecture uses partial product generator blocks in parallel to perform the MAC operation. Parallel architecture processes entire input sample represented using B-bits at once, when clock cycle occurs. This architecture also offers the flexibility to reuse the computational blocks during MAC operation.

Reusability factor (R) corresponding to parallel hardware architecture predicts number of times the operational blocks are used during processing of single output sample. To perform the MAC operation of K coefficients, it consumes amount of product generator blocks. In which, each input blocks and corresponding coefficient registers are associated with R number of inputs. Each coefficient register stores coefficients in an interleaved fashion.

As initial step in parallel hardware architecture, both input samples and coefficients are expressed in 2's complement binary representation using B-bits. Based on the LSB bit of the coefficient registers, partial products are generated and further these products are added using summation block, result are accumulated.

A. Functional Units of Parallel Hardware Architecture: Parallel Hardware Arithmetic architecture consists of three blocks to perform the sum of product operation for given coefficients:

- Partial product generator block
- Summation block
- Accumulation block

B. Partial Product Generator Block: The figure 3 shows the partial product generator. The input samples will drive the product generator block. The coefficients which drive the distributed arithmetic system and the MUX are multiplexed together to utilize the reuse of components. The individual bits of the coefficients are either stored in interleaved or multiplexed way in a single register. The input samples are moved further one sample at a time when all the bits of the coefficient registers are filled.

Each bit of the coefficient register is coupled with corresponding input samples. Based on the select line input to the switching network, it routes the proper input sample to the multiplexer. At an instance only one bit of the coefficient register is shifted right. Depending on the Least Significant Bit (LSB) position value, MUX sets output to corresponding input sample X_k when LSB is '1' or output to '0' when the LSB is 0. The contents of the registers (coefficient register) reach the same initial state once all bits are covered. Since LSB is connected to the Most Significant Bit (MSB) the bits will shift back to their original positions

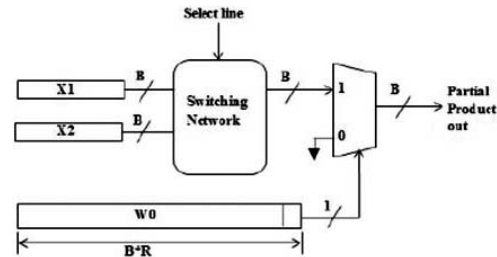


Fig. 3: Partial Product Generator [4]

C. Summation Block: The registered adders are arranged as tree formation in the summation block. The diagram of the summation block is shown in figure.4. For every clock cycle the partial products move further to next level in the tree, this aids in the easy implementation of the summation block using adders.

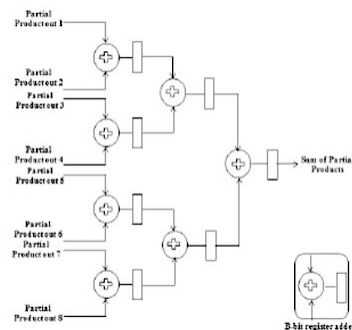


Fig. 4: Summation Block [4]

D. Accumulation Block: The figure 5 shows the shifted output from the summation block and the accumulation block output. From the figure it is clear that the output result is ready after $R * B$ clock cycles. The result from the summation block is stored for cycles and further shifted right each bit at a time and further added to the next result of summation block. Till $R * B$ bits are processed, the cycle is repeated. The Parallel Hardware Architecture based accumulator block has one accumulator for each reuse and multiple such accumulators. The output is obtained after summing all the values in accumulator after partial products are generated for all R . Small area and lower latency are the main advantages of the multiplexed feedback accumulator over the other approaches. The multiplexed feedback accumulator require only single accumulator compared to that of accumulators and no additional adders are required to calculate the output. The sign control (T_s) is initialized to zero and it is made as one once the Most Significant Bit (MSB) occurs.

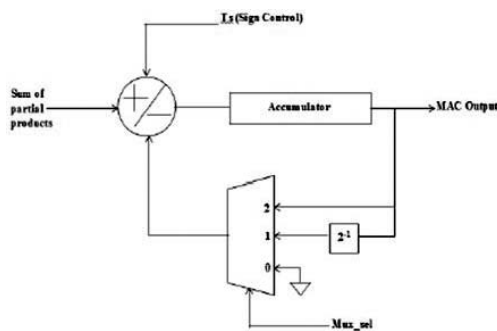


Fig. 5: Accumulation Block [4]

The interconnection of functional units of parallel hardware architecture for four taps is shown in figure 6 the architecture uses a number of partial product generator blocks connected in parallel. The blocks execute concurrently to generate many partial products in a single clock cycle. Then, the partial products are added using adder stages to get the final sum. The accumulator value is added to the sum to get the final sum. The number of partial product blocks is dependence on the reusability factor. The switching network blocks use a common select line. The multiplier blocks are controlled by different select lines or coefficient registers. On each select line input, the entire sample is passed on to the output.

DESIGN AND IMPLEMENTATION OF PARALLEL HARDWARE ARCHITECTURE

The functional units of the proposed architecture are developed using H/W RTL code in Verilog at module level. Each module is characterized by module name, input and output ports, event or clock base control. the data flows from the top most switching module to bottom accumulator module through intermediate modules such as partial product generator and summation block.

Once the modules are developed individually, their behavior is simulated in Xilinx ISE 14.1. In the simulation process, the module is synthesized on Virtex 7 family of FPGA and its logic functionality is verified. Further, these modules are cascaded to build the complete architecture. All the modules are controlled by a common clock.

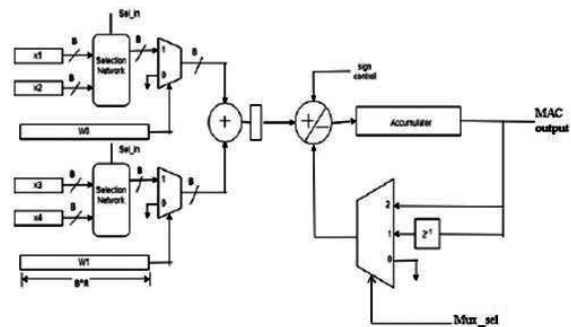


Fig. 6: Parallel Hardware Architecture [4]

RESULTS AND DISCUSSIONS

The proposed architecture is developed using hardware RTL code, Verilog for four, eight and sixteen taps. The complexity is analyzed by varying different parameters of the design. The throughput in terms MACs per cycle is found for different number of taps, number of bits and reusability factor. The space complexity is found in terms number of LUTs and slice registers by varying number of filter taps and number of bits.

Throughput of the proposed architecture in terms of MACs per cycle is given as:

$$\text{Throughput} = \frac{K}{B.R} \text{ MACs/Cycle}$$

A. Throughput Vs Reusability with Precision

Fixed To 8 Bits: The figure 8 shows MACs per cycle with reusability, with precision fixed to 8 bits for various taps (K). For higher tap values, the throughput is exponentially decreasing with

respect to reusability. When reusability is equal to unity, K product generators will work in parallel to perform the MAC operation. Whereas, for higher values of R, the number of product generators required will be less. It reuses the existing hardware to perform the MAC operation. The reusing of hardware to perform the MAC will lead to efficient utilization of resources, but at the cost of decreased throughput rate. These parameters are to be traded off for better performance.

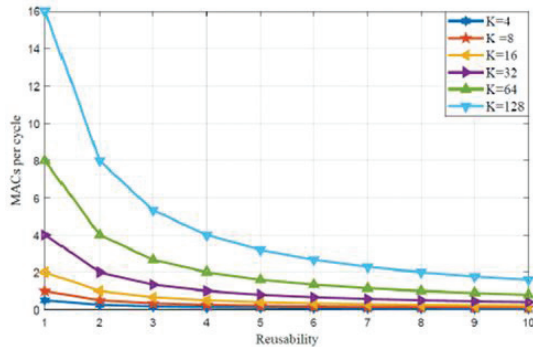


Fig. 8 : Variation of MACs per cycle with respect to reusability, with precision fixed to 8-bits

B. Throughput Vs. Length with Reusability Fixed To 2:

The figure 9 shows MACs per cycle with respect to taps for different bit precisions with reusability fixed to 2. It indicates that, the throughput rate remains constant irrespective of length of taps. The throughput corresponding to 8-bit precision has a higher value compared to 64-bit precision. For varying length of taps MACs per cycle remain constant. It is independent on the variation of and has inverse relation with bit precision $\left[\frac{1}{B} \right]$. Throughput decreases with increase in number of bit precision

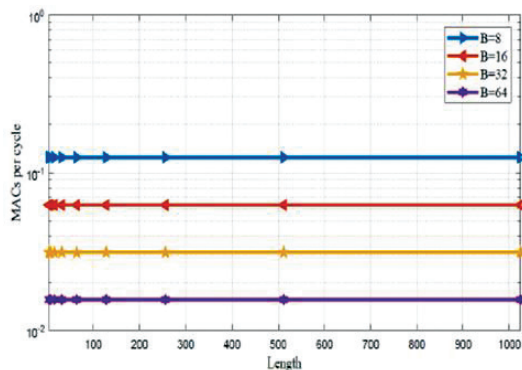


Fig. 9 : Variation of MAC per cycle with respect to Length of taps, with Reusability fixed to 2 by varying precision

C. Throughput Vs Bit Precision with Reusability Fixed To 2:

The figure 10 shows throughput with respect to precision in bits, with reusability fixed to 2. The figure 10 shows the variation of throughput for different taps. It indicates that, the MACs per cycle decreases with increase in bit precision, for various tap lengths. The throughput corresponding to the higher order taps at low bit precision is high. Throughput has inverse relation with both number of bits and reusability.

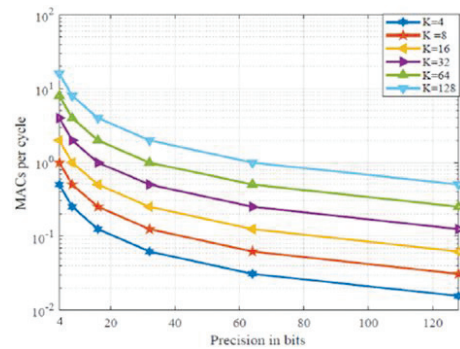


Fig. 10: Variation of MAC per cycle with respect to Number of bits, with Reusability fixed to 2

In proposed parallel hardware, the reusability is decides the throughput rate. At R=1, the maximum throughput rate is attained at the cost of hardware complexity. These two factors must be traded off depending upon the application. However, the parallel hardware MAC has constant relation with filter length at desirable Whereas, the throughput decreases with higher bit precision.

D. Number of Slice LUTs Vs Length with Varying Bit Precision:

The figure 12 shows variation of number of slice LUTs with respect to Length of taps, with changing Bit precision. The number of slice LUTs required to implement the design increases with increase in the number of taps. In addition, the number of slice LUTs required also increase with increase bits precision at desired tap value. However, slice LUTs shows inverse relation with reusability.

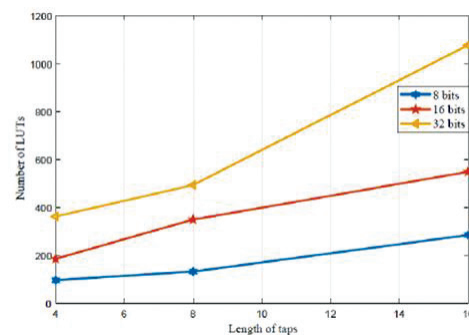


Fig. 12: Variation of Number of LUTs with respect to Length, for different Number of bits

E. Number of Slice Register Vs Length with Varying Bit Precision: The number of slice registers required to synthesize hardware is also obtained from the synthesis listing summary report. The figure 13 shows number of slice registers with respect to variation in Length, with varying Bit precision.

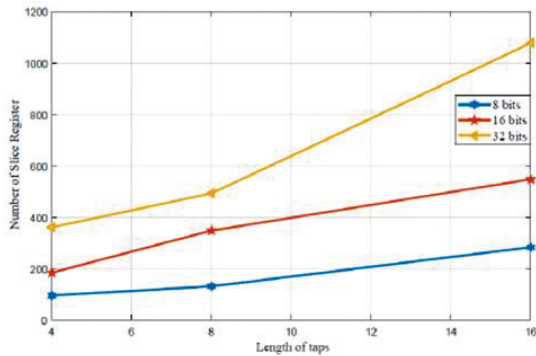


Fig. 13: Variation of Number of Slice Register with respect to Length, for different Number of Bits

The figure shows that, the number of slice registers required to implement the design increases with increase in the number of taps. In addition, the number of slice register required also increase with increase bits precision at desired tap value. However, slice register shows inverse relation with reusability.

CONCLUSION

The functional units of the proposed architecture are developed at module level using Verilog HDL and behavior is simulated in Xilinx ISE 14.1 and synthesized on Virtex 7 family of FPGA. The throughput in terms of MACs per Cycle of the designed module is gauged with respect to different parameters by developing test benches. The hardware complexity in terms of number of slice LUTs and slice registers is empirically presented.

The obtained throughput for 128 taps is 16 MACs per cycle with reusability equal to 1 at clock frequency of 8.33 MHz for precision fixed to 8 bits as opposed to 1 MAC per cycle seen in serial MAC found in different architecture. With increase in reusability, the throughput is observed to be decreasing. The throughput is shown to be dependent on bit precision and reusability. Whereas, in serial MAC throughput varies with number of taps.

The space complexity for 16 taps is found to be 1078 number of slice LUTs with reusability equal to 2 for bit precision fixed to 32 bits. With increase in number of

taps and bit precision, the required number of slice LUTs increases. The disadvantage of this method is increased hardware complexity as opposed to serial MAC. Hence, the throughput and hardware complexity must be traded off. The parallel architecture exhibits constant throughput irrespective of coefficient length for fixed bit precision and reusability factor. The architecture even offers the flexibility to reuse computational blocks while performing MAC operation.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Implementation of High Speed MAC

REFERENCES

1. C. Wang et al., "Near-Threshold Energy- and Area-Efficient Reconfigurable DWPT/DWT Processor for Healthcare-Monitoring Applications," in IEEE Transactions on Circuits and Systems II: Express Briefs, Jan. 2015; vol. 62, no. 1, pp. 70-74.
2. N. Akbarzadeh, S. Timarchi and A. A. Hamidi, "Efficient multiply-add unit specified for DSPs utilizing low-power pipeline modulo $2n+1$ multiplier," 2015 9th Iranian Conference on Machine Vision and Image Processing (MVIP), Tehran, 2015, pp. 120-123
3. Ali M. Al-Haj —Fast Discrete Wavelet Transform using FPGAs and Distributed Arithmetic, International Journal of Applied Science and Engineering, 2003, Vol. pp. 160-171.
4. Haw-Jing Lo," Design of a Reusable Distributed Arithmetic Filter and its Application to the affine projection algorithm, Doctoral Thesis, Georgia Institute of Technology, May 2009.
5. M. S. Prakash and R. A. Shaik, "A distributed arithmetic based approach for the implementation of the Sign-LMS adaptive filter", 2015 International Conference on Signal Processing and Communication Engineering Systems, Guntur, 2015, pp. 326-330.
6. L. S. DeBrunner, D. Williams and C. Riker, "Truncated multiply-and-accumulate units for FIR filter implementation with reduced coefficient length", 2017 51st Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, 2017, pp. 457-461.

Smart Med-Minder

Shradha Sapra¹, Madhurima Hooda¹, Anshul Chhabra¹, Saru Dhir¹

¹Amity School of Engineering & Technology

ABSTRACT

Key to most parts of medication from primarily care to specific medications, drugs prescribed by physician have turned into a noteworthy segment of healthcare frameworks overall. Inferable from their psychoactive impacts, these medications are frequently taken in ways not expected by the specialist or by somebody other than the individual for whom it was recommended. Patients frequently neglect to take their medication prescribed by the specialist or take it out of the plan suggested by the specialist. There are additionally examples of young people taking medications, for example, sedatives, stimulants and depressants. Thus, the major problem is that after the issuing of medicine prescribed by the specialist, its utilization can't be monitored. This paper provides insights on how to construct a framework around physician endorsed drugs which is helpful in validating the usage of medication on the basis of identity of the patient and the scheduled prescribed to that patient. It also helps in facilitating the doctor or pharmacist to monitor the utilization of medication through an app which will be used by the pharmacist register the patient with the complete personal information and the prescribed medication.

Keywords: *IoT healthcare network, IoT Architecture, Visions of IoT*

INTRODUCTION

Key to most parts of medication from primarily care to specific medications, drugs prescribed by physician have turned into a noteworthy segment of healthcare frameworks overall. Inferable from their psychoactive impacts, these medications are frequently taken in ways not expected by the specialist or by somebody other than the individual for whom it was recommended. Patients frequently neglect to take their medication prescribed by the specialist or take it out of the plan suggested by the specialist. There are additionally examples of young people taking medications, for example, sedatives, stimulants and depressants. Thus, the major problem is that after the issuing of medicine prescribed by the specialist, its utilization can't be monitored. IoT based healthcare devices have helped the patients to take their medication at the prescribed time.

1.1. IoT Healthcare Network: The IoT healthcare system or the IoT network system for healthcare (called as IoThNet) is one of the indispensable components of the IoT in healthcare. It acts as a supporting system which provides encourages the transmission and acceptance of patient's medical information, and empowers the utilization of healthcare services custom fitted communications.

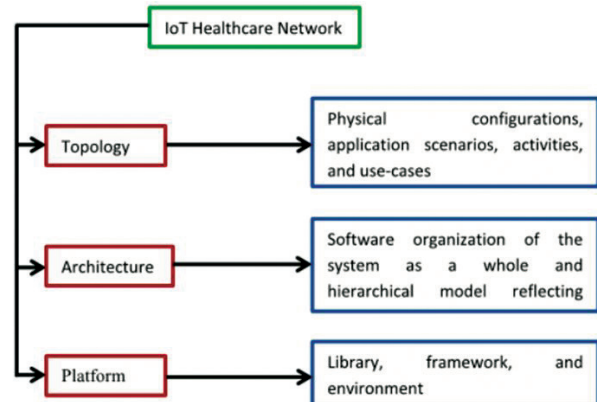


Fig. 1: IoT Healthcare Network

1.2. IoT Healthcare Architecture: The IoThNet architecture refers to a diagram for the specification of the IoThNet's physical components, their practical association, and its working standards and strategies. Many investigations have verified that the IPv6-based 6LoWPAN is the base of the IoThNet. As indicated by the idea of IoThNet, wearables and sensors utilize IPv6 and 6LoWPAN frameworks for the transfer of information using the protocol-802.15.4. Information is then reverting back through sensor nodes using UDP (User Datagram Protocol).

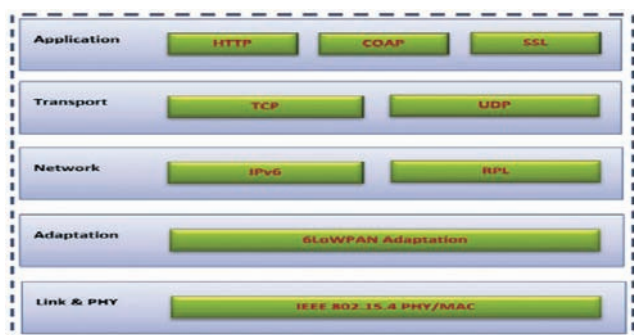


Fig. 2: IoT protocol stack of 6LoWPAN

1.3. Vision of IoT in Healthcare

1.3.1. Challenges of today's

Healthcare: Despite the facts that, the world's interest for medicinal services have increased, regardless we live in the traditional model of hospital-centric care, in which residents visit specialists.

Some of the challenges and barriers faced by these hospital-centric cares are:

- **Rising medical cost:** One of the biggest factors in the health care today is the increasing cost for the healthcare.
- **Urbanization:** It was predicted by World Health Organization that 70 percent of world's population lives in urban cities which implies that urban cities require more healthcare services.
- **Adherence monitoring:** The absences of adherence results in increasing risks of hospitalization and thus, raise the burden to the patients.

1.3.2. IoT-driven medicinal services: Progressing from hospital-centric to patient-centric:

An IoT technology plays an important role in many different areas of medical field:

- **Hospitals:** Hospitals are getting more noticeable to treat, operate, admit or monitor expanding number of patients. Keeping in mind the end goal to run their operations easily, they always depend on advanced advances. For instance, "Smart Ambulances" can do early diagnosis as a result of which the staff could make the required arrangements before the patient arrives. Such situation could be imagined with the reconciliation of IoT technology. Smart ambulances will be requiring an arrangement of medicinal sensors which are reliable for performing diagnosis, a protected interface for communicating with the hospital, and other preparations like an

operating room. Surgeries may turn out to be more relevant and productive with IoT. Thus, one can imagine the part of IoT in different divisions of the hospitals, for example, Intensive Care Unit (ICU), essential care unit, and specific units.

- **Clinics:** Primarily, patients visit their family doctors who could exploit IoT in a wide range of ways. For instance, the specialists are able to get the lab reports of their patients virtually before their visit. IoT has the potential to give a protected twoway interaction amongst patients and clinic receptions to arrange appointments without making long telephone calls. IoT gives solutions which are cost friendly for clinical facilities in order to create an associated screening for their patients so the doctor could invest greater quality time with their patients.
- **Anywhere (Non-clinical Settings):** There are some other areas also where the IoT is providing tremendous benefits to the patient:
 - **Mobile clinics:** There is an expanding enthusiasm for portable health clinics. IoT has the potential to have a major effect in improving the infrastructure of the mobile clinics that could collaborate with the the hospitals to interact virtually for diagnosis.
 - **Telemedicine:** IoT has a great deal to offer in this field because of the fact that a huge segment of total population of the world possesses cell phones and smartphones, which are not just specialized gadgets for communication, but rather likewise utilized for interfacing with various different sensors. On account of medicinal care, smartphones are assumed to have a fundamental part by allowing patients to test their own health themselves. Thus, the hospitals can still work well by expanding the virtual care services.
 - **Smart Homes:** While the telemedicine services could decrease the number of sittings to hospitals and clinics, the need for setting up a technical IoT infrastructure in patient's home is becoming important and thus, establishing smart homes provides supportive network to allow citizens to experience quality of life.
 - **Smart cities and connected communities:** The quick relocation of huge population towards urban areas has increased the

demands and difficulties in many urban communities.

Consequently, rising efforts have been made for building smart cities by incorporating different infrastructure to enhance bearable-ness, supportability, affordability and proficiency. The healthcare system is a fundamental piece of smart cities and urban conditions. For instance, urban areas have been incorporated with environment sensors which are helpful in streaming the sensor information to a brought together area like the cloud servers that can be accessed by the healthcare department. This could help in making citizens mindful of various

conditions, for example, poisons and pollutants, dust, temperature and humidity conditions, etc. IoT helps in conveying this data continuously to prevent medical problems in advance.

1.4. Existing devices and apps available: According to a survey, it was found that only 47 percent of the patients take their medication on time. The solution to this problem led to the development of an IoT based device which is now popularly known as smart pill containers or smart pill bottles. These devices are able to generate and transmit signals when the bottle is opened. This helps as a reminder for the patients to take their medication at the prescribed time.

Some of the IoT based smart devices are described here with their functionalities:

Table 1: Smart Pill containers and their functions [2]

S. No.	Product	Limitations	Comparison with Smart Med Minder
1.	CerePak -It is a MeadWestVaco product that records when pills are removed. The information is sent using RFID to the reader attached to a computer. This blister pack can hold upto 32 pills.	It can only hold 32 pills. No locking function on the device which can result in drug overdose.	There is no specific number of pills that can be stored in the device. The device exhibits a strong locking phenomenon for the prevention of drug overdose.
2.	eCAP -It is a cap produced by Information Mediary Corporation (IMC) that can be fitted on pill bottles. It is provided with a beep alert and flash to remind the patient to take his medicine. The cap also records the openings of the bottle and transmits the data using RFID to the reader which is attached to a computer.	There is no locking mechanism on the device	The device exhibits a strong locking phenomenon for the prevention of drug overdose.
3.	Glow Cap -Glow Cap is a product of Vitality that can be fitted on pill bottles. It is provided with a beep alert and flash to remind the patient to take his medicine.	The device only beeps alert through LED. There is no functionality of transferring the opening and closing alert to the patient through the app.	The device facilitates alert for opening and closing of the bottle to the patient through the app.
4.	MedSignals -It is a pillbox comprising of 4 slots. It is provided with a beep alert to remind the patient to take his medication on time. The correct slot can be identified with the flashing light.	No locking mechanism on the device. Transfer of information takes place over a phone line.	The device exhibits a strong locking phenomenon for the prevention of drug overdose. The device facilitates alert for opening and closing of the bottle to the patient through the app.
5.	MEMS 6 Track Cap - It is an AARDEX Group product that is useful in recording pill bottle openings and closings. It is provided with an LCD display which shows the frequency of openings and the time since the bottle was last opened.	No locking mechanism on the device.	The device exhibits a strong locking phenomenon for the prevention of drug overdose.

Conted...

6.	Rex – It is a product of Mediocre Technologies. It provides verbal instructions when a patient presses the button. The instructions could be text-to-speech generated by computer or in the form of human voice using microphone.	The device doesn't transfer the data of how many pills taken or the consumption record of the medicines.	The device doesn't transfer the data of how many pills taken or the consumption record of the medicines.
7.	SIMpill - It can be attached to the sides of the pill bottle and it the openings of the bottle and sends a message to a computer. If the bottle is not opened on time then, the computer transmits a reminder message to the patient's phone which can be in the form of a text-message, voice or email.	The device sends the reminder message for taking the medication on time through text message or email. There is no locking mechanism on the device for the prevention of drug overdose.	The device uses the latest smart application for transferring the data and signals. The device exhibits a strong locking phenomenon for the prevention of drug overdose.

PROPOSED SMART MED-MINDER BLOCK

2.1. Description:

Pharmacist's App: This app will be helpful in creating a patient's profile and register the prescribed medication to the patient. It will be associated with bottle ids, scheduled time and prescriptions of each patient. This app will also provide the pharmacist privilege to connect to a bottle id of any patient at any time. The unlock notification of the bottle as well as the requirement of refill of medicines can be seen by the pharmacist through the bottle id of any patient stored in this app.

Patient's Phone App: The major purpose of this app is to unlock the pill bottle to take the medicine through finger scan, retina scan, voice recognition or Bluetooth authentication. The push notification of this unlocking event would be sent to pharmacist's app as well as to patient's loved ones. This app also enables the patient to view his prescription schedule and also set an alarm at the scheduled time.

Pill Bottle: The 'smart bottle' will consist of two components. The electrical component consists of the circuitry for power, Bluetooth connectivity and microcontroller unit. The mechanical unit exposes the functionality for the locking mechanism of the bottle.

A. Battery: A lithium battery is used to provide voltage for the Bluetooth chip and the microcontroller.

B. Voltage Regulator: To encourage the distinctive voltage inputs required by the finger scanner, Bluetooth chip and the microcontroller, we will utilize a controller to level move the input DC as required by each of them.

C. Bluetooth Chip: A Bluetooth Low Energy chip (Bluetooth Smart or Version 4.0+) will be utilized to associate with the pharmacist and patient's app to the pill bottle.

D. Microcontroller: The MCU will keep up the clock, make and send logs to Bluetooth, receive verification from the other modules and communicate the lock/unlock signal.

E. Lock Driver: As the lock engine will take more power than can be provided by the output pins of the microcontroller hence, the output from the microcontroller would drive a gate controlling flow of power to the lock.

F. Position Sensor: It will identify if and when pill bottle has been opened as a component of the control loop. The output of the position sensor will be encouraged as input to the microcontroller unit to tell if locking/unlocking event was fruitful or not. We will utilize a hall effect sensor to detect the change in magnetic field because of the lock.

G. Lock: Locking instrument will be a linear solenoid on the top of the cap that embeds a locking pin into a space on the pill bottle, guaranteeing that the cap can't turn until the

point that is controlled and pin is lifted. Pin shall be having a little magnet to work with the hall effect sensor. [1]

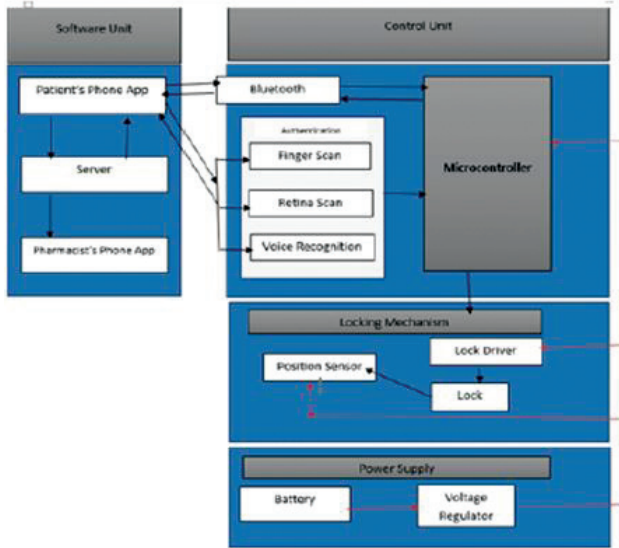


Fig. 3: Proposed framework for Smart Med-Minder

*RED LINES depicts power supply.

The cap of the smart pill box is connected with the patient’s phone app as well as the pharmacist’s app. The pharmacist maintains the complete database of the patient which includes patient’s full name, address, contact number and prescribed medicine schedule of each patient. Each patient is given a patient id and bottle id associated with the bottle given to the patient by the doctor on treatment. The pharmacist is provided with privilege to connect to any bottle id of any patient at any time. The unlock notification of the bottle as well as the requirement of refill of medicines can be seen by the pharmacist through the bottle id of any patient stored in this app.

The patient can unlock the bottle using various mechanism present in the patient’s app. These mechanisms include Fingerprint scanner, Retina scanner, Bluetooth authentication, Voice Recognition system or by using manual lock present on the cap of the bottle. If the patient unlocks the bottle on the prescribed time, a signal is sent to the patient’s app as well as the database that the medicine has been taken at that particular time. The pharmacist can check any patient’s medication history from the database.

If the patient forgets to take the medicine on the prescribed time then, the smart pill bottle beeps

an alarm and flashes an LED light to remind the patient to take the medication on time. It also sends a notification to the patient’s phone app to take the prescribed medicine.

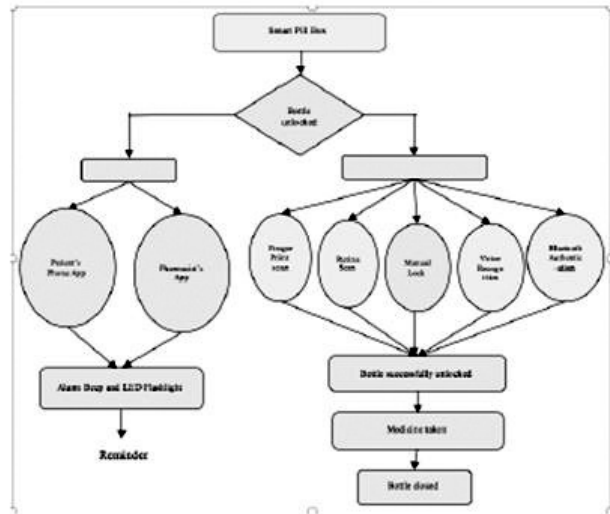


Fig. 4: Flowchart of Smart Med-Minder

2.2. Features of Smart Med-Minder

- a. Portable:** The device is small in size and easy to carry anywhere.
- b. Daily reminder:** The device facilitates daily alarm as per the scheduled time of the prescription. It also flashes the LED light present on the bottle.
- c. Notifications:** The device provides push notification to the patient as well as the pharmacist. This app also enables the loved one’s of the patient to get notifications whether he took the medicine or not.
- d. Tracking of dosage:** It’s a big deal when people don’t take their medicine on time. This app enables the patient to keep a track of their dosage history.
- e. LED flash light:** An LED flash light is provided on the pill bottle that flashes in case of overdose warning, daily alarm and low battery indicator.
- f. Double dose tracking:** The device sends a notification to the app as well as flashes the LED light if the bottle is unlocked before the scheduled prescription time. This helps in reducing overdose of medicines.
- g. Safety lock:** The device facilitates a high safety mechanism so as to keep it away from children or other people. The safety module offers five choices to the patient for unlocking the device depending upon the patient’s comfort:

- Fingerprint scanner
- Retina scanner
- Voice recognition system
- Bluetooth authentication
- Manual lock on cap

h. Tamper-proof: The device is tampered proof.

Limitations of the Proposed Model: The device is designed to provide various services to the patients such as locking mechanisms to prevent drug overdose, daily LED flashlight to remind patients to take medication and much more. Yet, the device has some limitations which need to be overcome.

The device exhibits several safety lock mechanisms such as Bluetooth authentication, Fingerprint scanner, Retina scan, Voice recognition system and as well as a manual lock on the cap. The locking mechanisms provided help in preventing drug overdose. But, the Smartphone through which bottle is opened should support the finger scan, retina scan, Bluetooth, voice recognition functionalities. Moreover, various safety phenomenon used increases the cost of the device at the initial state. In the scenarios where the smart phone of the patient gets discharged, the bottle will get opened only through the manual lock provided on the cap of the bottle.

CONCLUSIONS AND FUTURE SCOPE

There exist many scenarios where young people taking medications, for example, sedatives, stimulants and depressants more than what they are prescribed by their doctor. Drug over dosage is becoming a major problem in today's youth. A solution to this problem could be monitoring of the medication after issuing it from the doctor. The smart pill box solves the problem to much extent. It also helps in facilitating the pharmacist as well as the patient's loved ones to keep a check on the utilization of medication through an android application. It sends reminder and push notifications to the patient's phone to take the prescribed medicine on time. It also enables to keep a track of overdose of medicine by the pharmacist. One major drawback of the smart pill bottle

is the cost factor. The bottle facilitates many unlocking mechanism such as fingerprint scanner, retina scanner, Bluetooth authentication, voice recognition system and as well as manual lock on the cap. The inclusions of these mechanisms in the android application results in the rise of the cost of the pill bottle. Thus, the device needs to be cost-efficient so that it is in reach and available to every individual.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Smart Med-Minder

REFERENCES

1. Asavari Tayal, Eric Lee and Manav Ramesh. Smart Pill Bottle. ECE 445 Project Proposal -2/8/2016
2. Norman M. Goldfarb. Improving Subject Compliance with Smart Pill Bottles. August 2007.
3. S.M. Riazul Isla, Daehan Kwak, M.D. Humaun Kabir, Mahmud Hossain and Kyung-Sup Kwak. The Internet of Things for Health Care: A Comprehensive Survey. 2015.
4. B. Sobhan Babu, K. Srikanth, T. Ramanjaneyulu, I. Lakshmi Narayana. IoT for Healthcare. 2014.
5. Bahar Farahania, Farshad Firouzib, Victor Change, Mustafa Badaroglu, Nicholas Constante, Kunal Mankodiyae. Towards fogdriven IoT eHealth: Promises and challenges of IoT in medicine and healthcare.
6. <https://herohealth.com/>
7. <https://www.npr.org/sections/healthshots/2017/08/22/538153337/smart-pill-bottlesarent-enough-to-help-the-medicine-go-down>
8. <https://www.popsoci.com/smart-pill-bottles>
9. https://firstclinical.com/journal/2007/0708_Pill_Bottles.pdf
10. <http://www.instructables.com/id/IoT-Pill-Bottle>

Providing Cyber Security using Machine Learning for Social Networks

Sheba Pari N.¹, Majjaru Chandrababu¹, Senthil Kumar K.²

¹Research Scholar, ²Associate Professor, SITE VIT University, Vellore, India

ABSTRACT

Social networks are the most common type of interaction between people these days. Attacks on these networks are currently at an all time high which can be by corrupting the data, introducing malicious data, getting access to confidential data or intrusion on the network. The main requirement is providing security to such networks. As and when security is being provided to these networks, attacks are also evolving. Cyber attacks are becoming complex which means that sometimes the threat for which the solution needs to be found is unknown. Threats are becoming automated, which means threats are AI induced. If threats are AI induced, using less efficient algorithms for cyber security is not the optimal solution. Hence Machine learning algorithms are used in conjunction to provide cyber security for social networks.

Keywords: attacks; cyber security; intrusion; machine learning; social networks;

INTRODUCTION

Social networks are the most common type of interaction between people these days, where communication is done by means of data contents such as text, images, videos and so on. A network built of people with similar ideas or views. Sharing of data, which includes personal information, is very common on social networks. In this age of social networking, keeping this information private and secure is the foremost challenge. This paper talks about providing cyber security to social networks. When computer systems or networks are protected from any sort of harm such as cyber attacks it is defined as Cyber Security. This harm caused can be, by corrupting the data, introducing malicious data, getting access to confidential data or intrusion on the network. Cyber Security is practices which are used to protect the network of systems from cyber attacks^[1]. Protecting the systems can either be physical protection or cyber security. A fraction of cyber security is information security to maintain the integrity, authenticity and confidentiality of the data. Threats (Cyber Attacks) being injected in the network can take many forms which the cyber security tries to resolve. But past few years the complexity of cyber attacks has significantly increased and is still increasing^[2]. These threats are hard to detect and resolve. These threats may not just be about information theft but can lead to worse

situations such as chronic loss to an entire industry. Since the threats are evolving drastically, the old school way of treating the threats won't do any good to the system and may not also be practical to implement. It has been predicted that in the coming years the major cyber attack could involve artificial intelligence systems. Attackers have started automating the threats wherein the threats have successfully entered the network without being detected by same cyber security methods used till now.

The test is to find threat which you have no idea about. When we take an analogy of this, this is the same situation which happens in our human body. Our DNA is being attacked by a huge number of unknown viruses on a day to day basis. But our immune system distinguishes between what belongs to our body and what doesn't belong. It adapts to threats which mutate as well. Motivated by this ability of the human immune system, Artificial intelligence technology against cyber attacks which are complex has enabled a sophisticated way for industries to protect themselves. The worst social media cyber attacks are^[3]

A. Phishing messages: Phishing is an effort by the attackers to obtain sensitive/personal details of the user. Custom phishing messages are sent via social media and when the user accesses the message, the attacker gets access to the user's device and in turn all confidential details.

B. Impersonation: In this type of attack fake accounts are created by the attackers on social media and are connected with genuine users. The attacker spreads a Trojan through these social media accounts to get access to the user’s device.

C. Account Takeover: When there is vulnerability in 3rd party applications, the attackers can gain access to accounts and the accounts of legitimate users are compromised.

D. Botnets: When malware are introduced into the networks without the users knowing about it is called at Botnets.

All these attacks are majorly interested in gaining access to sensitive information. This can be prevented by the users with social media accounts by

- Not trusting communications with users who is not known.
- Not opening any links or attachments received to the user account.
- Not posting anything and everything from the internet onto the user account.
- Not posting Confidential/sensitive information about self.

MACHINE LEARNING AND CYBER SECURITY

Artificial Intelligence is making our machines intelligent comparable to an individual’s intelligence. Artificial Intelligence is a broader concept whereas Machine learning is a part of Artificial intelligence which is more concerned about machines learning by themselves [4]. Social networks are continually under attack. Using AI features, attacks have been able to spread from system to system without supervision faster. Attackers are using machine learning to increase the impact of their attack. When the impact of attacks are progressing at a rapid rate, using old school cyber security techniques will not be able to protect our systems from cyber attacks. In addition to that complexity of the attack has made detecting more difficult. Hence cyber security needs to be provided using machine learning [5].

When huge volumes of information are involved such as the data in social networks, machine learning and cyber security are best suited for processing. The

main advantages of using machine learning techniques over existing techniques of cyber security are

- More powerful and more efficient.
- More faster in detecting
- Cyber security using machine learning does not require previous understanding of an attack to understand whether it is harmful or not.
- It even works against attacks which wouldn’t have been detected by earlier methods. Machine learning is broadly classified into 3 types, supervised learning, unsupervised learning and Reinforcement learning [6]. In supervised learning, the training data is analysed first, results of which are used for future analyses of different data. In this, for every data instance there is an input and a corresponding output which is labelled data. The Unsupervised learning deduces the function from non-categorized data. In this we have only input data and no labelled data. Based on the data it may be clustered, summarized are some patterns may be found. When supervised and unsupervised learning are combined it is called as semi-supervised learning. This is when there are some labelled data and majority of unlabelled data. In Reinforcement learning, there is an agent who is acting in an environment and what actions the agent takes at every stage is what is decided. This action can either be penalties or rewards based on the result.

METHODOLOGY

To provide cyber security attacks for social networks using machine language a number of algorithms have been proposed earlier. A few algorithms that can be used for providing cyber security are Fully connected Feed-forward Deep Neural Networks (FNN), Convolutional Feed-forward Deep Neural Networks (CNN) and Recurrent Deep Neural Networks (RNN)[6]. All of the above algorithms are based on neural networks. A Neural Network (NN) usually consists of elements of huge numbers that are interconnected called neurons, working in harmony to solve definite problems. There are 3 groups of neurons, first called as Input neurons which sense the environment through sensors and the next set of neurons, the hidden neurons which are activated through weighted connections between the input and hidden units [7]. The third group is the output neurons which are activated through the weighted connections between the hidden unit and the output units.

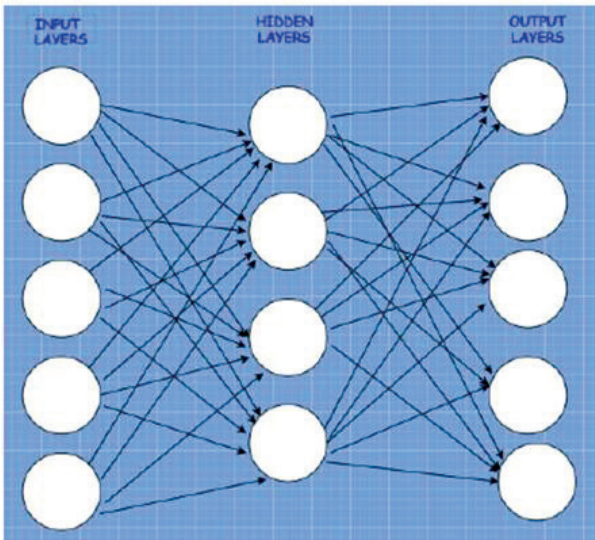


Figure 1: Neural network with one hidden layer

- A. FNN:** This algorithm is a type of Deep Neural Networks (DNN) where every neuron is connected to all the neurons in the previous layer. FNN provides an optimal solution for classification where input data is not assumed. The drawback is that the cost of computation is really high.
- B. CNN:** This algorithm is a type of Deep Neural Networks (DNN) where input data is not taken from all neurons but only a set of neurons of the previous layer. This technique has lesser cost of computation. This is usually preferred for spatial data but not for non-spatial data.
- C. RNN:** This algorithm is a type of Deep Neural Networks (DNN) where data is sent from neurons also to previous layers. This technique is hard to implement. Their performance when measured is the highest when compared to other algorithms.

While providing cyber security to social networks, there are volumes of data that need to be analyzed^[8]. When huge, dissimilar volumes of data are involved, NN and DNN seem more powerful and detect threats better than other techniques. Especially when complex abstract layers are involved these techniques seem to have an upper hand in solving problems. The reasons these techniques are used are due to the ability to find a solution accurately for unknown functions. There are many challenges when using NN and DNN for providing cyber security to social networks^[9]. A large part of this data's parameters should be labeled which is a practical concern. Various problems that may be encountered should be expected. To anticipate this for voluminous amount of data is complex and time

consuming. Best probable solution should be attempted to solve non convex data model problems. The entire problem is subdivided into sub problems and each are solved individually. So which means a neuron's network function constitutes other functions which in turn can be a composition of other functions^[10]. Each function is the nonlinear weighted sum. Finally these individual solutions are assembled to solve non convex problems. This method improves performance and is faster. Often finding the optimal solution is not a feasible option so other methods must be used in conjunction. Supplying the models with in appropriate or insufficient data can cause certain problems so a proper understanding of the problem, its complexity and covering all available data is a must^[9]. The different steps involved in implementation are^[10]



Figure 2: Steps in Implementation

- **Understanding the problem:** Analyzing of the various threats to Social networks. Threats which can be already known or still evolving. Highlighting potential serious issues.
- **Analyze Data and Data Dependencies:** This is the key step wherein the data, the data flow and the resultants to be got are analyzed.
- **Classification of threats:** In this step the rate of occurrence and the total number of threats are reviewed. The composition of functions and sub-

functions are validated. The common threats are listed and analyzed. Classification is done using DNN.

- **Prepare Dataset:** Majority of the implementation time is usually involved in preparation of data. The data used must be assessed, validated and also might be transformed to produce optimal results.
- **Developing the model:** In this step the model NN or DNN is developed.
- **Evaluate Model:** In this step validation is done to check if the data was classified correctly from the available data sets. Also evaluation of the labeled data is done.

CONCLUSION

Social networks consist of huge amount of data where data confidentiality must be met. When data is spoken about, making sure data is secure is a primary concern. Data must be protected from various cyber attacks such as Phishing messages, Impersonation, account takeover, and botnets. There are various methods in which cyber security can be provided to these attacks. Threats are evolving hence the methods used to provide security also needs to be advanced. Machine learning is used to support cyber security to social networks. Most of the machine learning models is based on supervised learning, unsupervised learning or reinforcement learning. All the models are based on neural networks and in turn deep neural networks. DNN models can be Fully connected Feed-forward Deep Neural Networks (FNN), Convolutional Feed-forward Deep Neural Networks (CNN) or Recurrent Deep Neural Networks (RNN). All are based on the basic neural networks. To implement the above models for providing cyber security for social networks using machine learning there are a number of steps such as Understanding the problem, Analyze Data and Data Dependencies, Classification of threats, Prepare Dataset, developing the model and finally evaluate model.

Evaluate Model

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Machine Learning For Social Networks

REFERENCES

1. Sumeet, D., Xian, D., “Data mining and machine learning in cyber security”, CRC Press 2016.
2. Ozlem Yavanoglu, Murat Aydos, “A review on cyber security datasets for machine learning algorithms”, 2017 IEEE International Conference on Big Data (Big Data), 2017, pp 2186 – 2193.
3. M. Sreenu , Dr V. Anantha Krishna , Devender Nayak N., “A general study on cyber attacks on social networks”, IOSR Journal of Computer Engineering, vol.19, Issue 5, pp. 01-04
4. Yang Xin; Lingshuang Kong; Zhi Liu; Yuling Chen; Yanmiao Li; Hongliang Zhu; Mingcheng Gao; Haixia Hou; Chunhua Wang, “ Machine learning and deep learning methods for cybersecurity”, IEEE Access, 2018, vol. 6, pp 35365 – 35381.
5. Charles Feng; Shuning Wu; Ningwei Liu, “ A user-centric machine learning framework for cyber security operations center”, 2017 IEEE International Conference on Intelligence and Security Informatics (ISI), 2017, pp 173 – 175.
6. Giovanni Apruzzese; Michele Colajanni; Luca Ferretti; Alessandro Guido; Mirco Marchetti, “On the effectiveness of machine and deep learning for cyber security”, IEEE Conference 2018 10th International Conference on Cyber Conflict (CyCon), 2018, pp 371 – 390.
7. Ming Feng; Hao Xu, “ Deep reinforcement learning based optimal defence for cyber physical system in presence of unknown cyber attack”, IEEE Symposium Series on Computational Intelligence (SSCI), 2017, pp 1 – 8.
8. M. Jordan and T. Mitchell. “Machine learning: trends, perspectives, and prospects.” *Science* 349, vol.6245, 2015, pp 255-260.
9. James B. Fraley ; James Cannady, “The promise of machine learning in cyber security”, IEEE Conference, SoutheastCon 2017, pp 1 – 6.
10. C. Szegedy, V. Vanhoucke, S. Ioffe, J. Shlens, and Z. Wojna. “Rethinking the inception architecture for computer vision.” In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, pp. 2818-2826. 2016.

A new Dimensions in Era of Science on Nano Materials

K. Srishailam¹, P. Venkata Ramana Rao², E. Purushotham³, P. Nagabrahmam⁴

¹Asst. Professor, ²Assoc. Professor, ³Asst. Professor, Department of Physics, ⁴Faculty, Department of Mechanical Engineering, S R Engineering College, Warangal, India

ABSTRACT

Nano science and nanotechnology are the examination and uses of little things. Nanomaterials can be utilized crosswise over in every one of the fields of science, for example, science, science, physical science, materials science, and designing. Researchers and designers are finding a different approaches to tailor wanted materials at the nanoscale. With the goal that their properties, for example, higher quality, lighter weight, expanded control of light range and synthetic reactivity can be utilized. The expansive scope of business items incorporate stain-safe and sans wrinkle material and makeup are accessible today. In the present article a wide vision – another measurements in time of science on nano materials is focussed.

Keywords: optical filters, Nanoscale, quantum effects, bioelectronic devices, nanocoatings.

INTRODUCTION

Nanoscale materials are characterized as an arrangement of substances where no less than one measurement is not as much as roughly 100 nanometers. A nanometer is one millionth of a millimeter. Which is around 100,000 times littler than the breadth of a human hair. nano materials are of intrigue (fig.1) in light of the fact that these have one of a kind optical, attractive, electrical and different properties at the nanoscale. These properties have the potential effect in hardware, pharmaceutical, and different fields.



Fig. 1: Nanomaterials

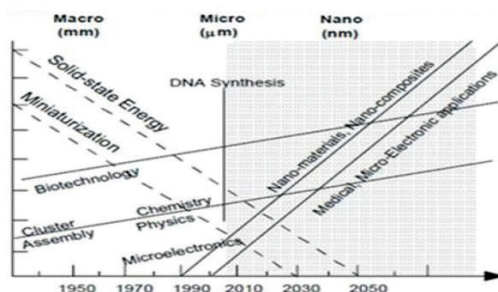


Fig. 2: Nono as new era of science and technology

nano materials hold potential to make supercomputers. These are sufficiently little to be conveyed in a shirt take. Machines can be built that can repair harmed tissues when gone through the human body. Nanostructured materials are utilized as a part of sensors, optical filters, low-edge laser, controlled medication conveyance and organic location.

Nano pharmaceutical is a generally new territory of biotechnology. The potential outcomes for new treatments and medical procedures to regard sicknesses and infections, for example, disease, appear to be interminable. The idea of nano robots and cell repair machines is additionally suitable. Diverse kinds of nanoparticles are being contemplated for applications in nano medication. They can be carbon-based skeletal-type structures, for example, the fullerenes, or micelle-like, lipid-based liposomes. They have various applications in medicate conveyance and the corrective business. At the nano scale these materials can have distinctive properties in light of the fact that their relative surface region to volume proportion is increased. Another motivation to have such properties is new quantum effects. These properties are not found in their mass part. Nano materials have a substantially more prominent surface region to volume proportion than their regular forms. It can prompt more prominent substance reactivity and influence their quality. Quantum effects can turn out to be more critical in deciding properties and qualities of materials at the nanoscale. They prompt novel optical, electrical and attractive practices.

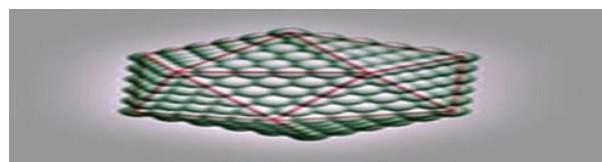
Occurrence: Some nano materials happen normally. The nano materials are built and intended for a specific item and right now being utilized as a part of numerous business items and procedures. They can be found as sunscreens, beauty care products, donning merchandise, recolor safe apparel, tires, gadgets, and additionally numerous other regular things, and are utilized as a part of pharmaceutical for reasons for finding, imaging and medication conveyance.

History of nano materials: Individuals were going over different nanosized objects and the related nanolevel procedures, and utilizing them practically speaking some time before the beginning of nanoera. Instinctive nanotechnology ancient pieces grew immediately, truth be told, they were not understanding the idea of these items and procedures. Around then little particles of different substances had properties diverse to those of similar substances with bigger molecule estimate was known, They were not knowing the purpose behind that.

In this way, individuals were occupied with nanotechnology subliminally. They couldn't figure that they were managing the nanoworld wonders. In numerous cases insider facts of old nanoproduction essentially go from age to age, Individuals knew and utilized characteristic textures: flax, cotton, fleece, silk. They could develop them and process into items. They didn't know what makes these textures exceptional? Infact , they have a created system of pores with the extent of 1-20 nanometers. They didn't know that these are average nanoporous materials. Characteristic textures possess absorption properties due to their nanoporous structure. Textures assimilate sweat well, rapidly swell and dry. Individuals aced the methods for getting ready bread, wine, brew, cheddar and different foodstuffs since antiquated circumstances. They didn't realize that the aging procedures at nanolevel. In Ancient Egypt it was somewhat normal to color hair dark. For quite a while it was trusted that the Egyptians utilized mostly regular vegetative colors like henna and dark hair color. As of late, Ph.Walter led inquire about on hair tests from old Egyptian entombment locales, It demonstrated that hair was colored in dark with glue from lime, lead oxide and little measure of water. Over the span of the coloring procedure nanoparticles of galenite (lead sulfide) were shaped. Normal dark hair shading is furnished with a color melanin. It is spread in hair keratin. The Egyptians could influence the coloring to glue respond with sulfur, which is a piece of keratin. They got galenite particles of couple of nanometers. That gave even and consistent coloring.

The British historical center flaunts Licurg's bowl as a major aspect of its legacy. This outstanding bowl is made by glass producers of Ancient Rome. This bowl has surprising optical properties. It changes shading with change of area (inside or outside) of the light source. In regular light the bowl is green, if lit up from inside, it turns red. The investigation of sections of the bowl, completed in the research facilities of General Electric in 1959 out of the blue. They demonstrated that the bowl comprises of common pop lime-quartz glass and has around 1% of gold and silver, and likewise 0,5 % of manganese as segments. The analysts at that point accepted, that the unordinary shade of glass is given by colloidal gold. Afterward, researchers found particles of gold and silver from 50 to 100 nanometers in estimate utilizing an electronic magnifying instrument.

Regular natural nano materials:Biological frameworks include characteristic, utilitarian nano materials. The structure of chalk and viruse, the wax precious stones covering a lotus leaf, arachnid and insect parasite silk^[2], the blue tone of tarantulas,butterfly wing scales, normal colloids like drain and horny material. Indeed, even our own bone frameworks are for the most part characteristic natural nano materials.



Viral Capsid



Fig. 3: Lotus effect hydrophobic effect with self-cleaning ability

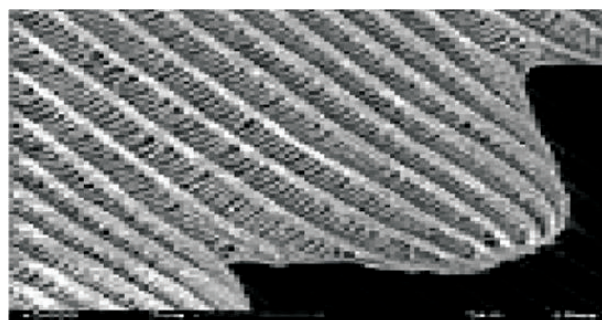


Fig. 4: SEM micrograph of a butterfly wing scale

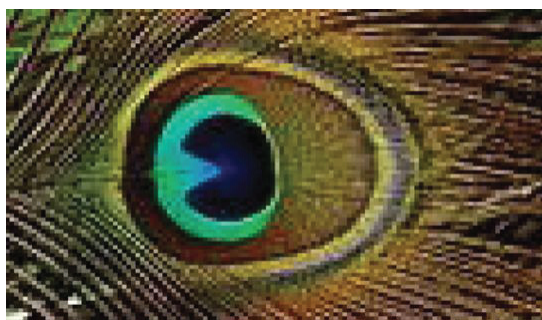


Fig. 5: Peacock feather



Fig. 6: Blue hue of a species of tarantula

APPLICATIONS

Nano materials are as of now in business utilize, Very expansive scope of business items is accessible today. Stain-safe and without wrinkle materials, beautifying agents, electronic supplies, paints and varnishes are accessible in showcase. Nanocoatings and nanocomposites are discovering utilizes as a part of various shopper items, for example, windows, sports gear, bikes and vehicles. There are novel UV-blocking coatings on glass bottles.

These shield refreshments from harm by daylight, Nano-dirt composites. Nanoscale titanium dioxide, for example, is discovering applications in makeup, sun-square creams and self-cleaning windows. Nanoscale silica is being utilized as filler. It incorporates beautifiers and dental fillings. Nanoscale added substances to or surface medicines of textures. These can give light weight ballistic vitality diversion in individual body protective layer. It can assist them with resisting wrinkling, recoloring, and bacterial development.

Eyeglasses, PC and camera presentations, windows, and different surfaces are covered with clear nanoscale films. The film statement can influence them to water and deposit repellent, antireflective, self-cleaning, impervious to bright or infrared light, antifog, antimicrobial, scratch-safe or electrically conductive.

Nanoscale materials empower us launderable and strong brilliant textures. Nano types of gear with

adaptable nanoscale sensors^[3] have capacities to monitor wellbeing^[4]

Lightweighing of autos, trucks, planes, water crafts, and space specialty could prompt critical fuel reserve funds. Nanoscale added substances in polymer composite materials are being utilized as a part of polished ash, tennis rackets, bikes, bike protective caps, vehicle parts, gear, and power instrument lodgings, These materials make them lightweight, firm, solid, and strong. Carbon nanotube sheets are presently being delivered for use in cutting edge air vehicles. For instance, the blend of light weight and conductivity makes them perfect for applications, for example, electromagnetic protecting and warm administration.

CONCLUSION

Nanoparticles have potential applications in various fields. Custom-made nano-particles are particularly composed and framed with modified physical properties keeping in mind the end goal to satisfy the necessities of particular applications. They can fill in as the final result, similar to sensor for uncommon purposes, pharmaceutical medications and quantum spots. They can fill in as parts in finished results, as on account of carbon dark in elastic items. The physical properties of the nano materials assume a key part in their execution. The novel physical and concoction properties of nano materials furnish interface electronic flag transduction with DNA acknowledgment occasions. These materials are utilized to configuration progressed bio-electronic devices with inventive capacities. There is as of now minimal accessible data on the blast and inflammable danger of these materials.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nano Materials

REFERENCES

1. Ramsden, J.J. Nanotechnology: An Introduction, Elsevier, Amsterdam (2011)
2. Novel natural nano material spins off from spider mite genome sequencing phys.org (may 23,2013).
3. Donglu Shi, nano materials and Devices 1st

Edition eBook ISBN: 9781455777495 26th September 2014

4. Kerativitayanan, P; Carrow, JK;Gaharwar, AK “nano materials for Engineering stem cell responses” (26 May 2015).
5. Asbach C, Kaminski H, Fissan H, Monz C, Dahmann D, Mülhopt S, Paur HR, Kiesling HJ, Herrmann F, Voetz M, Kuhlbusch TAJ, Comparison of four mobility particle sizers with different time resolution for stationary measurement. *J Nanopart Res* (2009) 11: 1593–1609.
6. Brouwer D, van Duuren-Stuurman B, Berges M, Jankowska E, Bard D, Mark D From workplace air measurement results towards estimates of exposure? Development of a strategy to assess exposure to manufactured nano-objects. *J Nanopart Res* (2009) 11: 1867–1881
7. Workplaces atmospheres – Ultrafine, nanoparticle and nano-structured aerosols – Inhalation exposure characterization and assessment, ISO copyright office, Case postale 56, CH-1211 Geneva 20, ISO/TR 27628 (2007)
8. Nanotechnologies – Health and safety practices in occupational settings relevant to nanotechnologies, ISO copyright office, Case postale 56, CH-1211 Geneva 20, ISO/TR 12885 (2008)

A Review on Computational Fluid Dynamics Projects

Swamy Reddy¹, R. Archana Reddy², G. Ravi Kiran³, B. Saritha⁴, S. Srinivas⁴

¹Assoc. Professor, ²Professor, ³Asst. Professor, Department of Mathematics, ⁴Faculty,
S R Engineering College, Warangal, India

ABSTRACT

Lately, end users have turned out to be more worried about the human experience and the individual comfort of the individual is ending up more vital in the plan of the constructed condition. Computational Fluid Dynamics (CFD) is a device that licenses appraisal of individual comfort. CFD is a flood of fluid mechanics that uses numerical methods to break down and take care of problems including fluid flows. The crucial reason for these problems are the Navier-Stokes conditions. While research applications of CFD are creating, as it the utilization of CFD in the aeronautic trade, the utilization of CFD in Civil Engineering applications is as of now at the bleeding edge. Arup have as of late built up a group to chip away at such projects and a portion of these will be displayed in this paper. The paper will talk about the research question of each task, the methodology received in building up the models, the aftereffects of the reproductions and a few exercises picked up going ahead. In view of the projects done to date, it can be presumed that CFD has been appeared to be an intense instrument that adds important data to fluid flow problems.

Keywords: Navier-Stokes, Computational Fluid Dynamics (CFD), pedestrian comfort, thermal comfort.

INTRODUCTION

Computational Fluid Dynamics (CFD) is the utilization of PCs and numerical methods to take care of problems in fluid flow. It is a strategy for understanding incomplete differential conditions in continuum mechanics utilizing numerical techniques. It includes separating the issue into a discrete number of volumes that can be examined all the more effortlessly^[1]. Consolidating the arrangements from these little volumes allows the age of the total arrangement. The conditions overseeing fluid movement depend on the crucial physical standards of the preservation of mass, force and vitality. CFD has been effectively connected in numerous regions of fluid mechanics, including, warmth and mass exchange^[2], synthetic response and ignition^[3], aerodynamics of autos and air ships, and pumps and turbines. The utilization of CFD in structural building applications, albeit later, is at present at the forefront because of the direct viable applications. Applications of CFD to structural designing incorporate breeze displaying and the dynamic reaction of structures^[4], ventilation^[5], fire, smoke flow and visibility^[3], scattering of poisons and profluent^[6], and warm move in buildings^[7]. Customarily, the collaboration of these wonders has been completed tentatively, utilizing scaled

models and short estimations. Be that as it may, it is once in a while conceivable to precisely catch all marvels ensuring repeatability. In the approach of enhancing computational power, and the improvement of numerical techniques, for example, Finite Element Analysis, CFD offers a chance to show numerous varieties of a similar issue at full scale, all the more effectively, in a virtual domain.

Similarly as with any PC reenactment, the nature of the outcomes is dependent on the nature of the data sources, the presumptions, demonstrating attributes utilized and the conditions used to speak to the wonders. There will definitely be approximations, and a hearty model approval process is fundamental. An abnormal state understanding of the displaying procedure and of the marvels being demonstrated is essential for the yield to be of any down to earth utilize.

With a specific end goal to catch the wonders in adequate detail, substantial limited volume models are essential requiring huge preparing power. These extensive models create an awesome measure of information, which thusly should be put away and broke down. The upsides of CFD be that as it may, far out-measure the drawbacks. It is a non-meddling, virtual displaying technique with

intense representation abilities. Results can be caught over the whole area. There are likewise critical cost and time reserve funds with CFD as there is chance to survey correlations between elective frameworks rapidly and effectively, without the disturbance of rolling out physical improvements on location.

This paper will talk about a few projects as of late attempted by the new CFD group at Arup, in particular, a Dublin Docklands tall building wind contemplate, a Hospital thermal comfort ponder, and a Dundrum Ventilation Shaft fire consider. The research question of each undertaking will be talked about, the methodology received in building up the models exhibited, and at long last the outcomes showed.

CFD MODELLING METHODOLOGY

Displaying in CFD contains three principle stages: pre-preparing, reproduction and post-handling. Pre-handling right off the bat includes the development of the geometric model for the flow space of intrigue, and the resulting division of this area into little control volumes (cells), a procedure frequently called ‘fitting’. The flow field and the conditions of movement are discretized, and the subsequent arrangement of logarithmic conditions is explained to give esteems at every hub. Once the model and the work have been made, suitable introductory conditions and limit conditions are then connected.

The Navier-Stokes conditions, the representing conditions for the conduct of fluid particles, are understood iteratively in each control volume inside the computational space until the point that the arrangement unites. The field arrangements of weight, speed, air temperature and different properties can be ascertained for each control volume at cell focuses and interjected to external indicates all together render the flow field.

Post-preparing includes diagramming the outcomes and survey the anticipated flow field in the CFD display at chosen areas, surfaces, or planes of intrigue. The Navier-Stokes conditions, utilized inside the CFD examination, apply a numerical portrayal to rough the laws of material science to create to a great degree precise outcomes, giving that the situation displayed is illustrative of the real world. In every one of the accompanying illustrations, Fire Dynamic Simulator Version 5.5.3 was utilized.

DUBLINDOCKL AND STALL BUILDING WIND STUDY

Computational Wind Engineering (CWE) is a branch of CFD worried about conduct of wind. Like breeze burrow tests, it can be utilized to understand the breeze flow through a urban domain and the impact of a proposed advancement on the neighborhood wind microclimate. Not at all like limit layer wind burrow tests, a virtual geographical model can be developed at full scale and hence, maintains a strategic distance from any closeness problems (i.e. Reynolds number infringement). What’s more, the breeze speed profile, which is reliable with the real world, can be determined straightforwardly in CWE as opposed to created misleadingly in a breeze burrow utilizing extra unpleasants components.

The proposed advancement at the Dublin Docklands comprises of the development of a place of business going in range from 8 to 17 stories, known as the Dublin Docklands tall building. The development of new buildings and the modification of the current landscape may adjust the flow of the breeze in the encompassing territory [8]. The proposed improvement can create a breeze domain at ground level that is discomforting or even perhaps hazardous to pedestrians. The appraisal of discomfort and pain of pedestrians was done as per the Lawson Comfort Criteria

(Table 1). The fundamental wellspring of pedestrian discomfort identifies with the power of the breeze felt on their body and their apparel, as extra exertion is required to arrange the breeze. Despite the fact that the power following up on a man is identified with the breeze speed, the level of pedestrian discomfort depends on recurrence of event and the movement being attempted and additionally the breeze speed.

Table 1: Lawson Comfort Criteria.

Wind effect	Threshold	Stationary	Strolling	Transit
Calm				
Felt on face				
Leaves move	4.0m/s			
Dust raised	6.0m/s			
Felt on body	8.0m/s			
Hard to walk	10m/s			
Trees moving				
Storm	15m/s			
Dangerous	20m/s			

A limit layer wind burrow investigation of the proposed advancement at the Dublin Docklands was beforehand directed by BMT Fluids to survey the effect of the proposed advancement on the breeze microclimate. Arup were charged to direct a further breeze appraisal to analyze the areas recognized as causing pedestrian discomfort or trouble and to assess the viability of the proposed relief measures.

The nearby breeze atmosphere was resolved from authentic meteorological information recorded at Dublin Airport. Two diverse datasets were investigated, to be specific; the information related with the greatest every day wind speeds recorded over a multi year time span somewhere in the range of 1985 and 2015, and the mean hourly breeze speeds recorded over a multi year duration somewhere in the range of 2005 and 2015. The breeze speeds in the region of the improvement will contrast from the breeze recorded in Dublin Airport. It is important to change the breeze rates to assess neighborhood conditions^[10]. From this, a solitary breeze speed profile was resolved for every bearing for both comfort and pain criteria, as outlined in Figures 1 and 2.

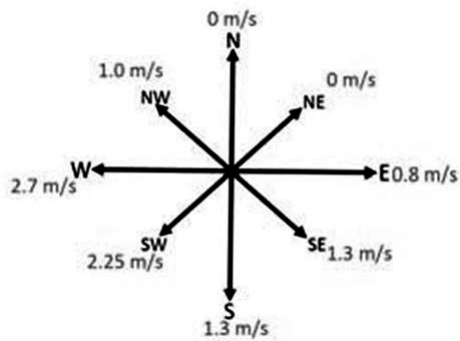


Figure 1: Comfort criteria

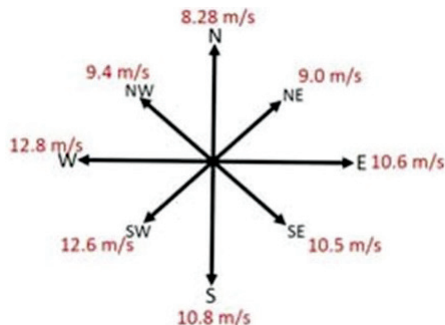


Figure 2: Distress criteria

The geometry for the CFD show was produced in ‘Sketchup’ drawing bundle utilizing illustrations got from the Client and Google Earth pictures of the encompassing zone. The geometry was transported in into ‘Flame Dynamics Simulator’ (FDS) programming

[11-12], utilized as a part of the CFD displaying. A view from the East of the Dublin Docklands tall building is delineated in Figures 3 and 4. The Dublin Docklands tall building was taken at the focal point of the computational space which extended 550m in the North-South bearing and 410 m in the East-West course. The space was demonstrated as 102.4 m in height.



Figure 3: Sketchup Geometry

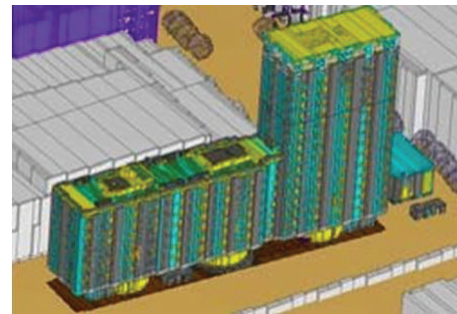


Figure 4: CFDmodel

As a major aspect of the computational procedure, the area was isolated into a sum of 16million cells. The cells go in estimate from 0.4 m at the Dublin Docklands tall working to 3.2 m at the external area. Shut limit conditions were connected on the base face of the area, and open limit conditions were demonstrated somewhere else. Information inspecting areas were been as conceivable to the correct sensor areas utilized as a part of the breeze burrow tests.

For the motivations behind approval of the CFD demonstrating process, the conditions in the breeze burrow were displayed utilizing CFD and examinations were drawn. The consequences of this approval indicated great consistency with the first breeze burrow test comes about.

The evaluation of the pedestrian comfort and misery in the pedestrian avenue between the 3Arena and the Dublin Docklands tall building shows that the fundamental territories of concern are at the southern end. The comparable breeze speeds from the point of view of comfort and pain are 12m/s and 24 m/s separately

(Figure 5). These breezes emerge when high westerly breezes are coordinated to ground level by the building façade. These high breezes cause discomfort and misery between the 3Arena and the Dublin Docklands tall building (Figure 6). Halfway along the building, the identical hourly normal whirlwind from a comfort point of view is 8.3 m/s. At the northern end, the investigation uncovers that the breeze speeds are deficient to cause either discomfort or trouble.

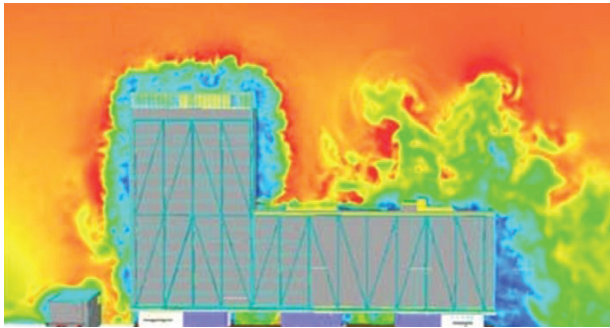


Figure 5: Distress Criteria, Wind from the West, Minimum values in blue (0m/s), Maximum values in red (20m/s)

Moreover, it is conceivable that the breezes from the south and north will make trouble the overall population. The identical hourly normal blast speed is evaluated at 15.4m/s and 16.3m/s from the North and Southwest, separately. These breeze speeds surpass the trouble limit for the overall population of 15m/s.

The appraisal of the pedestrian comfort and misery in the ways between the Dublin Docklands tall building uncovers that the breeze conditions may be discomforting and troubling to pedestrian. Be that as it may, the level of discomfort and trouble is identified with the breeze bearing. For example, while westerly breezes with a yearly return period may deliver conditions unsatisfactory for undertaking any action inside the undercroft, a slight move in heading toward the south outcomes in a satisfactory domain. No doubt a significant part of the pedestrian discomfort and trouble is because of westerly breezes. From the viewpoint of comfort, the equal hourly normal blast speed in the undercroft ways runs between 10 m/s and 13.9 m/s for westerly breezes, which is viewed as uncomfortable independent of the action being attempted. The fundamental wellspring of pain is because of westerly breezes which go between 15m/s and 30m/s along the length of the building. These high breeze speeds close ground level are because of the building channeling abnormal state twists descending.

The breeze speeds are additionally expanded through the undercroft ways as the breeze is constrained through smaller openings underneath the building. In spite of the fact that it may be normal that easterly breezes may cause comparable pedestrian discomfort and trouble inside the building undercroft, it is clear from this isn't the situation. The divider on the western limit of Dublin Port acts to aggravate the breeze. The feign idea of the divider makes the flow discrete and the arrangement of extensive vortex between the divider and the Dublin Docklands tall building. The vortex demonstrations to push a significant part of the breeze over the Dublin Docklands tall building. As a result there is less flow going under the Dublin Docklands tall building.

The appraisal of the Dublin Docklands tall building demonstrated that the southern degree of the pedestrian lane between the 3Arena and the Dublin Docklands tall building is inclined to pedestrian discomfort and misery. Pedestrian discomfort and trouble is likewise anticipated in the undercroft of the Dublin Docklands tall building. The investigation uncovers that rapid breezes at ground level in charge of conceivable pedestrian discomfort were to a great extent because of westerly breezes, where the building demonstrations to coordinate abnormal state twist towards the ground. The arrangement of a 2.5 m wide shelter with a 0.45 m upstand for the full width of the western side of the building is proposed as a moderation measure.

HOSPITAL THERMAL COMFORT STUDY

Arup was appointed to lead a thermal comfort investigation of a proposed new Hospital. An underlying examination of authentic climate information was done to recognize thermal conditions. Computational Fluid Dynamics (CFD) displaying was used so as to understand the inside flow field in the rooms and to recognize zones of patient discomfort.

Thermal comfort is a subjective assessment by people of their fulfillment with the thermal condition. Keeping up a standard of thermal comfort for inhabitants of walled in areas is an imperative objective of HVAC frameworks [13-14]. Inferable from the worldwide activity to enhance carbon impressions, many building proprietors are picking normally ventilated frameworks. A coveted inward temperature of 22°C for persistent comfort has been indicated by the Design Team. The

goal of this examination is to assess whether an interior temperature of 22°C can be kept up:

- During winter conditions, with a surrounding outside temperature of - 4.5°C With the louvers in the vacant position
- Assuming the warming arrangement of brilliant boards recommended by the Design Team is completely operational
- Assuming the geometry and format of the rooms as got from the Design Team.

The temperature atmosphere in the region of the new healing facility was assessed from just about 20 long stretches of memorable temperature information (December 1996 until December 2015) recorded at a neighborhood air terminal. Investigation of the information uncovered that the most continuous least temperatures were between 4-8°C, anyway is was normal to have temperatures as low as - 4°C. On seven events in 20 years, the temperature fell underneath - 8°C, and the base temperature recorded over the investigation time frame was - 10°C which happened twice (Figure 6)

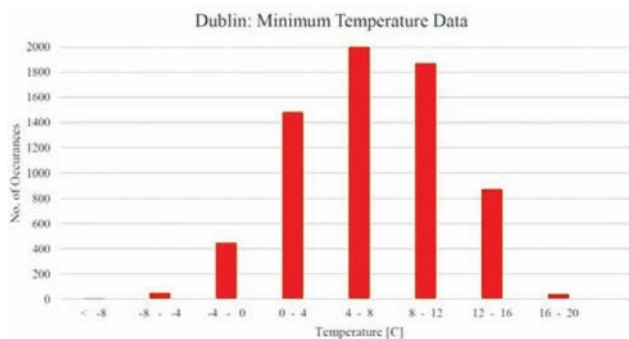


Figure 6: Frequency of Minimum Temperature Data EN1991-1-5 provides information on ambient temperature for thermal modelling

The characteristic outside temperature might be resolved from Figure NA.1, Table 5.1 and Table 5.2. Considering the climate maps given by the Eurocode, winter conditions, a light hued façade surface, and a North-East confronting introduction, a base air temperature of - 9°C was resolved.

The geometry for the CFD show was made utilizing the Revit demonstrate beforehand created for the venture. An aggregate of three best floor rooms were displayed, each with a story territory of 23 m2. The section-to-piece height was taken as 4.0 m and a false roof was incorporated at a height of 3.0 m above

floor level. Brilliant boards were displayed as surface mounted on the false roof, as showed in the arrangement perspective of the model. Every room has three 3.0 m x 0.6 m boards, one 1.2 m x 0.6 m board and one 1.8 m x 0.6 m boards giving an aggregate territory of brilliant boards per room of 7.2 m2. Coating units 2.5 m x 1.95 m and aluminum spandrel boards 2.5 m x 1.0 m and 2.5 m x 0.75 m were displayed, which can all be found in the height perspective of the model.

Extractor units with a breadth of 0.15 m were displayed in the region of the shower in the ensuite of each room. An exchange filler of territory 0.6 m x 0.6 m with half free zone was demonstrated in the lower part of the ensuite entryways. A louver of 2.5 m wide and 0.3 m high was displayed in each room. The free zone of these louvers was taken as 2.5 m x 0.2 m.

As determined by the Design Team, the warmth transition of every 3 m x 0.6 m board was taken as 1 kW/m2. The warmth transition of the littler boards were figured around region. The extractor flow rate, likewise determined by the Design Team, was taken as 0.065 m3/s.

The limits to the model at the floor, the roof, the back (along the inner passage) and the sides (interior allotments with neighboring rooms) were demonstrated as shut limits. The inside introductory temperature was taken as 22°C. The front of the model (the side containing the windows) was demonstrated as an open limit, with a connected outside encompassing temperature of - 4.5°C. This is spoken to by the blue segment.

The results from the CFD modelling at a height of 0.5m above the floor are illustrated below. Figure 7 presents the internal and external temperatures when the louver is in the open position and the external temperature is set at -4.5°C. Results indicated that the internal temperature at a height of m above the floor reaches 17.2°C when the external temperature is 0°C and 18.4°C when the external temperature is +5°C.

The results from the CFD modelling at a height of 1.5 m above the floor were also captured when the louver is in the open position and the external temperature is set at -4.5°C, 0°C and +5.0°C respectively. Results indicated that the internal temperature at a height of 0.5 m above the floor reaches 17.8°C when the external temperature is 0°C and 19.0°C when the external temperature is +5°C.

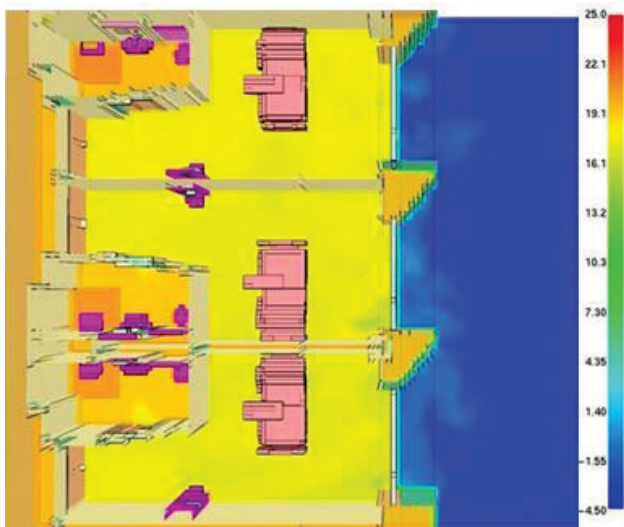


Figure 7: External Temperature -4.5°C

From the investigation of temperature information did for the neighborhood, temperatures of +5.0°C happen around 5% of the time, normal temperatures of +5.0°C happen roughly 16% of the time and least temperatures of +5.0°C happen around 34% of the time. A temperature of +5.0°C happens in the most continuous band. Given this, and the aftereffects of the CFD reenactments – the proposed design of brilliant boards and louvers won't convey a surrounding temperature of 22°C and will bring about a thermally uncomfortable condition. Results from this work brought about an amended thought of the proposed ventilation framework for the healing facility.

DUNDRUM VENTILATION SHAFT FIRE STUDY

Smoke Management System Limited dispatched Arup to deliver a CFD displaying examination for the mechanical differential weight shaft proposed for the Dundrum Apartment square, Dublin. The building is a current 3 story high private advancement with a storm cellar auto stop. The height of the most astounding floor is 8.575 m over the ground.

The proposed system (Figure 8) involves a mechanical concentrate system of 2 m³/s, which is connected to the entryway region with a vent arranged at abnormal state near the roof, and a normally ventilated gulf shaft, which associates with the anteroom territory through a vent that is situated at low level (i.e. with a delta guide close toward the floor).

The system for the anteroom territory is made out of two concentrate fans (one in activity and one on

standby) that are measured with a specific end goal to not surpass a differential weight of - 50 Pa inside the hall region. This is keeping in mind the end goal to stay away from spillage of smoke into the staircase zone while allowing the opening of the entryways as the system keeps on removing air smoke. The two concentrate fans are situated on the rooftop. The fans are associated with each entryway through a pole, which has an estimated zone of 0.5 m², with a damper arranged near the roof in each anteroom.

The substitution air provided into the hall is given through a little delta shaft. This pole, which provided the make-up air, is associated with each entryway however a low level louver or exchange grille. The motivation behind the arrangement of make-up air is to keep the weight differential of - 50 Pa being surpassed.

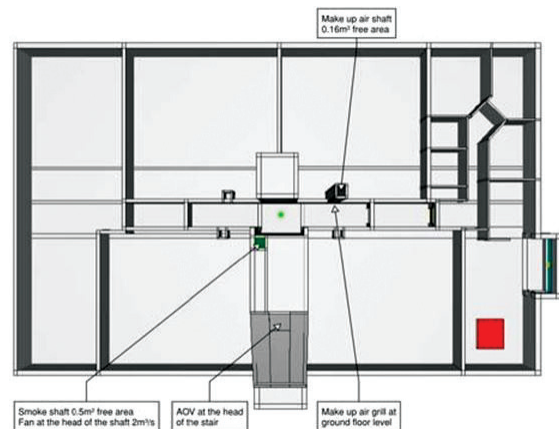


Figure 8: Proposed depressurisation system

1. The weight is kept up by the lopsidedness between the extraction rate and the gulf rate of airflow. Endless supply of flame in any of the halls, the extraction fans come into task. The smoke shaft damper opens on the level where the fire is distinguished, while the dampers on alternate levels stay shut. Air from the make-up shaft will be drawn into the suitable hall zone naturally by the extraction system. The system will separate consistently and it will be estimated keeping in mind the end goal to not surpass the - 50 Pa with the staircase entryway shut.
2. Through a CFD investigation, the ability of the de-pressurization mechanical smoke system to accomplish the accompanying viability criteria [15] for the entryway zone is inspected:
3. **Visibility:** least 10m to light-reflecting signage (e.g. divider);

4. **Temperature:** greatest 60°C at 1.8 m (head height) and underneath for inhabitants;
5. **Speed:** speed 5 m/s at all areas on the departure course, with the exception of at the bay/separate vents. A speed of 10 m/s is worthy in closeness to the bay and concentrate vents;
6. **Pressure:** a weight contrast of < 50 Pa ought to guarantee that the entryway opening power does not surpass 100 N at the handle of an ordinary (0.8 m x 2.0 m) single leaf entryway. The weight contrast over the stair entryway (and ways to condos other than that of flame starting point) will be constrained with the end goal that the power required to open the door(s) does not surpass 100 N.

Two models were created with the end goal of this investigation:

1. **Fire Model:** this situation plans to exhibit that the proposed depressurization system is fit for averting smoke entering the departure staircase in case of a fire in one of the condos.
2. **Weight appraisal display:** the point of this situation is to show that the proposed depressurization system is equipped for keeping up an adequate weight differential (i.e. <50 Pa) inside the entryway with the goal that entryways can be opened and shut when the smoke separate system is working.

The CFD comes about for the fire situation have demonstrated that smoke does not spread to the escape staircase. Reasonable conditions for visibility (in excess of 10 m) and temperature (under 60°C) are kept up consistently inside the escape staircase. In this manner, this shows the proposed depressurization system is equipped for averting smoke entering the staircase. What's more, smoke spreading inside the entryway is cleared at 210 s which compares to under 120 s after the flat entryway is shut. The time taken to clear the smoke inside the passage is under 2 minutes, which is regarded a satisfactory execution of the smoke control system. Also, the speed levels are kept underneath 10 m/s with the exception of on the region of the bay flame broil which is viewed as worthy.

The CFD comes about for the weight appraisal display have demonstrated that the weight levels are kept up between - 12.5 and 7.5 Pa when the proposed

depressurization system is enacted and achieved unflinching state conditions. These weight levels are inside the scope of - 50 and 50 Pa which relates to the acknowledgment criteria with the goal that tenants can open or close entryways in the hall. Along these lines this shows the proposed depressurization system is equipped for keeping up a adequate weight differential inside the hall so entryways can be opened and shut when the smoke separate system is working.

CONCLUSION

This paper displayed three projects as of late finished by the Arup Ireland CFD group. These three illustrations serve to feature the wide expansiveness of applications conceivable with CFD demonstrating, giving a profundity of understanding and knowledge. On account of the Dublin Docklands wind think about, CFD had a part to play in educating plan such to relieve unsavory breeze conditions. Authorization was allowed by the arranging expert putting CFD examination as equal to wind burrow testing. For the Hospital thermal comfort think about, CFD displaying demonstrated that the underlying outline would bring about uncomfortable conditions in the rooms, where they would be sufficiently warm however without inflow of natural air, or excessively cool yet with inflow of outside air. The result of the CFD think about was to change the outline. For the smoke shaft in Dundrum, CFD displaying could demonstrate that the changed smoke shaft had the ability to perform sufficiently and fulfill viability criteria. In rundown, CFD can possibly enhance nature of configuration, is of prompt reasonable utilize and has a critical part to play in counseling building later on.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Fluid Dynamics

REFERENCES

1. J.H. Ferziger and M Peric, Computational Methods for Fluid Dynamics, Springer, third version, 2002.
2. Lien, J. and Ahmed, N., 'Indoor air quality estimation with the establishment of a housetop turbine ventilator', Journal of Environmental Protection, 2012; 3, 1498-1508.

3. Senveli, A., Dizman, T. and Celen, A., 'CFD examination of smoke and temperature control system of an indoor parking area with stream fans', *Journal of Thermal Engineering*, 2014; 1(2), 116-130.
4. Montazeri, H and Blocken B., 'CFD reenactment of wind-prompted weight coefficients on buildings with and without overhangs: approval and affectability investigation', *Building and Environment*, 2013; 60, 137-149.
5. Meroney, R.N., 'CFD forecast of airflow in buildings for characteristic ventilation', in *Proceedings of the eleventh Americas Conference on Wind Engineering*, San Juan, Puerto Rico, 2009.
6. Prasad, K., Li, K., Moore, E.F., Bryant, R.A., Johnson, A. and Whetstone, J.R., 'Ozone harming substance discharges and scattering', *NIST extraordinary distribution 1159*, 2013.
7. Kobayashi, N., and Chen, Q., 'Story Supply relocation ventilation in a little office', *Indoor and Built Environment*, 2003; 12(4), 281-292.
8. Penwarden, A.D., 'Worthy breeze speeds in towns', *Building Science*, 1973; 8, 259-267.
9. T.V. Lawson, *Building Aerodynamics*, Imperial College Press, London, UK, 2001.
10. E. Simiu, *The plan of buildings for wind: a guide for ASCE 7-10 Standard users and planners for extraordinary structures*, second version, John Wiley and Sons Inc, Hoboken, New Jersey, USA, 2001.
11. K. Mc Gratten et al., *Fire Dynamic Simulator (Version 6) User's Guide 2014: NIST Special Publication 1019*.
12. K. Mc Gratten et al., *Fire Dynamic Simulator (Version 6) Technical Reference Guide*, NIST Special Publication 1018.
13. Papakonstantinou, K.A., Kiranoudis, C.T., Markatos, N.C., 'Computational investigation of thermal comfort: the instance of the archeological historical center of Athens', *Applied Mathematical Modeling*, 2000; 24, 477-494.
14. Webb, M., 'Building vitality and CFD reproduction to check thermal comfort in under floor air circulation (UFAD) plan', in *Proceedings of the thirteenth worldwide building execution reenactment affiliation*, Chambéry, France, 2013.
15. *Applications of flame security building standards to flame wellbeing outline of buildings. Human variables: Life security procedures – inhabitant departure, conduct and condition (sub-system 6)*, PD 7974-6:2004.

A Study on Pattern Matching Intrusion Detection System for Providing Network Security to Improve the Overall Performance of Security System

Goje Roopa¹, M. Sampath Reddy²

¹Assistant Professor, Department of CSE, ²Associate Professor, Department of Electronics & Communication Engineering, S R Engineering College, Warangal, India

ABSTRACT

The security of computer networks assumes a vital part in modern computer systems. Keeping in mind the end goal to uphold high protection levels against malicious attack, various software tools have been at present created. Intrusion Detection System has as of late turned into a warmed research theme because of its capacity of detecting and preventing the attacks from malicious network clients. A pattern matching IDS for network security has been proposed in this paper. Many network security applications depend on pattern matching to extricate the risk from network activity. The expansion in network speed and movement may influence existing calculations to end up a performance to bottleneck. Thusly it is extremely important to grow speedier and more proficient pattern matching calculation with a specific end goal to defeat the troubles on performance.

Keywords: Pattern Matching, Intrusion detection, Network Security

INTRODUCTION

The Internet and in addition nearby networks is expanding at a gigantic speed. This one path enhances the quality and convenience of the human life yet on the other hand gives a stage to network culprits and programmers. The quantity of intrusions into computer systems is developing and raising concerns about computer security. So computer networks are typically ensured against intrusions by the methods for get to restriction strategies. Regardless of the exertion gave to deliberately outlining a framework to ensure such attacks, network security is extremely hard to ensure, since attacks misuse obscure shortcomings or bugs, which are generally contained in framework and application software (McHugh et al, 200; Proctor, 2001). Intrusion detection which alludes to a specific class of framework attack detection issues is a generally new research territory in computer and information security [7]. When all is said in done IDS can be ordered into abuse and anomaly detection approaches. Abuse detection framework can dependably recognize intrusion attacks in relation to the known patterns of found vulnerabilities. Be that as it may, emanant intervention of security specialists is required to characterize precise standards or patterns, which confine

the applications of abuse detection systems, recognize deviations from typical network practices and caution for potential concealed attacks [2]. It can recognize novel attacks without from the earlier learning about them if the classification display has the generalization ability to separate intrusion pattern and information amid preparing. Tragically, anomaly detection approach experiences high false positive rate on ordering ordinary network activity. Along these lines, machine learning procedures have been utilized to catch the typical usable patterns and characterize the conduct as either ordinary or anomalous [26]. While the pattern matching algorithms are connected to network security, the speed of pattern matching normally turns into a bottleneck.

This paper proposes a pattern matching calculation which beats the inadequacies of traditional algorithms. The paper is sorted out as takes after: section-II related work, section-III Pattern Recognition Methods, section-IV Pattern Recognition System, section-V conclusion.

RELATED WORKS

Pattern Recognition is one of the most essential territories which have been considered in computer

science. In a standard formulation of the issue, we are given a pattern and an information and it is required to discover all events of the pattern in the information [3]. Since the publication of the Bayer-Moore and Knuth-Morris-Pratt calculation, a few many papers have been distributed managing pattern recognition.

As observed from the writing study conveyed over, the analysts worldwide have been working in different Intrusion Detection procedures by and large and Pattern Matching methods specifically. The above diagram of related works shows that pattern matching procedures are reasonable to give a solution to some open issues in IDS improvement. The different algorithms are accessible for Pattern Matching procedure with changing level of exactness. It ought to be expressed that, for the sending of IDSs utilizing pattern matching system in operational environments, one of the fundamental challenges is the high production of false alarms. There is a need of a calculation which gives low false alarm rate.

THE PATTERN RECOGNITION METHODS

Pattern recognition experiences an imperative producing for a long time. Pattern recognition incorporates a great deal of strategies which are inducing the advancement of various applications in various field.

1. Statistical Pattern Recognition: The Statistical strategies have been commonly utilized for pattern recognition. Measurable approaches have various focal points. It can give accurate notification of malicious exercises that regularly happen over expanded time frames and are great markers of looming foreswearing of-benefit attacks [23]. Be that as it may, it likewise has disadvantages. It can be hard to decide edges that adjust the probability of false positive alarms with the probability of false negative alarms. In addition, this strategy require accurate measurable distributions, be that as it may, not all practices can be demonstrated utilizing simply factual strategies. The measurable pattern recognition manages includes only without consider the relations between highlights.

2. Data Clustering: Data clustering is a strategy for discovering patterns in unlabeled data with numerous dimensions. It is an unsupervised technique. The principle preferred standpoint of

data clustering is the capacity to gain from and identify intrusions in the review data, while not requiring the express descriptions of different attack classes. The technique for data clustering can be partitioned into two classes, one is progressive clustering and the other is partition clustering.

3. Fuzzy Set: As the quantitative highlights in the intrusion data are partitioned into the interim with fresh limit, there might exists a sharp limit issue for pattern classification. The fuzzy rationale gives the halfway participation in set theory to integrate with the association manages and visit scenes which tackled the above issue. Fuzzy manage based systems enlivened by the fuzzy set theory have been effectively connected to unravel numerous complex and non-direct issues. The application of fuzzy sets in pattern recognition began in 1966, where two essential operations—abstraction and generalization. Pattern Recognition system in light of fuzzy sets theory can mirror considering process individual generally and profoundly.

4. Artificial Neural Networks: The Artificial Neural Network strategy empowers us to plan helpful nonlinear systems tolerating substantial quantities of contributions, with the outline construct exclusively in light of cases of information yield relationship. The principal Artificial Neural Network demonstrate was proposed in 1943. Today it is growing quick. Essentially it is a data clustering technique in light of separation estimation. This approach applies natural concepts to machines to perceive patterns. Pattern Recognition utilizing Artificial Neural Network is an extremely appealing since it requires least convent learning, and with enough layers and neurons, an Artificial Neural Network can make any mind boggling decision region.

5. Structural Pattern Recognition: Structural Pattern Recognition accentuations on the description of the structure, specifically clarify how some straightforward sub-patterns form one pattern. The sentence structure investigation and structure matching are the two principle strategies in structural pattern recognition. The premise of punctuation examination is the theory of formal dialect, the premise of structure matching is some of unique method of arithmetic in view of

sub-patterns. The structural pattern recognition handles with image information. This technique can be utilized as a part of applications with larger amount, for example, picture interpretation. Pattern Recognition of multidimensional items should be possible by structural pattern recognition with static classification or artificial neural networks.

6. Support Vector Machine (SVM): Support Vector Machine in view of the factual theory and strategy for SVM is a successful device that can take care of the issues of Pattern Recognition.

7. Approximate reasoning approach to Pattern Recognition: This technique utilized two concepts-one is fuzzy applications and the other is compositional control of induction can adapt to the issue for manage based pattern recognition^[31].

8. A logical combinatorial approach to Pattern Recognition: This approach can apply for both regulated pattern recognition and unsupervised pattern recognition.

PATTERN RECOGNITION SYSTEM

The anomaly intrusion detection system experiences high false alarm rates while the abuse intrusion detection system needs generalization capacities and can't identify new attack writes. Pattern Recognition strategies have been found to strike a fine adjust in this exchange off. The utilization of pattern recognition and classification has developed in the previous couple of years. The unpredictability of the classification systems and their expanded accessibility has made them more available. They can channel commotion and concentrate highlights from movement to encourage classification. Pattern classification is a progression of steps, beginning with the information, moving to segmentation, data extraction and translation and at last classification. After the classification, cost components can be added to build the intensity of the decision to act. All together for pattern recognition to be valuable in network security, two huge issues must be tended to; Data extraction and classification. Information from a solitary bundle is lacking for include extraction

Ordering various bundles may give a premise to depicting highlights yet what number of parcels are sufficient and how would we orchestrate the data from numerous parcels to make it helpful for data extraction.

The point of pattern classification is to use the information gained from pattern investigation to train the computer keeping in mind the end goal to achieve the classification. The progression of classification is the piece of the pattern recognition system.

The subsequent stage following Data extraction is classification. It is the way toward utilizing the data set to order the activity as ordinary or ill-conceived movement. The classifications can be isolated into three classifications: typical, Denial of Service and Scan. Numerical qualities were doled out the three classifications in view of their likelihood. Four sorts of classifiers are utilized: Bayesian, Feed Forward with Back propagation, ART2 and Kohonen neural networks.

CONCLUSION

Over the most recent twenty years, Intrusion Detection Systems have gradually developed from have and working system particular application to distributed systems that include a wide exhibit of working system. The difficulties that lie ahead for the up and coming generation of Intrusion Detection Systems are many. Traditional Intrusion Systems have not adjusted sufficiently to new networking ideal models like remote and portable networks. Components like noise in the review data, constantly changing activity profiles and the substantial measure of network movement make it hard to manufacture an ordinary movement profile of a network for the reason intrusion detection.

A perpetual issue that avoids far reaching arrangement of IDS is their powerlessness to stifle false alarms. Therefore, the essential and likely the most critical test that should be met is the improvement of viable strategies to diminish the high rate of false alarms.

Pattern Recognition is the core of all logical request, including understanding ourselves and this present reality around us and the creating of Pattern Recognition is expanding quick, the related fields and the applications of pattern recognition wound up more extensive and more extensive. IDS in view of pattern recognition have the fortes, for example, self versatility, low consume, resiliences and self learning and so on. So it can entirely enhance the all performance of security system. Obviously, the working of the patterns is the precondition.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Network Security

REFERENCES

1. Zhou Chunyue, Liu Yun, Zhang Hongke, "A Pattern Matching Based Network Intrusion Detection System", 1-4244-0342-1/06/2006 IEEE
2. Chi-Ho Tsang, Sam Kwong, Hanli Wang, Genetic-fuzzy administer mining approach and evaluation of highlight selection systems for anomaly intrusion detection. *The diary of Pattern Recognition* 40 (2007)
3. Shai Rubin, Somesh Jha, Barton Miller, "Protomatching Network Traffic for High Throughput Network Intrusion Detection", CCS'06, Oct 30-Nov 3, 2006, Alexandria, Virginia, USA
4. Monther Aldwairi, conte, and Paul Franzon, "Configurable String Matching Hardware for Speeding up Intrusion Detection, ACM SIGARCH Computer Architecture News, Vol. 33, No. 1, March 2005
5. Animesh Patcha, Jung-Min Park, "An Overview of Anomaly Detection Techniques: Existing Solutions and most recent Technological Trends", *Computer Networks* 51 (2007)
6. Zachary K. Pastry specialist and Viktor K. Prasanna, High-throughput Linked-Pattern Matching for Intrusion Detection Systems, ANCS'05, Oct 26-28, 2005, Princeton, New Jersey, USA
7. Dit-Yan Yeung, Yuxin Ding, Host-based Intrusion Detection utilizing Dynamic and Static Behavioral Models, *The diary of Pattern Recognition* 36 (2003).
8. Wu Yang, Bin-Xing Fang, Bo Liu, hong-li Zhang, Intrusion Detection System for High-Speed Network, *Computer Communications* 27 (2004)
9. Zachary Baker, V.K. Prasanna, Time and Area Efficient Pattern Matching on FPGAs, FPGA'04, Feb 22-24, 2004, Monterey, California, USA
10. Christopher Kruegel, Giovanni Vigna, William Robertson, A Multi-Model Approach to the Detection of Web-Based Attacks, *Computer Networks* 48 (2005)
11. IANG Bo, LIU Bin, High-Speed Discrete Content Sensitive Pattern Match Algorithm for Deep Packet Filtering, Proceedings of the 2003 International Conference on Computer Networks and Mobile Computing (ICCNMC'03), IEEE
12. Ningning Wu, Jing Zhang, "Factor-analysis based anomaly detection and clustering", *Decision support Systems* 42 (2006)
13. Qingbo Yin, Rubo Zhang, Xueyao Li, "A New Intrusion Detection Method Based On Linear Prediction", InfoSecu04, Nov 14-16, 2004, Pudong, Shanghai, China
14. Robin Sommer, Vern Paxson, Enhancing Byte-Level Network Intrusion Detection Signatures with Context, CCS'03, Oct 27-31, 2003, Washington, DC, USA
15. Steven L. Scott, A Bayesian pParadigm for Designing Intrusion Detection Systems, *Computational Statistics and Data Analysis* 45 (2004)
16. R Sidhu and V. K. Prasanna, "Quick Regular Expression Matching utilizing FPGAs", in IEEE Symposium on Field-Programmable Custom Computing Machine, Napa Valley, CA, April 2001, IEEE
17. Lih-Chyau Wu, Sout-Fong Chen, Building Intrusion Pattern Miner for Snort Network Intrusion Detection System, 0-7803-7882-2/03/2003 IEEE.
18. Sourcefire.Snort, The Open Source Network Intrusion Detection System. <http://www.snort.org>, 2003
19. Proctor, P.E., 2001. *The Practical Intrusion Detection Handbook*, Prentice-Hall, Englewood Cliffs, NJ
20. Axelsson S., 2000, the Base-Rate Fallacy and the Difficulty of Intrusion Detection, *ACM Trans, Inform. Syst. Security* (3)
21. Fang Hao, Murali Kodialam, T.V.Lakshman, Hui Zhang, Fast payload-Based Flow Estimation for Traffic Monitoring and Network Security, ANCS'05, Oct 26-28, 2005, Princeton, New Jersey, USA

22. Lothar Wendehals, Alessandro Orso, Recognizing Behavioral Patterns at Runtime utilizing Finite Automata, WODA'06, May 2006, Shanghai, China
23. Yang Wang and Hidetsune Kobayashi, High Performance Pattern Matching Algorithm for Network Security, IJCSNS, Vol.6 No.10, Oct 2006.
24. Giacinto, Fabio Roli, Luca Didaci, Fusion of Multiple Classifier for Intrusion Detection in Computer Networks, Pattern Recognition Letters 24 (2003).
25. Richard Lippmann, david Fried, Joshua, Kendall, McClung, Weber, Webster, Wyschogrod, Cunningham, Zissman, "Evaluation Intrusion Detection Systems:The 1998 DARPA Off-Line Intrusion Detection Evaluation", 0-7695-0490-6/99, IEEE
26. Stephen Gossin, et al: Pattern Matching in Snort. <http://www.sporksoft.com/~njones/notes/CSE202/project.pdf>, 2002
27. Mohammad Saniee Abadeh, Jafar Habibi, Zeynab Barzegar, Muna Sergi, A Parallel Genetic Local Search Algorithm for Intrusion Detection in Computer Networks, Engineering Applications of Artificial Intelligence 20 (2007).
28. Shiuhpyng Winston Shieh and Virgil D. Gligor, "A Pattern Oriented Instruction Model and its Applications", in Proceedings of the 1991 IEEE Computer Society Symposium on Research in Security and Privacy, pages 327-342. IEEE, Service Center, Piscataway, NJ, May 1991
29. Jian-Cai Huang, Jun-Feng Tian, Rui-Zhong Du, Jian-Qiang Zhai, " Research of Pattern Matching in Intrusion Detection", Proceedings of second international conference on matching learning and cybetnetics, Xi'an, 2-5 Nov. 2003, IEEE
30. Young H. Cho and William H. Mangione-Smith, A Pattern Matching Co-processor for Network Security, DAC 2005, June 13-17, 2005, Anaheim, California, USA
31. Lippmann, Fried, Graf, Haines, Kendall, McClung, Weber, Webster, Wyschogrod, Cunningham, Zissman, Evaluating Intrusion Detection Systems: The 1998 DARPA OFF-Line ID Evaluation, IEEE, 1999
32. Liu, Sun, Wang, Pattern Recognition: a diagram, IJCSNS, June 2006
33. Zhou, Liu, Research on computer network security in view of Pattern Recognition, IEEE, 2003

A Study on the Aspect of Nanomaterials towards Sustainable Energy

P. Venkata Ramana Rao¹, K. Srishailam², K. Devender², L. Radha Krishna³

¹Assoc. Professor, ²Asst. Professor, Department of Physics, ³Faculty, S R Engineering College, Warangal, India

ABSTRACT

The utilization of nanotechnology to build up a suite of sustainable energy production plans is a standout amongst the most vital logical difficulties of the 21st century. The test is to configuration, to incorporate, and to describe new utilitarian nanomaterials with controllable sizes, shapes, and/or structures. Nanotechnology is producing a ton of consideration nowadays and in this manner building awesome desires in the scholastic network as well as among financial specialists, the legislatures, and industry. This paper, investigates a portion of the conceivable executions of nanotechnology for as good as ever strategies for energy conversion, viewing a requirement for this as managed without trading off our condition. Its one of a kind ability to manufacture new structures at nuclear scale has just created novel materials and gadgets with incredible potential applications in a wide number of fields. Center is given to essential part of nanomaterials, arrangement and portrayal some of nanomaterials imperative for sustainable energy, dye sensitized solar cells and hydrogen production technology.

Keywords: energy conversion, solar energy, hydrogen, dye sensitized solar cells.

INTRODUCTION

Nanotechnology has assumed a critical part in the outline, amalgamation, and portrayal of different new and novel energy materials and impetuses for processing powers from non-renewable energy source assets, for example, coal, oil, and flammable gas. Today, petroleum derivatives still record for 90% of the world's energy utilization, and their utilization is relied upon to crest around the year 2050. The far reaching utilization of petroleum derivatives is tormented with issues, for example, the age of increasingly genuine natural issues, the related atmosphere transforms we are witnessing, and the way that the long haul accessibility of unrefined petroleum is constrained. Therefore, it is important to build up a suite of sustainable energy sources and energy-storage materials [1].

The utilization of petroleum derivative based advances is most likely one of the main sources of the continuous increase in the contamination and in the convergence of ozone depleting substances. Sustainable sources must have higher commitment on the lively lattice in providing more energy accessible for the humankind in a short period, having low ecological effect.

The interest on the conversion of environmen-count neighborly energy sources prompted the improvement

of a few gadgets that took the benefit of the continuous advancement on a few fields of research, which can bring about new materials for effectively created gadgets. For instance, the performance of direct methanol power modules, an outstanding technology was enhanced because of the improvement of nanomaterials particularly intended for the ener-gy conversion process and their advancement enables the utilization of light to help the procedure through a synergic course of action [2]. The combination and chara-cterization of new and novel useful nano-materials with wellcontrolled sizes, shapes, poro-sities, crystalline stages, and structures are absolutely critical for leaps forward in a few sustainable energy advances.

This article gives a diagram of how nanoscience and nanotechnology may add to the advancement of more productive and sustainable energy frameworks. Nanotechnology is an expansive term regularly used to portray materials and wonders at nanoscale, i.e., on the size of 1 billionth to a few many billionths of a meter (Fig.1). Be that as it may, it specifically infers the miniaturization as well as the exact control of particles and atoms to plan and control the properties of thenanomaterials/nanosystems. Nanomaterials show distinct size-subordinate properties in the 1-100 nm run where quantum wonders are involved. This is one of the major reasons why nanotechnology has a significant

affect on energy conversion and storage. These properties are totally not quite the same as those controlled by bulk materials, producing uniquely designed gadgets with capacities not found in bulk materials or in nature [3].

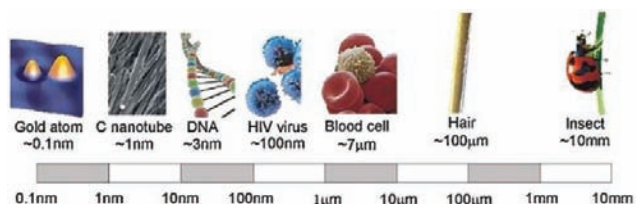


Figure 1: Length scale and some related example.^[4]

Nanoscience and nanotechnology (N&N), and their merger with surface science (SS), may add to the improvement of a more effective and sustainable energy framework. Like any science or technology field, SS has developed along a period pivot that could be imagined as a S-bend (Fig. 2). In the beginning periods, inquire about exercises were dominated by improvement of a “tool compartment” for test readiness and portrayal (e.g. single precious stones) and in addition theoretical models and calculation schemes^[5].

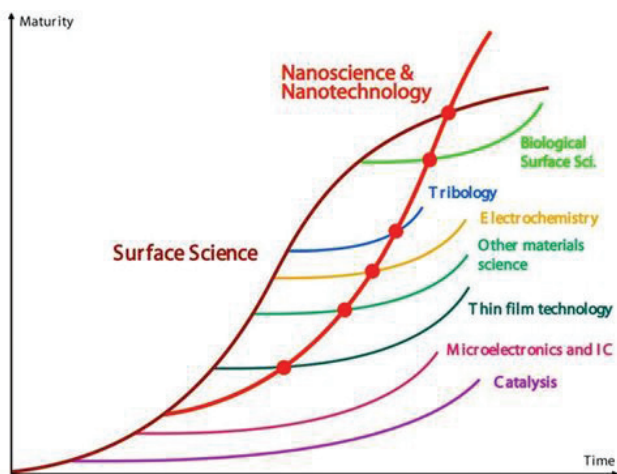


Figure 2: The historical improvement of surface science has taken after a S-shaped curve, which has filled in as a reason for the development of an extensive assortment of different fields (not the minimum Nanoscience and Nanotechnology), every one of them following its own particular S-curve.

Today, Nanoscience and Nanotechnology influence for all intents and purposes any field of science and technology, as outlined by the crossing points^[5]

SIZE MATTERS ON THENANOSCALE

It is notable that the properties of issue change essentially when the size changes from the macroscale to the microscale and from the microscale to the nanoscale.

Nanotechnology is frequently defined as the science and engineering occurring at measurements of 100 nm and underneath. Nanomaterials show distinct size-subordinate properties in the 1-100nm territory where quantum marvels are involved. This is one of the major reasons why nanotechnology significantly affects energy conversion and storage.

Important to recall is that the impacts of morphology, structure, and creation of nano-materials are similarly important. It is likewise important to think about the collaboration of size, morphology, structure, and organization for the plan and controlled readiness of nano or nanostructured materials. The composite materials demonstrate a proficient energy move in the form of intense pho-ton motion from the metal nanoparticles to neighboring semiconductor particles. Contrasted with unadulterated semi-conductor frameworks, the enhanced energy exchange prompts a higher grouping of electron/opening sets on the semiconductor surface with upgraded photocatalytic rates. Optical properties of the metallic nanoparticles could be tuned based on their size, shape, and creation. This implies a controllable interaction happens between the metal and semiconductor materials. The sound control of the photoactivity of the composite materials ends up conceivable in the obvious and UV district of the solar range^[1,6].

Another case of a size impact is the nickel impetus utilized for hydrogen or syngas production by means of reforming or fractional oxidation of methane. Synergist hydrogen production is an important procedure for both petroleum product conversion and for biomass use. On the off chance that modest hydrogen could be effortlessly delivered, numerous issues in energy production and nature could be illuminated. Nickel-based impetuses have been widely utilized and investigated due to the high action, minimal effort, and copious accessibility of nickel. In any case, nickel-based impetuses experience the ill effects of a fast deactivation by coke formation and/or molecule accumulation at high temperatures. A high steam/carbon proportion has been connected for the industrial production of hydrogen or syngas over Ni-based impetuses, in order to inhibit coke formation and sustain the reactant forms. This isn't energy proficient in light of the fact that a gigantic measure of energy is squandered to produce steam. To make and enhance nanocatalysts, new and novel impetus readiness strategies are important. For instance, a Rh_Ni@CeO2 impetus arranged by means of an infection layout for the oxidative steam reforming of ethanol^[7]. This novel impetus readiness technique can likewise be utilized to increase the energy or limit of a Li-particle battery.

NANOTECHNOLOGY FOR SOLAR CELLS AND SOLARFUELS

In the near future nanotechnology may add to proficient and minimal effort frameworks for quality rating, storing, and transporting energy. Materials and structures that are planned and fabricated at the nanoscale level and thin movies can offer the potential to create new devices and procedures that may enhance efficiencies and lessen costs in many areas, as solar photovoltaic frameworks, hydrogen production, power modules, solar thermal frameworks and energy saving advances as low e-coatings and electrochromic devices for smart windows. Usually ignored that the portion of commitment of renewable energy sources to the total energy spending will originate from all conceivable forms of applications and sources and to be powerful it must be combined with energy saving technological breakthroughs^[8]. This energy source can be utilized as a part of various ways: photovoltaic (PV) technology – which specifically changes over light into electrical current, solar– thermal frameworks – utilized as a part of solar collectors, artificial photosynthesis – which creates either carbohydrates or hydrogen via water splitting, the alleged ‘passive solar’ advancements, where building configuration maximizes solar lighting and heating, and even biomass technology – where plants utilize the solar radiation to drive chemical transformations and create complex carbohydrates, which are utilized to deliver power, steam or biofuels. All these energy-related procedures and their applications are encased in the purported solar economy^[3,4].

PV solar cells enable production of power by the means of photoelectric impact. Currently, PV market is based on silicon wafer-based solar cells (thick cells of around 150– 300 nm made of crystalline silicon). This technology, classified as the first-generation of photovoltaic cells, accounts for more than 86% of the global solar cell market. The second-age of photovoltaic materials depends on the presentation of thin film layers (1– 2 nm) of semiconductor materials.

The use of nanocrystal quantum spots^[9], which are nanoparticles normally made of direct bandgap semiconductors, prompts thin film sun based cells in light of a silicon or conductive straightforward oxide (CTO), like indium-tin-oxide (ITO), substrate with a covering of nanocrystals. Photocatalyzed rot of toxins at different titania surfaces is of incredible intrigue. Electron exchange responses are at the base of these photoinduced shapes and were likewise the subject of

one of the hypothetical duties. The average arrangement of photocatalysis includes gathering of light photons in a semiconductor (most generally TiO₂), and coming about transformation of these photons to electronic excitations, which by then initiate the desired synthetic response on the semiconductor surface^[10].

Color sharpened sun oriented cells (DSCs) developed by Michael Grätzel turned into a particularly prominent other option to silicon based sunlight based cells as a result of their awesome potential to change over sun powered vitality into electric vitality effortlessly. This cell can be produced using shabby materials, for instance, inorganic and natural colors which don't ought to be exceedingly unadulterated as is required for silicon wafer.

The color sharpened (Gratzel) sun powered cell (Fig. 3) is maybe the most punctual sun based cell direct using nanoscale portions for its execution^[11]. Here, light ingestion happens prevalently in color particles tied down to the surface of nanoparticles of a wide bandgap semiconductor, typically TiO₂.

The streamlining of the color/TiO₂ layer is vigorously subject to nanoscale creation and portrayal; the TiO₂-layer must have an extensive surface zone to adequately fuse color, anyway a structure that is thin and adequately open to take into consideration profitable accuse transport of least hardships. Without thinking about light dissipating impacts, the ideal film engineering under these conditions is column like, with as much surface region as possible (thin columns) in parallel with the essential of profitable (low opposition) stream of charge. Accomplishing complex and pre-made, and reasonable, nanostructures on substantial scale surfaces is a test.

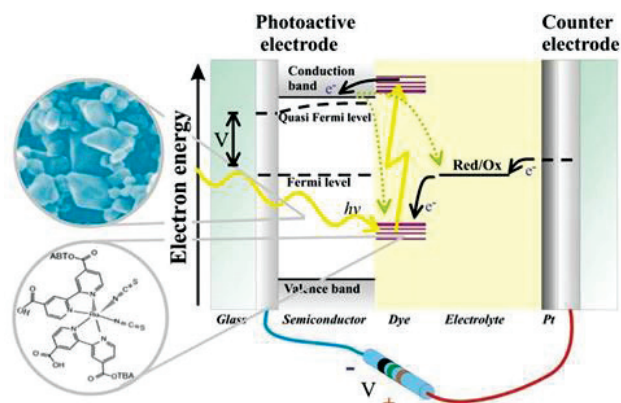


Figure 3: Schematic of a color sharpened sunlight based cell, the execution of which fundamentally depends upon nanoscale parts. Light ingestion occurs in a color, which is tied down to a nanoporous semiconductor layer^[5]

Power devices (FC) are electrochemical devices that change over a fuel, for example, hydrogen or methanol specifically to power through an electro-catalytic process rather than by ignition, in this manner potentially yielding significantly higher energy conversion efficiencies than in conventional burning engines. With hydrogen as a fuel, the FC is an amazingly clean energy converter (however recollect that an overall cleanness, based on life cycle analysis (LCA), relies upon how hydrogen is created). At the heart of a FC are the cathodes, on which the actual electro-catalytic conversions happen.

Metal hydrides have for quite a while been in center as one of several alternatives to store hydrogen in a hydrogenbased economy. Two different alternatives are high-weight gas containers and fluid hydrogen. In metal hydrides one uses the way that hydrogen take-up in specific metals is exothermic, and besides permits immersion takes-up that are close, or may even outperform, that of liquid hydrogen. The esteem one needs to pay for this stockpiling approach is:

- the heat generated during uptake is usually lost energy and should be re-provided for later release of hydrogen,
- the cost of the storage material,
- the extra weight and volume of the storage material (especially troublesome in versatile applications),
- the added technological intricacy of regulating valves and weight meters and so forth (in comparison with e.g. normal gasoline as a fuel),
- the safety precautions.

We won't harp on all these issues here, yet take note of that there is a reestablished interest in hydrogen storage materials, both conventional metal hydrides and new materials, for example, carbon nano-structures and novel compounds^[5].

CHARACTERIZATION OF ENERGY - RELATED NANO OR NANOSTRUCTURED MATERIALS

To configuration, to blend, and to apply nano-materials, we have to understand the reaction mechanisms and procedures occurring on the surface of nano or nanostructured materials, under ultrahigh vacuum (UHV) conditions as well as under real conditions. Fortunately, advance in vacuum technology and surface-

science strategies has prompted significant advance in our ability to characterize nanomaterials and especially surface procedures. A suite of surface-touchy systems, for example, AES, particle scattering spectroscopy (ISS), UV and X-ray photoemission spectroscopy (UPS and XPS), high-resolution electron energy loss spectroscopy (HREELS), low energy electron diffraction (LEED), and scanning test microscopies (e.g., scanning tunneling microscopy, STM, and atomic force microscopy, AFM)^[1].

Model systems consisting of either flat, single-crystal surfaces or welldefined nanoclusters on surfaces are examined under clean and wellcontrolled, frequently UHV, conditions. With this approach, a great amount of detailed insight into fundamental procedures on surfaces has been obtained.

CONCLUSION

Sustainable energy production, transformation and utilize are especially expected to maintain the readily and cheap access to energy to the growing and increasingly demanding world population while minimizing the impact on the earth. The novel multifunctional materials created from the broad and multidisciplinary field that is nowadays called nanotechnology are critical to conquer a portion of the technological limitations of the various alternatives to the non-renewable energies. Novel multifunctional materials delivered through utilization of nanotechnology offer great upgrades in all domains of total energy framework, for example, transportation and storage of energy. To anticipate where and how nanotechnology will have the largest impact is unrealistic. On the short term basis it will probably have more visible influence on existing energy framework through introduction of better and more energy productive materials, on fuel conversion schemes and so forth.. In farther future nanotechnology will doubtlessly play a major part in the improvement of genuinely sustainable arrangements like advanced PV systems. For sustainable energy production nanotechnology is one of the fastest growing research fields today.

Nanomaterials fill in as energy carriers, absorbents, media for energy transfer, catalysts, converters, and energy pools or vessels for reactions. In all of these applications, the core technology to be produced is the preparation of novel nanomaterials with controllable sizes, shapes, and/or structures. Conventional techniques, for example, doping, impregnation, and particle exchange, will

continue to be utilized, yet there is great opportunity to learn from and attempt to impersonate the nanomaterials and nanomachinery in nature. Many properties of living systems could potentially be harnessed, and techniques based on nonequilibrium characteristics will have interesting applications later on.

The examples above illustrate how N&N may influence and penetrate into various subsystems of the total energy framework, for example, primary supply of energy (solar light harvesting, and so forth.), storage (hydrides, and so forth.), conversion and utilization of energy (power devices, industrial catalysis, and so on.), and abatement of environmental impacts (emission and water cleaning).

This evolutionary character and the long time scales call for caution in promising excessively too early – otherwise N&N risks facing a genuine backlash when (as well) high expectations and too far reaching promises are not satisfied.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nano Materials

REFERENCES

1. Ch. Liu, U. Burghaus, F. Besenbacher, Zh. Lin Wang Preparation and Characterization of Nanomaterials for Sustainable Energy Production, *NANOFOCUS*, 2010; 4(10), 5517-5526.
2. F. L. de Souza, L. O. Martins de Andrade, A. Sarto Polo Nanomaterials for Solar Energy Conversion: Dye-Sensitized Solar Cells Based on Ruthenium (II) Tris-Heteroleptic Compounds or Natural Dyes, DOI: 10.1007/978-3-642-31736-1_2, Springer-Verlag Berlin Heidelberg, 2013; 49-80.
3. S. Pelemiš, I. Cabin Nanotechnology Materials For Solar Energy Conversion, *Contemporary Materials (Renewable Energy Sources)*, IV-2, UDK 66.017/.018:697.514, doi: 10.7251/COMEN1302145P, 2013; 145-151.
4. E. Serrano, G. Rus, J. García-Martínez, Nanotechnology for sustainable energy, *Renewable and Sustainable Energy Reviews*, 2009; 13(9), 2373-2384.
5. M. Zach, C. Hagglund, D. Chakarov, B. Kasemo, Nanoscience and nanotechnology for advanced energy systems, *ScienceDirect, Current Opinion in Solid State and Materials Science* 2006; 10, 132– 143.
6. P. Christopher, D.B. Ingram, S. Linic, Enhancing Photochemical Activity of Semiconductor Nanoparticles with Optically Active Ag Nanostructures: Photochemistry Mediated by Ag Surface Plasmons, *J. Phys. Chem. C*, 2010; 114, 9173– 9177.
7. B. Neltner, B. Peddie, A. Xu, W. Doenlen, K. Durand, D. S. Yun, S. Speakman, A. Peterson, A. Belcher, Production of Hydrogen Using Nanocrystalline Protein-Templated Catalysts on M13 Phage. *ACS Nano*, 2010; 4, 3227– 3235.
8. P. Yianoulis, M. Giannouli, *Thin Solid Films and Nanomaterials for Solar Energy Conversion and Energy Saving Applications*, *Journal of Nano Research Vol. 2* (2008), Online available since 2008/Aug/07 at www.scientific.net Trans Tech Publications, Switzerland, doi:10.4028/www.scientific.net/JNanoR. 2008; 2.49, 44-60.
9. R.T. Ross, A.J. Nozik, Efficiency of hot-carrier solar energy converters. *Journal of Applied Physics*, 1982; 53(5), 3813-3818.
10. M. S. A. Abdel-Mottaleb, Frank N'uesch, M.S. Mohamed, A. Abdel-Mottaleb, *Solar Energy and Nanomaterials for Clean Energy Development*, Hindawi Publishing Corporation International Journal of Photoenergy, Volume 2009, Article ID 525968, 2 pages, doi:10.1155/2009/525968, 2009.
11. B. O'Regan, M. Graetzel, A minimal effort, high-proficiency solar cell based on dye-sensitized colloidal TiO₂ Films, *Nature*, 1991; 353-737.

A Study on the Comparison of Various Retrieval Methods based on the Measured Accuracy

M. Ayyavaraiah¹, Bondu Venkateswarlu²

¹Research Scholar, Dayananda Sagar University, ¹Assistant Professor, Malla Reddy College of Engineering, Secunderabad; ²Associate Professor, Dayananda Sagar University

ABSTRACT

In this day and age, innovation is improving step by step, the most upgraded research zone in computerized image preparing is image retrieval system. The procedures utilized for recovering image based on content, the substance as content, sketch, shading and shape that can be depict the image. Here we introduce different image retrieval strategies which is utilized as sketch content. So the system is alluded to as Sketch Based Image Retrieval System (SBIR). In this current paper, we actualize EHD, Integrated EHD & HOD and HOG algorithms and provide the examination of 3 algorithms based on their measured accuracy. SBIR is invaluable than absolutely message base image search. The retrieval system utilizing sketches can be basic and powerful in our every day life, for example, Medical finding, computerized library, search engines, wrongdoing aversion, geographical information, photograph sharing locales and remote sensing systems.

Keywords: EHD, Database, HOG, Sketch, Image.

INTRODUCTION

With the advancement of the innovation and accessibility of the image catching gadgets, for example, scanners, computerized cameras, the measure of the computerized image accumulation increments quickly. It is imperative to effectively store and recover images for various applications, for this reason many image retrieval system have been produced. Query By Image Retrieval (QBIR) is otherwise called content based image retrieval. In the advanced image preparing, content based image retrieval is most mainstream and rising research zone. The information removed from the content of query is utilized for the content based image retrieval information systems. In these systems the watchwords are clarified with images and after that utilizing content based search technique recover images. To extricate the visual content of an image like surface, shading, shape or sketch is the objective of CBIR. This paper presents utilizing sketch as a content, so the system progresses toward becoming Sketch Based Image Retrieval System (SBIR).

This paper is exhibited the issues and difficulties that identified with actualizing a CBIR system utilizing free hand sketches. The most critical errand is to conquer any hindrance amongst picture and sketch. In sketch based image retrieval system client gave an illustration

surface, where the client can draw a sketch as info. The element vector of info sketch contrasts and highlight vector of database images and recover the coordinated image from the database and show on screen as yield of the system. This system recovers the image superior to the past utilized systems.

Section 2 gives the writing review, which gives the information about beforehand utilized systems for image retrieval. Utilizing HOG descriptor and integrated EHD are clarified in section 3. Section 4 demonstrates the system result. At long last section 5 gives the conclusion of the system.

RELATED WORK

A. Retrieval using Cross Media Relevance Models:

For ordering libraries have normally utilized manual image explanation and after that later their image accumulations are recovered. Be that as it may, manual image explanation methodology is a costly and work serious and consequently there has been incredible enthusiasm for thinking of recovering images based on content in a programmed way. Here, to explaining and recovering images based on a preparation set of images, we propose a programmed approach [1].

He accept that a little vocabulary of blobs can be depicted as locales in an image . Utilizing bunching from image highlights blobs are produced. Given a preparation set of images with explanations, we demonstrate that to foresee the likelihood of producing a word given the blobs in an image probabilistic models is utilized. This might be utilized to consequently clarify and recover images given a word as a query. Here demonstrates that importance models enable us to determine these probabilities normally. Creator says his approach demonstrates the convenience of utilizing formal information retrieval models for the errand of image explanation and retrieval.

B. Content Based Image Retrieval: It is a programmed procedure based on client contribution to search pertinent images. The info could be sketches, illustration images or parameters. An ordinary CBIR process first the image highlights extricates and proficiently store them. At that point it contrasts and the database images and returns the outcomes^[2].

Highlight extraction and likeness measure are exceptionally subject to the utilized highlights. There would be in excess of one portrayal in each component,. Among these portrayals, to depict highlights histogram is the most regularly utilized procedure.

PROPOSED SYSTEM DESIGN

In the proposed system for enhancing the productivity of an image retrieval system, we incorporate the EHD and HOG descriptor. There is endeavoring to beat the disadvantage of individual EHD and HOG descriptor algorithm.

A. System Architecture: In the system architecture a productive sketch based image retrieval system is proposed.

Fig. 1 demonstrates the fundamental system engineering. It includes squares like Display subsystem, Feature vector age, Feature extraction, Retrieval subsystem and Database administration subsystem.

In this, the Histogram of Oriented Gradients (HOG) and Edge Histogram Descriptor (EHD) highlight vector integrated together. From this element vector locate the comparative image.

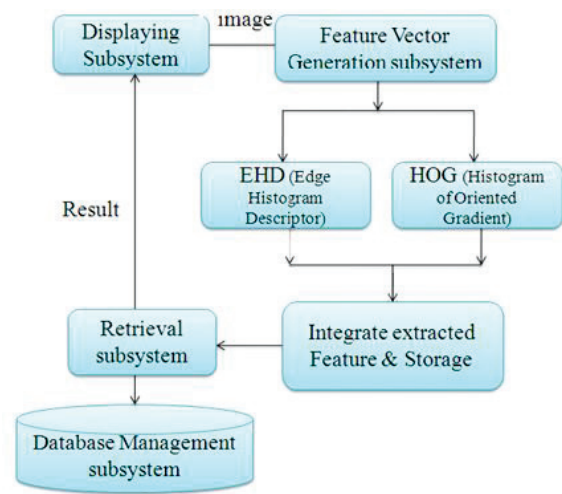


Fig. 1: System Architecture

The showing subsystem gave the attracting surface to client to draw the sketches. And furthermore give the screen to retrieval of coordinated images ^[3]. The Display subsystem that is actualized UI can be found in Fig. 2 and our program has been composed in Java.

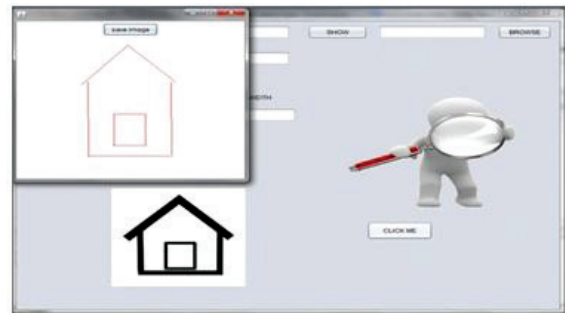


Fig. 2: Implemented User Interface

B. Proposed Algorithms

1. Edge Histogram Descriptor (EHD)

Histogram: The histogram is the most generally utilized designs. To connote any comprehensive component creation of an image. Histogram is helpful for ordering and recovering image.

Edge: Edge in images constitute an essential element to speak to their content. One method for speaking to a critical edge highlight is to utilize a histogram in the image space speaks to the recurrence and directionality of brilliance changes in the image subsequently it is called as Edge Histogram.

The EHD speaks to the spatial dispersion of edges in an image. The extraction procedure of the EHD comprises of the accompanying stages ^[4].

1. The image exhibit is partitioned into 4x4 sub images.

2. Each sub image is additionally parceled into non-covering square image obstructs whose size relies upon the determination of the information image.
3. The edges in each image-square is sorted into one of the accompanying
4. Six composes vertical, even, 45 corner to corner, non-directional edge , 135 slanting and no-edge.
5. Each canister esteem is standardized by the aggregate number of image-hinders in the sub image.
6. The standardized receptacle esteems are nonlinearly quantized.

There are five kinds of edge Histogram

At the point when the client select EHD algorithm, SBIR system finds the edges of the image. Fig. 3 demonstrates the edges of the image utilizing EHD algorithm.

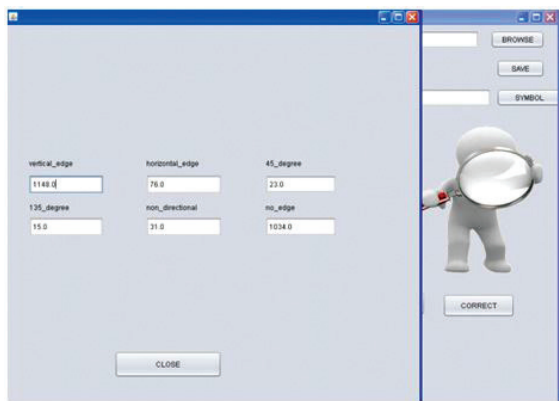


Fig. 3. Edges of Image Using EHD Algorithm

These edges as an element vector of image and this element vector contrast and the database images include vector, when coordinates the component vector comparative image is show on the showing subsystem as a yield image.

Fig. 4 shows the Sketch based image retrieval by using EHD algorithm.

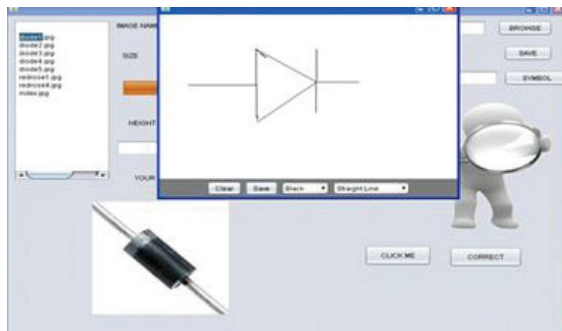


Fig. 4: Image Retrieval By Using EHD

2. Histogram of Oriented Gradients Descriptor (HOG):

Histogram of Oriented Gradients (HOG) are highlight descriptors utilized for the capacity of protest recognition in image preparing and PC vision. The procedure figures measure of gradient orientation in limited areas of an image. The Histogram of Oriented Gradient descriptors is that the neighborhood question appearance and shape inside an image can be portrayed by the dissemination of edge directions or power gradients^[5].

The utilization of descriptors can be accomplished by partitioning the image into cells. The cell is little coupled areas, and for each cell collect ling a histogram of gradient directions or edge orientations inside the cell for the pixels. The course of action of these histograms, at that point speaks to the descriptor. For improved accuracy, the neighborhood histograms can be differentiate standardized by computing a measure of the force over a bigger area of the image, entitled as block, and after that with this incentive inside the block to standardize all cells.

Histogram of Oriented Gradients (HOG) by

1. Gradient Computation
2. Orientation Binning
3. Descriptor Blocks
4. Block Normalization
5. SVM Classifier

For executing the HOG calculation, first prepare the image and after that the test image. HOG calculation finds the gradients of the image as a component vector. Fig. 5 demonstrates the gradients of the image.

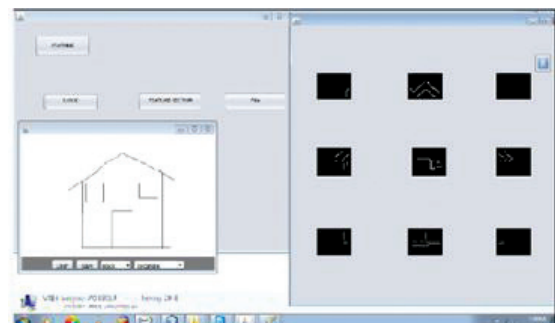


Fig. 5: Image Gradients Using HOG

3. Integrated EHD & HOG: While preparing the image, first discover the power gradients of the image utilizing HOG descriptor and then discover the edges of the image utilizing EHD descriptor. In database client which image he will prepare so he can characterize class and put the element vector in related class.

In testing client draw sketch on surface zone, first discover the gradients and edges of the image as a component vector, subsequent to finding the element vector utilizing SVM demonstrate classifier discover the element vector has a place with which class. When class is discover it contrast the element vector and highlight vector of chose class images and then demonstrates all images according to closeness coordinate with edge set by the client and recover comparative images. This system recovers images superior to the individual EHD and HOG descriptors.

Register an integrated EHD and HOG by

1. Compute gradient of image utilizing watchful.
2. Find gradient at specific edges or edge (even, vertical, 45-degree and so on).
3. Save block to database.
4. Utilize SVM demonstrate for grouping.

Fig. 6 displays the retrieval of image by using integrated EHD & HOG.

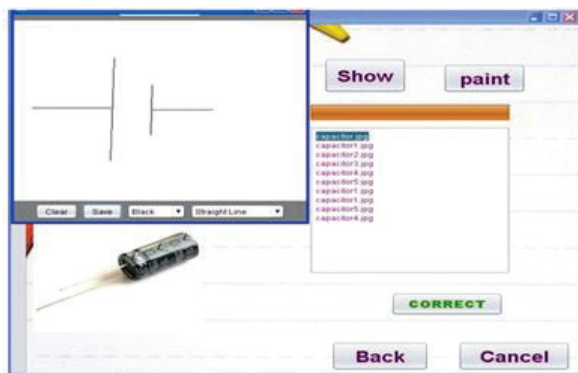


Fig. 6: Using Integrated EHD & HOG for Image Retrieval

RESULT AND DISSCUSION

While testing the Sketch Based Image Retrieval System, compute the Precision and Recall to assess the viability and accuracy of the system.

Where the Precision gives information identified with viability of the system.

Precision=Q/P.....

Q = No. of images displayed with similar shape. P = No. of images displayed.

Where the Recall provides the information regarding exact accuracy of the system.

Recall=Q/Z

Q = No. of images displayed with similar shape.

Z = No. of images with similar shape in whole database .

Fig. 7 shows Precision & Recall graph of integrated System.

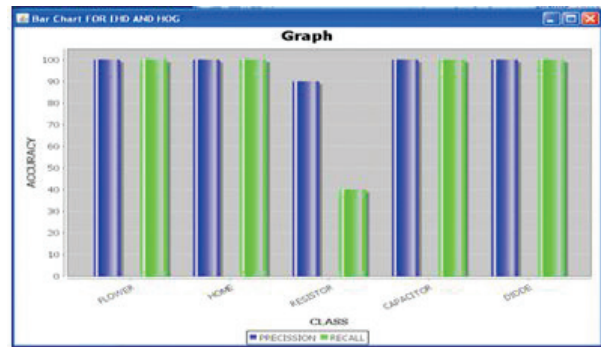


Fig. 7: Precision & Recall Graph of Integrated System

Fig. 8 shows the accuracy of EHD, HOG & Integrated EHD & HOG.

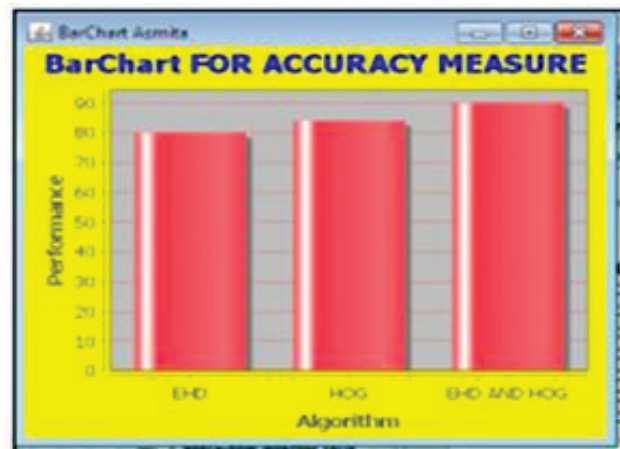


Fig. 8: Accuracy of the System

Think about the integrated system, based on standard precision esteem, system recovers preferred image over the individual EHD and HOG system (appeared in Table D). So the integrated system is more powerful than other system.

Table I : Sketch Based System effectiveness

Method	EHD	HOG	Integrated EHD & HOG
Average Precision	80%	84%	90%

A. Integrated System Advantages

1. It is look at for substantial database.
2. Integrated EHD and HOG is more superior to the individual descriptor.
3. The edge Histogram descriptor not predominantly search better for information poor sketch, while other case demonstrate better outcome can be accomplish for more point by point this issue can be overwhelmed by the HOG strategy.
4. Capture edge or gradient structure that is exceptionally normal for neighborhood shape.

B. Integrated System Disadvantages

1. Time required to recover image is more contrasted with individual EHD and HOG.
2. In this system muddled images can not draw.

CONCLUSION

In this system depict the individual sketch technique and endeavor to incorporate this strategy for diminishing the individual strategies downside. In this system to actualize the new searching strategy and enhancing the nature of searching image, in this procedure EHD and HOG technique work parallel and standardized outcome is shown. This system recovers the image superior to the individual EHD and HOG. Integrated system gives the better accuracy.

In future work to make board which can draw confounded images i.e give device, takes a shot at shading spaces. Additionally can make more classes in Integrated system to characterize the images.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Cross Media Retrieval

REFERENCES

1. J. Jeon, V. Lavrenko, and R. Manmatha,— Automatic Image Annotation and Retrieval Using Cross-Media Relevance Models”, Proc. 26th Ann. Int’l ACM SIGIR Conf. Research and Development in Information Retrieval (SIGIR ‘03), pp. 119-126, 2003.
2. J. H. Choi a *, S. H. Stop a, S. J. Stop ,” Design and Implementation of a Concept-based Image Retrieval System with Edge Description Templates”, Electronics and Telecommunications Research Institute, 161 Gajeong-dong, Yuseong-gu, Daejeon, 305-350 KOREA.
3. B. Szanto. P. Pozsegovics, Z. samossy Sz. Sergyan, |Sketch4Match Content-based Image Retrieval System Using Sketches”SAMI 2011 _9th IEEE International Symposium on Applied Machine Intelligence and Informatics January 27-29, 2011 Smolenice, Slovakia.
4. A. K. Jain, J.E. Lee, R. Jin, and N. Gregg,—Content based image retrieval: an application to tattoo images”, IEEE International Conference on Image Processing, pp. 2745-2748, November 2009.
5. Rui Hua, John Collomossea,—A Performance Evaluation of Gradient Field HOG Descriptor for Sketch Based Image Retrieval”, Centre for Vision, Speech and Signal Processing, University of Surrey, UK.
6. Prof. Balram Puruswani, Jyoti Jain M.Tech (CTA) Dept. of Computer Science, Gyan Ganga College of Technology Jabalpur (M.P.),—A Preliminary Study on Sketch Based Image Retrieval System”, International Journal of Modern Engineering and Management Research, Volume 1, Issue 1, April 2013 ISSN: 2320-9984.

A Study on the Significant Difference between the Students of General Category and Reserved Category in their Achievement in English

C. Goverdhan¹, D. Santhosh¹, Katyayani Sangam², S. Shailaja³, D. Mahesh⁴

¹Asst. Professor, Department of English, S R Engineering College, Warangal, India; ²University of Hafar Al Batin, Kingdom of Saudi Arabia; ³Asst. Professor, Department of English, ⁴Faculty, S R Engineering College, Warangal, India

ABSTRACT

The present investigation was directed to discover the present situation of achievement in English subject based on locality, gender, income and caste. The specialist embraced the overview strategy to discover the previously mentioned issue. 70 students of ninth grade were chosen by utilizing stratified random examining process as the example of the study. Data was gathered by taking an independent achievement test and the gathered information was broke down by the utilizing SPSS software. The finding of the examination uncovered that there is no huge distinction between the scores of Achievement test in English among the girls and boys and additionally uncovered that there is critical of family income's influence among the gatherings on the achievement of English.

Keywords: English, Achievement, Secondary Level Students, Sub-urban, Rural Learners, Family Income.

INTRODUCTION

Step by step English language turns out to be more well known language among the Indians. English language is presently a global language and additionally an interdisciplinary language. Language is implied by which youngsters think about the past, get a handle on the present and approach what's to come. With no uncertainty language assumes a critical part in the intellectual, mental, enthusiastic and social improvement of a man. So English has involved a one of a kind position in our nation, however after the freedom its place in the educational modules is changed. English language is spreading significantly in the present time too. So everybody hurries to get his kid conceded in the school to learn English where English is unmistakably instructed.

The essential capacity each young fellow is relied upon to have the capacity to express him obviously and adequately and the absence of it hampers his advance in scholarly subjects. For a scholastic achievement of students there are numerous variables that influence the achievement. The present examination was directed in the retrogressive zone of Bankura region to know the status of achievement of English.

OBJECTIVES OF THE STUDY

The examination was led to satisfy the accompanying goals:

- To see if kid and young lady students vary essentially in their achievement in English.
- To discover influence of family income for the achievement of English.
- To explore whether the students of general and saved caste vary fundamentally in their achievement.
- To discover the distinction of sub-urban and rustic students in the event that they have in their achievement in English.

HYPOTHESES OF THE STUDY

In the present study null hypothesis were confined. They are as per the following:

- Ho1) There is no huge distinction amongst kid and young lady students in their achievement in English.

- Ho2) There is no huge distinction of connection between the students with respect to their locality of home in the achievement in English.
- Ho3) There is no critical connection of family income's influence on the achievement in English.
- Ho4) There is no critical distinction between the students of general and saved caste in their achievement in English.

DELIMITATION

The present study was delimited in the following aspects:

Sample area: The study was confined to the students of 9th grade from Nanda Pallimangal High School (H.S) and Hirbandh High School (H.S) in the Block of Hirbandh, Bankura district in West Bengal. So it is impossible to apply the generalization of the present study to all the students West Bengal.

Sample size: The present study contained the small size of sample which was 70 students. So only the sample of 70 students that can "t be applied the generalization to all the 9th grade students.

Time: To do the present research work, the duration of time is vital. But here the time is limited. So the outcomes and results of the study might affect the validity and reliability of the research. To get fruitful result, the longitudinal research is very essential for this study.

Content area: Content area for the study was limited that is only 2 units of the English subject were chosen by the researcher for taking achievement test.

Curriculum: For this study the researcher followed only the curriculum prescribed by the West Bengal Board of Secondary Education.

VARIABLES

Dependent Variables: Students' achievement

Independent Variables: Gender, Family income, geographical area and Caste

Intervening Variables: Intelligence, Motivation, time spent in study at home

Research Design: The investigator selected Descriptive research design. Under this design, more specific design that is **Survey study** was conducted to give detailed description of existing phenomena with the using of collected data.

Sample: To consider the whole masses isn't possible to the specialist. With the objective that the examiner depended upon the sample. To assemble data from the masses i.e. ninth Grade students, the analyst picked the sample measure i.e. 70 students of ninth grade in Bengali medium schools i.e. Nanda Pallimangal High School (H.S) and Hirbandh High School (H.S). To pick sample, the specialist used stratified random examining process. Through this technique the picking sample is 40 young woman students and 30 kid students. For ANOVA testing the sample gauge was 51 from the total sample that is 70 was picked by the operator. To test criticalness association differentiate between the students of sub-urban and commonplace, the master picked the sample gauge was 26 from certified sample by the method of randomization.

RESEARCH TOOLS

- One poll for achievement test made by the specialist where add up to questions are 30 with 1 imprints and these inquiries are numerous decision based alternatives.
- Another poll made by the scientist for meeting of the students to get some prominent data.

STATISTICAL TECHNIQUES

In the present examination, a few measurable methods^[1] were utilized by the agent for breaking down the quantitative information as per the idea of factors included and goals of the investigation. A concise portrayal of the spellbinding and inferential measurable methods utilized as a part of the investigation of information is given beneath:

1. Mean(M)
2. Standard Deviation(SD)
3. t-test
4. Correlation(Pearson)
5. ANOVA

All these statistics were calculated by using SPSS software.

MAJOR FINDINGS OF THE STUDY

Real discoveries of the present investigation have been originated from the examination and understanding. This investigation was centered around achievement of English at ninth grade students based on gender, income of the family, territory and class.

1. There is no noteworthy distinction between the scores of achievement test in English^[2] among the understudy gatherings (girls and boys). Along these lines, it is inferred that both the gatherings were equivalent with respect to their achievement in English.
2. There is a huge connection of contrast between the gatherings (rural and provincial students) in their achievement in English. In this manner it is reasoned that both the gatherings were same and the locality of the students did not have any connection to their achievement.
3. There is no critical influence^[4] of family income among the gatherings on the achievement in English. Hence it is inferred that the three gatherings based on family income were not equivalent in their achievement in English. It implies that the family income had influenced on their achievement.

There is a noteworthy contrast between the students of general classification and held classification in their achievement in English. Hence it is incorporated that the classifications of students had no huge influence on their achievement in English.

CONCLUSION

The purpose of the present study was to find out the students' achievement on the basis of gender, area, income of the family and category of the 9th students. The result of the study has been discussed under the following-

Gender: The outcome in light of the examination of the present investigation uncovered that the two gatherings (girls and boys) were discovered equivalent in regard of mean scores yielded by them on Learning Outcomes (Achievement of English). This prompted the acknowledgment of the null speculation $H_0:1$ expressing that students who are boys and girls have no noteworthy distinction for their achievement in English.

Area: The result based on the analysis of the present study revealed that the two groups (suburban and rural students) were found equal so the null hypothesis was accepted.

Family income: The outcome in light of the investigation of the present examination uncovered that the three gatherings (high, medium and low income) were not discovered equivalent. It implies that the income of the family has huge influence on the achievement of the students. This prompted the dismissal of the null speculation.

Caste: The outcome in light of the investigation of the present examination uncovered that the two gatherings (general and held caste) were discovered unequal in regard of mean scores yielded by them on Learning Outcomes (Achievement in English). This prompted the dismissal of the null speculation. It is expressing that the mean score of general caste students is very more noteworthy than the mean score of held caste students for the achievement of English.

SUGGESTION FOR FURTHER STUDIES

The examiner is very mindful of the constraints under which display look into was directed and in this way acknowledges no broad speculations could be made. These discoveries^[6] are just demonstrative of patterns. The present examination recognized a few different ways of conceivable investigation and number of critical discoveries has been accounted for in the present investigation. For additionally think about, the agent is recommending a few zones-

Population: For the present examination the examiner picked the ninth grade students as population of the investigation. The examination can be directed based on other level of students like lower essential, upper essential, higher auxiliary and so forth as population of the investigation.

Sample size: The present investigation was delimited to 70 students of ninth grade. It can be planned and recreated on more extensive sample.

Sample: Sample of the present investigation was bound to the students of ninth grade of govt. helped schools. Be that as it may, for better legitimacy of the investigation it can be directed on expansive sample and sample can be taken from both govt. and tuition based schools.

Geographical area: The examination was kept in the area of Hirband square of Bankura locale, W.B. So for additionally consider the replication of this exploration should be possible in different states, different areas of W.B and so on. And it is likewise relevant to the urban area.

Variable: The present examination depended on the variables like achievement, gender, income of the family. Comparative examinations might be directed by including more variables like intrigue and mentality and so on.

Content: The investigation was delaminated to two units of English subject of class 9. It can be led by taking more units of the said subject.

Subject: The present investigation was kept to one subject that is English as it were. Comparable research endeavors can be placed in on different subjects likewise e.g. Material science, Chemistry, Mathematics, Social Sciences Hindi and so on.

Curriculum: The present examination was directed to assess the achievement of the students by taking the recommended curriculum of WBBSE. Comparative investigation can be led by taking the curriculum of CBSE or ICSE.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: ELT

REFERENCES

1. Anil, B., Obtaining of English as a Second Language at College Level-An Empirical Study. I-administrator's Journal on English Language Teaching, Vol-5. No-4. Recovered from <https://eric.ed.gov/?id=EJ1097375>, October-December 2015.
2. Banerjee, S, A Study of Current Status Quo of English as a Second Language in India Study Done on West Bengal Schools". Universal Journal of Scientific and Research Publications, August 2016; Volume-6, Issue-8. Recovered from <https://pdfs.semanticscholar.org/1e5b/545e017aed226f99f6a96022a5251c75c7ba.pdf>.
3. Best, Kahn and Jha. Research in Education. Pearson India Education Pvt. Ltd., Noida 2017.
4. Chauhan, S. Research Methodology in Education, Dorling Kindersley (India) Pvt. Ltd., Noida 2012.
5. Devak, N. English Language Pedagogy. Kalpaz Publications, Delhi 2015.
6. Golam, A. M. Elements Affecting Students' English Achievement at Secondary Level in Bangladesh: The Comparative Study of Narayanganj and Bhola Sadar Upazilla September 2012.
7. Ghosh, A. A Comparative Study of the Achievement of the Students of Class 10 in Rural and Urban Govt. Helped Schools of Murshidabad (West Bengal). Worldwide Journal of Advanced Education and Research, 2017; Volume 2, Issue 3, Page No. 246-249.
8. John, C. R., and Singh, B. G., An investigation of Achievement in English of Tribal students: Comparison of determinants. Oct. 2014; Volume - 19 (Issue 10), PP 01-10.
9. Khatri, H. L. and Lata, S., Educational Technology. Shipra Publications, Delhi 2016.
10. Lokesh, K., System of Educational Research. Vikas Publishing House Pvt. Ltd., New Delhi 2003.
11. Malkawi, N. A. M. and Smadi, M. The Effectiveness of Using Brainstorming Strategy in the Development of Academic Achievement of Sixth Grade Students in English Grammar at Public Schools in Jordan. Worldwide Education Studies, 2018; Vol-11, No-3.
12. Mangal, S.K and Mangal, U. Fundamentals of Educational Technology. PHI Learning Private Limited, Delhi 2016.
13. Mehmood, T., Parveen, U., Hashmi, A., Shakoor, T., Hussain, T. & Ali, S. Examination of Grade Three Students Performance in the Subject of English in Pakistan. American International Journal of Contemporary Research, November 2012; Vol-2, No-11.
14. Menaka, B. and Jebaraj, J. S. J. Perusing Comprehension in Relation to Academic Achievement in English among Higher Secondary Students. Universal Journal of Research – GRANTHAALAYAH. May-2017; Vol-5, Iss-5: SE. Recovered from http://granthaalayah.com/Articles/Vol5Iss5/20_IJRG17_SE05_20.pdf

A Study on the Synthesis of Polypyrrole Nanocomposites for their Morphological Studies

E. Purushotham¹, K. Devender¹, P. Venkata Ramana Rao², S. Satyavani³

¹Asst. Professor, ²Assoc. Professor, Department of Physics, ³Faculty, Department of EEE, S R Engineering College, Warangal, India

ABSTRACT

This study examines the data about the synthesis of polypyrrole/Cr₂O₃ doped nanocomposites (NCs) as a protecting color in organic coatings. Polypyrrole/Cr₂O₃ doped NCs were set up by in situ chemical oxidative polymerization of pyrrole monomer. Here dopant Cr₂O₃ nanoparticles (NPs) were orchestrated by arrangement ignition technique utilizing Aloe-vera gel as fuel with ammonium per sulfate (APS) as oxidant. Diverse convergences of Cr₂O₃ (10-50 wt %) NPs were fused into the polypyrrole. The combined nanocomposites were described by methods for powder X-ray diffraction (PXRD) and Scanning electron microscopy (SEM). The measure of the NPs were computed by Scherer strategy, and observed to associate with 20 nm. TEM results are in predictable with the XRD results. The morphology of the got composites demonstrates the permeable and agglomerated particles which are because of vast measure of gas advancement amid NPs synthesis by arrangement burning strategy and electrical properties were considered.

Keywords: SEM, Cr₂O₃, Polypyrrole (PPy), Nanocomposites, XRD.

INTRODUCTION

Directing electroactive polymers (CEP) still remain a subject of extraordinary examination of many research bunches around the world. Amid the previous decade, there have been numerous reports concerning productive examinations. Conductive polymers, for example, Polypyrrole (PPY), polypyrrole (PPy), and their composites are broadly utilizes as sensors [2], vitality stockpiling materials, because of the effortless synthesis and flexibility in preparing [3]. Leading polymers including polypyrrole (PPy), Polypyrrole (PPY), polyethylene di-oxythiophene (PEDOT), and polythiophene (PT) have both electrochemical twofold layer capacitance and pseudo-capacitance emerging from the quick and reversible oxidation and decrease forms identified with their p-conjugated polymer chains [1-3]. Among these directing polymers, PPy is outstanding as a promising cathode material for supercapacitors, in light of the fact that it has different huge favorable circumstances, for example, high particular capacitance, great conductivity, bio-compatibility and outstanding mechanical properties [4]. However, like other electronically directing polymers, PPy experiences volumetric shrinkage amid release process which can prompt

diminishing in cyclic strength [6-9]. Nanocomposites are a class of composites in which the strengthening stage measurements are in the request of nanometers [4]. Due to their nanometer measure qualities nanocomposites have unrivaled properties than the ordinary, miniaturized scale composites due to maximize the interfacial grip. Such enhanced properties can be achieved in nanocomposites in which the building squares are scattered in a polymer matrix. Of directing polymers, polypyrrole (PPy) is for the most part perceived to be one of promising leading polymers for business application because of its high electrical conductivity, great ecological steadiness and simplicity of synthesis [4]. To enhance the cyclic strength of the directing polymer, scientists have as of late combined different PPy-based composites with various leveled organized materials to ruin the volume change of the leading polymer amid the charge– release forms [10-12]. As is known to all, progress metal oxides have been greatly detailed as anode materials for pseudo-capacitors as a result of their vast capacitance and quick redox kinetics [3]. In this paper we report the synthesis of Cr₂O₃ nanoparticles utilizing Aloe-vera gel, synthesis of polypyrrole/Cr₂O₃ nanocomposites and their structural, morphological and electrical studies in detail.

MATERIALS AND METHOD

Experimental

Synthesis of Polymer: The synthesis Polypyrrole (PPY) depended on mixing fluid arrangement of aniline hydrochloride and ammonium persulphate at room temperature, trailed by the detachment of PPY hydrochloride accelerate by filtration and drying. An equi-molar volume of aniline and hydrochloride corrosive was disintegrated in refined water in a volumetric carafe to get 100 ml of arrangement. Thus, ammoniumpersulphate (0.6M) was disintegrated in 100 ml water. The two arrangements were kept for 1 hour at room temperature and then mixed in a measuring glass, blended with a mechanical stirrer and permitted to polymerizing. Following multi day, the PPY encourage was gathered on a channel, washed with 0.3 M HCL and $\text{CH}_3)_2\text{CO}$ over and again. The Polypyrrole hydrochloride powder was then dried in air in vacuum at 60°C for 24 hour.

Bio-Mediated Synthesis of Cr_2O_3 Nanoparticles: The chromiumoxide nanoparticles were orchestrated without anyone else 'proliferating low temperature burning strategy', utilizing chromium nitrate ($\text{Cr}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$) as forerunner and Aloe-Vera gel as a fuel. Truth be told 2.14 g of chromiumnitrate was taken in 300 ml petri-dish and 10 ml of Aloe-Vera gel was added to the petri-dish and kept on an attractive stirrer for ~ 10 min. The uniform mixture of both oxidizer and additionally the fuel was then brought into the pre-warmed suppress heater kept at 450°C . The mixture overflows with foam yielding at last a dark powder of NiO nanoparticles.

The normal molecule size of the NiO was computed by Debye-Scherrer and it was observed to be ~ 15 nm^[12-16].



Fig. 1: Flow Chart for Preparation of Cr_2O_3 NPs

Synthesis of Polypyrrole/ Cr_2O_3 nanocomposites:

Synthesis of Polypyrrole: Copper oxide composites were completed by in-situ polymerization strategy. Aniline (0.3 M) was mixed in 0.3 M HCl and mixed for 15 min to frame aniline hydrochloride. Copper oxide powder were included the mass part to the above arrangement with energetic mixing to keep the copper oxide homogeneously suspended in the arrangement. To this arrangement, 0.6 M of ammonium for every sulfate, which goes about as an oxidizer was gradually included drop-wise with nonstop blending at ice temperature for 4 hours to totally polymerize. The accelerate was separated, washed with deionized water and $\text{CH}_3)_2\text{CO}$, and at long last dried in a stove for 24 h to accomplish a steady mass. The Polypyrrole - copper oxide composites were along these lines got containing different weight level of chromium oxide (i.e.10, 20, 30, 40, and half)

RESULTS AND DISCUSSIONS

XRD Analysis

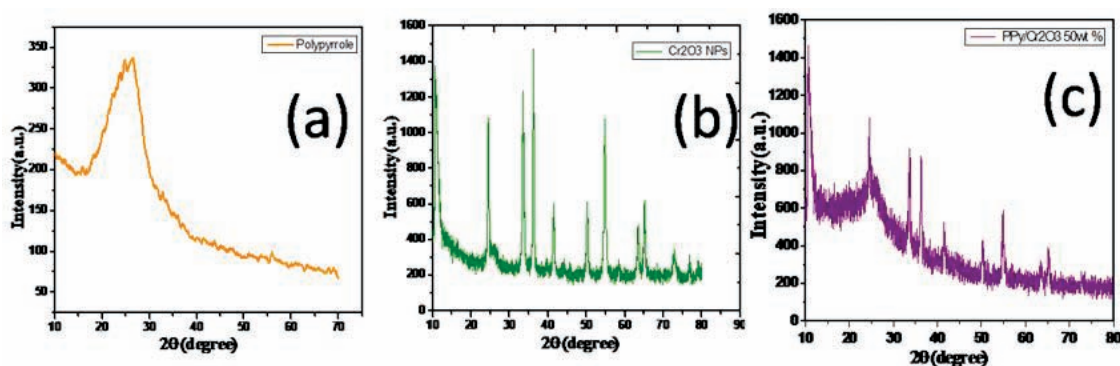


Fig. 2: XRD Pattern of (a) PPy (b)PPy/ Cr_2O_3 , (50 wt %).

X-Ray Diffraction studies were performed utilizing Shimadzu-7000 diffractometer with Cu as the objective (1.54 Å) and chromium as the channel. Fig.2 demonstrates X-ray diffraction example of Polypyrrole. An expansive pinnacle focused at $2\theta = 25.530$ might be allocated to the dispersing from the Pyrrole chains at interplanar dividing which plainly infers the shapeless idea of Polypyrrole and it compares to diffraction planes (200) of unadulterated Polypyrrole and PPY/Cr₂O₃ nanocomposites. It was plainly seen from the PXRD diagram that unadulterated PPY was in undefined nature and as the Cr₂O₃ fixation increments from 30wt % the shapeless nature mostly vanish and crystallinity in the NCs were watched. It was apparent that the Cr₂O₃ nanoparticles were totally interlocked between the polypyrrole chains. There were no extra polluting influence crests were seen in XRD range. The normal crystallite size (D) was planned by utilizing Scherrer's formula^[5],

$$D = \frac{0.89\lambda}{\beta \cos\theta} \quad \dots(1)$$

Where D, the average crystallite size, λ ; the wavelength of the X-rays (0.15405 nm). The deliberate average crystalline size (D) of PPY/Cr₂O₃ 30 wt % NCs were establish to be 28-36 nm.

Morphology studies

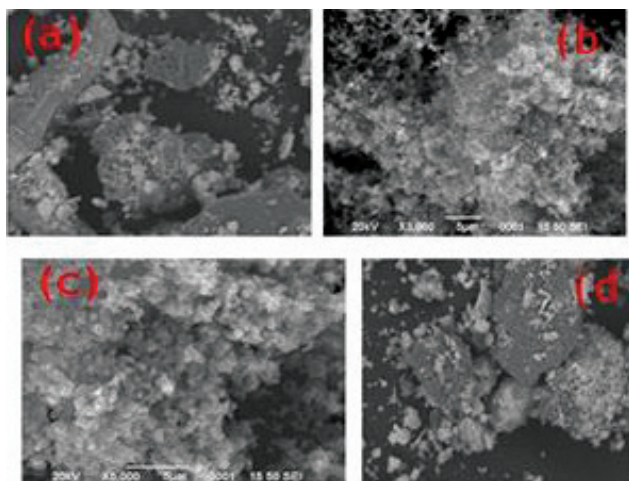


Fig. 3: SEM Images Of a) Cr₂O₃ b)Ppy c) & d) 10wt% &50wt% of Ppy/Cr₂O₃ NCs

The Fig.3 demonstrates surface morphology of the composites were considered by methods for SEM and the results indicated agglomeration of particles. From micrographs of TEM, particles size was around 25nm. Since it is exposed that the nanocomposite is accompanied by much micrometric and nanometric irregularity^[12-14].

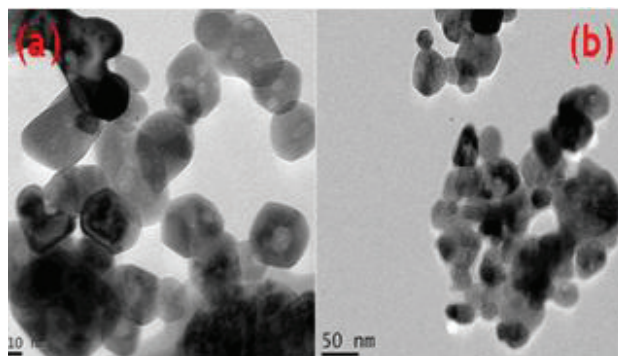


Fig. 4: TEM Images of Polypyrrole/Cr₂O₃ 50wt% NCs

Fig (a) and (b) Shows TEM picture of Polypyrrole/Cr₂O₃ 50wt% NCs (50 wt %) nanocomposites. TEM picture with interplanar separating d esteem equivalent to 0.28 nm. These results are in predictable with the PXRD.

DC Conductivity Studies: The dc conductivity of the nano-composites were considered by utilizing Keithley 6514 electrometer. The plot of surface dc conductivity of PPY and its composites with temperature are appeared in Fig. The conductivity is found to increment with increment in temperature. This expansion in conductivity with temperature is the normal for “warm enacted conduct”. The expansion in conductivity could be because of increment of effectiveness of charge exchange between the polymer chains and the dopant with upgrade in temperature. The warm restoring influences of the arrangement of polymer chain, which prompts the expansion of conjugation length perhaps at the same time achieves increment in the conductivity of the composites.

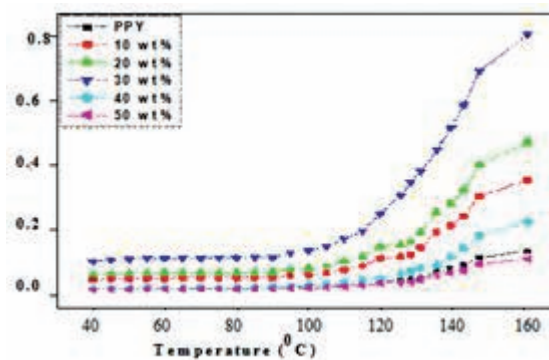


Fig. 5: DC Conductivity Study of Ppy/Cr₂O₃ NC

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nano Materials

CONCLUSIONS

Pure and PPy/Cr₂O₃ NCs were effectively arranged by in-situ polymerization technique. The nanocomposites demonstrated high crystalline nature with no contamination tops. The surface morphology of the composites were examined by methods for SEM and the results indicated agglomeration of particles. From micrographs of TEM, particles size was around 25 nm which was in great concurrence with that of the molecule size figured from Scherer condition. The expansion in conductivity could be because of increment of productivity of charge exchange between the polymer chains and the dopant with improvement in temperature. Every one of these results together uncover that the synthesized composites can be utilized as a part of the field of optical applications.

REFERENCES

- Hajeebaba K Inamdar, H. Nagabhushana, Basavaraja Sannakki, R.D. Mathad , DC Conductivity Study of Polypyrrole/Cr₂O₃ Nanocomposites arranged through Green Synthesis Materials Today: Proceedings 3 (2016), pp3850– 3854.
- R. L. N. Chandrakanthi, M. A. Careem, Preparation and portrayal of CdS and Cu₂S nanoparticle/ Polypyrrole composite movies, Thin Solid Films, 417(2002), pp-51-56.
- Sharanabasamma M Ambalagi*, Hajeebaba K Inamdar and Basavaraja Sannakki, Materials Mechanism of DC Conductivity Measurement of Zinc Oxide Doped Polypyrrole Nanocomposites Today: Proceedings 3 (2016), pp3945– 3950.
- Ali Fakhri a., Sajjad Behrouz b, Mohammad Asif c, Inderjeet Tyagi d, Shilpi Agarwal d,e, Vinod Kumar Gupta d,e,**, “Synthesis, structural and morphological attributes of Cr₂O₃ nanoparticles Co-doped with boron and nitrogen” , Journal of Molecular Liquids 213 (2016) 326– 331.
- Y. He, Synthesis of Polypyrrole/nano-CeO₂ composite microspheres through a strong – balanced out emulsion course, Mater. Chem. Phys, 92, (2005), pp134-137.
- A. G. MacDiarmid, L. S. Yang, W. S. Huang, B. D. Humphrey, Polyaniline: electrochemistry and application to battery-powered batteries, Synth. Met.,18,(1987), PP-393-398.
- D. Verma, V. Datta, Role of novel microstructure of polyaniline-CSA thin film in alkali detecting at room temperature, Sens. Actuat. B,134,(2008) PP-373-376.
- S Farheen, F Jahan, HK Inamdar, RD Mathad, “Impact of polymer mixing on mechanical and warm properties”, Modern Applied Science, (2015),12 (1), pp 520-22
- SM Ambalgi, HK Inamdar, VT Manjula, SG Sannakki Nagaraja,” Synthesis, Characterization and Electrical Properties of Polypyrrole/Chromium Oxide Nanocomposites”, International Journal of Engineering Research (2016), 5 (2), pp 119-122
- M. P. Pileni, “Attractive liquids: creation, attractive properties, and association of nanocrystals,” Advanced Functional Materials”, Vol.11, (2001), pp-323– 336.
- S.C. Chen *, T.Y. Kuo, T.H. Sun, “Microstructures, electrical and optical properties of non-stoichiometric p-type chromiumoxide films by radio recurrence receptive sputtering”, Surface and Coatings Technology 205 (2010) S236– S240.
- J. Sort, J. Nogues. X. Amils, S. Surinach. J.S. Munoz, and M.D. Baro, “Room temperature attractive solidifying in mechanically processed ferromagnetic-antiferromagnetic composites,” Journal of Magnetism and Magnetic Materials, Vol.219, (2000) pp-53– 57.
- I. Hotovy, J. Huran, P. Siciliano, S. Capone, L. Spiess, and V. Rehacek “The impacts of readiness parameters on Cr₂O₃ thin film properties for gas-detecting application,” Sen and Act, B, (2001) pp-126– 132.
- V. Ponnarasan and A. Krishnan, “ Studies on Pure and Divalent Metal Doped Copper Oxide Nanoparticles”, Adv. Studies Theory Phys., vol.8, no. 6, 251-258, 2014.
- Wei Chen, Gary C. Lickfield and Charles Q. (2004). Yang polymer 45(3), 2004, P 1063-1071. [16]. S. A. Chen, K. R. Chuang, C. I. Chao, H. T. Lee, White light emanation from electroluminescence diode with polyaniline as the radiating layer, Synth. Met.,82,(1996)PP-207-210.

An Enhanced Study of Computational Fluid Dynamics

Ravi Kiran¹, G. Anusha¹, G. Swamy Reddy², C. Balarama Krishna³, Ch. Sridevi⁴

¹Asst. Professor, ²Assoc. Professor, ³Asst. Professor, Department of Mathematics, ⁴Faculty,
S R Engineering College, Warangal, India

ABSTRACT

Ideal from the eighteenth century huge measure of research is going in the field of fluid flow and its application to regular problems. From the invention of the computer and development in the field of fluid mechanics, its governing equations and approach of numerical techniques, CFD has begun and has advanced to a great degree. The plan and the development procedure of any item finished the years has turned out to be moderately more simple and less tedious to the customary strategies, so here the fundamental intention of this paper is to give a history, have the significance and feasibility study of computational Fluid Dynamics (CFD) as a computational apparatus for different analysis of engineering related application based problems. It manages the present situation, generally extent of CFD, its pertinence for engineering problems, test for its validation of the obtained results and its focal points over the test strategies.

CFD as an instrument can be connected for problems identified with turbo-machinery, building performance for various weather conditions, storm analysis, warm exchangers, completely created turbulent flow in pipes, analysis of fluid flow and airfoil of an airplane, cooling of electronic chips in the processor using constrained convection and so on.

Keywords: simulation, CFD, analysis, turbulence models, validation.

INTRODUCTION

Presently a days noteworthy consideration is given on improving the effectiveness and minimizing the fuel utilization of engines because of the worldwide exertion of reducing Carbon-dioxide discharges. Coming to Refrigeration frameworks it is COP (Coefficient of Performance) that issues the most, significant endeavors have been made by researchers all through the world in making these frameworks more solid, more eco-accommodating, optimizing to get most elevated yield for a given input. Coming to analysis of fluid flow through pipes, it is the decrease in the inlet pumping vitality that is most essential for such frameworks to work effectively.

In 17-eighteenth century researchers all through depended mainly on exploratory validation of a theory rather than simply the mathematics. With the appearance of computers, educated information about fields in which research occurred and with development of the mathematics for the theory, another field which was the unification of mathematical models and computers to obtain answers for a certain sort of an issue. This

field has developed hugely since then. A great deal of innovation in fields identified with this occurred in the nineteenth century, which offered ascend to assortment of subjects, various application fields and parcel of ways to approach a given issue. With the revelation of fluid mechanics governing flow equations, numerical methods to unravel differential equations in mathematics, this field took off. There are diverse apparatuses to examine distinctive sort of problems, starting with Finite Element Method (FEM) for auxiliary based problems, Finite Volume Method (FVM) for fluid mechanics, thermal, heat transfer problems.^[12]

Despite the fact that, these computational methods (simulation) are destructive in the industry for configuration reason, research and development (R and D), their validation may at present be under inquiry. Importance of results rely on the field of use analyzing its qualities, confinements and trying to improve the blunders in development of the model under study.

This paper investigates different angles to be thought about: the field of use, the plan, RandD study, particular parameters of interest in the work under

study. It additionally investigates the feasibility of use of CFD principles (methods) to the given research issue, its significance, its results and their validation with the customary or neo-conventional methods of obtaining the consequences of the study. The extent of use of CFD is humongous, ideal from fluid flow to bio-mechanics using the relative principles, anyway this paper depends on an audit and dialog of mainly the use of CFD principles to center mechanical engineering problems.^[12]

APPLICATIONS OF CFD

Since the appearance of computational fields and capacity of solving differential equations numerically, the fields in which CFD is connected has increased. This paper mainly takes a gander at applications from more extensive domains like car, aviation segments with fixation in IC Engines, Turbochargers, Heat transfer problems , air foils and couple of utilizations in non-customary fields.

CASE STUDIES

1. An-Shik Yang et.al.^[1] employed CFD as a tool in Urban and community planning to simulate, obtain flow parameters and characteristics around different buildings to obtain ventilation. Simulation domain (3kmx2kmx0.6km) was taken. A standard k- ε two equation turbulence model was used.
2. D.Bhandari et.al.^[2] carried out work in analyzing fluids(air and water) passing through a closed pipe (internal flow) using CFD software. The results obtained were for fully developed turbulent flow. GAMBIT was used for geometry modeling, Fluent for simulation. The pipe was made of steel for simulation with (length x diameter)of 8m x 0.2m. Inlet velocities of (water, air) are 0.05,1 m/s. A standard k- ε model was used.
3. S.Kandwal et.al.^[3] carried out research work for NACA 4412 airfoil, compared simulation results with work conducted by Abbott et.al. GAMBIT and Fluent was used for geometry modeling and simulation. Unstructured mesh was used. Inlet temperature and mach number of 288.17K and 0.15.
4. Rajesh Bisane et.al.^[4] carried simulation work for 4- stroke C.I Engine and analyzed the exhaust gas system. Diameter of diffuser inlet and engine outlet=0.0254m, 0.15m. A standard k- ε model was implemented, with GAMBIT for geometry creation. Inlet mass flow for conventional, turbocharged, supercharged was 0.00749,0.0115,0.014 kg/s at 562K,686K,637K respectively. Outlet opening pressure= 1.325,2.89,2.94 bar at 353K,669K,573K respectively.
5. Rajesh Khatri et.al.^[5] conducted work on analysis of laminar flow over a flat plate. A flat plate 400mm long was maintained at a constant temperature of 333K. The fluid was passed over the plate at a velocity of 2m/s at 300K.
6. Pulkit Agarwal et.al.^[6] carried out work for heat Transfer from Fins of an air cooled motorcycle engine under varying climates. Fluent was used for simulation. Speed range was 40-72 kmph. The engine was modelled as aluminium cylinder with fins on outer surface and a stroke volume of 150 to 187 cm³ . Model creation was done using GAMBIT. A fine mesh was created near the fins. A face mesh was done by quad element. The volume was meshed by hex element. A fixed pressure of 101.325kPa was set as BC. Top and bottom surfaces were specified as adiabatic walls and the flow was kept from left to right. Temperature was specified at the inner surface. Metallic fin was meshed and specified as solid region.
7. Mukesh Didwania et.al.^[7] carried out work on analysis of heat transfer through two different shaped fins. Air was facilitated by the blower at a certain suitable velocity based on Reynolds number. SOLID WORKS was used to create the geometry model. It had three parts Solid Base, Solid Fin Surface and rectangular duct. All were created independently and assembled. Mesh was generated by ANSYS and it included Tetrahedral, Wedges, Pyramids, Hexahedral and Polyhedral mesh. The bottom wall was kept at a constant temperature of 430 K. No slip condition was applied leading to a zero velocity. The side walls were adiabatic. The inlet air temperature was 280 K. Simulation was done with FLUENT. A standard k- ε model was employed.
8. Arularasan R et.al.^[8] conducted work on analysis of a heat sink for cooling of electronic devices to select an optimal heat sink design, studies on

the fluid flow and heat transfer characteristics of a parallel plate heat sink was done. Fluent was used for simulation. Parameters involved were fin height, fin thickness, base height and fin pitch which ranged from 16-48mm, 0.8-1.6mm, 4-12mm, 1.5-4mm respectively. A condition of heat input at 100W was assumed at the heat sink base.

9. Vinod M. Angadi et.al.^[9] conducted work on analysis of heat transfer enhancement of car radiator using nano- fluid as a coolant. The analysis was done using STAR CCM+. Aluminium oxide was used as an additive. Flow rate changed from 2-6 litre/ min . Nano particle volumetric concentration varied from 1% to 6% of base fluid. Fin geometry was modelled on STAR CCM+ with Tube length, space between tubes, thickness, length as 31,1.5,0.3,2 cm. Number of fins used=34.

Fin material used : aluminium. Temperature was taken in the range of 1000K-5000K. A 313K was the static temperature taken as initial conditions. Inlet temperature=50 degrees , convective heat transfer coefficient=50 W/m²K.

10. Ravi shankar P R et.al.^[10] did take a shot at supercritical aerofoil at various approach with a basic aerofoil. NACA SC(02) 0714 and NACA 4412 aerofoil profiles were utilized for flow analysis. GAMBIT for geometry creation and FLUENT for simulation. The analysis was done at a Mach number of 0.6. A standard k-ε demonstrate was utilized. Limit conditions were defined with properties of fluid being thickness, consistency, thermal conductivity and particular heat of air as 1.185 kg/m³ , 0.0000183 kg/ms , 0.0261 W/mK ,1.004 kJ/kgK individually. Weight of 101325 Pa and a speed of 250 m/s was set.

RESULTS, DISCUSSION AND REMARKS

1. **An-Shik Yanget.al.results were:** Its howed that due to presence of two high rise building and a low height building in between, the wind velocity was at 1m/s. A better ventilation at 1.5-2m/s was obtained eliminating a high rise building.

Remarks: Can be implemented with k-ω or SST models to obtain further accuracy and perform a comparative study.

2. **D.Bhandari et.al.results:**

Table 1: Result

Result	Simulation	Experimental	% error w.r.t exp.
Centerline Velocity (Air, Water)	1.19,0.061(m/s)	1.22,0.0612 2 (m/s)	2.45 %; 0.359 %
Skin friction coefficient (air, water)	0.01, 0.009	0.00795,0.01	-25.4% ; 10%

Remarks: A k-ω model is better for fully developed turbulent, it can implemented to obtain more fine results. CFX is less time consuming and utilize less space for same meshing. Type of meshing is not specified, that will decide what package to be used for better results and convergence.

3. **S. Kandwal et.al.results:**

Table 2: Result

Result	Simulation	Experimental	% error w.r.t exp.
Coefficient of lift and drag	0.654, 0.001	0.649, 0.007	-0.77% ; 85.1%

Remarks: SST model works better for airfoils. Also research could be conducted by simulating using CFX package for unstructured mesh type as it works better.

4. **Rajesh Khatri et.al. results:**

Table 3: Result

Result	Analytical	Simulation	% error w.r.t exp.
Heat transfer coefficient (W/m ² K)	8.77	9.28	5.49 %
Heat Flux (W/m ²)	115.76	121.81	4.96 %

It was watched that limit layer thickness was greatest for Reynolds number 10,000 and minimum for Reynolds number 50,000 It was watched that the variety of nusselt number was linear till the Reynolds number increased to 5876. The CFD comes about demonstrated a 5.5% blunder with the scientific arrangements, indicating dependability of the CFD code.

Remarks: The type of turbulence model used is not defined. SST model works good for such problems.

5. PulkitAgarwalet.al.results: It was watched that with increase in temperature on the fin surface , increasing air temperature which occurred in view of lessening in heat transfer due to less temperature slant. It was in like manner saw that the heat lost at same vehicle speed increased with diminish in natural temperature. With enduring temperature, heat transfer increased with speed.

Remarks: Type of turbulence exhibit isn't clearly defined. A standard k-ε turbulence show is used for building simulation, yet its seen that k-ε SST show makes better results.

6. Mukesh Didwania et.al.results:

Table 4:L Result

Result	Rectangular fin	Circular fin
Heat transfer rate (W)	-406.93	-397.85
Pressure loss (Pa)	0.091872931	0.091870584
Increase in temperature (K)	10.1492	10.15789

It was concluded that Circular fin was optimum fin for maximum heat transfer.

7. Arularasan R et.al.results: By keeping a minimum measure of fins, a greatest conceivable fin pitch could be maintained with the goal that the weight drop would be minimum and wind current would be most extreme. In view of the manufacturability and flow speed or flow sidestep constrains, diminish in fin thickness was not practical. It was discovered that for a low thermal obstruction and low weight drop in the chose heat sink demonstrate, the geometric parameters like the fin tallness, fin thickness, base stature and fin

pitch were observed to be ideal at 48 mm, 1.6 mm, 8 mm and 4mm separately.

Remarks: Type of turbulence demonstrate isn't obviously defined. A standard k-ε turbulence show is utilized for building simulation, however its seen that k-ε SST demonstrate creates better outcomes. Additionally an all the more fine work must be utilized for precise outcomes.

8. Vinod M. Angadi et.al.results: It was watched that with increase in the fluid flow rate and by keeping the base fluid steady without adding any nano-particles, the heat transfer coefficient esteems continued increasing. Additionally when nano fluids in certain portions were added to the base fluid and the flow rates were kept steady , heat transfer coefficient increased. With increase in the estimation of temperature the heat transfer coefficient esteem increased. It was proposed to keep a higher extent of fluid flow rate clubbed with a higher volumetric level of nano-particles added substances, which would guarantee an improved heat transfer.

9. RavishankarPRet.al.results: Results in the middle of approach from 0-15 degrees the drag weight for supercritical aerofoil was less contrasted with straightforward aerofoil , at 15 degrees drag weight for supercritical aerofoil was slightest and at 30 degrees the drag weight for supercritical aerofoil was more than the basic aerofoil. The speed diminish in the flow field in supercritical aerofoil was less when contrasted with basic aerofoil.

Remarks: k-ε SST display creates better results. As it deals with free stream and close divider conditions.

From the contextual investigations and writing overview, it was watched that Computational Fluid Dynamics gives the comfort of being ready to turn off , turn on particular terms of governing equations, direct the analysis for various conditions, obtain results, begin a similar study, propose the best method feasible and so forth. This allows the testing of theoretical models, suggesting new ways for theoretical investigations, likewise gives a stage to test theories which would never potentially have been practical through experimentation. Along these lines, CFD gives a couple of significant favorable circumstances when contrasted and test fluid dynamics:

Lead time in plan and development is diminished fundamentally alongside a noteworthy savings in allotment of supplies for experimentation. It can mimic flow conditions which are un-paralleled, not reproducible in trial demonstrate test. It can recondition the parameters and get distinctive yields and approve. CFD gives all the more closer, definite and complete information which can suit part of parameters and make it as near genuine circumstance as would be prudent. The most prominent component of it is its savvy include contrasted with trial fluid dynamics or wind burrow testing and in a way specifically addresses worldwide vitality utilization by consuming less power and being profoundly proficient.

CONCLUSION

The whole paper displayed Computational Fluid Dynamics as an apparatus for various research cases and constant problem solving. The scope of problems experienced or handled is from wind stream simulation around buildings for planning urban areas to engine related or heat transfer problems. In the wake of studying the cases and reviewing writing, appropriate remarks were made. As it is observed, it can be presumed that the wide assortment of use of CFD is admirable, the on-going and already done research compliment each other through validation and from the contextual investigations it is seen that validation is attractive and is in close concurrence with the exploratory results. Consequently CFD as an instrument for simulation can be viewed as dependable for research works, or specific problem solving.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Fluid Dynamics

REFERENCES

1. A Shik Yang, Chih-Yung Wen, Yu-Chou Wu, Yu-Hsuan Juan, and Ying-Ming Su, 'Wind Field Analysis for a High-ascent Residential Building Layout in Danhai, Taiwan' Proceedings of the World Congress on Engineering 2013 Vol II, WCE 2013, July 3 - 5, 2013, London, U.K.
2. D.Bhandari, Dr.Singh,' Analysis of completely created turbulent flow in a pipe using computational fluid dynamics', International Journal of Engineering Research and Technology (IJERT) Vol. 1 Issue 5, July - 2012 ISSN: 2278-0181.
3. S.Kandwal, Dr.S.Singh, 'CFD study of fluid flow and streamlined powers on an airfoil.', International Journal of Engineering Research and Technology (IJERT) Vol. 1 Issue 7, September - 2012 ISSN: 2278-0181.
4. Rajesh Bisane, Dhananjay Katpatal, 'Test investigation and cfd analysis of a single cylinder four stroke c.i. engine fumes framework', IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308.
5. Rajesh Khatri, Pankaj Agrawal, Mohan Gupta, Jitendra verma, ' Laminar flow analysis over a level plate by computational fluid dynamics', International Journal of Advances in Engineering and Technology, May 2012. ©IJAET ISSN: 2231-1963-Vol. 3, Issue 2, pp. 756-764.
6. Pulkit Agarwal, Mayur Shrikhande and P. Srinivasan,'Heat Transfer Simulation by CFD from Fins of an Air Cooled Motorcycle Engine under Varying Climatic Conditions', Proceedings of the World Congress on Engineering 2011 Vol III WCE 2011, July 6 - 8, 2011, London, U.K.
7. Mukesh Didwania, Gopal Krishan, Ravikant, 'Study and Analysis of Heat Transfer through Two Different Shape Fins using CFD Tool', International Journal of IT, Engineering and Applied Sciences Research (IJEASR) ISSN: 2319-4413 Volume 2, No. 4, April 2013.
8. Arularasan R.and Velraj R. 'CFD analysis in a heat sink for cooling of electronic gadgets', International Journal of The Computer, the Internet and Management Vol. 16.No.3 (September-December, 2008) pp 1-11.
9. Vinod M. Angadi, R.Nagaraj, Dr.O.D.Hebbal,' CFD analysis of heat transfer improvement of an auto radiator using nanofluid as a coolant', International Journal of Engineering Research and Technology (IJERT) Vol. 3 Issue 8, August - 2014 ISSN: 2278-0181.
10. Ravi Shankar P R, H.K.Amarnath, Omprakash D. Hebbal, ' Simulations of supercritical aerofoil

- at various approach with a straightforward aerofoil using familiar’, International Journal of Engineering Research and Technology (IJERT) Vol. 3 Issue 8, August - 2014 ISSN: 2278-0181.
11. O.Ban, U.S Lee, B.H.Ahn, Y.S.Kin, ‘Utilization of Computational Fluid Dynamics to Rotary Compressor Efficiency and Noise’, International Compressor Engineering Conference.
 12. Prashant Bhatt, Rajesh Satankar, ‘ Computational Fluid Dynamics analysis of wind turbine rotor cutting edges an audit’, IJCRR Vol 04 issue 21.

An Enhanced Study on the Challenges Encountered in Mathematical Modelling

Anusha¹, C. Balarama Krishna¹, G. Ravi Kiran¹, P. Ramchander Rao²

¹Asst. Professor, Department of Mathematics, ²Faculty, S R Engineering College, Warangal, India

ABSTRACT

This paper compactly shows challenges encountered when demonstrating systems mathematically. Mathematical displaying altogether involves math symbols, numbers and relations shaping an utilitarian condition. These mathematical equations can speak to any arrangement of interests, additionally gives ease PC reenactments. Mathematical models are widely used in various fields i.e. engineering, by scientists, and analysts to give an unmistakable understanding of the issue. Demonstrating contributed a considerable measure since reversal of the idea. Straightforward and complex structures raised because of demonstrating. In that sense displaying is a vital piece of engineering. It can be alluded to as the essential building square of each framework. An intricate model anyway isn't a perfect arrangement. Engineers must be mindful not to dispose of all data as this may render the planned model pointless – as nitty gritty in this paper the model ought to be straightforward with all fundamental and important information. Fundamentally the motivation behind this paper is to demonstrate the significance and obviously clarify in detail challenges encountered when displaying

Keywords: Replica, Modelling, Algorithm, Taxonomy, Challenges and Uncertainty

INTRODUCTION

Throughout the years Mathematical models were utilized and still in ongoing history have gotten a huge conceptualisation in engineering. Mathematical models can be characterized as – just communicating a true framework as far as math symbols, numbers and relations shaping a useful mathematical condition. The equations speaking to a framework come in various structures – arithmetical, partial quadratics and straight or non-direct systems depending much on the wonders being displayed. Certifiable framework includes extraordinary, disconnected wonders subsequently various portrayal or plan of every marvel. Fundamentally the inferred condition for a specific marvel holds less however significant data and framework flow should have been recognized hereafter managed. In engineering, straightforwardness, succinctness and understanding are critical developments for each undertaking in engineering. Engineers pride themselves on these points of reference. An excessive amount of definite data on a model forces troubles when creating algorithms and may from this time forward bring challenges amid framework recreation: where reproduction is the specialty of imitating a true procedure.

MODELLING

Mathematical displaying in basically terms can be depicted as the building square of science, computing, examining and engineering. In control engineering, modelling:”mathematical portrayal of a physical wonder, framework or gadget, mathematical models takes numerous structures, for example, dynamic framework models, factual models, diversion models, differential equation...etc.”simulation:”a PC program, or bundle, that endeavors to reenact or mimic a conceptual model of a specific framework or gadget.” These two fundamental ideas are correlative segments – exist together. Simulation frames a necessary with theoretical mathematical models. The sole reason for simulation is to set up some benchmarking, new experiences to an issue, foresee conduct for systems. The fundamental measure is to build up a model, compose algorithm and at long last mimic the theoretical model for advance understanding. Simulation of the model has an additional preferred standpoint since this method can be executed the same number of times until a successful and adequate model is attained^[1-3]. In control engineering simulations are executed utilizing projects,

for example, MATLAB, SCILAB, C, C++, Linux and so forth. These projects have their own benefits of understanding and performance^[4-6]. The basic/simple of displaying are essential in this way challenges should be routed to enhance demonstrate adequacy and approval on simulations. Simulations console nature of a model subsequently validation. Quality of attainability in science, computing and engineering is accordingly of demonstrating. Take for example, building bridges to high rises and autos to PCs, demonstrating must be done to assess and understand the characteristics that may affect the framework introduction. Models are utilized as learning progressions, modest to outline and execute than genuine partners and safeguard replicas or models (fakers). Consequently, models and their one of a kind usage are articulations of entomb – subjective understandings^[7].

Importance’s of Mathematical Modeling:

1. Can speak to the performance of a framework or process (framework usefulness)
2. Useful computerized information or pictures can be made from mathematical models
3. Can speak to genuine marvels involving one of a kind practices:
 - a. Physical framework e.g. engines
 - b. Financial framework
 - c. Social framework and so on.
4. Predicting likelihood of results (i.e. future expectations) – since foreseeing likelihood of results of a genuine framework is monotonous and appropriate unrealistic which has prompted the utilization of models. Models have a stipend of adaptability and simulations are completed as regularly as an architect needs.
5. Economically demonstrating is savvy as opposed to genuine experimentation and displaying goes for delivering a satisfactorily precise model at insignificant cost with some adaptability.
6. Modelling in Engineering empowers the assessment of expected change.
7. Models are basic for choice investigation and basic leadership.

ALGORITHM

Fundamentally algorithm implies uncertain strides to taking care of a specific issue, given as set of directions

or mathematical formulae’s. Albeit, every issue can be exceptional, algorithm does not mean an unequivocal response to the issue but rather a rule prompting an answer. As a noteworthy truth, algorithms are inalienable in engineering and computing helping in neutralizing distinctive marvel i.e. framework contact, info and yield voltages, monetary adjust, interests and so on. In this way, Algorithmic subject is one of the developing zones in science, computing and engineering. As in this way, it has prompted an assortment of reading material and articles being distributed on the topic, covering easy to convoluted points – thing arranging, seeking to framework demonstrating.

Mathematical Modeling incorporates meticulous assignments however set down directions are non-existent. Take for example fine art or critical thinking – as people with various information base and unparalleled traps sacked some place, can concoct heap approaches for a similar situation leaving a greater space for thinking and contentions about which arrangement is ideal. An indistinguishable applies to engineers from each may have an approach to settle the wonder. In any case, there are three exchange offs that a designer must be acquainted with from the beginning of demonstrating and hardening with one of these perspectives bargains alternate: this viewpoints hold inside properties including mix of measures of good-of-fit in every mode, subsidizing and show level of opportunity. These three perspectives refute the way that any model outlined is perfect^[8]. These exchange off perspectives are:

1. Accuracy
2. Cost
3. Flexibility

Why Algorithms in Engineering: Everything considered, PC application would not typically exist like they are today or be conceivable without ALGORITHMS. In spite of the fact that PCs are intended to help—the work they do is past mind boggling utilizing algorithms. Basically algorithms give the focal part in computing, information examination, and demonstrating thusly key in relatively every part of our being—professional and personal. As we confront distinctive difficulties in our day-to-day life, businesses, industrial facilities, engineering and in banks (accounts) algorithms are planned intuitively and deliberately to help alleviate the problems—Problem Solving Techniques. Algorithms essentially contribute close to 99.9% in displaying giving concise understanding.

Mathematical Modelling and Algorithm Flow Diagram *Conted...*

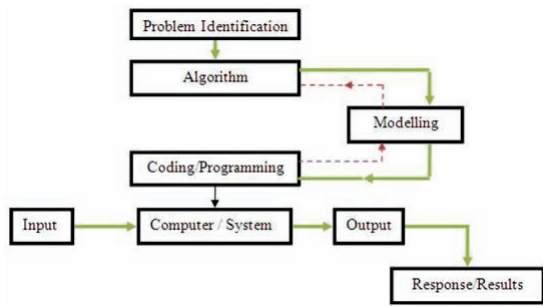


Fig. 1: Modelling and Algorithm Flow Diagram

Understanding a problem from the beginning is an exceptionally vital perspective an information examiner, PC pro and a specialist can accomplish, fizzling which the objective tried or wanted won't be met since the essentials are misjudged and confused. As a preventative measure, it is standard to get the problem appropriate from a hypothetical and pragmatic point of view before planning algorithms. One needs to settle on factors like computational means, diagnostic techniques and so on with everything taken into account making an entire and extensive algorithm. Displaying at that point comes as a subsidiary from the algorithm. At exactly that point in the wake of outlining a powerful model, a program can be composed, fixed and kept running on framework sustaining proper contributions to assess and investigate the sources of info connection to the yield reaction. However, the above stream diagram in Figure 1 may demonstrate a straightforward method of mathematical displaying and algorithm, don't be tricked to the reality – as displaying and algorithm can at present face challenges examined in segment 4 of this paper. The accompanying subsection defines all phrasings utilized when demonstrating. Table 1 gives an itemized taxonomy.

Modelling and Algorithm Taxonomy

Table 1: Taxonomy

Term	Description
Algorithm	
Ambiquity	Multi-interpretations, multi-outcomes and inexactness of a system.
Uncertainty	A certain min – max boundary a system is required to operate at or system inherent deficiencies, thus, of knowledge incompleteness.

Unknowns	Not known—the dissimilarity between developing/becoming and present knowledge.
Unknowable	Unattainable knowledge. Knowledge that is no way near humans due evolutionary progressions, limitations and or can be 'attained by quantum leaps by humans ^[7]
Modelling	
Approximation	This modelling aspect emphasis relevance by approximating reasoning hence dealing with formulae complication and complexity
Simplification	Tractability needed on problems and solutions—promotes absolute comprehensiveness
Fallacy	The misfortune of being oblivious fallible or erroneous belief on the methodology due to unfounded and wrongful misleading notations.

MATHEMATICAL MODELING CHALLENGES

Perusing this, you may end up making an inquiry like, “why demonstrate?” rather than applying subjective judgements and instinct to decide. There is nothing incorrectly in contemplating except for one should remember that human comprehensions might be imperfect. Wrong judgements are (i.e. characteristic to people) made and when executed there can prompt wrecking catastrophes^[9, 10]. Uncertainty is in the human instinct in this manner inescapable. In this way, demonstrating is basic in each choice problem. Displaying has been the stay for analysts, scientists and engineers, reforming ventures, lives the world over – settling on it the apparatus of decision for all orders. In any case, demonstrating master experiences various challenges on their particular fields^[7].

Demonstrating on the counterbalance can be seen as a problem, in this manner requiring a gathering of talented specialists (i.e. analysts, scientists, engineers and so forth) to cure the circumstance. The undertakings can be shared by in excess of one cognizant gifted personality shaping the shared view and empowering smooth innovativeness and developments among a group of specialists. Demonstrating verifiably gives

valuable grounds and additionally unambiguous entomb subjective understanding – nonetheless, displaying can yield begging to be proven wrong understandings and challenges^[7].

Sensibly, systems are special and have bunch qualities, traits, and capacities as hence these properties make overpowering, hard to tackle problems which then again makes demonstrating an impressive assignment. Take for example, a mechanical transport line framework i.e. metal transportation belt in mining industry, on its full and ordinary activity it experiences afflictions, for example, rain, dust, exceptionally hot climate, contact, belt extend, belt tear, voltage floods, control cuts, engine drive warming up and backfire. These can be a repulsive assignment for engineers in the matter of how to display this framework to cure all the nonlinear inconsistencies previously mentioned. From this time forward, the former parts cover the most widely recognized challenges in detail.

Knowledge and Skills in Modeling: The essential prerequisite before displaying is gathering data for specific process we mean to research. The information acquired will thusly be useful for facilitate investigation and translation. These optional advances prevalently manage the result of the procedure. On the off chance that the information, examinations systems are imperfect, the ultimate result will be defective rendering the model defective and unusable. Social affair, examining and deciphering information require expertise and experience. The vast majority do not have these characteristics, constraining their demonstrating capacities. Multifaceted nature lessening, information testing, supposition (i.e. accept nonlinear procedure to be direct) are confinement in displaying. To be out of line to the procedure presumptions are joined into the technique to decrease multifaceted nature and over investigation of data^[11]. It is constantly best not over break down process, as this could mean just pertinent data is consolidated to the model. Over dissecting of the procedure characteristics, capacities prompts advancement of complex models. Consequently, as the model consolidates numerous characteristics, it wind up close incomprehensible if certainly feasible for the model to be comprehended. Along these lines, individuals achieve a halt when it comes to credits to center or incorporate into the model. Disposing of a few information thought to be unessential can have mishaps conceivably pulverizing outcomes. The inquiry is how you decide pertinent and throwing out insignificant information from a group? This remaining

parts an implausible factor. Specialists swing to center around the choice problem rather the entire procedure by overlooking different variables. It has been by and by for an a long time, it is working yet is it best? The inquiry stays to be replied.

Whom to involve in the Modeling process: Countless or enterprises without the expected aptitudes to take care of the choice problem, outsource their choice problem – a typical standard. This can be an overwhelming errand for the accompanying reasons; the measure of assets used to distinguish stern and qualified specialists – if not known to them. Typically organizations that are compelling and productive are less accessible, along these lines, delays are inescapable; Outsourcing ventures is expensive thusly, budgetary limitations are a gigantic impediment to any extend movement. As subsequently, organizations with stringent spending reserves depend on less expensive help; the fundamental angle is NO one is a specialist in all orders – who are the correct individuals to evoke the errand to achieve a shared objective?

Uncertainty in Models: Demonstrating is intended to decrease the consequences of vulnerabilities yet because of advanced advances and or high framework many-sided quality has demonstrated fairly hard to stay aware of vulnerabilities. Systems are required to execute basic choices with potential antagonistic outcomes. It is anyway basic for specialists i.e. scientists, analysts, engineers to be learned, gifted and ready to apply their instinctive reasoning to settle on imaginative and viable choices. Instinctive here infers to choices that are sensible, expository, conceivable, and practical and prove – based. As a part of this instinct, an expert(s) ought to be straightforward on the choice and know the thinking behind each every critical choice as this guide in enduring vulnerabilities with profundity understanding. In science and engineering, vulnerabilities are caught as far as lower and upper limits. This demonstrates a huge low and high limit which a framework is to work inside those limits. These limits are resilience edge to anomalies on the framework. A resilience edge innately gives a framework typical and solid task with no consequences acquired. Having resilience edge is the best strategy to rehearse than confinement. Specialists are still tested tremendously when managing uncertainty. There are difficult to distinguish and almost difficult to quantify thus impediments are set. Sound deceitful however it turned out to be working for quite a long time. Another factor is that of desires. Engineers and society desires

are at verge point (vast and overpowering). For each framework composed performance of high class bore is normal thus putting weight on displaying and planning specialists. This anyway decreases the resilience of errors^[10].

Prosperity/Plentiful of Information: Knowledge is the capacity to make basic, systematic choices in light of the assets at ones transfer and do vital activities to supplement choices made. Essentially every living creature ready to execute and get by in this cruel tyrannical callous earth it's assumed clever. Wealth of information can be seen as part of Decision Making (DM). Having a lot of information advances the nature of reasonability and DM. DM can be ascribed into three perspectives. Right off the bat, information and data handling – breaking down, testing and assessment of the information. Also, learning creation/development – following the examined information a database can be made for additionally utilize. Thirdly, evaluation of the related vulnerabilities and dangers – this angle must be carefully surveyed for the advancement of the framework in task. This guideline has an additional favorable position on vigor and it includes progressively the adaptability of the framework and last however slightest it improves the capacity of suitable basic leadership. However, as a specialist it should come regular that having plenitude of information does not mean moment assurance. There might be a few irregularities that may prompt errors in DM yielding undesired results. Examining and investigating information to screen out the errors or irregularities is tedious and require aptitude which a great many people don't have.

CONCLUSION

The paper has been composed, all displaying and algorithm challenges delineated. Displaying is an unmistakable idea everything being equal, analysts and engineering processes. It enables the specialists to be immensely imaginative and innovative. It is anyway urgent and standard to shoulder at the top of the priority list that challenges are inescapable in any genuine problem as it is for demonstrating. Tending to any demonstrating problem without earlier legitimate skills and knowledge can be an impediment to a useful arrangement. The intelligent paper has represented in detail the capability of these problems on the adequacy of demonstrating. The paper spread out and clearly teaches learners over each platform.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Mathematical Modeling

REFERENCES

1. A. Ali, Modeling and Simulation of MEMS Components: Challenges and Possible Solutions, Micromachining Techniques for Fabrication of Micro and Nano Structures, 2012; pp. 277 - 301.
2. A. K. Simon Taylor, Katherine Morse, Andreas Tolk, Levent Yilmaz & Justyna Zander, Grand Challenges on the Theory of Modeling and Simulation, Symposium on Theory of Modeling and Simulation 2013.
3. R. Crosbie, Grand Challenges in Modeling and Simulation, SCS M&S Magazine, 2010; pp. 1 - 8.
4. J. F. Sturm, Using SeDuMi 1.02, a MATLAB tool compartment for streamlining over symmetric cones, Optimization techniques and programming, 1999; vol. 11, pp. 625-653.
5. D. Hanselman and B. C. Littlefield, Mastering MATLAB 5: A far reaching instructional exercise and reference: Prentice Hall PTR 1997.
6. B. W. Kernighan, D. M. Ritchie, and P. Ekelint, The C programming dialect 1988; vol. 2: prentice-Hall Englewood Cliffs.
7. C. T. Ragsdale, Spreadsheet Modeling and Decision examination: A Practical Introduction to Management Science. Joined States of America: Thomson Learning 2004.
8. A. Levitin, Introduction to The Design and Analysis of Algorithms. Greg Tobin: United States of America 2007.
9. S. Talukder, Mathematical Modeling and Applications of Particle Swarm Optimization, School of Engineering at Blekinge Institute of Technology, Blekinge 2011.
10. G. J. K. Bilal M. Ayyub, Uncertainty Modeling and Analysis in Engineering and the Sciences. Joined States of America: Chapman and Hall/ CRC 2006.
11. K. Mapoka, The Potential of Auto - Tuned PID, MPC and PFC On Industrial Mining, Automatic Control and System Engineering (ACSE), Sheffield 2012.

A Review on Heterocyclic Compounds in Synthetic, Agricultural and Industrial Applications

K. Srivani¹, Veerati Radhika², E. Laxminarayana³, S. Haripriya⁴

¹Asst. Professor, ²Assoc. Professor, Department of Chemistry, S R Engineering College, Warangal;

³Assoc. Professor, Srinidhi Institute of Science and Technology, Hyderabad; ⁴Faculty, Department of Civil Engineering, S R Engineering College, Warangal, India

ABSTRACT

Heterocyclic chemistry offers a case for the absence of distinct demarcations; truth be told, it overruns the majority of the other chemical disciplines. Heterocyclic are inseparably woven into the existence forms. The fundamental enthusiasm of the agrochemical enterprises in heterocyclic is frequently associated with their regular event. Synthetic chemistry gives cornucopia of heterocyclic systems. Heterocyclic compounds assume a similar major part in harvest and creature treatment as they do in medication. We will consider here just the utilization of synthetic compounds on crops in the field; numerous specialists have been created that capacity as insecticides, fungicides, herbicides, and plant growth regulators (PGRs), and these operators are by and large called pesticides. Principle point of this paper is to display the information in regards to the heterocyclic compounds that constitute the biggest family or organic compounds. These are critical with wide exhibit of synthetic, agricultural and industrial applications.

Keywords: heterocyclic substances, Synthesized compounds, agricultural.

INTRODUCTION

This will endeavor to draw out a portion of the features of heterocyclic compounds especially of pesticidal importance in the zone of organic chemistry. This surveys the history, importance and grouping of pesticides and examines quickly about their monetary importance in the cultivating sector. The yield insurance chemicals broadly utilized as a part of horticulture to control different irritations are named insecticides, fungicides, rodenticides, herbicides and fumigants relying on their method of movement. Among pesticides, insecticides are broadly utilized chemicals to control different maladies caused by various creepy crawlies.

Nitrogen, oxygen and sulfur containing heterocyclic compounds are key building squares used to create compounds of natural or therapeutic enthusiasm to scientific experts. Countless containing heterocyclic building squares have applications in pharmaceuticals and agrochemical research and medication revelation. Heterocyclic compounds likewise have a down to earth use as segments in colors, cell reinforcements, copolymers, bases, and ligands.

As in pharmaceutical research, the industry combines a huge number of compounds for testing in the already specified regions; many are found to have some level of movement, however frequently not with enough to legitimize business advancement. The cost of creation likewise may keep the acquaintance of new operators with the market, as will mammalian lethality contemplations. By the by, the field is substantial and of incredible importance in the immense zone of horticulture. The genuine estimation of synthetic agrochemicals just ended up obvious by the disclosure in the 1940s of the great insecticides Dichlorodiphenyltrichloroethane [DDT; more legitimately 1,1-bis(p-chloro-phenyl)-2,2,2-trichloroethane], and esters of organophosphorus acids, for example, parathion ((EtO)₂P(S)OC₆H₄NO₂-p), among different compounds. Research on pesticides and PGRs turned into a major action of numerous industrial firms, and an incredible assortment of structures were found to have business esteem, heterocycles being noticeable among them. This will condense a portion of the heterocyclic compounds that were marketed amid the early long periods of pesticide and PGR inquire about. Survey these compounds gives a great prologue to the extensive variety of heterocyclic ring systems found in the more dynamic specialists.

The present work clarifies amalgamation of thiadiazole, isoxazole, benzimidazole, dihydropyrimidinones, and benzodiazepine subordinates, and their organic importance, for example, insecticidal and fungicidal properties.

MATERIAL AND METHOD

Synthesis of new thiadiazolyl derivatives containing imida- zolidin taxophore akin to imidacloprid

This arrangements with the combination of 1,2,3-thiadiazolyl imidazole subordinates as neo nicotinoid insecticides. This investigation relates fundamentally to N-(4-aryl-5-1,2,3-thiadiazolylmethyl)-2-nitroiminoimidazoline subordinates. Retro synthetic examination of target particles requires fittingly substituted propio and valerophenones as beginning materials for 1,2,3-thiadiazole subordinates and 2-nitroimino imidazole as a moderate. The semicabzones of propio and valero-phenone (2a-k) are cyclised with thionyl chloride to get 5-alkyl-4-aryl-1,2,3-thiadiazole (3a-k), which is additionally transformed into 1-oxo-2-1-[1-(4-aryl-1,2,3-thiadiazol-5-yl)methyl/propyl]-tetrahydro-1H-2-imidazolyliden-1-hydraziniumolate (6a-p). The succession of synthetic strategy is delineated.

The formation and portrayal of bizarre compound (6 l-p) acquired in the buildup of 4-aryl-5-(1-bromopropyl)-1,2,3-thiadiazole with 2-nitroimine imidazole is depicted.

Synthesis of isoxazolyltriazole derivatives as fungicides: With a view to getting naturally dynamic isoxazole subordinates containing triazole moiety, combination of a progression of compounds have been considered and the synthetic system is portrayed. The triazole moiety has been observed to be an important taxophore to show fungitoxic properties hindering the phone divider combination and otherwise called C-14 demethylation inhibitor (to go about as fungicide). The vast majority of the misused azole fungicides contain a fragrant ring framework, and to the best of the author's information no compound with isoxazole heterocyclic moiety has so far been synthesized and contemplated for their fungitoxic properties.

The objective particle 5-aryl-3-(4H-1,2,4-triazol-4-yl methyl) isoxazole (13a-k) is set up by N-alkylation of 1H-1,2,4-triazole (12) with 5-aryl-3-chloromethyl-

isoxazole under mellow essential conditions utilizing diverse bases in polar dissolvable. The yields got are in the scope of 80-90 %. The likelihood of formation of C-4 alkylated item is discounted in view of the unequivocal portrayal of the item utilizing ghastly information.

Synthesis of Picloram: Picloram is a herbicide that specifically slaughters broadleaf weeds. Its union is appeared in plot 5. Picloram has auxin-like (growth-advancing) properties; it acts by expanding plant growth so quickly as to go through the normal supplements and slaughter the plant.

Applications of Heterocyclic Compounds in Agricultural

Triazine Derivatives: Different 1,3,5-triazines have to a great degree significant properties as herbicides. It was expressed in 19841a that they constitute the most important class of heterocyclic compounds in all of agrochemistry. The most unmistakable is atrazine, which at high focus is an aggregate herbicide, yet at bring down fixations is helpful for preemergence control of weeds. Numerous triazines have been examined, and a few have showed up available. A portion of these are appeared in Figure 1. All depend on the consecutive uprooting of .chlorine from cyanuric chloride (2,4,6-trichloro-1,3,5-triazine,) with nucleophiles.

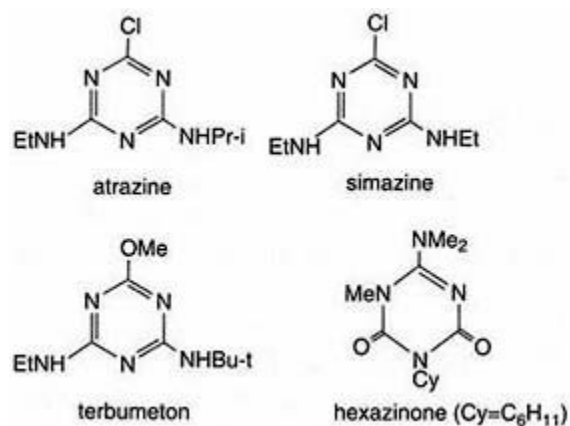


Figure 1

Pyridine Derivatives: Some valuable pyridine subsidiaries are appeared in Figure 2. It will be demonstrated that these subsidiaries display an assortment of kinds of biochemical action. Paraquat and diquat are both quaternary salts in view of bipyridyls. Pyridine is the beginning material for the two compounds. They are non-particular, quick activity herbicides that follow up on every green plant through

impedance with the photosynthetic electron-transport framework. Fluridone is a herbicide that is a gamma-pyridone subordinate. It is a carotenoid inhibitor; this is an outstanding kind of movement that meddles with the photosynthesis procedure so as to prompt creation of the plant-deadly singlet oxygen.

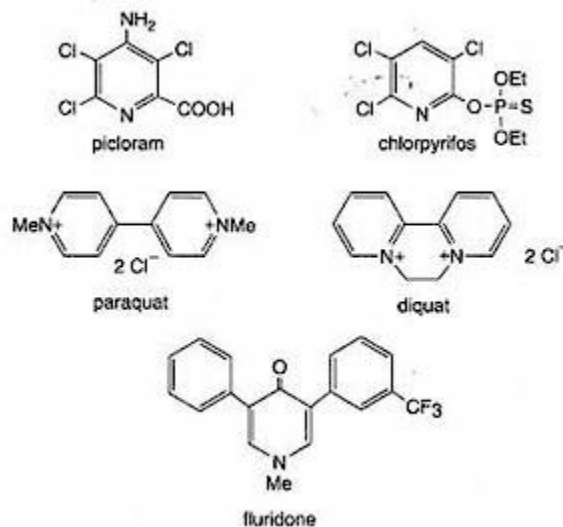


Figure 2: Some pyridine agrochemicals

Pyrimidine Derivatives: Some prominent pyrimidine-based agrochemicals are shown.

The combination of these compounds utilizes the customary cyclization techniques for pyrimidine chemistry. For instance, dimethirimol is set up by response of the n-butyl subordinate of ethyl acetoacetate with N, N-dimethylguanidine. This operator and ethirimol are fungicides, which appear to act through impedance with the digestion of adenine in the plant. Bromacil and lenacil are analogs of uracil and are produced using cyclizations around urea; both are utilized as aggregate herbicides. Diazinon, pirimiphos, and pirimicarb are insecticides that respond with the catalyst cholinesterase that is engaged with the sensory system. Their prompt precursors are 4-carbonyl subsidiaries of the pyrimidines, which are predominant forms in keto-enol tautomerism; the acyl bunches are included by assault oxygen of the enolic form. Fenarimol is set up by buildup of dichlorobenzophenone and 5-lithiopyrimidine. It is a valuable fungicide that demonstrates to square ergosterol biosynthesis in the organisms. A few heterocyclic compounds are powerful blockers of sterol biosynthesis. Plant - growth controlling force is found in ancymidol, which acts by restraining gibberellin biosynthesis. Gibberellins are cyclic diterpenes of 19-20

carbons that are growth-advancing operators in plants; their hindrance impedes the growth of plants without executing the plant. A simple of the normally happening purine subsidiary zeatin (which controls cell division) has an incentive in enhancing the storage of plants.

Triazolopyrimidines: Flumetsulam was the first of another family of herbicides containing the triazolo[5,1-a]pyrimidine ring system². Important in this compound likewise was the nearness of a sulfonamido gathering. Here, the ring framework has [1,5-c] combination and the switched structure of the sulfonamide gathering. It is dynamic against grass and broadleaf weeds. Triazolopyrimidines show their herbicidal movement by restraining the compound acetolactate synthase³.

Pinoxaden: This herbicide is dynamic against grass weed species in the developing of grain oat crops, particularly rice. It is an inhibitor of acetylcoenzyme A carboxylase. Its structure developed from contemplations of the pyrazolidine-3,5-diones (and their enol subsidiaries), huge numbers of which have important herbicidal activity⁴.

Alkyne-Containing Heterocycles: Numerous heterocycles with alkyne bunches have powerful pesticidal action and constitute another wide family accepting consideration. As herbicides, they fill in as inhibitors of the protein protoporphyrinogen-IX oxidase, which catalyzes the last advance in the biosynthesis of chlorophyll. An ordinary herbicidal heterocycle a work in progress is pyraclonil, which is appeared alongside a few other valuable alkynyl-heterocycles⁵.

Thiamethoxam: This new bug spray is classed as an individual from the important neonicotinoid family, which go about as agonists of the nicotinic acetylcholine receptor. Thiamethoxam has foundational action, implying that a level of it or dynamic metabolic products⁶ is kept up in the plant and ingested by the assaulting creepy crawlies. It is particularly utilized as a part of the security of tomato crops.

Chlorantraniliprole: Diamide insecticides are another class of as of late presented edit insurance operators, which carry on as activators of ryanodine receptors in the creepy crawlies. This prompts uncontrolled calcium discharge in muscles. Chlorantraniliprole is an individual from this family and is in business use for security from different pests⁷.

Triketones with Heterocyclic Substituents:

Triketones speak to a very much considered, yet at the same time growing, family of herbicides. Some with pyridyl substituents are among the most dynamic. The triketones are inhibitors of the plant protein 4-hydroxyphenylpyruvate dioxygenase (HPPD), which assumes a key part in the biosynthesis of plastoquinone and tocopherol⁸. Nicotinoyl syncarpic corrosive is appeared as an ordinary structure of this compose. Its intense herbicidal movement prompted synthetic work that has yielded many related structures in an effort to enhance selectivity in the herbicidal activity.

Examples of the Results from More Recent Research Only a few illustrative structures will be shown here, defining some trends in research of the 2000s.

Applications of Heterocyclic Compounds in Commercial Fields:

Heterocyclic compounds are of awesome importance in a wide range of fields of business. They speak to specific, all around created regions of innovation. A critical utilization of heterocyclic compounds is in the field of colors and shades. Broadened conjugation is an important element for a compound to be colored, and heterocyclic systems, typically multicyclic, in awesome numbers have been built around this principle⁹. Industrial organic chemistry can follow its beginnings back to the (coincidental) disclosure of mauveine in 1856 by W. H. Perkin; it was the principal organic compound to be arranged synthetically at the industrial scale. Another heterocyclic compound, indigo was gotten from regular sources and was utilized for hundreds of years before it was synthesized in 1883 and later made financially. These two early compounds show the expanded conjugation so important in the improvement of new color and shade chemicals^{1b}. Innovation in the region of photography is very created, making utilization of heterocyclic compounds in different courses in the few stages of the process^{1c,d}.

Heterocyclic compounds can take an interest in polymer innovation in a few different ways. They can be pendants on a polymer chain, as may be formed from the polymerization of vinyl monomers with heterocyclic substituents. There are forms where the polymer is formed by shutting heterocyclic rings. At last, heterocyclic gatherings can be added to beforehand formed polymers^{1e}. Ruined heterocyclic amines are utilized as light stabilizers in plastic and covering

formulations, ensuring against debasement by bright radiation. These specialists are known as blocked amine light stabilizers (HALSs) and are normally subsidiaries of 2,2,6,6-tetramethylpiperidine¹⁰. A case of a HALS operator is Tinuvin 770 (BASF), which is a diester of sebacic corrosive and 4-hydroxy-2,2,6,6-tetramethylpiperidine. It is thought to act through the formation of a piperidinoxyl radical¹¹.

A flourishing and exceedingly important field is the development of coordination edifices from metallic species and heterocycles. These com-plexes can be valuable as response impetuses and have different uses too. To delineate the impetus region (which is extensive), the zirconium complex formed from the anion of indenylindoyl anion and $ZrCl_4$ is offered for instance. The complex has the formula Zr_2Cl_2 and is an amazing impetus for the polymerization of olefins.

Another significant property is the particular official of certain metallic species¹³. A case of this kind of ligand is the 1,10-phenanthroline subordinate (PDALC), which specifically ties to bigger metallic cations, for example, Ca^{++} and Pb^{++} . The solidified coordination complex formed from calcium perchlorate has the formula $[Ca(PDALC)_2](ClO_4)_2 \cdot H_2O$. Certain heterocyclic ligands have unique incentive in particular complexation since, as on account of PDALC, the spine containing the ligating nitrogen iotas can be unbending and offer a cavity of settled geometry to get the metal.

A generally new and as yet creating field is the utilization of hetero-cyclic compounds in electro-optical applications, which incorporates light-producing diodes (LEDs), thin-film transistors, and photovoltaic cells. One kind of helpful structure has a few heterocyclic rings, for example, pyrrole or thiophene participated in a straight mold. The phosphole ring framework is another member in this sort of cluster. This is delineated by compound in which two thiophene rings are appended to a focal phosphole ring (as the sulfide). This compound has LED properties; when stored as a thin film between a bilayer cathode and anode, yellow light was produced by use of a low voltage¹⁴. Other related structures are being analyzed for comparable electro-optical action.

Another new utilization of heterocyclic compounds is in the field of ionic fluids. These compounds for the most part are quaternary salts of certain heterocyclic bases, and they are discovering use as high-bubbling

polar solvents for extractions or as response media¹⁵. Normal, among the ionic fluids known so far are salts of imidazole, which are appeared as takes after.

CONCLUSION

The Review depicted in this, exhibits the amalgamation of new chemical substances embracing different methodologies and the compounds are screened for pesticidal movement in order to discover a lead particle for a predefined organic action and clarifies blend of thiadiazole, isoxazole, picloram, and benzodiazepine subordinates, and their natural importance, for example, insecticidal and fungicidal properties.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Hetrocyclic Compounds

REFERENCES

1. A. R. Katritzky and C. W. Rees, Eds., *Comprehensive Heterocyclic Chemistry*, Vol. 1, Pergamon, Oxford, UK, 1984; ; (a) P. J. Crowley, Chapter 1.07; (b) D. R. Waring, Chapter 1.12; (c) J. Bailey and B. A. Clark, Chapter 1.14; (d) J. Stevens, Chapter 1.13; (e) S. M. Heilmann and J. K. Rasmussen, Chapter 1.11.
2. W. A. Kleschick, B. C. Gerwick, C. M. Carson, W. T. Monte, and S. W. J. Snider, *J. Agric. Nourishment Chem.*, 1992, 40, 1083.
3. T. C. Johnson, T. P. Martin, R. K. Mann, and M. A. Pobanz, *Bioorg. Med. Chem.*, 2009,17, 4230.
4. M. Muehlebach, M. Boeger, F. Cederbaum, D. Comes, A. A. Friedmann, J. Glock,T. Niderman, A. Stoller, and T. Wagner, *Bioorg. Med. Chem.*, 2009,17, 4241.
5. C. Lamberth, *Bioorg. Med. Chem.*, 2009, 17, 4047.
6. R. Karmakar, R. Bhattacharya, and G. Kulshrestha, *J. Agric. Sustenance Chem.*,2009,57, 6360.
7. G. P. Lahm, D. Cordova, and J. D. Barry, *Bioorg. Med. Chem.*, 2009 17, 4127.R. Beaudegnies, A. J. F. Edmunds, T. E. M. Fraser, R. G. Corridor, T. R. Hawkes, G. Mitchell, J. Schaezter, S. Wendeborn, and J. Wibley, *Bioorg. Med. Chem.*, 2009,17, 4134.
8. A. F. Pozharskii, A. T. Soldatenkov, and A. R. Katritzky, *Heterocycles in Life and Society: An Introduction to Heterocyclic Chemistry and Bio-chemistry and the Role of Heterocycles in Science, Technology, Medicine and Agriculture*, Wiley, New York, 1997.
9. H. Jia, H. Wang, and W. Chen, *Radiation Phys. Chem.*, 2007, B76, 1179.
10. C. Saron, M. I. Felisberti, F. Zulli, and M. Giordano, *J. Braz. Chem. Soc.*, 2007, 18, 900.
11. S. Nagy, B. P. Etherton, R. Krishnamurti, and J. A. Tyrell, U.S. Patent 6,2002, April 23,376,629.
12. R. T. Gephart III, N. J. Williams, J. H. Reibenspies, A. S. De Dousa, and R. D. Hancock, *Inorg. Chem.*, 2008,47, 10342.
13. C. Faye, T.- Y. Cho, M. Hissler, C. W. Chen, T.- Y. Luh, C.- C. Wu, and R. Reau, *J. Am.Chem. Soc.*, 2003,125, 9254.
14. R. P. Singh, R. D. Verma, D. T. Meshri, and J. M. Shreeve, *Angew. Chem. Int. Ed.*, 2007,45,3584.

An Overview of the Factors Affecting Handovers and Effective Highlights of Handover Techniques for Next Generation Wireless Networks

Pramod Kumar P¹, CH Sandeep², Naresh Kumar S³

¹Research Scholar, Osmania University, Senior Assistant Professor, ²Research Scholar, SR University, Associate Professor, ³Assistant Professor, Department of CSE, S R Engineering College, Warangal, India

ABSTRACT

Mobility is the need of the hour computing and communication devices of today are ubiquitous and work in heterogeneous environment. Wordings, for example, Always Best Connected, Seamless Mobility are considered as key highlights of Next Generation Wireless Networks (NGWN). The test for Next Generation Wireless devices is guaranteeing end-to-end availability via consistently relocating between Heterogeneous wireless technologies (viz. Wireless LAN, WiMax, Cellular, UMTS, and LTE and so forth.) This procedure of handover between various wireless technologies alluded to as Vertical Handovers/Handoffs has critical significance among industry and the scholarly world scientists. The prime target of this paper is to give a one-stop literature store on nuts and bolts of Handovers, Classifications, Algorithms, Factors impacting Handovers and alluring highlights of Handover mechanisms for NGWN.

Keywords: Multi Attribute Decision Making (MADM), Soft Handoff, Hard Handoff, Next Generation Wireless Networks, VHD algorithms.

INTRODUCTION

The 4G Revolution has started with a considerable lot of the points of interest in wireless technology. Wireless technologies, for example, LTE, WLAN, WiMAX, and so on were produced with various standards and these technologies offer assortment of administrations, distinctive information rates and differing territory of scope. One of the approaching test in organize administration is to set up association between end to end heterogeneous wireless technologies. To give such end-to-end association between heterogeneous networks we have to perform Handover. On the off chance that the serving and target base station amid Handover are of various wireless technologies then such a Handover is called as Vertical Handover/Handoffs. The term interworking is utilized to express collaborations between heterogeneous networks with the point of giving a conclusion to-end communication^[1]. A Handover decision is a huge issue, in Next Generation Wireless Networks (4G). Handoff between two base stations (BSs) of a similar system is called Horizontal handoff. Flat handoff includes a terminal gadget to change cells inside a similar kind of system (e.g., inside a CDMA arrange) to keep up benefit progression. It

can be additionally arranged into Link-layer handoff and Intra-system handoff. Even handoff between two BS, under same Foreign Agent (FA) is known as Link-layer handoff. In Intra-system handoff, the flat handoff happens between two BSs that have a place with two unique FAs and the two FAs has a place with a similar system and consequently to same Gateway Foreign Agent. Vertical handoff alludes to a system hub changing the kind of availability it uses to get to a supporting framework, more often than not to help hub mobility. Vertical handovers allude to the programmed fall over starting with one technology then onto the next so as to keep up communication^[2].

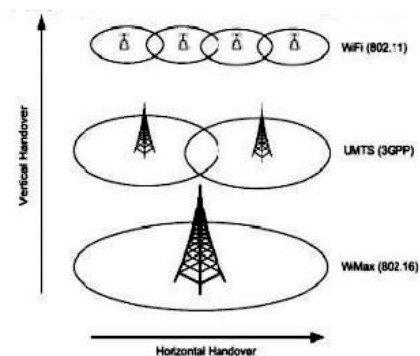


Fig. 1: Basic Structure

The vertical handoff system enables a terminal gadget to change networks between various kinds of networks (e.g., somewhere in the range of 3G and 4G networks) in a way that is totally straightforward to end client applications.

RELATED WORK

The prerequisite for handoff component can be classified in to dynamic and non-dynamic necessities. The dynamic prerequisites incorporate RSS, speed, throughput, client inclinations, handover idleness, network stack adjusting as parameters and non-dynamic necessities incorporate network cost, control utilization, network security and bandwidth as parameters.

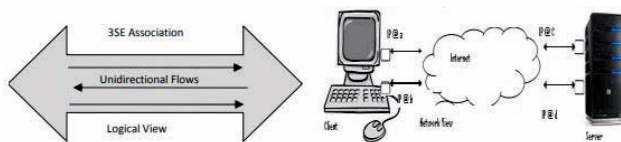


Fig. 2: Architecture

We have to discover approaches to enhance vitality proficiency in wireless networks. Power is expended amid versatile exchanging or handoffs. Amid handoff, visit interface initiation can cause impressive battery seepage. The issue of intensity sparing additionally emerges in network disclosure in light of the fact that superfluous interface initiation can increase control utilization. It is additionally vital to consolidate control utilization factor amid handoff decision. Secure handoff has turned into a vital factor in wireless networks. The network security comprises of the arrangements and strategies embraced by the network to forestall and screen unapproved get to, abuse, alteration, and network-available assets. The security highlights, for example, most elevated amounts of respectability, validation, and secrecy, network security ought to be inserted in the handoff arrangements. NGWN comprises of heterogeneous network overseen by various administrators like 2G, 3G portable communication systems, WLAN, IEEE 802.16e (WiMax), satellite. Issues in 4G network can be mobility, when portable client changes starting with one network then onto the next network or from one Base Station (BS) to another the component utilized is —Handover. So in heterogeneous network vertical handoff decision (VHD) is mostly utilized for persistent administration. A handoff conspire is required to save availability as devices move about, and in the meantime reduce unsettling influence to on-going exchanges. Accordingly, handoffs must display low idleness, support negligible measures of information misfortune, as well as scale to extensive networks.

PROPOSED SYSTEM

In the event that a misfortune occasion happened in wireless environment the congestion window size will be dropped. This is one of the real issues of TCP and SCTP. At the point when bundles are lost because of mobility or most exceedingly awful radio channel conditions, the transmission rate lessening causes a critical throughput decrease. With a specific end goal to conquer this issue, and recognize misfortunes because of congestion, 3SE appraisals the correct bandwidth capacity ahead of time. In the event that the switch under evaluations the bandwidth capacity, it will under use the connection and waste the important bandwidth asset, and if the switch overestimates the capacity, it will give inappropriate criticism to senders to increase their congestion windows and may cause line development and much support flood. It is exceptionally hard to choose a legitimate estimation of bandwidth capacity ahead of time for a wireless connection. This is on the grounds that a wireless channel is shared by contending neighbor hubs and the quantity of hubs sharing this channel may change constantly. And another reason is that the wireless connection bandwidth is influenced by many changing physical conditions, for example, flag quality, proliferation separation and transmitter control. those evaluated on the auxiliary way. On the off chance that the bandwidth on the optional way is bigger than the bandwidth on the way where the time out happened then the way definition are swapped. The optional way turns into the new essential way and the other way around. The point of this change is to transmit new packets on the way that is by all accounts in better conditions, increasing the likelihood of a fruitful communication. With a specific end goal to stay away from visit way swaps, a period hysteresis of 60s is presented. wireless bit is a 802.11b WLAN. Connections have diverse limits, except if generally indicated, the one-way spread postponement is set to 40ms on the settled part and is unimportant on the wireless channel. The 3SE incorporates execution of Dynamic Address Reconfiguration and Integration with the MIH system. The reenactment comes about assessing the vehicle of MIH messages by means of 3SE and the effect of handover signaling delays.

ANALYSIS

Framework introduce 3SE and its capacities in particular multihoming, multistreaming, address

reconfiguration and can recognize among misfortunes because of congestion and radio channel disappointments. Among the fundamental curiosities introduced by 3SE, there are the expanded bandwidth estimation and the productive utilization of multihoming by the redefinition of essential and optional way. What's more, they give a total answer for utilize 3SE as a productive transport answer for MIH. The arrangement consolidates a way determination algorithm and the utilization of MIH administrations to enhance 3SEs conduct. Reproduction comes about demonstrates that the proposed arrangement lessens the effect of packet misfortune and the occasion generation rate on the transmission delay, RSS measurements either with an expected lifetime metric or the accessible bandwidth of the WLAN candidate. We have two situations. In the principal situation when the mobile terminal moves from the scope region of a WLAN into a 3G, a handover to the 3G network is started. At the point when RSS normal of the WLAN association falls underneath a predefined edge, and the evaluated lifetime is not exactly or equivalent to the handover delay, the handover is activated. In the second situation when the mobile terminal moves towards a WLAN cell, the handover to the WLAN is activated if the normal RSS measurements of the WLAN flag are bigger than a limit and the accessible bandwidth of the WLAN meets the bandwidth necessities of the application.

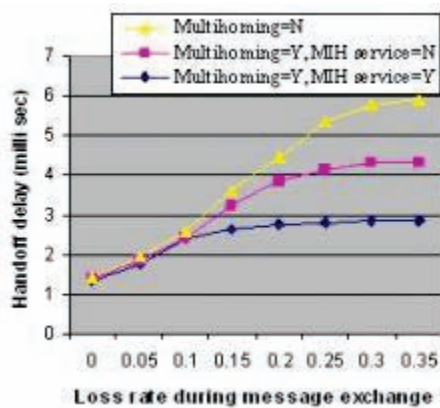


Fig. 3: Analysis

An algorithm is proposed amongst WLAN and 3G which is based on correlation of the current RSS and a dynamic RSS edge when a mobile terminal is associated with a WLAN passage. A voyaging separation expectation based algorithm is produced to take out the pointless handovers which is introduced in the above strategy. The algorithm or fuzzy logic. The mobile gadget gathers highlights of accessible wireless networks and sends them

to a middleware called vertical handover administrator through the current connections. The vertical handover chief comprises of three primary components: network handling supervisor, highlight authority and ANN preparing/selector. A multilayer feed forward ANN is utilized to decide the best handover target wireless network accessible to the mobile gadget, based on the client's inclinations. A fuzzy logic based algorithm.

CONCLUSION

This examination is to transmit new bundles in transit that is in every way in better conditions, improving the probability of a powerful correspondence. In order to avoid visit way swaps, a period hysteresis of 60s is presented. remote fragment is a 802.11b WLAN. Associations have assorted points of confinement, aside from if by and large demonstrated, the restricted spread deferral is set to 40ms on the settled part and is unimportant on the remote channel. The 3SE fuses execution of Dynamic Address Reconfiguration and Integration with the MIH structure. The proliferation happens evaluating the vehicle of MIH messages by methods for 3SE and the impact of handover flagging deferrals. The present examination gives a one-stop writing store on rudiments of Handovers, Classifications, Algorithms, Factors influencing Handovers and appealing features of Handover systems for NGWN.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Wireless Networks

REFERENCES

1. Sarla More, Dr.Durgesh Kumar Mishra, 4G Revolution: WiMAX Technology, Professor and Head Department of Computer science and Engineering Thakur Shivkumar Singh Memorial Engineering College Burhanpur, India 2010.
2. Abdoul-Aziz IssakaHassane, Li Renfa, and ZengFanzi Handover Decision Based on User Preferences in Heterogeneous Wireless Networks —College of Information Science and Engineering, Hunan University, China 2012.
3. B. R. Chandavarkar, G. Hammer Mohan Reddy Survey Paper: Mobility Management in

- Heterogeneous Wireless Networks| Department of Information Technology National Institute of Technology Karnataka, Surathkal, Mangalore, India 2011.
4. MandeepKaur Gondara1 and Dr. Sanjay Kadam|Requirementsof Vertical Handoff Mechanism In 4G Wireless Networks| Ph. D Student, Computer Science Department, University of Pune, Pune 2011.
 5. NidalNasser,|Handoffs in Fourth Generation Heterogeneous Networks| University of GuelphAhmedHasswa and HossamHassanein, Queen's University2010.
 6. Ashutoshdutta, subir das, davidfamolari Seamless handover transversely finished heterogeneous networks| Henning schulzrinne, programming designing office, ColumbiaUniversity, New York.
 7. S. Mohanty, I.F. Akyildiz, A cross (layer 2 + 3) handoff organization tradition for cutting edge remote frameworks, IEEE Transactions on Mobile Computing 5 (10) (2006) 1347– 1360.

Definite Aims and Objectives of Teaching English Language

S. Shailaja¹, T. Satyanaraya², C. Goverdhan³, A. Srinivas⁴

¹Asst. Professor, ²Professor, ³Asst. Professor, Department of English, ⁴Faculty, S R Engineering College, Warangal, India

ABSTRACT

With regards to language learning, the part of a language teacher is to a great degree powerful in students' achievement. They should have serious information and careful understanding of the general and psychological principles that represent students nature and conduct particularly in connection to the students learning background. While teaching, they should remember the psychological capacity and the getting a handle on limit of the learners. Viable teaching of a language depends on specific principles. The paper manages the connection between teaching principles and learning abilities and likewise manages the effect of inspiration on learner's achievement.

Keywords: *teaching, principles, learning, language, students, classroom.*

INTRODUCTION

English is a global language talked by 700 hundred million individuals on the planet after Chinese language. It is officially perceived everywhere throughout the world. It is fascinating to take note of that it is a language of library, language of media, language of exchange, web, trade, business, worldwide transactions and higher education. It is the connection language in India. The correspondence between two nations and the two states happens just through English. Since English is a language of International correspondence, learning English Language is a shared objective for some individuals.

The point of teaching English in India is to empower the students to get command over the language. To empower the students to peruse, compose and communicate in English easily. Be that as it may, it is apparent that the greater part of the learners are not accomplishing their objective. Students can prevail in examination however they don't recollect that anything that they learned in their language classes nor do they get down to earth command over the language. Like history and science English isn't information subject it can't be learnt basically by retaining the words and standards of syntax. It involves hone. As Thompson and Wyatt expressed that the intensity of articulation in a language involves aptitude as opposed to of learning. It is a power that develops by practice not by knowing just implications or standards. Similarly as painting and

moving language is an ability subject that can be aced just by ceaseless practice. To show English language viably, the teacher should remember the accompanying principles of language teaching:

PRINCIPLE OF DEFINITIVE AIMS & OBJECTIVE

The teaching of English language winds up productive just when the teacher knows about positive points and targets. Without points and destinations teaching may not stay deliberate action. As per Thompson and Wyatt(1952)^[2]the teacher ought to recollect the four particular points while teaching English to students. They are:

- i. To understand communicated in English
- ii. To communicate in English
- iii. To understand composed English
- iv. To write in English

Thompson and Wyatt(1952)^[2] likewise commented that "it is fundamental that Indian individuals ought not just understand English when it is talked or composed yet additionally he should himself have the capacity to talk and compose it".

Principle of planning: Viable teaching requires legitimate arranging. Rule of arranging is a noteworthy

component of teaching learning framework. Powerful Planning includes five fundamental segments: very much outlined curriculum, learning targets, teaching and learning exercises, appraisal instrument, and assessment strategies to check the understudy understanding of the subject. Standard of arranging gives structure to fundamental learning so the teacher can't go amiss from the primary subject. It causes the teacher to know points and destinations of the course ahead of time with the goal that the teacher can be sorted out to finish the syllabus in the given time span. It can likewise help the teacher in opportune arrangement of the exercise and trust in conveyance.

Principle of motivation: The most vital factor in second language obtaining is inspiration. The accomplishment of an understudy relies upon the rate of teacher's inspiration of students. Language teachers can't show language viably on the off chance that they don't understand the connection amongst inspiration and its effect on language procurement. So the teacher's job is to make an agreeable domain in which every one of the students feel perceived and esteemed. Rouse the students by giving earlier year students' achievements. Language can be immediately learned if interest is made in it. Urge the students to set here and now objectives and help them to accomplish specific objectives. By knowing students by names teacher can customize classroom condition. Inspiration, both characteristic and extraneous is of preeminent essential in the accomplishment of students everything being equal. Teachers' supporting condition, unprejudiced criticism, neighborly air have extraordinary effect on language securing of students.

Principle of creativity: Creativity makes distinction in the classroom. During the time spent teaching learning the teacher ought to empower creativity in the classroom. Inventive classrooms give condition where students are urged to express their thoughts and thoroughly consider of the crate. In the realm of web teachers can fuse innovative learning by making enamoring exercises on different themes that lift students' capacity to think of creative thoughts.

Principle of feedback: Feedback is a basic component of enhancing the learning procedure of the students. Feedback is recognized as a crucial way to deal with encourage students' improvement as autonomous learners to screen, assess and control their own learning. (Ferguson,2011)^[3]. It has been demonstrated that feedback

upgrade learning and enhances students' results. Giving feedback is an essential ability for teachers in higher education and impacts the nature of the students' learning procedure (Hattie&Timperley,2007)^[4]. Feedback can be conveyed oral or composed and it can be given to singular understudy or to the entire class. Through appropriate feedback students can get direction and open doors for development by recognizing their downsides.

Principle of variety: Variety is likewise a standout amongst the most compelling variables to improve teaching learning process. Traditional strategies for teaching are obsolete at this point. The teacher can acquire variety the classroom by utilizing distinctive learning exercises, feedback strategies, assets, and different teaching ways to deal with make the classroom vivacious and interesting.

Principle of sensitivity and participation: Teaching learning is a helpful procedure. Teacher ought to give support and advance affable conduct in the classroom. If there should arise an occurrence of classroom disagreements teacher ought to develop unprejudiced standpoint and settles on a decision in light of the best interests of all.

Principle of self learning: Spoon-encouraging through thick addresses has been the customary strategy for teaching in the classroom (Boyer,1987)^[5]. Spoon-bolstering kind of teaching principally consists of teacher focused style of directions where the educator furnishes the students with the greater part of the data they have to know for the course bringing about controlling autonomous idea and action.(Collins American English Dictionary on the web, n.d.).In spoon nourishing sort of learning the teacher express precisely what he wishes to instruct. Students all to do is to take abundant notes, retain the material and they will have the capacity to finish the test with a sensible review (Dehler,2014)^[6]. In spoon-bolstering sort of teaching students wind up uninvolved learners and they don't assume any liability for their own particular learning and in the long run overlook what they realized when the course is finished. In understudy focused learning condition the teacher can establish the framework for free reasoning and critical thinking abilities.

Principle of group dynamics: Teacher ought to urge students to take an interest in group exercises and group assignments that advance focused soul, shared

understanding and individual inclination. Principle of group dynamics fortifies excitement in group exercises with the goal that students get more language practice as the majority of the exercises are done in sets or in groups. These group exercises likewise create certainty and free reasoning aptitudes among students.

Central of drill and Practice: As Palmer says, language learning is basically a propensity shaping procedure, a procedure amid which we get new propensities. At the point when students are learning a remote language they require adequate practice and drill to get rid of mother tongue since the hints of the new language is not the same as those of mother tongue. So it is essential for teachers to assist the students with mastering the structures and hints of English Language.

Principle of Repetition: Repetition is additionally one of the essential language learning systems. Propensities are framed through reiteration. During the time spent learning students have a tendency to overlook things with the progression of time. It has been demonstrated that things often rehashed are best recalled. So it is the obligation of the teacher to apply the idea of redundancy during the time spent learning.

Principle of activity (Learning by doing): In the customary classroom students are just detached beneficiaries of data. Presently the idea of teaching learning has been changed from teacher driven to the understudy driven. Activity based learning suggests that students learn by doing different exercises. The part of a teacher is not just restricted to be a teacher they have to assume distinctive parts, for example, classroom supervisor, a facilitator, a guide, communicator and screen to make the students effectively associated with different kinds of exercises that cultivate all round improvement. Activity based learning urge the students to be autonomous masterminds. The exercises assemble students' self certainty as well as create sound connection amongst students and students and teachers and students.

Principle of setting and circumstance: The main objective of teaching English language is to empower the learner to utilize it. Since the reason for the language is to empower the learner to utilize it then it must be practiced in appropriate realistic circumstances or envisioned circumstances. Language learning is not all that simple except if it is associated with handy life. Strict interpretation, mechanical drilling of words

and structures drilling as well as makes the language learning incapable. In situational language teaching every one of the words sentences become out of genuine circumstance so students can apply that information in everyday life circumstances.

Principle of rest & Recreation: Nowadays Technology has turned into a necessary piece of current age. They have turned out to be dependent on another technique for online correspondence through web based life, twitter or they are probably going to be seen watching T.V projects or playing videogames. There is no degree for rest and recreation that revive both personality and body. Teachers should assume liability for orchestrating recreational exercises for students. Recreation exercises like climbing, tree ranch, painting, drawing, sorting out school occasions, shows, plays and sports revive the psyche as well as builds up the compatibility between the teachers and students. These recreation exercises diminish pressure and help students to feel more invigorated to improve as an understudy.

CONCLUSION

The paper tosses light on the teaching principles and the part of a teacher in procedure of dynamic learning of students. It has been demonstrated that teaching principles are imperative devices so as to improve students' interest in language learning exercises. Teaching English Language has experienced huge changes in the previous two decades. New patterns and strategies have been worked out in the field of teaching English. However students are confronting such a significant number of difficulties in correspondence. The most widely recognized difficulties are: Problems in elocution, Problems in understanding and getting a handle on, poor listening aptitudes, issues in articulation and composing, and issues in communication has incredible negative effect on scholastic achievement. With regards to these issues the part of a teacher has turned out to be extremely pivotal in language learning. It is the obligation of the teacher to distinguish the fundamental connection between the principles of teaching and the language learning capacity and to apply them to improve learning aptitudes.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: ELT

REFERENCES

1. Wong, C. A contextual investigation of College Level Second Language Teachers' Perceptions and Implementations of Communicative Language Teaching. *The Professional Educator*, 2012; (36) 2, 18-34.
2. Thompson and Wyatt , *Teaching of English In India*, Vol.8 Madras, Oxford University Press 1952.
3. Ferguson, P. Students' impression of value feedback in Teacher's education. *Appraisal and Evaluation in Higher Education*, 2011; 36(1),51-62.
4. Hattie, j.& Timperley, H. The intensity of feedback. *Survey of Educational Research*, 2007; 77(1),81-112.
5. Boyer, E.L. *College, The undergraduate Experience in America*. Newyork: Harper & Row 1987.
6. Dehler, G.E &Welsh, M.A. *Against Spoon Feeding for Learning. Reflections on Students' cases to Knowledge*. *Diary Of Management Education*, 2014; 38(,875-893.6).
7. Harold E. Palmer. *The Principles of Language Study*, *The Modern Language Journal*, 1922; Vol.6.
8. Bhaskar Rao Digumarthi and Elizabeth M.E.S, *Methods of Teaching English*, Discovery Publishing House, New Delhi, 2009.
9. Richards, J C Rodgers and Theodore, S. *Methodologies and Methods in Language and Teaching*. New York University, Cambridge Press, 1986, P.P 61-64.
10. Kohil, A.L. *Techniques of Teaching English*, Dhanpet, Rai Publishing House, Delhi 2013.
11. Saraswathi,V. *English Language Teaching; Principles and Practices*, India,Chennai: Orient Blackswan 2004.

Designing a Collaborative Detection System for Detecting the Threats to the Cyber Security in Big Data

Goje Roopa¹, Dadi Ramesh¹

¹Assistant Professor, Department of CSE, S R Engineering College, Warangal, India

ABSTRACT

In the season of big data, it is a trouble to be unraveled for empowering the solid development of the Internet and the Internet+, mindful the data security of people, foundations and nations. Along these lines, this manuscript makes a shared discovering arrangement of cyber security threats in big data. At first, it clarifies the record aggregate model of Flume, the data store of Kafka, and the data strategy of Esper; at that point it designs one-to-many record compilation, reliable data store, CEP data method utilizing episode query and occasion show comparing. Future execution of this structure comes about great consistency and high capability. Besides, this framework execution additionally comes about reward of low cost and bendy activity.

Keywords: kafka, Big data, threat, Internet, cyber security.

INTRODUCTION

Now-a-days, there is a tremendous advancement in the Internet and in addition Internet clients which thusly builds the quick development of electronic trade, IT Finance, Internet industry etc(Internet+), Hence more attackers shows up which forces threats on cyber security. As per the report distributed by Akamai, about the internet advancement security in the second from last quarter of 2015, Cyber security threats expanded , different data spillages and cyber assaults are kept on rising, especially DDoS(Distributed Denial of Service) assaults are expanded to tremendous extent(i.e. upto 180%) which makes a record. Report likewise indicates if DDoS assaults expanded ceaselessly then it might incapacitate center switch of system administrators. Additionally, cyber assaults will cause genuine and noteworthy outcomes, for example, loss of salary, harm to notoriety and information frameworks, and taking of private data or client touchy data.

Particularly in the time of big data, there is an enormous assault on the data created at each minute, and conventional frameworks are to be overpowered in managing these assaults. Be that as it may, the big data innovation is broadly connected to different ventures, and it is simply started to use in the security business. In this manner, it will be an improvement pattern to recognize the cyber security threats by ideals of the big data innovation.

For example, Zuech R et al. presented the particular issues of big heterogeneous data combination, heterogeneous interruption recognition models, and security information and event management (SIEM) frameworks from a wide range of heterogeneous sources.

There are five models utilized as a part of big data innovation to process the data: an incorporated online constant examination complex event processing model which is called Esper^{[6][7]} proposed by Giuseppe Antonio Di Luna et al; a distributive and cluster processing model which is called Hadoop^[4] proposed by Dong Cutting et al; a distributive and continuous investigation model which is called Agilis^{[1][11]} proposed by Leonardo Aniello and Roberto Baldoni et al; a distributive blame tolerant online ongoing examination model which is called Storm^{[10][13]} proposed by Nathan Marz's et al; a distributive multi-cycle group processing model which is called Spark^[12] proposed by Michael Armbrust et al. These big data processing models give a decent specialized help to the discovery of cyber security threat. In any case, these models are just data processing models and can't be utilized as a total arrangement of free security threat identification framework. Consequently, it is extremely important to build a security threat identification framework by using the big data processing model.

Any assault on the Internet has a specific law, and it needs to utilize a specific innovation to find.

Diane Staheli et al. proposed a community oriented examination framework - CARINA, utilizing cooperative data investigation and revelation procedures to give better choices to organize investigation [14]. It has faith in Axiom 6 in that “A relationship dependably exists between the Attacker and their Victim(s) even it is removed, temporary, or backhanded.” Hence, a govern for recognizing the assault is created by the relationship, and the connection between the attacker and the victim is discovered by the assault rules. Besides, Esper engine is a data processing model for processing the data as per the assault rules. Along these lines, this paper builds a community identification arrangement of cyber security threats in big data by utilizing the Esper engine as the data processing model, the Flume as the reliable profoundly accessible huge log gathering, total and transmission and the Kafka as the data cache.

RELATED WORKS

A. Flume: For successful Collecting, Aggregating and Broadcasting substantial measure of log data, Flume is an anticipated and very accessible framework, delivered by Apache.

^[2] The reason for its activity is Agent, which is picked as the base autonomous task unit, and Event is utilized as a center unit of data processing. Every Agent comprises of three essential parts: Source, Channel and Sink.

From outside assets, Source gathers an event, changes over into some exact configuration and then sends this event into a solitary or numerous channels. It produces distinctive strategies to assemble data from data sources, for example, Request Procedure Call, reassure, content, syslog, executive, and so on.

As a Broadcasting channel, Channel stores the Event send by the Source until the point that Event has been taken by Sink. It gives many Channel composes, for example, Memory Channel, File Channel, Java Database Connectivity Channel and so forth.

As a data collector, Sink obtains the Event from the Channel, plays out the data perseverance for the event (for example, the event is stored into document frameworks, databases, or submitted to the remote server) or sends the Event into another Source. It additionally gives numerous

data getting modes, for example, support, RPC, content, HDFS, syslog TCP, and so on.

Flume influences an event to flow from Source to channel and then to Sink by utilizing this three parts. It gives three models: coordinated, one-to-many, many-to-one. In addition, for a similar Agent, Source and Sink are offbeat.

B. Kafka: Kafka is a conveyed makes buy in informing framework which is having high yield. It has the following qualities:^[3]

1. Fastness: A solitary Kafka hub can handle several uber bytes for every second from thousands of clients.

2. Scalability: It allows single bunch to be assumed as a key part of data for extensive organizations, and the development can be performed adaptably and straightforwardly without the downtime. The data stream is separated and scattered into the group, which influences the data to flow bigger than the limit of any one machine and accomplishes the bunch coordination.

3. Persistence: To defeat data misfortune messages are stored in a circle and duplicated in the group. With no adjustment in the execution every hub can handle one million Mega bytes.

4. Distribution: Kafka is a present bunch focus which gives heartiness and adaptation to internal failure.

It contains of three segments i.e. Maker, Consumer and Broker. Maker is a message distributer. It creates and sends the data to Broker; Consumer is a message endorser, it gets and then process the data from a Broke; Broker is a message stockpiling exhibit, the execution is improved in view of not keeping up the data utilization state. Furthermore, the three segments do the coordination of solicitations and sending through the Zookeeper^{[5][8]}.

Zookeeper is a conveyed coordination administration of utilizations, which depends on the Fast Paxos^[9]. It creates a pioneer through the race, and just the pioneer can present the proposer.

C. Esper: Esper is a flow of data processing technique for Complex Event Processing (CEP), it has the following highlights:^[6]

1. By utilizing Event Processing Language (EPL) questions of memory database complex events are handled. It has better processing and query execution when contrasted and conventional social database.
2. Event is handled by utilizing two components. State Machine is utilized to execute event mode coordinating in view of the articulation. The event processing strategy is to coordinate the event anticipated that would exist, the truant event or the blend of events; and the query of the event flow is actualized through the EPL proclamation. Channel, Slip window, total, joint investigation is the elements of event processing. The EPL receives the view to put the developed data into one event flow and to drive the flow of the data; and the data is handled amid the data flow procedure to acquire a last required outcome.
3. It gives numerous data processing techniques: POJOS (Plain Old Java Objects), MAP, SOCKET, XML, and so on.
4. 500 thousand events are handled every second and achieves 70Mbps information flow rate
5. When another threat arrives, recognition rationale is computerized powerfully by erasing/coordinating SQL query explanations.
6. The overhead is low.

The example of Esper is a decide that is made out of nuclear events and administrators. The nuclear events are altered events, and the example administrators are of 4 composes:

1. Repetition administrators: each, every-unmistakable, [num] and until
2. Logical administrators: and, or, not
3. Order administrator: - > (followed by)

4. Event lifecycle administrators: clock: inside, clock: inside max, while-articulation

The example administrators are like different administrators and additionally have the need. As per the need of the example administrators, the example articulation “a->b” alludes to that if event of an event b on the correct side follows the event of an event an on the left side, it enters an Esper engine. The example articulation “each a->b” implies that once an event B enters, all events A preceding the event B are coordinated, and on the off chance that it prevails with regards to coordinating, it enters the Esper engine.

The nuclear events are joined into various articulations by utilizing the example administrators in order to frame diverse examples, and the relationship between’s the events is investigated by the examples.

Design of Mutual Detection of Threat: In the mutual threat detection architecture, the data agreement is generally partitioned into five phases: data source, data accumulation, data cache, data processing, and data stockpiling. The data source is different system data bundles communicated on the system; the data gathering is to just handle and channel the system parcels, and is utilized as the maker of Kafka to make data; the data cache is to compose the Broker by resource of Zookeeper, so the data accumulation rate is reliable with the data allotment rate, and it supplies the consistency of the data; the data administration is utilized as the client of Kafka to expend the data amid the EPL query and model of Esper Engine, and it enacts the tuning in for the occurrence indistinguishable the model; the data stockpiling is to relentlessly store the data in the period of data accumulation and data processing, and to give the data for disconnected investigation and plan. The fundamental reproduction of the mutual hazard detection basic outline is represented in Figure 1.

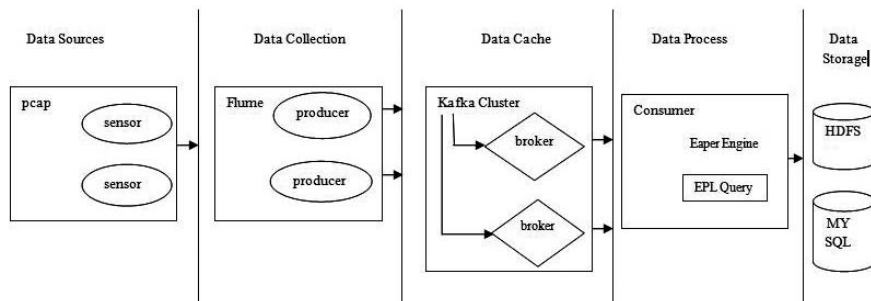


Fig. 1: Shows mutual threat detection architecture

CONCLUSION

With a specific end goal to advance solid and safe improvement of the Internet+, this paper builds a cooperative detection framework for distinguishing the threats to the cyber security in big data by utilizing the innovation of big data.

Firstly, it presents the included advancements - the arrangement of pacp bundles, the log gathering parts of Flume, the qualities and data accumulation segments of Kafka middleware, the memory database, the event stream query instrument and the example coordinating component of Esper, and the assault kind of DDoS. Besides, it outlines the data flow for parsing the system bundles, the one-to-many log gathering model of Flume, the steady data storing of Kafka and the CEP data processing of Esper, and additionally plans the general architecture model of the community threat detection.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Collaborative Detection System

REFERENCES

1. Aniello L., Baldoni R., Chockler G., Laventman G., Lodi G., Vigfusson Y, Agilis, An Internet-Scale Distributed Event Processing System for Collaborative Detection of Cyber Attacks. MidLab Technical Report 04/(2011).
2. Apache Flume, <http://flume.apache.org/>, 2016.
3. Apache Kafka [EB/OL], <http://kafka.apache.org/>, 2016.
4. Apache Software Foundation, <http://hadoop.apache.org/>, 2016.
5. Apache ZooKeeper, <http://zookeeper.apache.org/>, 2016.
6. Esper Tech: Event Series Intelligence, <http://www.espertech.com/>, 2016.
7. Di Luna G.A., A Collaborative Processing System for Cyber Attacks Detection and Crime Monitoring. Informatica (2010).
8. Hunt P., Konar M., Junqueira F.P, Zookeeper: sans wait Coordination for Internet-scale Systems, Usenix Annual Technical Conference, Berkeley, CA: Usenix (2010).
9. Leslie Lamport, Fast Paxos, Distributed Computing, 19(2) (2006), 79-103.
10. Lodi G., Aniello L., Luna G.A.D., Baldoni R, An Event-based Platform for Collaborative Threats Detection and Monitoring, Information Systems (2014), 175-195.
11. Roberto Baldoni, Gregory Chockler, Collaborative Financial Infrastructure Protection, Springer (2012), 157-174.
12. Spark, Lightning-quick bunch processing, <http://spark.apache.org/>, 2016.
13. Storm, conveyed and blame tolerant continuous calculation, <http://storm-project.net/>, 2016.
14. Staheli D., Mancuso V., Harnasch R., Fulcher C., Chmielinski M., Kearns, A., Vuksani E, Collaborative Data Analysis and Discovery for Cyber Security, WSIW@ SOUPS (2016).

Identifying the Evolution of Ways towards Thinking about the Students Mathematical Learning Process

R. Archana Reddy¹, G. Swamy Reddy²

¹Professor, ²Associate Professor, Department of Humanities and Sciences, S R Engineering College, Warangal, India

ABSTRACT

We depict an involvement with in-service teachers. In this experience the teachers composed instructional proposals to create students mathematical knowledge. This proposition was utilized to instruct a similar course a few times. After every execution the teachers talked about the experience. We watched the cycles of refinement when the teachers actualized the proposals and talked about the outcomes. In this process the teachers' originations about learning and teaching mathematics developed. The originations changed when the teachers shared and examined the outcomes among themselves. We utilized the Models and Modeling perspective to dissect instructional proposals. The documents delivered by the teachers were the base to recognize the development of mindsets about the students learning process. The teachers depicted in this paper are studying in a master's program in mathematics education.

Keywords: *In-service teachers, Modelling, Cycles of understanding.*

INTRODUCTION

Learning mathematics involves the improvement of mathematical knowledge and thinking. The students need to learn ideas, to create capacities, aptitudes, and propensities for the discipline. Also, they need to obtain capacities to exchange the knowledge and aptitudes to new assignments and learning settings. By what method should this be possible in the classroom? What kind of mathematics teachers are required? What kind of educational projects, tasks, and processes ought to be created? By what method should mathematics teachers be bolstered to incorporate exercises into their teaching hones that rouse students to focus on learning? When we talk about the need to enhance a teaching and learning process there are a few inquiries that emerge and identify with all levels of members – from students, to teachers, to designers, to specialists of the education framework. In this paper we talk about inquiries including: What kind of mathematical exercises and learning processes do teachers underscore in their mathematics instructional proposals when they need to include issues? How do teachers think students learn mathematics? How do teachers imagine their part and the part of their students during instruction? The outcomes introduced in this paper were gotten from a teachers' training program. This program includes

Models and Modeling and Problem Solving perspectives as procedures to educate mathematics.

LITERATURE REVIEW

The Models and Modeling perspective (MM) is our structure. It uncovers the intricacy of the teaching of mathematics, learning, and critical thinking (Lesh, 2010)^[2]. MM imagines the learning of mathematics as a process of improvement of calculated frameworks or models that are continually changing during the interaction between the individual and the issue or circumstance. The learning process involves a progression of cycles of understanding where the calculated frameworks are changing to more refined models. The early interpretation of the circumstance for the most part changes since subjects bit by bit see more important information. In these cycles the subjects think in various courses about givens, objectives, and the conceivable way from givens to objectives. The initial suspicions are incorrect or too much limiting. The early cycles are infertile and misshaped contrasted and the later interpretations. According to Lesh and Doerr (2003)^[3], models are: "Reasonable frameworks (consisting of components, relations, activities and principles governing interactions) that are communicated using outside documentation

frameworks". For instance, the students create models or calculated frameworks to portray or explain the conduct of a genuine circumstance or issue postured in the classroom. The students can likewise create models to make another issue or circumstance.

In the MM perspective the subjects create models to understand nature and circumstances where they are involved. According to this perspective, the process of externalization of the originations is an asset to understand the subjects' state of mind. The models give information about the subjects' originations of the circumstance. They demonstrate the early mindsets and how these advance (Lesh, 2010)^[2].

The subjects of the Models and Modeling perspective research can be students, teachers, designers, analysts (or instructors) themselves or other education chiefs. In this sense, the teachers ought to make models to understand the students' learning and teaching processes. Doerr and Lesh (2003)^[3] recommend that we need to make settings in which teachers can express and adjust their mindsets about the teaching and learning processes. MM perspective gives information about how teachers interpret their training, how their mindsets advance after some time and how these interpretations influence the educator's training.

Lesh (2003)^[1] recommends that teachers need to interpret circumstances with regards to their real practice. The teachers need to at the same time address mathematical substance, instructive methodologies, and mental parts of a teaching and learning circumstance; for instance, those perspectives identified with the applied learning in the individual and social settings. They should have the capacity to decide for themselves whether their interpretations and ensuing activities are moving towards wanted closures specifically settings.

METHODOLOGY

Six in-service teachers with involvement with the high school level participated in this process. Nonetheless, the information exhibited here were taken from two teachers (Kent and Jim). They were studying a master's degree program in Mathematics Education. The teachers had already discussed Problem Solving Perspective (Schoenfeld, 1994) among other mental hypotheses to understand the learning and teaching process. They had talked about the benefits of encouraging critical thinking in the classroom to advance mathematical knowledge

and thinking. They could separate between the routine and non-routine issues (Santos, 1997)^[4]. They examined the part of teachers and students in this perspective. They additionally had partaken in critical thinking encounters, as students of the master's program. The teachers were requested to outline an instructional proposition through genuine circumstances or issues that would encourage the students' improvement in mathematical knowledge and thinking. The teachers needed to actualize the proposals in the classroom. A few inquiries were raised: What mathematical knowledge and thinking should students display toward the finish of a mathematics course? The proposals were utilized as a part of courses instructed in various cycles by the teachers. The proposals were actualized, adjusted, refined maybe a couple times. We were interested in the process of advancement of the proposals made by the teachers since we were studying the teachers' models or mindsets about the students' learning process. In this sense we took every one of the documents created by the teachers. To begin with, we recognized two diverse mindsets about the students' learning process. We additionally recognized cycles of understanding of the proposals which were continually changing during the interaction among the teachers, the companions, the instructor, the classroom and the proposals. The correspondence was critical. The teachers had the chance to impart the proposals to their instructor. They talked about together the outline of the proposals, destinations, issues, instructive systems picked and mental parts of a teaching and learning circumstance as those said by Lesh (2003)^[1]. We watched the teachers' work during one year. The teachers were designing, modifying, implementing and refining the proposals. There were two implementations in the classrooms.

RESULTS AND DISCUSSION OF RESULTS

The didactic proposals were dissected and the part of the included problems. We distinguished two unique kinds of proposals. The objective was to utilize them like an instrument to assess the mathematical learning. We alluded to them as Problem as Assessment. The second kind included problems as a vehicle for promoting the improvement of mathematical knowledge and thinking. We alluded to them as Problem as Media Learning.

Didactic proposals: Problem as Assessment

There were three proposals portrayed by this compose. These proposals included mathematical definitions, properties, illustrations, and activities. The

part of the instructor was to present and open a few cases to show the utilization of the mathematical ideas and the properties. The teachers urged the students to rehash comparable exercises as we can find in Fig. 1 (taken from one of the instructional proposals). These exercises can be considered activities or routine problems since they were proposed after the educator explained how to take care of comparable problems. The setting of these exercises was the mathematics, i.e. the inquiries were about mathematical subjects.

The teachers supported the inclusion of activities in the didactic proposition. They suspected that the students needed to fabricate mathematical knowledge before solving problems. They additionally contended the need to include ideas before including methods.

Activity 1:

The teacher, in plenary, explains to the students how to manipulate and use the following equations

$$(x-h)^2 = 4p(y-k) \quad (y-k)^2 = 4p(x-h)$$

The goal is that students relate the equation with the graph.

Fig. 1: Example of the activities included in the first type of the proposals. This one was elaborated by one teacher who will be called Kent.

The teachers educated the students the prerequisite ideas and abilities in mathematical settings. They showed general substance and then they demonstrated to utilize preceding ideas, abilities and heuristics to take care of routine mathematical problems. In these proposals the teachers' part in the classroom was to initiate and answer inquiries from students and to control the exercises towards a few goals. The problems included in the proposition by the teachers were the supposed routine mathematical problems (Fig. 1). The non-routine problems were included toward the finish of the didactic proposition. The part of them was centered around the transfer of knowledge to new circumstances. The teachers utilized these last problems to assess the learning of mathematics. The problems were like those from course readings (Fig. 2). The teachers trusted the students could manipulate logarithmic articulations and utilize them to take care of problems in various settings (Problem 1 is an example).

Problem 1. The trajectory described by a projectile launched horizontally from a point situated y meters above the ground with a speed v m/s is a parabola whose equation is

$$y = -\frac{g x^2}{2v^2}$$

Where " x " is the horizontal distance from the launch site, and the value of g is approximately 9.81 m/s^2 . The origin is taken as the base of the projectile.

Under these conditions a stone is thrown horizontally from a point 3m above the ground with an initial speed of 50m/s. Calculate the horizontal distance to the starting point and draw the trajectory of the projectile.

Fig. 2: This is a non-routine problem included in Kent's instructional proposal. It is considered a non-routine problem because the teacher did not show the students how to solve it. The problem was a challenge for the students.

The constrained accomplishments of students in solving non-routine problems enabled Kent to analyze their didactic proposition and the instructional exercises. The discussion between the educator and the instructor allowed the instructor to recognize two processes that were not associated in the proposition: the learning of knowledge and the assessment. At the end of the day, the instructor had not associated the determination of exercises identified with the condition of the parabola and its diagram, and the process of solving non-routine problems associated with illustrative movement. The educator discovered that the assessment process of learning had turned into a process of mathematical learning. Solving the non-routine problems moved toward becoming for the students another phase of advancement of mathematical substance understanding.

After discussion with the instructors, the educator perceived that the problem solving process ought to be utilized to create learning instead of being utilized just to assess the procured knowledge. This state of mind enabled him to redefine the part of problems in the proposition, the targets and the idea of assessment and transference of knowledge. He altered the model or state of mind about the process of learning and he reorganized the instructional exercises previously implementing again.


Didactic proposals: Problem as Media Learning

There were three proposals portrayed by this write. One proposition of this write was outlined by Jim. The proposition was based on solving non-routine problems involving circumstances that were natural to the students. The composed non-routine problems involved the analysis of useful relations between quantities in various settings, for example, excursions, shopping, and telephone calls. The problems were introduced from the earliest starting point of the proposition until the finish of it. The educator explained that the point was to create mathematical understanding through problem solving.

The instructor actualized the proposition with students who had taken past conventional variable based math courses. The students worked individually to answer the inquiries proposed in the movement. Jim's part was centered around reviewing the answers given by students; he approved students' answers, and answered questions. In a few sessions Jim proposed to manipulate logarithmic articulations as homework, however he watched that students did not take part in this movement. The mathematical articulations proposed were not related with the principal action.

Jim discussed the outcomes obtained by the students with the instructor. This discussion enabled Jim to assess and refine the didactic proposition. He redefined goals and instructive technique to be sought after later. He audited the exercises included in the understudy's homework keeping in mind the end goal to associate them with the main action in the worksheet. He chose to incorporate work in sets and gathering discussions in the classroom. Jim built a second form (Fig. 3).

As a team complete the following table. Calculate the price to pay for x number of kilograms of tortillas, make a graph, and answer the questions. Consider that a kilogram of tortillas cost 12 pesos.



Kg of tortillas	Amount to pay
$\frac{1}{4}$	
2	
$3\frac{1}{2}$	
5	
7.5	
$8\frac{3}{4}$	
17	
25.5	

a) If a store produces 215.5 kg of tortillas a day. How much money is made if everything is sold?

b) Express the equation that allows you to calculate the cost of any number of tortillas: _____

c) Use this expression to calculate the cost of 51 kg of tortillas. Explain the procedure. _____

d) The following equation $\frac{2}{5}y - x = \frac{3}{4}$ is used to calculate the total cost of tortillas. The "x" represents the amount in kg of tortillas, "y" is the total amount due and the constant value is the cost of the paper to wrap the tortillas. What is the expression to calculate the total amount due "y"?

e) How many kg of tortillas can be bought with 780 pesos? _____

f) How many kg of tortillas can be bought with 20 pesos? _____

Fig. 3: Second version of the activity designed by Jim

Jim executed his second form of the didactic proposition with another class. He organized students in sets to help each other in the learning process. Problem solving and gathering discussions were gone for guiding the session to his targets for the exercise. His part as an educator changed and was never again centered just around crafted by individual students. In any case, when the instructor conveyed the consequences of the execution, he understood that his part had concentrated again on validating systems and answering inquiries, instead of questioning the knowledge of students, notwithstanding when they were doing the normal action.

Jim found that working in sets could assist the students with assessing and refine their answers to the

inquiries and understand the general circumstance in the movement. These settings imparted individual ideas, produce contentions, and assess ideas. The two sorts of proposals showed three important aspects: the part of the students, the part of the teachers and the mathematical knowledge. This way included the students did just a single kind of movement, for example, the reiteration of calculations and methods. The teachers did not consider the importance of developing capacities and propensities for thought in the classroom, for example, generating guesses, argumentation, and the meta-discernment process.

In the second form of the proposals the teachers demonstrated another cycle of refinement about their understanding of the students' learning process. They thought about the importance of developing capacities and propensities for thought in the classroom. The teachers distinguished the need to relate the applied knowledge and the capacity to utilize it in different circumstances in the classroom; in this way, they reorganized the exercises and problems in the didactic proposition looking for students to transfer their experience (Doerr and Lesh, 2003)^[1].

At the point when the teachers were involved in the plan and usage of the didactic proposals they displayed their originations about the mathematics and the mathematical learning process. These originations were changing while they were discussing the outcomes. According to Models and Modeling Perspective (Lesh, 2010)^[2], we require this kind of circumstance for teachers to uncover, demonstrate, revise and refine their thinking, and thusly to alter and broaden their origination of the mathematics and the mathematical learning process. The teachers need to interpret or assess the students' thinking, plan proper arrangements of instructional exercises, select and adjust or broaden tasks in the light of understudy understanding (Doerr and Lesh, on the same page).

CONCLUSIONS

The inquiries raised in this paper are: What kind of mathematical exercises and learning processes do teachers emphasize in the mathematics instructional proposals when they need to include word problems? How do teachers think students learn mathematics? How do teachers imagine their part and the part of their students during instruction? These are firmly identified with the sort of didactic proposals outlined and actualized by the teachers.

The chance to impart the proposition to partners and instructors, enabled the teachers to assess, revise and refine their thinking about teaching and learning mathematics. The teachers had the chance to problematize the didactic proposition and instructors had the chance to know their convictions about mathematical knowledge, the assessment and learning that mathematics teachers had.

Regarding the third inquiry postured in this paper we found that the teachers did not problematize the action of the students in the classroom to advance learning. The origination was diminished to answer the inquiries and approve the strategies. The chance to discuss the involvement with associates and instructors allowed teachers to understand the need to change the parts credited to the students and the educator. The teachers were analyzing the assessment of the understudy learning as well. Teachers began to understand that assessment was not just to see that “six students effectively answered and four did it incorrectly”. They are learning about how to make community situations to help the learning process. Instructors are additionally in the process of learning, creating models that permit an understanding of the advancement and improvement of the educator learning background. Instructors are sharing ideas in seminars, which serves to create models which bolster the advancement of teachers.

We concur with the Models and Modeling perspective that is worried about the many-sided quality of circumstances that teachers need to consider to be better teachers and about how they need to make models to depict, explain, manipulate, anticipate, and control their own teaching practice. Learning requires the adjustment of mental models that are made and altered when the subject can analyze and convey them to others. Cooperative conditions can bolster this process.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Mathematical modelling

REFERENCES

1. Doerr, H. M. and Lesh R, Mahwah, NJ: Lawrence Erlbaum. A modeling perspective on instructor advancement. In R. Lesh, and H. M. Doerr (Eds.), *Beyond constructivism. Models and modeling perspectives on mathematics problem solving, learning, and teaching 2003*; (pp. 125-139).
2. Lesh, R. Instruments, researchable issues and guesses for investigating understanding statistics (or different subjects) meaningfully. *Diary of Mathematical Modeling and Application*, 2010; 1(2), 16-48.
3. Lesh, R. and Doerr, H. M., Mahwah, NJ: Lawrence Erlbaum. Establishments of a models and modeling perspective on mathematics teaching, learning, and problem solving. In R. Lesh, and H. Doerr (Eds.), *Beyond constructivism. Models and modeling perspectives on mathematics problem solving, learning, and teaching 2003*; (pp. 3-34).
4. Santos, L. M. *Principios y métodos de la resolución de problemas en el aprendizaje de las matemáticas*. México: Grupo Editorial Iberoamérica 1997.
5. Schoenfeld, A. H. *Mathematical and thinking problem solving*. Hillsdale: Lawrence Erlbaum Associates, Inc 1994.

Impact of English Language Teaching in Technical Education

D.Santhosh¹, C. Goverdhan¹, Katyayani Sangam², S. Shailaja³, G. Roopa⁴

¹Asst. Professor, Department of English, S R Engineering College, Warangal, India; ²University of Hafar Al Batin, Kingdom of Saudi Arabia; ³Asst. Professor, Department of English, ⁴Faculty, S R Engineering College, Warangal, India

ABSTRACT

The achievement of any country to a great extent relies upon the ability, proficiency, learning and expertise of its HR. The entire education system is for the satisfaction of this future need. For this situation, the present education is the future probability of improvement of any country. By and by, technical education is intensely inclined towards its ability to advance students with information and skills in getting a lucrative activity. The technical education is driven towards business rivalry, which is forced by monetary powers. Engineering schools are begun developing like mushrooms all through India and particularly in Gujarat. The greater part of the students have obtained their school education in regional languages. They learned English however just as one paper to get some great imprints. In these conditions, English is an equivocal language for the regional language students. They have a tendency to confer syntactic blunders in their understanding, written work and discussion. In Technical education, students need to learn English just in 1 or 2 semesters. However, later on they go out their engineering, they at that point think that its hard to talk in English. They might be great in their center branches; they discover trouble in bantering and passing their insight and capacity. The vast majority of the schools are opened up by private financial specialists. Thus, to cut the use, they choose English instructors on impermanent address premise. Because of absence of clear approach by the administration, the two students and English instructors need to endure. The nature of the vast majority of the engineering organizations is sketchy. Because of the disappointment of giving employability skills, students especially and country in the vast setting need to endure.

Keywords: *English Teaching, English Language, Technical Education, Degree Engineering, Diploma Engineering.*

INTRODUCTION

The coming of new machines and technology acquired exceptional changes all kinds of different backgrounds, society and in our country. The world is considered as global village. Numerous multinational organizations come to India in most recent two decades. They build up gigantic production plants. Some Indian organizations additionally build up their production plants in India. In the production plants, they require substantial prepared work constrain. This cycle has enormous effect on education, particularly on technical education of India. Diploma Engineering and Degree Engineering give great chance to have a high salary job. Engineering field can give handsome salary instantly in the wake of securing the capability. An ever increasing number of understudies are pulled in towards

Engineering field. The greater part of the understudies have passed their school education in regional medium.

Growth of Technical Education in India: A Brief History: Technical education does not have long history like writing in India. The principal engineering school set up in U.P. in 1847, for the preparation of Civil Engineers. More three Engineering Colleges were opened in 1856. Later on, Pune College of Engineering and Guindy College of Engineering were begun in 1858. After 1880, the demand for mechanical and electrical engineering emerged, however just apprenticeship classes in these subjects were presented. The Victoria Jubilee Technical Institute, which was begun in Mumbai in the year 1887, offered such apprenticeship classes. Its goal was to offer preparing to licentiates in Electrical, Mechanical and Textile Engineering. In 1915, the Indian Institute

of Science, Bangalore, presented Certificate Program in Electrical Engineering. The credit of first beginning degree classes in mechanical and electrical engineering and in metallurgy goes to the University of Banaras in 1917. Many engineering universities began after August 15, 1947. It is because of the acknowledgment that India needs to wind up an extraordinary mechanical nation, and would require a far expansive number of designers. Amid the most recent two decades, an efficient and a wide system of technical establishments offers diverse kinds of projects like expert courses, specialist (diploma) courses, graduate and post-graduate courses, and so on. In most recent two decades, engineering schools are begun developing like mushrooms all through India and particularly in Gujarat.

Importance of English Language:

Any language is medium of correspondence. C. L. Wrenn characterizes language in the accompanying words:

Language is the statement of human identity in words, regardless of whether composed or talked. It is the all inclusive medium alike to convey the basic actualities and emotions. (Wrenn: 2001;^[3])

Despite the fact that English is just one language as different languages may be. Yet, in late time, English turns into the medium of correspondence everywhere throughout the globe in the time of globalization. One can't make due in this focused world without English and PC learning. One can't consider higher examinations without the learning of English. One can't impart his or her thoughts, sentiments and considerations without the assistance of English to the colossal mass. English turns into a dowager of the world in obvious sense.

The information of English language is one of the fundamental parameters in the enrollment criteria. As in the Indian setting, an engineering understudy's achievement in the on-grounds enlistment is for the most part in view of their show of relational abilities. As indicated by the National Association of Software and Services Company (NASSCOM), just 25 percent of technical graduates are reasonable for work in the outsourcing business in light of their absence of capacities to talk or compose well in English. (Karnik, 2007 as referred to in P'Rayan 2008:^[1]).

Scenario of English Language Teaching: The vast majority of the students originate from the regional foundation. They learned English yet just as one paper to get some great imprints. They don't have any individual around them with whom they can talk. The four parameters of Language taking in, those are perusing, composing, tuning in and talking are not under any condition satisfied. On the off chance that some individual attempts to talk with the understudy in English, he barely can banter. In these conditions, English is a questionable language for the regional language students. They have a tendency to submit syntactic mistakes in their understanding, written work and discussion. They have great learning of different subjects, however their capability in English is extremely poor. The following are a few purposes behind the poor capability in English of the students.

Problems faced by Students:

- Students originate from regional medium schools.
- Parents can't understand and talk in English.
- Even educators can't impart in English in classrooms.
- Less significance and accentuation is given to the English language in the examination when contrasted with the other technical subjects.
- Students additionally take this subject for simply getting passing imprints.

Problems faced by English Teachers:

- Over quality of the quantity of students in the classroom.
- Teaching talking abilities is extremely perplexing in the expansive classes.
- Students underestimate English Language teaching taken.
- Only for 1 or 2 semesters is the ideal opportunity for instructors to educate English.
- Most of the students are from regional medium, they anticipate from the speaker to show English in their regional medium.
- In the vast majority of diploma universities, there isn't Language Laboratory office.
- Minimum significance is given by the students and by the entire framework to the capability in English.

Impact of English Language Teaching: In above conditions, it is extremely troublesome both, from the understudy side and instructor's side to legitimize English subject. Students can't impart in English. Bit by bit, they surrender their examinations in English. They firmly like to learn just in their regional medium. By thusly, they close the window of the world. They restrain themselves to specific limits. They are not prepared to expand themselves unimaginably which is the primary point of entire education framework. On the opposite side, multinational organizations require individuals who can give finish bundle, which means learning, effectiveness and capability in all fields. Despite the fact that students are great in different subjects, because of absence of English information, they don't land great positions after the finish of degree.

Scope of Improvement: Initially, we need to acknowledge that educators need to procure particular teaching systems for tending to students in the English language classrooms. English is dependably a test for regional medium students. They need trust in eye to eye correspondence. It is exceptionally fundamental to make a strategy through which students can utilize English as a piece of regular day to day existence without perplexed of English. We should attempt to give them learning condition in the education foundation. The significance of English ought not exclusively be prerequisite, ought to be the need. The most amazing viewpoint is that none of us are instructed any sort of relational abilities whenever in our life, not in our schools, universities, home or society. As an English instructor, we should think out of box to educate the students. We ought to urge the students to listen English News, take an interest in gather discourses, to display something, ought to do pretends, to peruse understanding, to compose papers, to compose different kinds of Letters, Reports and so forth. Every one of these exercises certainly enhance students' English. Scholarly messages, similar to novel, short story or sonnet, may ingest and grasp the consideration of the students. Intriguing stories may include students during the time spent perusing and taking in new

words and articulations from the content. With the quick advancement of science and technology, with the utilization of media technology and its application like varying media impacts, movement impacts should likewise come in English class. Media technology may assume positive part in advancing exercises and activities of students.

CONCLUSION

Late daily paper investigation says that of each hundred meetings, just five met all requirements for employability. It isn't on the grounds that they need in technical aptitudes, yet they need in relational abilities. English is critical for technical qualified youths. In the realm of globalization, the worker is required to manage the global customers straightforwardly. The command over the language assumes indispensable part in the enrollment procedure. It is imperative to have great command on English language along the technical learning of the individual branches. Intriguing English teaching-learning procedure will by one means or another take care of this issue. More weight age ought to be given to the English subject.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: ELT

REFERENCES

1. Crystal, David. *By snare or by convict: an excursion looking for English*. London: Harper Collins, 2007.
2. *English as a global language*. Cambridge: CUP, 1997.
3. *Language and the Internet*. Cambridge: CUP, 2001.
4. Wrenn C. L. *English Language*. Delhi: Vikas Publishing House, 2001.

Opportunities for Applying Deep Learning Networks to Tumour Classification

Naresh Kumar S¹, Pramod Kumar P², CH Sandeep³, Shwetha S⁴

¹Assistant Professor, Department of CSE, S R Engineering College, Warangal; ²Research Scholar, Osmania University, Senior Assistant Professor; ³Research Scholar SR University, Associate Professor, Department of CSE, S R Engineering College, Warangal; ⁴Assistant Professor, Department of CSE, Sumathi Reddy Institute of Technology and Science, Warangal, India

ABSTRACT

This paper investigates the opportunities for applying deep learning networks to tumor classification. It finds that basic networks can be found to convey sensible performance, equivalent with mid-run entertainers on the same dataset. Model saturation is a significant issue which can be settled by a combination of limiting the quantity of parameters in the model, include ensuring that training data is adjusted amongst positive and negative perceptions, low learning rates, and iteratively biasing the input data towards cases that the model has mis-arranged after past training epochs.

Keywords: deep learning networks, CNN, tumour classification

INTRODUCTION

When diagnosing the seriousness of a destructive tumor, one core diagnostic method is for a pathologist to dole out a seriousness score in light of tallies of the rate of mitoses. High rates of movement have a tendency to be related with more awful results for patients^[1], and are critical for clinicians in determining the intensity of a course of treatment for patients.

Verifiably these tallies have been finished using visual inspection of slides arranged from tissue biopsies. Specialists have now started applying deep learning methods to growth diagnostics. Favorable circumstances of this approach include reproducibility, and the capacity to investigate whole slides in detail instead of focusing barely on particular zones of interest.

Noteworthy work has been effective at identifying the nearness of mitoses in little images with pre-chosen zones of interest picked via trained analysts, for example, that of Cirean et al.^[2]. Notwithstanding, late work by has tried to sum up these outcomes over the investigation of whole slides instead of particular pre-chosen zones. Rubadue et al.

^[2] have shown that deep learning calculations can accomplish human level pathologist levels of exactness

using convolution neural networks, for example, GoogLe Net and ResNet.

This paper tests the use of deep learning methods to the Tumor Proliferation Assessment Challenge 2016 dataset. In this test, members were solicited to accurately arrange the area from mitoses in slide images as a major aspect of a bigger test. This paper approaches the issue by trying to distinguish whether individual sub-tests of slides contain mitoses.

This paper additionally (unsuccessfully) endeavors to stretch out the base model to build up a general ill-disposed system and a completely associated organize for the reasons for generating a guide showing the likelihood that a tumor is available in any given area in a slide image.

RELATED WORK

Medical imaging is an assignment to which different analysts have connected deep learning methods as of late. Cirean et al.^[2] introduced an early case of this application as far back as 2013. Be that as it may, the utilization of handmade highlights has still been a typical research approach as of late as two years back^{[12][13]}

Late research has connected a wide range of model kinds to the issues of cancer cell discovery. Arevalo et

al. [9] made progress rates of up to 82% classification precision with basic three layer networks connected to histopathological determination. Working on a significantly bigger data set, Paeng et al [10] figured out how to accomplish best in class mitosis distinguishing proof exactness rates with a ResNet based model. Specialists have as of late worked with substantially bigger datasets and have created sophisticated algorithms that can be sent in different conditions. For instance, Esteva et al. [14] have as of late trained a system to distinguish skin cancer sores to dermatologist level exactness using a dataset with more than 125,000 perceptions, with the resulting model equipped for being conveyed on a cellphone. Other late research has focussed on using images at various resolutions to distinguish fine and coarse subtle elements that would be indicative of the nearness of a cancer cell [15].

This paper trains on a significantly littler dataset that probably the most late work notwithstanding, thus depends more on systems, for example, data expansion to create adequate fluctuation in the dataset, drawing on crafted by Paeng et al. [10].

DATA SOURCES AND PREPARATION

Dataset: Data for the investigation has been sourced from the Tumor Proliferation Assessment Challenge 2016 datasets. The crude data set contains slide images of cancer biopsies marked by clinical pathologists. The base training dataset contains images taken from 73 mitosis biopsy slides, split into around 650 images. Of these, around 530 are named with areas for mitotic cells. The images are provided principally as 2,000 x 2,000 pixel images in TIFF arrange, with names provided in reciprocal csv documents.

Labelling Data: Tumors are little with respect to the span of the general slide. One tumor might be somewhere in the range of 30 and 60 pixels across, and an image may contain numerous mitoses, with a run of the mill slide containing somewhere in the range of 2 and 5 mitoses.

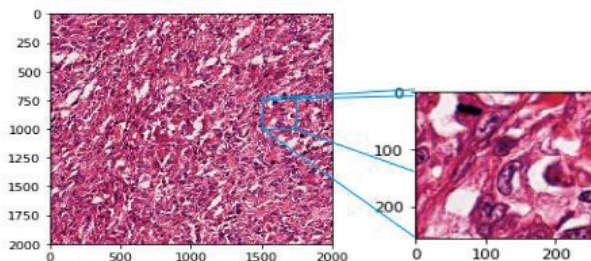


Figure 1: Slide sample, and mitosis section

To train a model to distinguish cells in these images, the slide is separated into littler tiles for training. The two main tile sizes utilized as a part of this paper are 256 x 256 pixel and 64 x 64 pixel tiles. This splitting of the images can result in tiles where a tumor image breaks across numerous tiles. Be that as it may, the marks just distinguish a single point where the tumor is found. Since the model will learn highlights relating to the territories of the image surrounding the particular marked point it is imperative to guarantee that adjoining slides are named as positive if a mitosis is distinguished near the limit.

To address this issue the data is deciphered from a single point for every mitosis to a probability map for a more extensive territory around the point set apart by the pathologist. This mirrors the mitosis possesses a place in the image bigger than simply the single point recognized by the pathologist.

The probability map is produced in light of the Euclidean separation of a pixel from the named point. In the event that it is a point on the probability map, and is the named point, then

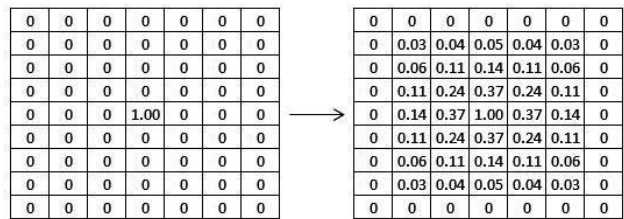


Figure 2: Translating a single point location of a mitosis to a probability map

At the point when the image is part into tiles, the probability map is likewise part and put away nearby the base image. This takes into consideration images to be labeled as containing a mitosis in view of whether they meet a minimum probability limit, with the edge ready to be set powerfully. The probability map likewise encourages further investigation of more sophisticated expository methods, for example, training pix2pix classifiers (Isola et al. [5]) and semantic segmentation classifiers (Shelhamer et al. [6]).

Slide Deconvolution: A noteworthy issue with performing investigation on slide image data is the changeability of the image resulting from manual arrangement of the slides by lab professionals. Images are stained with haematoxylin and eosin (H&E) to help pathologists in identifying mitoses, yet the manual

idea of the procedure implies that the final slides can change altogether in appearance, leading to false classifications. Different methods have been produced to consequently isolate H&E images from the base slide. The intent is to determine a partition framework that makes isolate H&E layers wherein every pixel in the original image is contributing principally either to the haematoxylin layer or the eosin layer.

Sophisticated methods exist for calculating a partition network that can neatly process such a deconvolution a slide into H&E layers. Scanty deconvolution (Xu et al. [7]) can accomplish an extremely exact partition, yet in preliminaries the recursive computation took around 10 minutes to perform on a single slide, so was not practical for application over a huge dataset. Instead, a linear principle segments method proposed by Macenko et al [7] was utilized, which can play out a detachment count using a single (non-recursive) estimation. Figure 3 represents the consequences of this H&E partition for a specimen slide, alongside the related probability map.

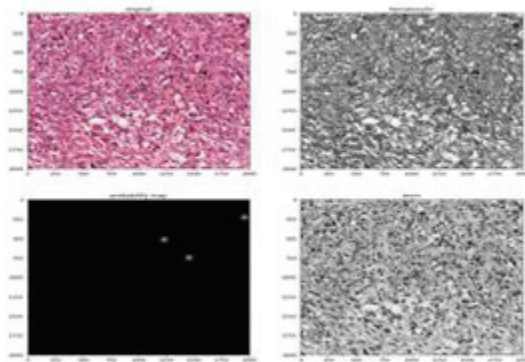


Figure 3: An original slide, and its associated probability map and hematoxylin and eosin deconvolutions

METHOD

The essential focal point of the examination was to train a binary classifier to identify whether an individual image segment contained a mitosis. Initial training utilized a straightforward three-layer convolutional neural system with a binary classifier in the final layer, with images broken into 256 x 256 pixel tiles.

Different internal structures were trialed with various channel sizes, utilization of cluster standardization and utilization of regularization. The essential internal structure of each convolutional layer included two convolution channels with group standardization and

ReLU enactments, trailed by a maximum pool layer. The thick layer included a single affine layer with dropout, trailed by the classifier.

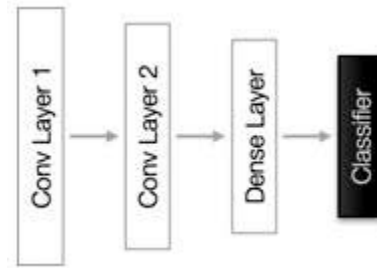


Figure 4: Basic convnet structure

Loss functions utilized included binary cross-entropy and SVM hinge loss. Minor departure from the model structure were tried including system profundity, channel size and inclusion of regularization.

Training on the full, unaugmented dataset immediately prompted model saturation. An essential driver of this is probably going to be the scanty nearness of positive outcomes in the dataset. An ordinary slide contains 2-4 mitoses, so when part into tiles, just around 5% will contain positive observations. All things considered, the model can accomplish high accuracy during training basically by learning to order all images as negative.

A second method used to address saturation was specifically biasing the dataset being bolstered to the model. This approach is gotten from an approach utilized by Paeng et al. [10], yet embraces a procedure of updating the dataset during training rather than preselecting a particular training dataset to use in tuning the model.

In the method connected, in the wake of running the model through an initial age of training, the model classifier was then connected to the training dataset. All misclassified observations were then gathered into a “negative feed” dataset. This dataset was then increased with an irregular example of effectively classified observations, and twisted using arbitrary pivots and applying Gaussian noise.

The learning rate was additionally changed during testing to determine an ideal rate that would not cause untimely saturation.

The essential metric used to quantify accomplishment of the model was basic classification accuracy i.e. is a tile accurately classified as containing a mitosis. This

measure has been utilized by scientists as a base for measuring model accuracy (Arevalo et al. 2015^[9]), and gives a base measure of the usefulness of the model.

RESULTS

Initial Model Testing: Initial training was performed on the whole training dataset using the fundamental convnet structure outlined above, alongside Inception and Resnet models. Standard SVM hinge and binary cross-entropy losses were utilized for the classifier layer, and learning rates were set in the scope of 1e-2 to 1e-4. The dataset was part into 256 x 256 pixel tiles and all observations were initially utilized. Models were trained on a combination of H&E isolated inputs, and H&E inputs combined with the original RGB slide image (i.e. six layers in absolute). The Adam optimiser was utilized to control inclination drop, with its default settings of $\beta_1 = 0.9$ and $\beta_2 = 0.999$ and learning rate set to 1e-6.

Initial training affirmed the issue of model saturation. After a single age all designs of the model were converging to characterize all images as negative.

As a first reaction, the “binary uncommon hinge loss” method was introduced into the model, with the parameter “a” set at estimations of 2 and 4. This method demonstrated ready to moderate the rate of saturation to two epochs instead of one, yet it couldn’t keep saturation from occurring completely.

As a second reaction, the training dataset was pared back to contain around 2/3 negative images and 1/3 positive to drive the model to take in more highlights applicable to positive classification. The learning rate was likewise lessened to 1e-5 to 1e-6 decrease the degree of overfitting. These methods again demonstrated effective at slowing the rate of model saturation, however not stopping it altogether.

The final method that was introduced was the “negative feed” method portrayed previously. This approach finally brought about the “fundamental convnet” outline model beginning to produce classifications across the two classifications. ResNet and Inception structures still experienced saturation issues. Accordingly, it was chosen to continue with the fundamental convnet structure in conjunction with the negative data feed method for more point by point fine tuning.

Model Fine Tuning: Different model structures were then trialed, varying diverse highlights of the model including;

- Training on 256x256 images and on 64x64 images
 Varying channel sizes in the first and second conv layers, including $(3 \times 3)(3 \times 3)$, $(8 \times 8)(8 \times 8)$ and $(8 \times 8)(8 \times 4)$
- Varying the quantity of neurons in the affine layer to 512, 1024 and 2056
- Varying the quantity of channels as 32, 64 and 128

The binary uncommon hinge loss was tried, at the end of the day played out no superior to anything binary cross-entropy or SVM hinge loss. Given the hazard that with a more adjusted dataset this method may begin distorting the data, binary cross-entropy was chosen as the favored method for the model.

The table beneath outlines the outcomes that were created from the model. By a long shot the best performing model is the first in the rundown, where approval accuracy of 78% was accomplished. This performance is approaching that of Arevaloa et al^[9], who revealed model performance of 82% with a three layer organize on 150 x 150 pixel images.

Image Size	Filter Size	Affine Size	Filter Number	Validation Accuracy
256x256	(3x3)(3x3)	512	128,64	78%
64x64	(3x3)(3x3)	512	128,64	61%
256x256	(3x3)(3x3)	1024	128,64	55%
256x256	(3x3)(3x3)	2056	128,64	54%
64x64	(8x8)(4x4)	512	128,64	58%
64x64	(8x8)(4x4)	512	64,32	56%

However, other model specifications performed significantly worse than this. A general trend in the data is that models seem to perform worse as the ratio of parameters increases relative to the image size. The small size of the overall dataset may be a cause of this problem, as a dataset with a great many parameters may begin to suffer from problems with co-linearities and a lack of degrees of freedom to fit the model.

RESULTS AND COMPARISONS

The model sums up sensibly well to the training data set, scoring 72% accuracy. Figure 5 demonstrates

the perplexity framework for the test dataset. The model shows great accuracy in predicting genuine negatives, yet the genuine positive expectation rate isn't great. The general F1 score for the model is 0.42, placing it somewhat underneath the center of the performance table for members in the 2016 Tumor Proliferation Challenge.

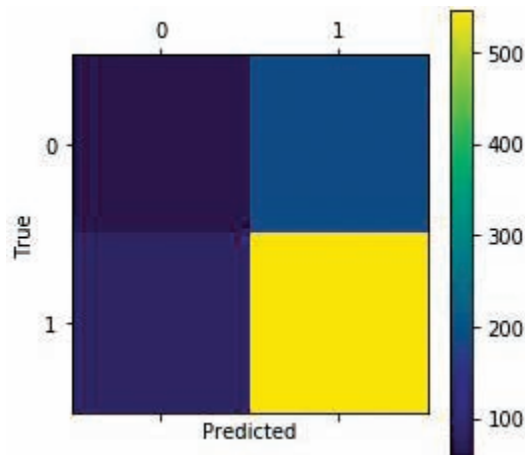


Figure 5: Confusion matrix for test data (1 = negative classification)

When scaling up the general predictions to a whole slide, the model makes sensible predictions with regards to the area of tumors be that as it may. This is particularly the case given that it is trained in a situation where positive and negative images are generally adjusted as far as their pervasiveness, though in the test condition negative images are essentially more predominant.

To imagine this, Figure 6 demonstrates an anticipated probability map versus the ground truth for a perception from the test dataset (in this portrayal, dark squares speak to a positive prediction by the model). Two of the three predictions are in the right area, yet it misses one prediction and produces a false positive for a second one.

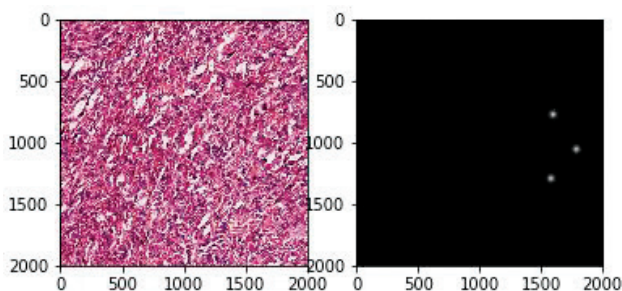


Figure 6: Probability Map versus Ground Truth Data-Test dataset

In the second case from the approval dataset, the model effectively distinguishes that one of the mitoses

parts across two tiles in the dataset, and recognizes it as being available in both the images (see the two neighboring dark squares). In any case, it again misses one mitosis, and has two false positive predictions.

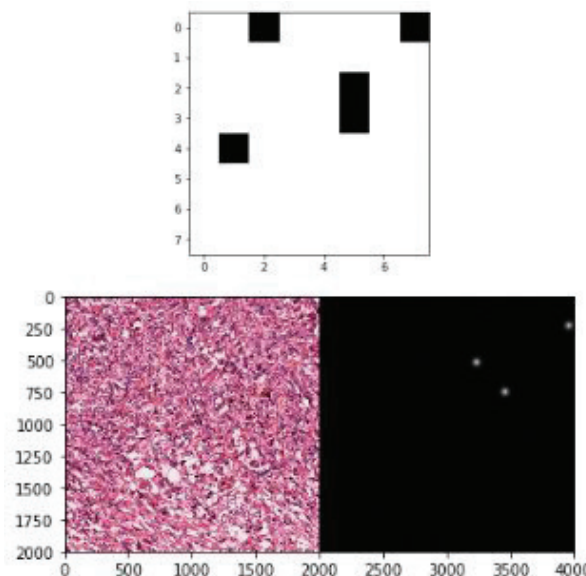


Figure 7: Probability Map versus Ground Truth Data-Mitosis split across two tiles

CONCLUSIONS

Cell slide data shows a troublesome classification assignment. The sparsity of positive data makes critical challenges in creating the correct training environment for the model. This can be overwhelmed by using procedures including training with low learning rates, using negative feed data age and conceivably using models with littler quantities of parameters. The straightforward convolutional network trained in this paper performs well on predicting genuine negative observations, even give the way that it is trained in an environment where negative observations are moderately rare.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Deep Learning Networks

REFERENCES

1. M. Veta, P. J. van Diest, M. Jiwa, S. Al-Janabi, and J. P. Pluim, "Mitosis counting in bosom cancer: Object-level interobserver assention and correlation with a programmed method" PloS one, vol. 11, no. 8, p.e0161286, 2016.

2. C. Ciresan, A. Giusti, L. M. Gambardella, and J. Schmidhuber, "Mitosis discovery in bosom cancer histology images with deep neural networks," in International Conference on Medical Image Computing and Computer-helped Intervention. Springer, 2013, pp. 411– 418
3. C. Rubadue, D. Suster, and D. Wang. "Deep Learning Assessment of Tumor Proliferation in Breast Cancer Histological Images", arXiv:1610.03467, <https://arxiv.org/pdf/1610.03467.pdf>
4. A Radford, R Jozefowicz and I Sutskever. Learning to Generate Reviews and Discovering Sentiment, arXiv:1704.01444, <https://arxiv.org/pdf/1704.01444.pdf>
5. P. Isola, J. Zhu, T. Zhou and A. Efros. "Image-to-Image Translation with Conditional Adversarial Networks", arXiv:1611.07004v1, 2016.
6. E. Shelhamer, J. Long and T. Darrell. "Completely Convolutional Networks for Semantic Segmentation", arXiv:1605.06211v1, 2016
7. J. Xu, L. Xiang, G. Wang, S. Ganesan, M. Feldman, N.N. Shih, H. Gilmore, A. Madabhushi, "Scanty Non-negative Matrix Factorization (SNMF) based shading unmixing for bosom histopathological image examination" IEEE Computer Graphics and Applications, vol.46,no.1,pp.20-9, 2015
8. M. Macenko, M. Niethammer, J. S. Marron, D. Borland, J. T. Woosley, G. Xiaojun, C. Schmitt, and N. E. Thomas. "A method for normalizing histology slides for quantitative analysis" IEEE ISBI, 2009. [dx.doi.org/10.1109/ISBI.2009.5193250](https://doi.org/10.1109/ISBI.2009.5193250)
9. J. Arevalo, F. A. González, R. Ramos-Pollán, J. L. Oliveira and M. A. Guevara Lopez. "Portrayal learning for mammography mass injury classification with convolutional neural networks" Computer Methods and Programs in Biomedicine, vol. 127 (2016) pp. 248– 257
10. K. Paeng, S. Hwang, S. Stop, M. Kim and S. Kim. "A Unified Framework for Tumor Proliferation Score Prediction in Breast Histopathology" arXiv:1612.07180v1, 2016
11. Van Rijsbergen, C. J. "Information Retrieval (second ed.)" Butterworth, 1979
12. X. Liu, J. Tang, "Mass classification in mammograms using chosen geometry and surface highlights, and a new SVM-based element choice method, Syst. J. IEEE 8 (3) (2014) 910– 920, <http://dx.doi.org/10.1109/JSYST.2013.2286539>.
13. M. Dong, X. Lu, Y. Mama, Y. Guo, Y. Mama, K. Wang, "A proficient approach for robotized mass segmentation and classification in mammograms", J. Digit. Imaging 28 (5) (2015)
14. A. Esteva, B. Kuprel, R.A. Novoa, J. Ko, S. M. Swetter, H. M. Blau and S. Thrun. "Dermatologist-level classification of skin cancer with deep neural networks", Nature 542, 115– 118 (Feb 2017)
15. K. J. Geras, S. Wolfson, S. G. Kim, L. Moyc, and K. Cho. "High-Resolution Breast Cancer Screening with Multi-View Deep Convolutional Neural Networks", arXiv:1703.07047v1, 2017
16. C. Hesse. "Tensorflow port of Image-to-Image Translation with Conditional Adversarial Nets" <https://github.com/affinelayer/pix2pix-tensorflow>

Security Challenges and Issues of the IoT System

CH Sandeep¹, Naresh Kumar S², Pramod Kumar P³

¹Research Scholar, SR University, Associate Professor, ²Assistant Professor, Department of CSE, S R Engineering College, Warangal; ³Research Scholar, Osmania University, Senior Assistant Professor, Department of CSE, S R Engineering College, Warangal, India

ABSTRACT

Internet of Things (IoT) has been a noteworthy research topic for very nearly 10 years now, where physical objects would be interconnected because of meeting of different existing innovations. IoT is quickly growing; anyway there are vulnerabilities about its security and privacy which could influence its practical advancement. This paper investigates the security issues and challenges and gives an all around characterized security architecture as a secrecy of the client's privacy and security which could result in its more extensive reception by masses.

Keywords: *IoT, Internet of Things, IoT security goals, IoT security architecture, IoT security challenges and issues.*

INTRODUCTION

The term, Internet of Things, a system of interconnected gadgets, was first proposed by Kevin Ashton in 1999 [1]. It is a noteworthy mechanical transformation that has refreshed the present Internet infrastructure to an idea of significantly more propelled registering network where all the physical objects around us will be particularly identifiable and pervasively associated with each other [2]. By this consistently rising innovation everything around us like TVs, coolers, autos and garments and so on will gather some valuable information with the assistance of different existing advancements, which will then be self-rulingly streaming the information to the concerned gadgets and based on which robotized moves will be made.

With various researches being completed, the vision of IoT is probably going to be a reality soon. As indicated by Gartner, around 25 billion remarkably identifiable objects are relied upon to be a piece of this worldwide figuring network constantly 2020 [3], which is stunningly a major number, anyway predominance of such a major network of interconnected gadgets will represent some new security and privacy dangers and put every one of those gadgets at a high danger of hackers as they grasp at the security holes to influence the gadgets to work for their own advantages.

GENERIC ARCHITECTURE

Generally, IoT has four main key levels as shown in Fig. 1, which are described below [7]:

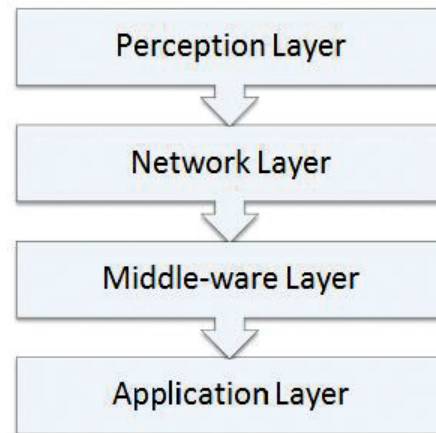


Fig. 1: Generic Architecture of IoT

Perception Layer: This layer comprises of various types of information sensors like RFID, Barcodes or some other sensor network [8]. The fundamental reason for this layer is to recognize the interesting objects and manage its gathered information got from the real world with the assistance of its separate sensor(s).

Network Layer: The reason for this layer is to transmit the accumulated data acquired from the perception layer, to a specific data preparing system through existing correspondence networks like Internet, Mobile Network or some other sort of solid network [9].

Middle-ware Layer: This layer comprises of data preparing systems that take automated activities in view

of the aftereffects of handled information and connections the system with the database which gives stockpiling abilities to the gathered information. This layer is benefit arranged which guarantees same administration compose between the connected devices ^[10].

Application Layer: This layer realizes different commonsense applications of IoT in light of the necessities of users and various types of ventures, for example, Smart Home, Smart Environment, Smart Transportation and Smart Hospital and so forth ^[11].

Security Goals: The real security goals of IoT are to guarantee legitimate character confirmation instruments and give confidentiality about the data and so forth. The Security group of three or CIA set of three, a recognized model for the improvement of security systems, executes the security by making utilization of the three territories which are Data confidentiality, integrity and availability as appeared in the Fig. 2. A break in any of these regions could make difficult issues the system so they should be represented. The three zones are depicted underneath:

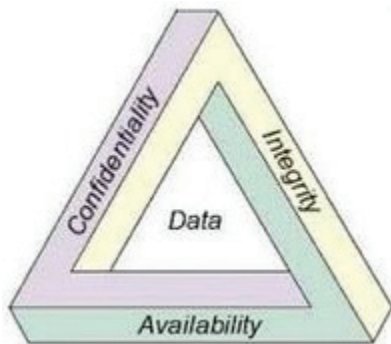


Fig. 2: The CIA Triad

Data Confidentiality: Data confidentiality is indistinguishable to giving flexibility to client from the outside obstruction. It is the capacity to give certainty to client about the privacy of the delicate data by utilizing distinctive systems to such an extent that its divulgence to the unauthorized party is forestalled and can be gotten to by the allowed users as it were. There are numerous security components to give confidentiality of the data including, however not constrained to, Data Encryption in which the data is changed over into ciphertext frame which makes it hard to access for the users having no legitimate approvals, the Two-advance verification, which gives validation by two ward parts and permits the entrance just if both the segments breeze through the confirmation test and the most widely recognized Biometric Verification in which each individual is exceptionally identifiable.

Data Integrity: Amid the correspondence, data could be modified by the cyber criminals or could be influenced by different elements that are outside human ability to control including the crash of server or an electromagnetic aggravation. Data Integrity alludes to the assurance of valuable data from the cyber criminals or the outside impedance amid transmission and gathering with some basic following strategies, so the data can't be altered without the system getting the risk ^[13]. The techniques to guarantee the exactness and creativity of data incorporates strategies like Checksum and Cyclic Redundancy Check (CRC) which are basic mistake finder components for a segment of data.

Data Availability: One of the significant goals of IoT security is to make data accessible to its users, at whatever point required. Data Availability guarantees the prompt access of approved gathering to their data assets in the typical conditions as well as in deplorable conditions. Because of reliance of organizations on it, it is important to give firewalls to countermeasure the assaults on the administrations like Denial-of-benefit (DoS) assault which can prevent the availability from securing data to the client end.

SECURITY CHALLENGES AND ISSUES

There have been numerous accomplishments in the research field of IoT, anyway there are still some open challenges that should be promotion dressed for the pervasiveness of this innovation. In this area a portion of the dangers in each architectural layer that requirements unique consideration are examined.

Perception Layer Challenges: Perception layer comprises of various sensor advancements like RFID which are presented to numerous sorts of dangers which are talked about beneath:

Unauthorized Access to the Tags. Because of the absence of appropriate confirmation instrument in countless systems, tags can be gotten to by somebody without approval. The attacker can't simply read the data however the data can be adjusted or even erased too ^[14].

Eavesdropping. In view of the remote attributes of the RFID it turns out to be simple for the attacker to sniff out the confidential data like passwords or some other data spilling out of tag-to-reader or reader-to-tag which makes it defenseless on the grounds that the attacker can make it to use in wretched ways ^[16].

Network Layer Challenges: Network layer comprises of the Wireless Sensor Network (WSN) which transmits the data from the sensor to its destination with reliability. The related security issues are examined underneath:

Sybil Attack. Sybil is a kind of attack in which the attacker manipulates the hub to exhibit different personalities for a single hub because of which an extensive piece of the system can be endangered resulting in false information about the redundancy^[19].

Sinkhole Attack. It is a kind of attack in which the enemy makes the traded off hub look appealing to the adjacent nodes because of which every one of the data spill out of a specific hub is redirected towards the bargained hub resulting in bundles drop i.e. all the activity is hushed while the system is tricked to trust that the data has been gotten on the other side. In addition this attack results in more vitality utilization which can cause DoS attack^[20].

Denial of Service (DoS) Attack. The kind of attack in which the network is overwhelmed with a futile parcel of activity by an attacker, resulting in an asset depletion of the focused on system because of which the network winds up inaccessible to the users^[22].

Middle-ware Layer Challenges: This layer is made out of data stockpiling advancements like cloud computing. The security challenges of this layer are examined beneath:

Unauthorized Access. Middle-ware Layer gives distinctive interfaces to the applications and data storerooms. The attacker can without much of a stretch reason harm to the system by forbidding the access to the related services of IoT or by deleting the existing data.

DoS Attack. It is like the DoS attack talked about in the past two layers i.e. it close down the system which results in unavailability of the services.

Malicious Insider. This kind of attack happens when somebody from the inside alters the data for individual advantages or the advantages of any outsider. The data can be effortlessly separated and then changed intentionally from the inside.

APPLICATION LAYER CHALLENGES

The related security issues of this layer are depicted underneath:

Malicious Code Injection. An attacker can use the at-attach the system from end-client with some hacking

methods that enables the attacker to inject any kind of malicious code into the system to take some kind of data from the client.

Denial-of-Service (DoS) Attack. DoS attacks these days have turned out to be complex, it offers a smoke screen to complete attacks to break the protective system and subsequently data privacy of the client, while deceiving the casualty into believing that the real attack is happening elsewhere. This put the non-encoded individual points of interest of the client at the hands of the programmer.

Sniffing Attack. An attacker can compel an attack on the system by introducing a sniffer application into the system, which could gain network information resulting in defilement of the system^[25].

SECURITY AT DIFFERENT LAYERS

There are many researches being completed to give a solid very much defined security architecture which can give confidentiality of the data security and privacy. W. Zhang et al.^[26] proposed an architecture for the security against the conceivable dangers, as appeared in Fig. 3.

Perception Layer: Perception Layer is the base layer of the IoT architecture which gives different security highlights to the hardware. It fills four essential needs which are Authentication, Data Privacy, Privacy of touchy information and Risk Assessment which are talked about underneath:

Authentication. Authentication is finished using Cryptographic Hash Algorithms which gives advanced marks to the terminals that could withstand all the conceivable known attacks like Side-channel attack, Brute force attack and Collision attack and so on

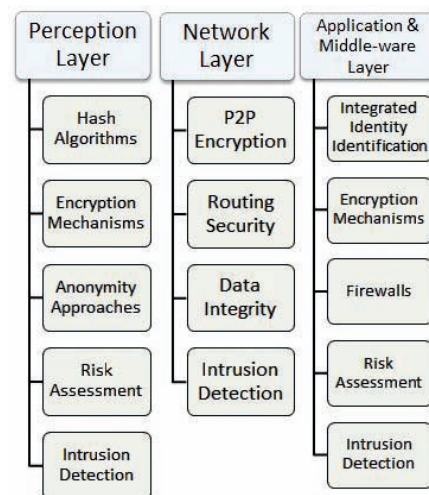


Fig. 3: Security Architecture of IoT

Data Privacy. Privacy of the data is ensured by symmetric and filter encryption algorithms, for example, RSA, DSA, BLOWFISH and DES and so on which keeps an unauthorized access to the sensor data while being gathered or sent to the following layer. Because of their low power consumption advantage, they can be easily executed into the sensors.

Risk Assessment. It is a key of IoT security which finds the new dangers to the system. It could help preventing the security breaks and determining the best security procedures. A case of it is the Dynamical Risk Assessment technique for IoT^[28].

Network Layer: The network layer which could be both wired or wireless is presented to different kinds of attacks. Because of the receptiveness of the wireless channels, interchanges can be checked effectively by a few hackers. The network layer security is further isolated into three kinds which are talked about beneath:

Authentication. With the assistance of an appropriate authentication process and point to point encryption, illicit access to the sensor nodes to spread phony information could be avoided^[30]. The most widely recognized kind of attack is the DoS attack which impacts the network by driving a great deal of futile movement towards it through various botnets filled by the system of interconnected devices.

Data Privacy. The wellbeing control instruments screens the system for any kind of intrusion and finally Data integrity methods are executed to ensure that the data got on the flip side is the same as the original one.

CONCLUSION

The main obstacle that stands in the method for the IoT improvement is the security and privacy issues. Security at all the levels of IoT is descriptive to the functioning of IoT. Fortunately, there as of now have been many research accomplishments in the IT security concerns and for powerful usage of a security infrastructure for IoT, these accomplishments must should be further expanded instead of focusing the consideration towards seeking the new conceivable security arrangements, to make IoT ready to give services to the cutting edge eager for data billions of devices with the capacity to upset the enemies. This paper talked about the security goals and conceivable security challenges and issues of the IoT

system. Then a very much defined architecture for the IoT security was displayed. Later on, more authentications, risk assessment and intrusion detection procedures in each architectural layer must be investigated in parallel to the execution of the security infrastructure using existing IT security highlights. In addition, legitimate structures, appropriate controls and strategies must be contrived to guarantee stable advancement of the secure technologies.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Internet of Things

REFERENCES

1. Kevin Ashton, That Internet of things thing, It can be gotten to at: <http://www.rfidjournal.com/articles/view?4986>
2. D. Singh, G. Tripathi, A.J. Jara, A study of Internet-of Things: Future Vision, Architecture, Challenges and Services, in Internet of Things (WF-IoT), 2014
3. Gartner, Inc. It can be accessed at: <http://www.gartner.com/newsroom/id/2905717>
4. Rolf H. Weber, "Web of Things - New security and protection challenges," in Computer Law and Security Review (CLSR), 2010, pp. 23-30
5. Rodrigo Roman, Pablo Najera and Javier Lopez, "Anchoring the Internet of Things," in IEEE Computer, Volume 44, Number 9, 2011, pp. 51-58
6. Friedemann Mattern and Christian Floerkemeier, "From the Internet of Computers to the Internet of Things," in Lecture Notes In Computer Science (LNCS), Volume 6462, 2010, pp 242-259
7. Hui Suo, Jiafu Wan, Caifeng Zou, Jianqi Liu, Security in the Internet of Things: A Review, in Computer Science and Electronics Engineering (ICCSEE), 2012, pp. 648-651
8. Ying Zhang, Technology Framework of the Internet of Things and Its Application, in Electrical and Control Engineering (ICECE), pp. 4109-4112
9. Xue Yang, Zhihua Li, Zhenmin Geng, Haitao Zhang, A Multi-layer Security Model for Internet of Things, in Communications in Computer and Information Science, 2012, Volume 312, pp 388-393

10. Rafiullah Khan, Sarmad Ullah Khan, R. Zaheer, S. Khan, Fu-ture Internet: The Internet of Things Architecture, Possible Applications and Key Challenges, in tenth International Conference on Frontiers of Information Technology (FIT 2012), 2012, pp. 257-260
11. Shi Yan-rong, Hou Tao, Internet of Things key innovations and designs inquire about in data preparing in Pro-ceedings of the second International Conference on Computer Science and Electronics Engineering (ICCSEE), 2013
12. Daniele Miorandi, Sabrina Sicari, Francesco De Pellegrini and Imrich Chlamtac, "Web of Things: Vision, applica-tions and research challenges," in Ad Hoc Networks, 2012, pp.1497-1516
13. Luigi Atzori, Antonio Iera, Giacomo Morabito, "The Internet of Things: A Survey," in Computer Networks, pp. 2787-2805
14. Mr. Ravi Uttarkar and Prof. Raj Kulkarni, "Web of Things: Architecture and Security," in International Journal of Com-puter Application, Volume 3, Issue 4, 2014
15. Mike Burmester and Breno de Medeiros, "RFID Security: Attacks, Countermeasures and Challenges."
16. Benjamin Khoo, "RFID as an Enabler of the Internet of Things: Issues of Security and Privacy," in IEEE International Conferences on Internet of Things, and Cyber, Physical and Social Computing, 2011
17. Aikaterini Mitrokotsa, Melanie R. Rieback and Andrew S. Tanenbaum, "Grouping of RFID Attacks."
18. Lan Li, "Concentrate on Security Architecture in the Internet of Things," in International Conference on Measurement, Infor-mation and Control (MIC), 2012
19. John R. Douceur, "The Sybil Attack," in Peer-to-Peer Systems - IPTPS, 2002, pp. 251-260
20. Nadeem AHmed, Salil S. Kanhere and Sanjay Jha, "The Holes Problem in Wireless Sensor Network: A Survey," in Mobile Computing and Communications Review, Volume 1, Number 2
21. Tapalina Bhattasali, Rituparna Chaki and Sugata Sanyal, "Lack of sleep Attack Detection in Wireless Sensor Net-work," in International Journal of Computer Applications, Volume 40, Number 15, 2012
22. Dr. G. Padmavathi, Mrs. D. Shanmugapriya, "An overview of AT-tacks, Security Mechanisms and Challenges in Wireless Sen-sor Networks," in International Journal of Computer Science and Information Security, Volume 4, Number 1, 2009
23. Priyanka S. Fulare and Nikita Chavhan, "False Data Detection in Wireless Sensor Network with Secure Communication," in International Journal of Smart Sensors and AdHoc Networks (IJSSAN), Volume-1, Issue-1, 2011
24. Rabi Prasad Padhy, Manas Ranjan Patra, Suresh Chandra Sa-tapathy, "Distributed computing: Security Issues and Research Challenges," in International Journal of Computer Science and Information Technology and Security (IJCSITS).
25. Bhupendra Singh Thakur, Sapna Chaudhary, "Content Sniff-ing Attack Detection in Client and Server Side: A Survey," in International Journal of Advanced Computer Research, Vol-ume 3, Number 2, 2013
26. W. Zhang, B. Qu, Security Architecture of the Internet of Things Oriented to Perceptual Layer, in International Jour-nal on Computer, Consumer and Control (IJ3C), Volume 2, No.2 (2013)
27. K.E. Emam, F.K. Dankar, Protecting Privacy Using kAnonymity, in Journal of the American Medical Infor-matics Association, Volume 15, Number 5, 2008
28. C. Liu, Y. Zhang, J. Zeng, L. Peng, R. Chen, Research on Dy-namical Security Risk Assessment for the Internet of Things propelled by immunology, in Eighth International Conference on Natural Computation (ICNC), 2012
29. T. Karygiannis, B. Eydt, G. Hair stylist, L. Bunn, T. Phillips, Guidelines for Securing Radio Frequency Identification (RFID) Systems, in Recommendations of National Institute of Standards and Technology
30. Yassine MALEH and Abdellah Ezzati, "A Review of secu-rity assaults and Intrusion Detection

- Schemes in Wireless Sen-sor Networks,” in International Journal of Wireless and Mobile Networks (IJWMN), Volume 5, Number 6, 2013
31. Z. Xu, Y. Yin, J. Wang, A Density-based Energy-proficient Clustering Algorithm for Wireless Sensor Networks, in Inter-national Journal of Future Generation Communication and Networking, Volume 6, Number 1, 2013
 32. Shashank Agrawal and Dario Vieira, A study on Internet of Things.
 33. Chen Qiang, Guang-ri Quan, Bai Yu and Liu Yang, Research on Security Issues of the Internet of Things, in International Journal of Future Generation Communication and Network-ing, Volume 6, Number 6, 2013, pp. 1-10
 34. Animesh Patcha, Jung-Min Park, A diagram of abnormality de-tection procedures: Existing arrangements and most recent mechanical patterns, in Computer Networks, Volume 51, Issue 2, 2007
 35. Jayavardhana Gubbi, Rajkumar Buyya, Slaven Marusic and Marimuthu Palaniswami, “Web of Things (IoT): A dream, building components, and future bearings.”

Relationship between Social Presence and Health Efficacy in VR Health Video

Han-Jin Jang¹, Ghee-Young Noh²

¹Dept. of Interaction Design, ²School of Media Communication, Hallym University, Korea

ABSTRACT

Background/Objectives: This research intended to systematically identify how a VR video aimed at improving recipients' health affects their health efficacy through structural equation modeling.

Method/Statistical analysis: The experiment was conducted with four participants simultaneously for 30 minutes at a time at the Virtual Reality and Health Research Center over approximately two weeks from May 1 to May 17, 2017. Data were collected using a self-report questionnaire. The final data used for the analysis were from 150 students consisting of 75 male and 75 female students.

Findings: Confirmatory factor analysis was performed to evaluate the construct validity of the scale using AMOS 22. The data analyzed included participants' responses on 22 items designed to measure five latents (social presence, arousal, message attention, message acceptance, health efficacy) constructs. Hypothesis 1 is whether social presence of VR Video is positively associated with arousal. SEM analysis indicated that social presence for VR Video is significantly associated with arousal, supporting the hypothesis. Hypothesis 2, 3 is whether arousal of VR Video is positively associated with message attention and acceptance. SEM analysis indicated that arousal for VR Video is significantly associated with message attention and acceptance, supporting the hypothesis. Hypothesis 4, 5 is whether message attention and acceptance is positively associated with health efficacy. SEM analysis indicated that message attention and acceptance for VR Video is significantly associated with health efficacy, supporting the hypothesis.

Improvements/Applications: This research is believed to contribute to the convergence and expansion of new theories as it approached the subject matter based on VR user experience, and demonstrated important contributors to health efficacy.

Keywords: *VR Video, Social Presence, Arousal, Message Attention, Message Acceptance, Health Efficacy*

INTRODUCTION

Visual, phonetic, linguistic information to activate the user experience and arousal of the recipient, who tries to understand what the information provider intends to deliver.¹ This sensory arousal allows recipients of such information to feel as though they are interacting with the actual physical world, and makes them feel as though they are connected to and dealing with real information.² Among others, a video message based on virtual

reality VR increases social interactions—specifically, increased feelings of intimacy and changes in recipients' perceptions and narrows spatial and psychological distance unlike regular video or voice messages.³

As such, VR expands the range of human perception unlike other media. For instance, while stimulation from a single message awakens an individual's latent experiences, or energy in reality, it is becoming increasingly possible that a message in VR delivers the experience an individual feels in reality as it is. This can be demonstrated by various health activities using VR. For example, a medical team at Hanyang University conducted a driving simulator experiment on 45 patients to treat their phobia. The experiment repeated various simulations of situations that caused the patients could feel fear; as the patients reported various physical symptoms

Corresponding Author:

Ghee-Young Noh
Professor, School of Media Communication,
Hallym University, Korea
Email: gnoh@hallym.ac.kr

as they coped with these situations on their own, results showed that their anxiety symptoms declined over time.⁴ A 1-month exercise therapy using a VR workout system on chronic stroke patients whose recovery period was over proved that the therapy improved the function of brain regions involved with the patients' walking and increased their walking ability.⁵ As demonstrated above, VR can simulate situations that are difficult to make available in the real world relatively accessible to users and at the same time, it has huge potential to be used in many different research areas in addition to therapy as it provides a well-constructed situation by the computer.

THEORETICAL BACKGROUND

Social Presence: Social presence is an important factor to narrow psychological distance, which perceives emotional exchanges. In a VR simulation where an individual communicates with the computer-generated environment or with a particular object, even though the users are not physically in the location or situation they are seeing, hearing, and feeling, they feel as though they are.⁶ For this reason, social presence is regarded as the perception of an individual rather than the ability of a medium, and such social presence occurs in a mediated VR when users *feel* the experience of the shapes, sensory cues, and behaviors that represent the simulated objects; the level of social presence refers to the extent to which the other object is perceived as close to information or the intended meaning.⁷ A higher level of social presence means that users accept the medium more sociably, personally, and emotionally in a mediated VR and feel as if the object or environment is real even if it is not.⁸

The easiest way to increase social presence in VR is to use its unique features as a medium. Unlike other media, VR can easily provide nonlinguistic messages by enriching the information of the message it delivers.⁹ If social presence provided by VR is lacking, however, the medium tends to be less preferable, emotional, and personal, and feel more serious, official, and impersonal.¹⁰ People consider such environments to feel nonhuman and do not share many messages. Nevertheless, this does not explain why experiment participants experience different levels of social presence in the same environment. Therefore, social presence should be viewed as the users' psychological experience, not as the medium's feature.¹¹ In addition, it has been reported that the level of arousal increases when users feel more social

presence using media that evoked such social presence.¹² It was also reported that videos providing continuous movement increase social presence and arousal more so than still images.¹³ In this regard, this research intends to verify the following hypothesis on the correlation between social presence and arousal.

Hypothesis 1: A higher level of social presence felt in a VR video will lead to a higher level of a user's arousal experience.

Arousal: Arousal in social presence research refers to the degree of the user experience's reaction to the.¹⁴ Furthermore, arousal refers to a psychological state perceived by people when they feel interested in or curious about something.¹⁵ While arousal explains a behavior that has as its goal to emphasize the importance of intrinsic motivation in understanding the motivation of human behavior, the level of arousal also affects the attention or acceptance of a message. More notably, the level of arousal delivered from external stimulation works as some sort of important message in acceptance of the message and can alter people's judgement, information processing, or memory.¹⁶ For example, when people view a message providing a video that triggers a high level of arousal, it is more noted than one that leads to a lower level of arousal.¹⁷ When the level of arousal is higher, people are more likely to pay attention to and focus on the message that delivers the emotional arousal and accept the message;¹⁶ such a message is highly effective in changing the recipients' actual behavior when it contains social meaning.¹⁸ Therefore, arousal plays an important role; more arousal leads recipients to pay closer attention, to think about the delivered message more actively, and to changes their behavior in the direction suggested by the message. Based on this discussion above, this research aims to validate the following hypotheses:

Hypothesis 2: A higher level of arousal provided by a VR video will lead to a higher level of attention to the message.

Hypothesis 3: A higher level of arousal provided by a VR video will lead to a higher level of acceptance for the message.

Health Efficacy and Message: Health efficacy, a belief that individuals can control and manage themselves via improved lifestyle habits, has a huge effect on motivating individuals' health improvement behaviors and putting

them into practice—for example, identifying current health status and problems and establishing plans to keep themselves healthy—individuals with stronger belief in health efficacy are more likely to have efficient and active thoughts and behaviors to improve their health.¹⁹ As the level of health efficacy varies depending on an individual's characteristics, which have been formed based on one's ability and belief, the behavior result appears differently depending on how an individual develops his or her health efficacy.²⁰ In other words, since health efficacy can affect whether to start a new health behavior, stop the health behavior an individual has continued, and resume the discontinued behavior, it is an important concept that must be considered to alter health behavior.²¹

Variables that can have an effect on health efficacy have been found to include the effects of a message itself: attitudes toward health messages, cognitive reactions toward health messages, acceptances of health message, and attentiveness to health messages.²² The health message provided by the medium delivers not just a health message but the medium's feature or structure, which affects an individual's health efficacy. For this reason, the same message delivered via different media can have different effects on individuals, depending on the method or technology used to deliver it.²³ In the past, the basic type of health message to deliver information to individuals was a typical text, but this type of message has grown gradually into a health message containing images and texts, a video message containing movements and voices, and recently a VR message applying all of these: videos, voices, images and texts. In short, various types of health messages are used to enhance health efficacy. Nevertheless, exposed to these various sorts of messages, recipients pay more attention to some more than others. They take in the necessary information through a selective process called *message attention*, and only accept the messages they believe that they need to remember or act on.

This feature affects cognitive information processing as well as a message itself in accepting the message. The level of attention paid when a message is delivered changes the level of message acceptance. In contexts where positive messages are expected, negative messages draw higher levels of message attention; a positive increases attention to a message when a negative message is expected. This type of message is effective especially in health-related attitude or behavior,²⁴ and

can affect psychological perceptions about health.²⁵ In this regard, this research intends to examine the correlation between message attention and acceptance, which must be considered when it comes to changes in health efficacy, through the following hypotheses:

Hypothesis 4: The higher level of message attention provided by using VR video will lead to a higher level of health efficacy.

Hypothesis 5: The higher level of message acceptance provided by using VR video will lead to a higher level of health efficacy.

METHOD

Participants: This study recruited study participants from among male and female students at the Hallym University based in the Gangwon-do province. The experiment was conducted at the Virtual Reality and Health Research Center over approximately two weeks from May 1 to May 17, 2017. The study participants were informed of the experiment procedure and precautions. After answering the pre-survey questionnaire, the participants moved to a separate place and watched a film using a virtual reality device. Data were collected using a self-report questionnaire. In data analysis, uncooperative respondents were eliminated. The final data used for the analysis were from 150 students consisting of 75 male and 75 female students. Amos 20.0 software was used for analysis. The correlation coefficient of each variable and the significance level test results were examined through structural analysis model.

Experimental Procedure: The experiment was conducted by one researcher and one research assistant. As for the device used for the experiment, four Android mobile phones of the same model containing a virtual reality video and Head Mount Display (HMD) device for watching virtual reality (VR Boss) were used. The virtual reality video used in this experiment, "infectious disease prevention through washing hands," was produced for this experiment. The experiment was conducted with four participants simultaneously for 30 minutes at a time at the Virtual Reality and Health Research Center. The participants were seated with one meter or more between each other. Each wore a wireless virtual reality device over his or her head to ensure free movement and watched the video seated on a swivel chair, which allowed them to comfortably move their

body. To control external variables, the HMD device with stereo headphones was set at the maximum volume to block the noise from the surrounding environment. Additionally, the virtual reality video player application, VaR's VR Player PRO, was configured equivalently to allow the participants to control the screen themselves through head tracking. The participants watched the virtual reality video for about five minutes, comfortably seated on the chair and freely controlling the perspective by moving their bodies or heads.

Measures: The questions used by Kim and Biocca²⁶ to measure the level of social presence were reconstructed for the scale of social presence. There were three questions in total with each item measured on a 5-point scale, and the reliability coefficient was .657. The arousal scale questions by Champion²⁷ were reconstructed for the survey. Responses to each of the 3 questions were marked on a 5-point scale, and the reliability coefficient was .800. The questions by Jyotkia²⁸ were reconstructed for message attention and acceptance. Responses to each of the four questions on message attention and three questions on acceptance were marked on 5-point scale. The reliability coefficient of message attention was .832, and that of acceptance was .702. The questions by Dutta-Bergman²⁹ were reconstructed for health efficacy. Responses to each

of the four questions on disgust were marked on 5-point scale. The reliability coefficient was .826.

RESULTS

Measurement Model Analysis: Confirmatory factor analysis (CFA) was performed to evaluate the construct validity of the scale using AMOS 22. The data analyzed included participants' responses on 22 items designed to measure five latent constructs (factors): Social Presence, Arousal, Message Attention, Message Acceptance and Health Efficacy. The model-data fit was assessed with regard to both incremental and absolute model fit using multiple indices, such as root mean square error of approximation (RMSEA), standardized root mean square (SRMR), incremental fit index (IFI), Tucker-Lewis index (TLI), and comparative fit index (CFI). CFA analysis revealed that the fit of the model was fairly good— $\chi^2/df=1.236$, RMSEA=.040, SRMR=.053, IFI=.973, TLI=.965, and CFI=.972. The results of CFA confirmed that the unidimensional structure of each construct. [Table 1] shows factor loadings of the items, both unstandardized and standardized. All the standardized loadings were greater than .50 (range=0.538–0.910) and statistically significant at .05 alpha level, indicating adequate item reliability.

Table 1: Confirmatory Factor Analysis

Latent variable	Observed variable	Standardized Regression Weights	Regression Weights	Standard Error	Construct Reliability	Reliability
Social Presence	Q7_14	.538	1.000			.657
	Q7_11	.753	1.462	.273	5.358***	
	Q7_8	.594	1.118	.228	4.907***	
Arousal	Q6_8	.910	1.000			.800
	Q6_10	.711	.725	.081	8.918***	
	Q6_4	.681	.794	.093	8.526***	
Message Attention	Q5_3	.757	1.000			.832
	Q5_5	.792	1.098	.119	9.216***	
	Q5_7	.693	.918	.114	8.071***	
	Q5_9	.743	.834	.096	8.668***	
Message Acceptance	Q4_8	.600	1.000			.702
	Q4_2	.591	.716	.131	5.457***	
	Q4_6	.783	1.158	.185	6.274***	
Health Efficacy	Q1_1	.706	1.000			.826
	Q1_3	.701	1.153	.153	7.558***	
	Q1_5	.758	1.201	.149	8.080***	
	Q1_7	.789	1.328	.159	8.328***	

As addressed earlier, SEM is an appropriate tool for assessing the construct validity of a scale, more specifically, convergent and discriminant validity.³⁰ Convergent validity refers to the degree to which two measures designed to measure the same construct are related. Convergent validity was assessed using average variance extracted(AVE). Discriminant validity

refers to the distinctiveness of the factors measured by different sets of items.³¹ Discriminant validity of a scale is achieved when the AVE value of each latent variable is greater than its squared correlations with other latent variables in the scale.³² As shown in Table 2, all of AVEs are greater than squared correlation values, confirming the discriminant validity.

Table 2: AVE Discriminant Validity

Variable	Composite Reliability	Social Presence	Arousal	Message Attention	Message Acceptance	Health Efficacy
Social Presence	.597	.336				
Arousal	.836	.090	.633			
Message Attention	.886	.121	-.015	.660		
Message Acceptance	.776	.087	-.103	.274	.537	
Health Efficacy	.895	-.009	-.010	.220	.028	.495

Note: Boldfaced diagonal elements are the square roots of the average variance extracted; to demonstrate discriminant validity, boldfaced values should be higher relative to the correlation coefficients in the same row and column; AVE = average variance extracted.

The Structural Model and Hypothesis Testing:

After the construct validity of the scale was confirmed, structural equation modeling (SEM) was conducted to examine the predictive relationships among the five latent variables: Social Presence, Arousal, Message Attention, Message Acceptance and Health Efficacy. The fitted SEM model produced an acceptable fit — $\chi^2/df = 1.684$, RMSEA = 0.068, SRMR=.082, IFI=.916, TLI=.898, and CFI=.914.

Hypothesis 1 is whether social presence of VR Video is positively associated with arousal. SEM analysis indicated that social presence for VR Video is significantly associated with arousal, supporting

the hypothesis ($\beta=.74$, $t=5.12$, $p<.01$). Hypothesis 2 is whether arousal of VR Video is positively associated with message attention. SEM analysis indicated that arousal for VR Video is significantly associated with message attention, supporting the hypothesis ($\beta=.27$, $t=2.53$, $p<.05$). Hypothesis 3 is whether arousal of VR Video is positively associated with message acceptance. SEM analysis indicated that arousal for VR Video is significantly associated with message acceptance, supporting the hypothesis ($\beta=.25$, $t=2.63$, $p<.01$). Hypothesis 4 is whether message attention of VR Video is positively associated with health efficacy. SEM analysis indicated that message attention for VR Video is significantly associated with health efficacy, supporting the hypothesis ($\beta=.53$, $t=5.00$, $p<.05$). Hypothesis 5 is whether message acceptance of VR Video is positively associated with health efficacy. SEM analysis indicated that message acceptance for VR Video is significantly associated with health efficacy, supporting the hypothesis ($\beta=.25$, $t=2.46$, $p<.01$)[Table 3].

Table 3: Structural Equation Modeling Results

Variable	Standardized Regression Weights	Regression Weights	Standard Error	Construct Reliability	Hypothesis Testing
H1: Social Presence → Arousal	.736	1.021	.200	5.115***	Supported
H2: Arousal → Message Attention	.267	.212	.084	2.526**	Supported
H3: Arousal → Message Acceptance	.252	.190	.072	2.632***	Supported
H4: Message Attention → Health Efficacy	.528	.373	.075	5.001**	Supported
H4: Message Acceptance → Health Efficacy	.248	.166	.067	2.461***	Supported

DISCUSSION

This research intended to systematically identify how a VR video aimed at improving recipients' health affects their health efficacy through structural equation modeling (SEM). First, this research hypothesized that the higher level of social presence engendered by the use of VR video would lead to a higher levels of users' arousal levels, indicating excitement or interest in the message. The analysis showed that the increased social presence in the VR video does have a positive effect on arousal. This outcome was consistent with that of other research showing that individuals experience higher levels of arousal when their social presence was increased, evoking a higher level of social presence like VR videos.

Next, higher levels of arousal were found to have a positive effect on attention and acceptance of messages provided by VR. A message provided by videos with a higher level of arousal like VR ones made people pay more attention to messages provided using VR, which was in line with the findings of other research that a message provided by a video with a higher level of arousal was noted and accepted more than that with a lower level of arousal.³³ Therefore, arousal is an important factor for message attention or acceptance in message research, and more specifically, arousal in health-based VR videos present implications as to how to use a health message more actively. Last, it was found that the increased message attention and acceptance of VR videos aimed at improving health had a positive effect on health efficacy, a factor that directly affects for health-oriented behavior.

CONCLUSION

In conclusion, health messages provided in a VR environment were found to be more socially, personally, and emotionally effective than those provided in other medium environments, feel real even if they are virtual;⁸ VR health messages increase arousal levels and ultimately lead to a positive effect on health efficacy, which in turn can have a positive effect on recipients' intentions to improve their health, as this increased level of arousal makes individuals pay more attention to or accept more actively the message content. Nonetheless, the research did not consider various other variables related to individuals' basic psychological desires; therefore, future research might need to perform an additional analysis in this area. Despite this limitation, this research is believed to contribute to the convergence and expansion of new

theories as it approached the subject matter based on user experience, not VR's medium feature, and demonstrated important contributors to health efficacy.

Ethical Clearance: Not required

Source of Funding: This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2015S1A3A2046760).

Conflict of Interest: Social Presence and Health efficacy

REFERENCES

1. Mayer RE. The Cambridge handbook of multimedia learning [dissertation]. Cambridge university press;2005.
2. Reeder GD, McComick CB, Esselman ED. Self-referent processing and recall of prose. *Journal of Educational Psychology*. 1987;79(3):243.
3. Kim BS, KIM JM. A Study on presence owing to the mobile use of Youth, *Korean Social Science Research*. 2010;36(3):109-32.
4. Jang DP, Kim SI. Application of virtual reality technology in medical field, *Journal of Korea Multimedia Society*. 1999;3(1):49-54.
5. Jang SH, Kwon YH. Motor Recovery in Stroke Patients, *Yeungnam University Journal of Medicine*. 2005;22(2):119-30.
6. Lombard M, Ditton T. At the heart of it all: The concept of presence. *Journal of Computer-Mediated Communication*. 1997;3(2):0-0. DOI:10.1111/j.1083-6101.1997.tb00072.x.
7. Biocca F. The cyborg's dilemma: Progressive embodiment in virtual environments. *Journal of Computer-Mediated Communication*. 2001;3(2):0-0. DOI:10.1111/j.1083-6101.1997.tb00070.x.
8. Lee KM, Yoo SH. IT impact on Society and Mind for literary approach in USA, *IT impact on Society and Mind for literary approach in USA*. 2004;58:1-107.
9. Newberry B. Raising Student Social Presence in Online Classes, Bogen JE. Some educational implications of hemispheric specialization, *The human brain*. Englewood Cliffs, NJ: Prentice-Hall. 1977:133-52.

10. Hiemstra G. Teleconferencing, concern for face, and organizational culture. *Annals of the International Communication Association*. 1982;6(1):874-904.
11. Biocca F, Harms C, Burgoon JK. Toward a more robust theory and measure of social presence: Review and suggested criteria. *Presence: Teleoperators and virtual environments* 2003;12(5): 456-80.
12. Heeter C. Communication research on consumer VR. *Communication in the age of virtual reality*. 1995:191-218.
13. IJsselsteijn WA, de Ridder H, Freeman J, Avons SE. Presence: Concept, determinants and measurement. In *Human vision and electronic imaging 2000*;3959:520-9.
14. Reeves B, Nass C. How people treat computers, television, and new media like real people and places [dissertation]. CSLI Publications and Cambridge university press;1996. p. 3-18.
15. Lee SH. A study on the causal model of internet advertising effect : based on the flow experience determinants. [doctoral thesis]. University of Kyunghee;1999.
16. Storbeck J, Clore GL. Affective arousal as information: How affective arousal influences judgments, learning, and memory. *Social and personality psychology compass*. 2008;2(5):1824-43.
17. Cahill L, McGaugh JL. Mechanisms of emotional arousal and lasting declarative memory. *Trends in neurosciences*. 1998;21(7):294-9.
18. Evans JH. *Histocompatibility Testing 1970*. Edited by PAUL I. TERASAKI. 1979:656.
19. Lee JI, Kim SY, Seo KS. Effects of Self Efficacy, Health Related Hardiness on a Health Promoting Lifestyle of Middle-aged People. *The Journal of Korean academic society of nursing education*. 2007;13(2): 177-83.
20. Bandura A. The explanatory and predictive scope of self-efficacy theory. *Journal of social and clinical psychology*. 1986;4(3):359-73.
21. Kim KS, Lee JW. A Study of Environmental Factors and Self-efficacy in Female College Student Smokers. *Journal of Korean Academy of Fundamentals of Nursing*. 1999;6(2):185-97.
22. Jo SS, Han KH. A Study of Persuasive Effects of Women's Cancer Prevention Campaign: Focusing on the Effects of Message Type and Endorser Type. *The Korean Journal of Advertising and Public Relations*. 2009;11(1):248-75.
23. Ahn JM. A Study on the Characteristic of the Portal Journalism. *Korean Regional Communication Research Association*. 2011;11(1):187-218.
24. Homer PM, Yoon SG. Message framing and the interrelationships among ad-based feelings, affect, and cognition. *Journal of Advertising*. 1992;21(1):19-33.
25. Hallahan K. Seven models of framing: Implications for public relations. *Journal of public relations research*. 1999;11(3):205-42.
26. Kim T, Biocca F. Telepresence via television: Two dimensions of telepresence may have different connections to memory and persuasion. *Journal of Computer-Mediated Communication*. 1997;3(2):0-0. DOI:10.1111/j.1083-6101.1997.tb00073.x.
27. Champion VL, Skinner CS, Menon U, Rawl S, Giesler RB, Monahan P, Daggy D. A breast cancer fear scale: psychometric development. *Journal of Health Psychology*. 2004;9(6):753-62.
28. Jyotika B, Murali AAP. *Competitive Advantage of India Exports: Analytic Case Studies of Four Industries*. 1999.
29. Dutta-Bergman MJ. Primary sources of health information: Comparisons in the domain of health attitudes, health cognitions, and health behaviors. *Health communication*. 2004;16(3):273-88.
30. Anderson JC, Gerbing DW. Structural equation modeling in practice: A review and recommended two-step approach. *Psychological bulletin*. 1988;103(3):411.
31. Kline RB. Software review: Software programs for structural equation modeling: Amos, EQS, and LISREL. *Journal of psychoeducational assessment*. 1988;16(4):343-64.
32. Fornell C, Larcker DF. Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of marketing research*. 1981;382-88.
33. Cahill L, McGaugh JL. Mechanisms of emotional arousal and lasting declarative memory. *Trends in neurosciences* . 1988;21(7):294-99.

The Effect of Presence, Physical Environment and Human Service on Revisit Intention in VR Theme Park: Focusing on the Mediated Effect of Delight

Young-Ku Hong¹, Munseok Cho², Joo-Sang Jeon³

¹Doctoral Student, Dept. of Smart Convergence Consulting, ²Assistant Professor, ³Professor, Dept. of Public Administration, College of Social Science, Hansung University, 116, samseongyoro16gil, Seongbuk-Gu, Seoul Metropolitan Government, 02876, Korea

ABSTRACT

Background/Objectives: In this study, we investigated how Presence, Physical Environment and Human Service of VR Theme Park effect on customer 's Revisit Intention through the parameter of Delight.

Method/Statistical analysis: The subjects of this study were individuals who have experience of using VR Theme Park. Data collection was conducted by questionnaire survey. The questionnaire consisted of 44 items including 9 general items, and the Likert 5-point scale was used for the measurement. Statistical analysis was performed by SPSS and AMOS programs. Basic statistical analysis, factor analysis, reliability analysis, and measurement model analysis were conducted. Regression analysis was also performed to test mediating effect by structural equation model analysis.

Findings: The effect of Presence on Delight and Revisit Intention was turned out to be significant ($\beta = .571, .250$). On the other hand, the Physical Environment did not have a significant effect, and the effect of Human Service on Delight was significant and the effect on Revisit Intention was not significant. As a result of the mediated effect analysis, Delight mediated the relationship that Presence effect on Revisit Intention, which was similar to advance research. On the other hand, Physical Environment and Human Service showed that the mediated effect of Delight was not significant, so it showed different results from advance research in general Theme Park. This showed the implications that the important factors that affect the customer's Revisit Intention in VR Theme Park differ from General Theme Park.

Improvements/Applications: Furthermore, it is necessary to study various operational and marketing fields considering VR Theme Park 's operation type and characteristics, separately from General Theme Park. In addition, by using Delight and Revisit Intention as the major influencing factors, deep concerns should be required about how to increase sales and profits of VR Theme Park.

Keywords: Presence, Physical Environment, Human Service, Delight, Revisit Intention

INTRODUCTION

In recent years, the fourth industrial revolution is emerging as a top issue. The 4th Industrial Revolution extends the range from artificial intelligence (AI) to self-driving car, Virtual Reality (VR) and augmented reality (AR), biotechnology, and recently to humanities¹. According to the 'Global Wise' analysis data, the industry that has looked out to be the most promising was counted as Virtual Reality¹.

Virtual Reality (VR) is a science and technology that makes people seem to interact with actual surroundings,

Corresponding Author:

Munseok Cho
Assistant Professor,
Dept. of Public Administration,
College of Social Science, Hansung University,
116, samseongyoro 16gil, Seongbuk-Gu,
Seoul Metropolitan Government, 02876, Korea
Email: lucianocho@hansung.ac.kr

without experiencing in person that is difficult to experience every day.

The created virtual environment and situation etcetera are a human-computer interface that stimulates the user's five senses and allows them to freely navigate the boundaries between reality and imagination by allowing them to do spatial and temporal experiences that are similar to reality ².

Also, Theme Park is a creative amusement and cultural space that is directed and operated to enhance the mutual theme-related functions mainly on specific theme. And by directing a common story based on themes, it can be defined as a non-daily convergence cultural park that provide interest and Delight to Theme Park visitors ³.

VR Theme Park is a Theme Park put VR as a main topic, and it shows a fused form of VR and Theme Park. The VR market is expected to expand further to various content and software markets, according to Deloitte and Digi-Capital, it is expected to grow at the CAGR of 15%, \$ 30 billion by 2020, and VR Theme Parks will account for 12%, about \$ 3.6 billion in scale ⁴.

In the main advance research, the technology acceptance model asserts that through the concept of perceived usefulness and perceived ease of use, the more useful the technology or service is thought to be, the more favorable the attitude and intention to use it are appeared to be ⁵. Chang, Hyung-Jun (2017) studied the effects of VR characteristics on VR Presence, user characteristics, VR motion and persistent intention ⁶, and Nam, Sun-sook (2017) analyzed the effects of VR's device, perceived characteristics and Presence on pleasure and reuse-intention ⁷.

In terms of service scape, because of the Physical Environment provided by the firm, the consumer determines the overall impression depending on the experience or situation of the place or service ⁸. In this regard, Choi Mun-Yong (2014) studied the effect of Physical Environment, Human Services, congestion, and perceived waiting time on usage satisfaction in Theme Park ³.

Most of the advance researches have approached VR Theme Parks as technical concepts. However, considering the aspect of the Theme Park, it is also necessary to add service factors such as Physical Environment, Human Service, and enjoyment.

From this point of view, this study aims to analyze the effect OnRevisit Intention in the VR Theme Park, focusing on Presence, which is the main variable of the VR characteristics, and the Physical Environment, Human Service, which are the main variables of the existing Theme Park. We also analyzed the effect of Delight on Revisit Intention.

By analyzing the results of this study, we aimed to explain the relationship between the factors in an objective way and to derive implications to improve the direction of operation by increasing the Revisit Intention of VR Theme Park.

MATERIALS AND METHOD

Advance Research

Presence: Presence is created in a virtual environment with no physical contact, which means that it exists as the literal meaning of the etymology meaning of real feeling ^[6]. The US Webster dictionary defines 'Presence' as 'the fact or condition of being present' ^[7]. The definition of Wikipedia is limited to a space with a three-dimensional structure distinguished from commitment, another human cognitive phenomenon ⁹.

In the case of VR, it is Presence that is possible to explain the experience and psychological response of the media receiver very appropriately ¹⁰. The concept of commitment, which is a component factor of Presence, can be said to have originated from the recognition of the psychological phenomenon of human being deeply digging into or falling into something. It was said that people wanted to keep on being in a state of commitment when they experienced it, and if they did not stay in a state of commitment, it is said that they could make a negative assessment which they thought the current experience was annoying or boring and so forth, and they were trying to get out of their current state ¹¹. Chang, Hyung-Jun (2017) analyzed in his paper that VR Presence has a significant effect on contents satisfaction of user ($\beta = .162, p < .05$) and system satisfaction of user ($\beta = .466, p < .05$) ⁶. Lee, Soo-Kyung (2018) reported that Presence had a significant effect on Visit intention ($\beta = .470, t = 3.21$) in simple regression analysis, but it had not significant effect in multiple regression analysis ¹².

Physical Environment: The Physical Environment is defined as tangible commodities that facilitate

service execution or consumption, which refers to the environment in which services are created and interactions occur between the firm and the client¹³. Julie Baker (1987) observed environmental factors (temperature, humidity, noise, cleanliness), design factors (architecture, color, style, signboard), and social factors (customer appearance, behavior) in the Physical Environment¹⁴.

The concept of Physical Environment was widely supported by many scholars, and although it had intrinsically intangible character, it was shown that it was based on tangible or visible elements that existed around the service in terms of the customer who evaluated the service, the customer assessed what they could not see based on what they could see, and it presented theoretical basis that the Physical Environment mix has a significant impact on the customer during the service purchase process¹³.

Choi, Mun-Yong (2014) found that the effect of Physical Environment on use satisfaction ($\beta = .340$, $p < .05$) was significant³. In addition, Cha, Gil-Soo (1994) found that the consumer attribution on the location side changed by the level of the physical service environment ($p < .05$)¹³. Koo, Won-Il(2018) also noted that the effect of physical location of the virtual environment amusement facility on the user's revisit was significant ($\beta = .263$, $p < .05$)¹⁵.

Human Service: Service is to give Delight to the customer. These services are used as the meaning of economics, which is a means of generating profits, but on the other hand they are also seen as spiritual services, which means that there are no higher religions than services rendered to people or soul-based services, which originating from outlook on vocation³.

Lewis (1987) classified three types of services focused on service objects: Human Services, services related to goods, and services related to information. Among them, Human Services are categorized as guides, agency services, and sales services that rely on staff expertise knowledge³. In addition, Um, Seo-Ho (1994) classified the service quality of the Theme Park as physical service and Human Service. Among them, Human Service was explained as the employee dress, customer advertisement, kindness, customer guidance and employee behavior, and he found that employee's kindness had significant effect on service satisfaction ($\beta = .160$, $p < .05$)¹⁶.

About Human Service, Cha, Gil-Soo (1994) validated that consumer attribution changed variously by the level of service employee ($p < .05$), Choi, Mun-Yong (2014) validated that the effect of Human Services on user satisfaction was not significant ($\beta = .037$, $p > .05$)³.

Delight: Playfulness (voluntary interest) which is a feeling of fun and pleasure in the activity itself like a play (Webster & Martocchio, 1992) is an important scale in the flow experience and it can be called as a complex variable that includes individual fun, psychological stimulation and perception of interest (Csikszentmihalyi, 1990). In other words, although the definition of flow is different among scholars, it includes three elements in common: absorption, pleasure, and intrinsic motivation¹⁷. Entertainment contents such as dramas, movies, and games have the purpose of amusing people who experience it. The pleasure is that the user feels fun about the media message and give a demonstration of a pleasant emotional response⁷.

Kumar et al. (2001) proposed that there are two kinds of Delight depending on the type of joy felt by individuals. One way, consumers feel Delighted comprises joy and surprise, while the other way in which consumers experience Delight is when they are captivated by an experience which just evokes feelings of real joy¹⁸. Cho, Nae-Eul (2018) cited Frissen, & Raessens (2013) and discussed multimediality, virtuality, interactivity, and connectivity as features of digital media in relation to the concept of fun¹⁹.

Nam, Sun-Sook (2017) validated that Presence had a significant effect on Delight ($\beta = .506$, $p < .05$) [7]. Kim, Heung-Ryel et al. (2010) analyzed that the pleasure had a significant effect on customer behavior intention ($\beta = .238$, $p = 000$)¹⁷.

Revisit Intention: Continuous use intention refers to the continued use of the service being used due to service satisfaction or other reasons²⁰. Continuous use intention in the concept of loyalty is a deep commitment to the brand that makes it possible to continue to buy preferred products or services²¹. And it is defined as a favorable attitude toward services and repetitive purchasing behavior²².

The VR service can also be used to show whether the user's satisfaction after using VR contents in the same way as the advance studies appears as the intention to use continuously or not. In many media studies, the

improvement of satisfaction level appears to result in the improvement of the intention of continuous use. Therefore, it is important to improve the intention to use continuously for the success of VR content service²³.

Cho, Nae-Eul (2018) said that perceived fun of social platforms had a positive effect on sustained use intention ($\beta = .525$, $t = 6.510$, $p = .000$)¹⁹. In addition, Jianyu MA (2013) in her study validated that Delight became significantly related to Revisit Intentions ($\beta = .476$, $t = 11.956$, $p < .001$)¹⁸.

Research model and Methods

Research model: The research model of this study is shown in Figure 1. The independent variables are Presence, Physical Environment, and Human Service. The dependent variable is Revisit Intention and the parameter is Delight.

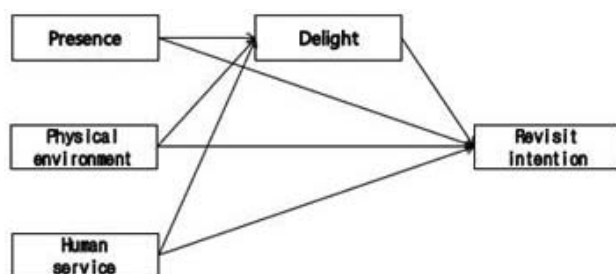


Figure 1: Research Model

In this study, we investigated how the independent variables of Presence, Physical Environment, and Human Service affect the dependent variable, Revisit Intention of firm that received diagnosis.

We also tried to find out how the parameters of Delight have a significant effect on relationship of Presence, Physical Environment and Human Service on Revisit Intention.

Hypothesis: The hypothesis according to the above research model is as follows

H1. Presence will have a positive impact on Revisit Intention.

H2. Physical Environment will have a positive impact on Revisit Intention.

H3. Human Service will have a positive impact on Revisit Intention.

H4. Presence will have a positive impact on Delight

H5. Physical Environment will have a positive impact on Delight

H6. Human Service will have a positive impact on Delight.

H7. Delight will have a positive impact on Revisit Intention

H8. Delight will mediate the relationship between Presence and Revisit Intention.

H9. Delight will mediate the relationship between Physical Environment and Revisit Intention.

H10. Delight will mediate the relationship between Human Service and Revisit Intention.

Data collection and Analysis methods: Data collection for this study was conducted by questionnaire method. The questionnaire consisted of two types of questionnaire, printout questionnaire and Google questionnaire. The questionnaire consisted of 44 items including 9 general items, and the Likert 5 - point scale was used for numerical data.

The questionnaire distribution was conducted from April to June 2018 for individuals with experience using VR Theme Park.

Statistical analysis was carried out using the SPSS and AMOS programs for total 194 pieces, excluding missing items and incorrect answers about the 209 pieces of collected questionnaire.

First, frequency analysis and descriptive statistics analysis were conducted. For the numerical data, we analyzed the validity and reliability of the variables. Confirmatory factor analysis was performed for single dimensionality test of each variables and analysis of measurement model was conducted to test the fit of research model.

Then, the structural equation model analysis was conducted to confirm the research hypothesis test, the mediated effect analysis, and the inter - group path difference test.

RESULTS AND DISCUSSION

Analysis Results

Basic statistical analysis: Frequency analysis was conducted to identify the demographic characteristics of the sample.

First of all, according to industry, other occupations account for 44%, were more than the service industry (36.1%) and the manufacturing industry. Other firms also accounted for 42.3% on the firm size, compared with 25.3% of large corporations and 23.2% of small and medium enterprises. In addition, younger age group under age 20 were 41.2% and the male group were 63.9%, which took the majority. Most of the education was made up of higher education (97.4%) who are higher than college graduates, so it was estimated that stable sample data would be obtained considering the understanding of respondents. Jobs were characterized by the majority of office workers (41.8%), college students (31.4%). And the classes of monthly income less than 2 million won occupied 38.7%.

The descriptive statistics analysis of the measure variables was conducted. The results of the descriptive statistics analysis of individual measured variables

showed that the standard deviation is larger than 3, the absolute value of the skewness was larger than 3, and the absolute value of the kurtosis is smaller than 8, so individual measurement variables could be considered to have a normal distribution²⁴.

Measurement Model Analysis

a. Confirmatory Factor Analysis: Confirmatory Factor Analysis (CFA) and measurement model analysis were performed for all measured variables of the already secured latent variables. However, analysis result of distinction standard of the first measurement model did not satisfy the fit index.

In order to satisfy the model fit index, the measurement variables were modified for the fourth time. The analysis results of the final measurement model and the model fit are shown in Table 1.

Table 1: Result of model fit analysis

Model Fit	p-value	X ² /DF	RMR	GFI	AGFI	NFI	TLI	CFI	RMSEA
measured value	.000	1.751	.045	.870	.832	.905	.949	.957	.062
standard	>.05	<3	<.8	>.8	>.8	>.9	>.9	>.9	<.08

In the model fit index’s analysis result of the fourth measurement model, because X² (P) is .000, which was below the acceptance standard, the null hypothesis that the measurement model was appropriate was rejected.

However, it was necessary to comprehensively consider other fit indexes to determine the model fit. As a result of analyzing the fourth measurement model, it was confirmed finally that all 9 standards except X² (P) were satisfied.

b. Validity and reliability evaluation: The convergent validity was analyzed by mean variance extraction method.

As a result of analyzing the Average Variance Extracted (AVE) value of each potential variable, Presence was 0.623, the Physical Environment was 0.721, the Human Service was 0.747, the Delight was 0.737, and the Revisit Intention was 0.605. Because all of them were over 0.5, so it could be said that convergent validity was secured.

In the analysis of Correlation, Covariance, ‘R ± 2 * SE’ was not all 1. In addition, because the

threshold value of X² between the constraint model and the non-constraint model for Delight and Revisit Intention having the greatest correlation coefficient was 21.418 and was larger than 3.84, it was confirmed that the discriminant validity was also secured.

Reliability analysis of the measurement model were performed. The Cronbach alpha values of the latent variables were 0.830 for the Presence, 0.928 for the Physical Environment, 0.937 for the Human Service, 0.933 for the Delight and 0.819 for the Revisit Intention. Because all of which were 0.7 or more, reliability could be assured.

Hypothesis test

a. Basic hypothesis test: Structural equation modeling has conducted based on pre-established measurement models. And the structural equation model was analyzed using AMOS.

The test results for the basic hypothesis were shown in Table 2.

Table 2: Results of basic hypothesis test

Hypothesis (path)	Standardized Coefficients	S.E.	C.R.	P-value	R ²	Choice
H1 (Presence → Revisit Intention)	.250	.079	3.185	.001	.825	adopt
H2 (Physical Environment → Revisit Intention)	-.108	.106	-1.067	.286	.825	reject
H3 (Human Service → Revisit Intention)	.043	.106	.437	.662	.825	reject
H4 (Presence → Delight)	.571	.096	6.587	***	.583	adopt
H5 (Physical Environment → Delight)	.104	.136	.870	.384	.583	reject
H6 (Human Service → Delight)	.240	.135	2.109	.035	.583	adopt
H7 (Delight → Revisit Intention)	.752	.092	7.480	***	.825	adopt

Because the p-values of H1, H4, H6, and H7 hypotheses were less than 0.05 and the Coefficients were a positive number (+), so H1, H4, H6, and H7 hypotheses were adopted.

However, Because the p-values of H2, H3, and H5 hypotheses were 0.05 or more, so that hypotheses were not significant, so the H2, H3, and H5 hypotheses were rejected.

In other words, the larger the Presence, the greater how much it effect on Delight and Revisit Intention, the larger the Human Service, the greater Delight, and the larger Delight, the greater Revisit Intention.

b. Mediated effect test: Test results of the mediated effect hypothesis were shown in Table 3.

Table 3: Results of Mediated effect test

Hypothesis (path)	Direct effect	p-value	Indirect effect	p-value
H8 (Presence → Delight → Revisit Intention)	.250	.015	.430	.010
H9 (Physical Environment → Delight → Revisit Intention)	-.108	.232	.078	.361
H10 (Human Service → Delight → Revisit Intention)	.043	.609	.180	.059

As the analysis result of the hypothesis of H8, indirect effect was considered to be statistically significant in the path between Presence and Revisit Intention (path coefficient = .430, $p < .05$), and so this hypothesis was adopted. In other words, Delight was shown that it mediated in the relationship between Presence and Revisit Intention.

However, because the p-values of the H9 and H10 hypotheses were larger than of 0.05, so the effects of the hypotheses did not significant, so the H9, H10 hypotheses were rejected.

CONCLUSION

Results and Implications: As a analysis result of this study, Presence was shown that had a significant effect on Revisit Intention. Also, it was shown that Presence affected Delight, and Delight had a significant effect on Revisit Intention.

On the other hand, Physical Environment and Human Service were shown that had no significant effect on Revisit Intention.

However, Human Service did not directly affect Revisit Intention but it had a significant effect on Delight, and Delight influenced Revisit Intention. So, it was shown that Human Service influenced Revisit Intention indirectly through Delight.

In the analysis of mediated effect of Delight, it was shown that Delight had a significant mediating role in the relationship between Presence and Revisit Intention. However, in the relationship between Physical Environment and Revisit Intention, the relationship between Human Service and Revisit Intention, Delight did not have a significant mediating role.

Here, we could gain some implications.

First, it was shown that Presence was significant in the effect relationship between Delight, Revisit

Intention. Similar results were reconfirmed in several advance studies of existing VR Theme Parks.

Second, the effect of Delight on the Revisit Intention was further enhanced by doing mediating role in the relationship between Presence and Revisit Intention. We need to examine a variety of ways to increase customer's revisit by further increasing the mediated effect of Delight.

Third, the analysis result of the relationship between Physical Environment, Human Service and Revisit Intention in VR Theme Park, which is one of the main purpose of this study, did not show the same results of advance studies on general Theme Parks. In VR Theme Park, which is smaller space than general Theme Parks, immersive potential factors such as Presence were important factors. But other important factors of general Theme Parks for customer's revisit such as Physical Environment, Human Service had not yet notable in VR Theme Parks. However, it should be noted that the Human Service factor has shown that it can increase customer's revisit when the variables of Delight operate in the middle.

Improvement: First of all, more expanded and detailed works are required in the conclusions and implications of this study. The initial VR Theme Park was introduced as the urban use, and it had strong image as 3D or 4D game room experiencing stereoscopic Virtual Reality in a small space. In the general Theme Park as well as VR Theme Park, the VR game zone has been developed and operated, but at the initial stage, It was only at the level of such comments merely that it provided a variety of experiences at low cost.

At present, however, VR Theme Parks which are used in the city are also becoming larger and expanding into various fields such as resorts, department stores, local government festivals and so on. As in the case of the East Valley of Science & Fantasy, the VR Theme Park which was opened in Guizhou, China in 2017, the VR Theme Park is gradually becoming larger and the VR program form is changing from a simple fixed experience facility to active experience facility similar to the general Theme Park attraction.

Therefore, it is necessary to study continuously the effect of Physical Environment and Human Service factors on VR Theme Park while doing simultaneously time series study with more time.

The most important thing is to find out various factors that can improve the customer's Delight and Revisit Intention, thereby we should increase the number of visitors to the VR Theme Park, increase sales by increasing value added, increasing profitability. Finally, it is necessary to heighten and expand the level of VR Theme Park's operation and marketing by doing so.

Ethical Clearance: Not required

Source of Funding: This study was supported by the study fund of the Graduate School of Hansung University.

Conflict of Interest: Focusing on the Mediated Effect of Delight

REFERENCES

1. Kim, Yoo-Jeong. The world's fourth-largest industry theme is 'VR'. ChosunBiz. (2017.5.25). http://biz.chosun.com/site/data/html_dir/2017/05/25/2_017052501069.html#csidx17a0a747c3050698018f14b12303661.
2. Chun, Whang-Soo, Han, Mi-Kyung, Jang, Jong-Hyun. Application Trend in Virtual Reality. *Electron and telecommunication trends*. 2017 Feb; 32(1).
3. Choi, Mun-Yong. A Study on the influence relationship among the character of waiting circumstance, waiting time and service performance space: with Theme Park as the central figure [dissertation]. Seoul: Hanyang University; 2014.
4. Kim, Chi-Ho. Study of Theme Park attractions using Virtual Reality and Augmented Reality Technologies. *Journal of digital convergence*. 2017 Sep; 15(9).
5. Lee, Chang-Hyung. A Study on the Influence Factor of Potential Consumers' Intention to Use Terrestrial Multi Channel Service: Analysis of Structural Equation Modeling (SEM) [dissertation]. Seoul: Seoul National University of Science and Technology; 2015.
6. Chang, Hyung-Jun. Study on the Influence of VR Characteristics on User Satisfaction and Intention to Use Continuously: Focusing on VR

- Presence, User Characteristics, and VR Sickness [dissertation]. Seoul: Seoul National University of Science and Technology; 2017.
7. Nam, Sun-Sook. Influence of VR game type on the Evaluation of Device/ Perceived characteristics, Presence and Enjoyment [master's thesis]. Seoul: Chung-Ang University; 2017.
 8. Kim, Mi-jeong. Pension Servicescape Influencing Positive Emotion, Customer Value, and Revisit Intention[dissertation].Seoul: Seoul Sejong University; 2017.
 9. Barfield, W., Zeltzer, D., Sheridan, T., & Slater, M. Presence and performance within virtual environments. *Virtual environments and advanced interface design*; 1995.
 10. IJsselsteijn, W., de Ridder, H., Hamberg, R., Bouwhuis, D., & Freeman, J. Perceived depth and the feeling of Presence in 3DTV. *Displays*, 18(4). 1998.
 11. Lee, Sung-Ho, Ahn, Joong-Ho, Jahng, Jung-hoo. The Effect of perceived interactivity's mediator role mobile contents users' attitude and behavioral intention. *Asia Pacific Journal of Information Systems* 16(3). 2006.
 12. Lee, Soo-Kyung. Effects of Virtual Reality Content in Tourism on Expectancy Effects on Tourism: Mainly Focused on Presence's Mediated effect [master's thesis]. Seoul: Yonsei University; 2018.
 13. Cha, Gil-Soo. Influences of physical evidence and service personal mixes on service postpurchase evaluation[dissertation]. Seoul: Kyonggi University; 1994
 14. Baker, J. The Role of the Environment in Marketing Services: The Customer Perspective. in John A, Czepiel, Carole Congram and James Shanahameds, *The Service Challenge: Integrating for Competitive Advantage*. Chicago: AMA. 1987.
 15. Koo, Won-II. The Effect of a Virtual Environment Attraction Experience on Relationship Quality and Revisit in Theme Parks. *Korea Journal of Tourism Research* 42(6). 2018.
 16. Um, Seo-Ho. Development of a Multi-Item Scale for Measuring Theme Park Service Quality. *Journal of Korean institute of landscape architecture* 22(2). 1994.
 17. Kim, Heung-Ryel, Lee, Tae-Hee, Yoon, Seol-Min. A Study on Behavioral Intention about Visiting in Theme Park, Based on ExtendedTheory of Planned Behavior: An Investigation into the Role of Playfulness. *Korea Journal of Tourism and Hospitality Research* 24(2). 2010.
 18. Jianyu MA. Emotions derived from Theme Park experiences: The antecedents and consequences of customer Delight[dissertation]. St Lucia: The University of Queensland; 2013.
 19. Cho, Nae-Eul. A Study on the Influence of 'Fun' Factors on Intention to Use Social Platform[dissertation]. Seoul: Korea University; 2018.
 20. Shi, Ho-Young, Kim, Ki-Soo. A Study on the Factors Affecting the Continued Usage Intention of Internet Portal Sit. *study of information system* 19(3). 2010.
 21. Oliver, R. L. Effect of expectation and disconfirmation on postexposure product evaluations: An alternative interpretation. *Journal of applied psychology* 62(4). 1977.
 22. Colgate, M., & Lang, B. Switching barriers in consumer markets: an investigation of the financial services industry. *Journal of consumer marketing*18(4). 2001
 23. Park, Chang-Mook. A Study on the Social TV Motivation and Interaction[dissertation]. Seoul: Seoul National University of Science and Technology; 2015.
 24. Shin, Gun-Kwon. *Amos 23 Statistics analysis*. 2nd ed. Seoul: Cheong-ram Publishing Co; 2016.

Psychometric Evaluation of Cost-Reduction Practice

Miyoung Lee¹, Mi-Kyoung Lee¹, Mi Ok Choi², Youngshin Song³

¹College of Nursing, Eulji University, 77, Gyeryong-ro, 771beon-gil, Jung-gu, Daejeon, Republic of Korea; ²Total Medical Co., Ltd, 12, Eulji-ro 14-gil, Jung-gu, Seoul, Republic of Korea; ³College of Nursing, Chungnam National University, 266, Munhwa-ro, Jung-gu, Daejeon, Republic of Korea

ABSTRACT

Background/Objectives: It is difficult to measure cost-effective nursing. Methodological study design was applied as to test the construct validity and reliability of cost reduction practice scale (15-item) in Korean nurses.

Method/Statistical analysis: Data were collected from 587 nurses who working at four hospitals located in S and D cities in Korea. Reliability and construct validity of the scale were conducted. Data were analyzed using the SPSS 23.0 program. Item analysis and exploratory factor analysis (EFA) were performed to evaluate the construct validity. The reliability of the scale was verified by Cronbach's alpha to confirm the internal consistency.

Findings: The former was used to calculate correlations between each item and total items. The latter was used to identify the structure of the factors that represent test items. Before the exploratory factor analysis, the data were confirmed with Kaiser-Meyer-Olkin test and Bartlett's sphericity test to determine if the data could be analyzed using factor analysis. As a result of item analysis, the item-total item correlation of the modified 12 items was .291-.499. The exploratory factor analysis using varimax rotation of principal component analysis yielded two factors that have an eigenvalue of one or greater. Ten items with factor loadings of .432 or greater were extracted as factor 1(consumable savings); eigenvalue and explanatory power were determined to be 3.36 and 27.99%, respectively. The factor loadings of the other two items were .886 or greater, and they were extracted as factor 2(equipment management). Their eigenvalues and explanatory power were 1.75 and 14.57%, respectively. The total variance was 42.56%. For reliability of the cost-reduction practice, Cronbach's $\alpha = .770$.

Improvements/Applications: The scale is expected to be helpful in determining the level of cost reduction practice of nurses at the hospital and searching for strategies.

Keywords: Nurse, Cost reduction practice, Scale, Validity, Factor analysis

INTRODUCTION

As competition intensifies in the medical profession, hospitals are constantly striving to strengthen their competitiveness by building an environment conducive to the improvement of hospital management. With the diversification and specialization of medical technology, hospitals are initiating efforts to make the management

more efficient; they are not only providing education for the improvement of expert knowledge that health care providers must have but also searching for methods for managing expensive medical equipment and expendable assets, such as medicine, materials, and consumables used in diagnoses and treatment^[1]. Labor, material, and management costs^[2,3] have been identified as the main factors influencing hospital profitability. Nurses are key personnel who provide medical services with the nearest proximity to patients; they account for more than a half of hospital staff and are in charge of managing medical equipment or ward assets. Thus, nurses can make efforts to improve nursing services and reduce costs^[4,5]; indeed, increased economic knowledge and an

Corresponding Author:

Mi-Kyoung Lee
Associate Professor, College of Nursing
Eulji University, South Korea
Email: lmk@eulji.ac.kr

attitude with a sense of ownership^[6, 7] in nurses can be helpful in achieving the long-term goals and improving competitiveness of the hospital. Many nurses, however, still lack the ability to choose hospital resources and efficiently use them or the initiative to conduct cost-to-performance measurement^[8]. As such, despite the necessity of determining the level of nurses' cost-reduction practice, finding an objective tool to measure it is difficult. Previous studies have been limited to determining the economic knowledge or attitude of nurses^[1, 8] or reporting quality assurance activities for cost reduction or work improvement^[9]. An instrument for measuring cost-reduction performance developed^[10], but only the reliability and content validity of the overall items were established, and the usefulness of the instrument needed to be tested. Accordingly, the present study was conducted to establish the usefulness of the previously developed instrument^[10] by testing the reliability and validity of the instrument. The present study also aimed to provide basic data for establishing the cost-reduction practice methods by nurses.

METHOD

Study design and sample: This methodological research aimed to test the reliability and validity of the cost-reduction practice instrument^[10]. The participants were 587 nurses working at four hospitals with 500 beds or more located in S and D cities in South Korea. At the time of data collection, the purpose of the study was explained, and nurses who consented to participate in the study were instructed to complete the questionnaire.

Measurement: The initial content of the cost-reduction practice instrument was composed by the investigator based on the investigator's own clinical experience at the time of development. To increase the validity of the instrument, it was revised based on consultations with five head nurses and directors of nursing with five years or more of experience in managing wards, as well as one professor of nursing management. Afterward, the instrument was revised and supplemented through a preliminary survey among general-duty nurses. The instrument was composed of 15 items and responses were indicated using a four-point Likert scale. The instrument was developed to measure the practice level of cost reduction in actions that are generally performed in clinical practice, and contains items on the use and handling of equipment and consumables. A higher score

indicates higher cost reduction. The reliability of the instrument at the time of development measured by Cronbach's α was .769^[10].

Data analysis: The collected data were analyzed using SPSS 23.0. Frequency analysis was performed to identify the general characteristics of the participants. The reliability and validity of the instrument were determined by exploratory factor analysis. Correlations between each item and total items were calculated through item analysis, and items with a correlation coefficient of less than .30 were judged to be inappropriate to be included in the instrument and subsequently deleted. The reliability of the instrument was determined by Cronbach's α , which is used to determine the internal consistency of items. The construct validity of the instrument was determined by exploratory factor analysis. Before conducting the exploratory factor analysis, the results of Kaiser-Meyer-Olkin (KMO) and Bartlett's sphericity tests were checked to determine if the data were appropriate for factor analysis. Through exploratory factor analysis, items with an initial eigenvalue of one or greater and factor loading value of 0.4 or higher were selected.

RESULTS AND DISCUSSION

RESULTS

Demographics of participants: This methodological research aimed to test the reliability and validity of the cost-reduction practice instrument^[10]. The participants were 587 nurses working at four hospitals with 500 beds or more located in S and D cities in South Korea. At the time of data collection, the purpose of the study was explained, and nurses who consented to participate in the study were instructed to complete the questionnaire [Table 1].

Table 1: General characteristics of participants (N = 587)

Variables	Category	n	%
Gender	Male	10	1.7
	Female	577	98.3
Age (yr)	<30	401	68.3
	30-39	146	24.8
	≥40	40	6.9
Education	Associate degree	327	55.7
	Over bachelor's degree	260	44.3

Conted...

Clinical career (yr)	<3	176	30.0
	3-7	218	37.1
	≥7	193	32.9
Position	Staff nurse	501	85.3
	Over charge nurse	86	14.7
Department	General ward	264	45.0
	Special unit	229	39.0
	Other	94	16.0

Construct validity: The results of item and exploratory factor analyses were confirmed to assess the construct validity. The range of correlation coefficients between each item and the 12 total items (revised through item analysis of the 15 items) was .291 to .499. Although the correlation coefficient of item 12 was less than .30, this item was not deleted to avoid decreasing the Cronbach’s α coefficient; moreover, content review indicated that the item was appropriate for the composition of the instrument. Accordingly, 12 items were used for exploratory factor analysis.

Results of the KMO and Bartlett’s sphericity tests were checked before factor analysis to determine if the

data were appropriate for conducting exploratory factor analysis. The data were determined to be appropriate for exploratory factor analysis: KMO test result of .82 and Bartlett’s sphericity test result of $\chi^2=1412.18$ with the probability level of $p<.001$. The exploratory factor analysis using varimax rotation of principal component analysis yielded two factors that have an eigenvalue of one or greater. These two factors were confirmed to be appropriate by the inflection point of the scree graph, given in Figure 1. Thus, ten items with factor loadings of .432 or greater were extracted as factor 1; eigenvalue and explanatory power were determined to be 3.36 and 27.99%, respectively. The factor loadings of the other two items were .886 or greater, and they were extracted as factor 2. Their eigenvalues and explanatory power were 1.75 and 14.57%, respectively. Correlation coefficient between the factors was .23 ($p<.001$).

Factor 1 was named “consumable savings,” as it was composed of items related to the appropriate use of treatment materials and consumables. Factor 2 was named “equipment management,” as it included the use of equipment suitable for the intended purpose and management for the prevention of equipment failure. The two factors explained 42.56% of nurses’ cost-reduction practice [Table 2].

Table 2: Exploratory factor analysis of cost-reduction practice (N = 587)

Questions	Item	Mean ± SD	Item-total correlation	Factor	
				1	2
Q10	I have an experience of preparing excessive amount of lubricant when inserting a catheter and discarded the leftover.	3.13 ± 0.64	.478	.658	.004
Q9	I have used gauze, alcohol sponge, and surgical pad for cleaning or other purposes.	3.12 ± 0.60	.494	.654	.054
Q14	I have used dressing scissors and kelly for other than their intended purposes.	3.38 ± 0.68	.419	.622	.013
Q2	I have used sterile gloves when treating patients even though disposable gloves may have been sufficient.	3.29 ± 0.62	.468	.601	.081
Q4	I have an experience of opening the whole package of disposable syringes to prepare for injections and discarded unused leftover syringes.	3.38 ± 0.61	.499	.585	.204
Q8	Even if I needed only an injection needle, I opened a disposable syringe and used only the needle.	3.17 ± 0.71	.448	.585	.100
Q15	I have kept ward consumables in my possession for personal use.	3.47 ± 0.63	.482	.558	.240
Q11	I needed a 3-way cover, so I opened a new package but used only the cover.	3.05 ± 0.69	.417	.537	.134
Q6	I sometimes dispose of general waste in a medical waste container.	3.24 ± 0.63	.341	.512	-.076

Conted...

Q3	I sometimes use various recording papers of the ward as general purpose printing paper or memo paper.	3.07 ± 0.78	.321	.432	.080
Q12	After using a portable EKG analyzer and defibrillator, remove gel or other foreign material on the cables and equipment right away.	3.11 ± 0.82	.291	.059	.903
Q13	If fluid or other foreign material falls on infusion pump, wipe it off immediately to prevent equipment failure.	2.95 ± 0.83	.343	.121	.886
Eigen Value				3.36	1.75
Total Variance				27.99	14.57
Cronbach's alpha, total: .770				.777	.789

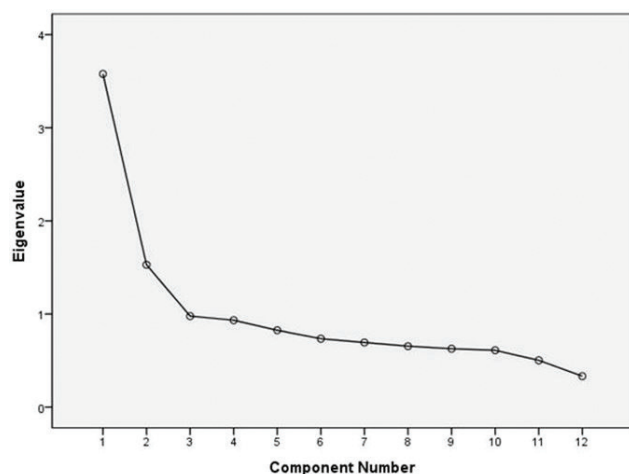


Figure 1: Scree plot

Reliability: Cronbach's α coefficient, which indicates internal consistency, was determined to assess the reliability of the instrument. The Cronbach's α of the total 12 items of the cost-reduction practice instrument was .770, and those of the factors "consumable savings" and "equipment management" were .777 and .789, respectively.

DISCUSSION

Hospitals are heavily investing to survive and thrive in a changing medical environment, and accordingly, their interest in efficient management is increasing. Therefore, determining the level of cost-reduction activities of nurses, who serve significant roles in hospital management, is necessary. Nonetheless, finding a useful tool to measure it is difficult. Accordingly, the present study was conducted to test the reliability and validity of the cost-reduction practice instrument^[10]. This instrument was initially developed with 15 items without subfactors, but as a result of items analysis and

exploratory factor analysis in the present study, 12 items and two subfactors were extracted, and their explanatory power was determined to be 42.56%.

In the case of item 12, among the 15 items in the previous study, the correlation coefficient between each item and total items was .291, which was less than the criterion of .30. The item was not deleted because it describes the act of removing foreign material to prevent equipment failure and adjudged to be an item that should be included to measure the level of cost-reduction practice. Items 1, 5, and 7 were deleted as a result of the instrument validity test. Item 1 was "I have discarded leftover Betadine or alcohol pads after dressing," and item 7 was "I have collected E.O. gas bags, yellow paper, and nonwoven fabric used as instrument or wrapping paper of consumables in the central supply room and sent them for recycling." As items 1 and 7 were actions to be performed for infection control rather than as cost-reduction practice, their deletion was adjudged to be appropriate. Item 5 was "I have used patient urine specimen container as a drinking cup or drainage measurement container." As few nurses reported performing such behavior for cost reduction, deleting item 5 was also considered appropriate.

Items that constituted the two factors were as follows. The first factor consisted of items on whether nurses were using the consumables necessary for patient care for other purposes, and whether nurses were using the proper amount of consumables to perform nursing. The second factor included items specifically asking whether nurses were actively managing medical equipment used frequently in the hospital. Previous studies have also included such topics as cost reduction^[9] or material management^[5, 11] through the saving of consumables or hygienic material in nurses' cost-reduction efforts or

practice management indicators of nursing organizations. As nurse managers positively perceive the fact that their job performance includes the procurement and management of equipment^[12], the present instrument is judged to reflect properly the elements that measure the level of nurses' cost-reduction performance.

The cost-reduction practice of nurses, determined using an instrument that completed the final verification, showed mean scores ranging from 2.95 to 3.47 points; that is, the mean scores of all items were higher than the median score of the two points. This finding is similar to the result of 3.12 points^[7] measured using an instrument that is a modified and supplemented version of the instrument: many nurses show a positive level of performance on cost reduction. Among the cost-reduction practice items, the item "I have never kept ward consumables in my possession for personal use" scored the highest point of 3.47, which indicated the honesty of nurses and their self-restraint from taking hospital supplies for personal use. Among the 12 items, the lowest score of 2.95 points was obtained for the item "If fluid or other foreign material falls on the infusion pump, I wipe it off immediately to prevent equipment failure." Overall, it may be necessary to reinforce the guidelines for accurate equipment management practice, as the practice on consumable management is positive while that on equipment management is low. The reliability of both the current 12-item questionnaire and the 15-item questionnaire developed in a previous study^[10] measured by Cronbach's α was .769. Notwithstanding the fact that reliability increases as the number of items increases, owing to the increase in Cronbach's α , the reliability of the instrument was confirmed to maintain internal consistency despite the deletion of three items.

From testing the reliability and validity of the instrument, the cost-reduction practice instrument was determined to be composed of the use of consumables and equipment management practice. In addition, nurses generally used hospital supplies and equipment appropriate for their intended use when the level of cost-reduction practice was determined, and nurses were using these resources with a certain level of interest in management.

The significance of the present study lies in its confirmation of the usability of a cost-reduction practice instrument by testing the reliability and validity of the instrument, which was previously developed in

a situation where instruments to identify the level of nurses' cost reduction practice was lacking. Further, the advantage of the instrument is that it can be easily used because the instrument consists of only 12 items. The limitation of the present study is that criterion-related validity test, which determines relevance to a particular criterion, was not conducted. As the development of an instrument should be based on rational and logical evidence in terms of validity test, criterion-related validity test would be desirable for future studies.

CONCLUSION

The present study conducted item and exploratory factor analyses to test the construct validity of a previously developed instrument for measuring cost-reduction practice. The verified 12-item instrument consisted of 12 items categorized into the two factors of reduction in consumables and equipment management, with 10 and 2 items, respectively. The reliability of the instrument was tested by determining internal consistency, and the reliability of the instrument was confirmed, based on the high internal consistency of the items included in the two factors. Lastly, the content validity, construct validity, and internal consistency of the cost-reduction practice instrument were affirmed by the results of two previous studies. Therefore, the instrument is deemed appropriate for measuring the level of nurses' cost-reduction practice.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Hong HS, Kim YS. A study on the performance analysis of knowledge and attitude about inventory management of woman nurses. *Korean International Accounting Review*. 2004 Oct 31;11:87-101. <http://www.dbpia.co.kr/Article/NODE01178174>
2. Kwon KH, Kim DY, Cho DY. The Analysis of the Impact Factors in Hospital's Management Performance Indicator. *Journal of Industrial Economics and Business*. 2017;30(1):105-22. DOI :10.22558/jieb.2017.02.30.1.105

3. Park BS, Lee YK, Kim YS. Efficiency evaluation of general hospitals using DEA. *The Journal of the Korea Contents Association*. 2009;9(4):299-312. DOI:10.5392/JKCA.2009.9.4.299
4. Yoo DK. A study on quality perceptions and satisfaction for medical service marketing. *J Korean Acad Nurs Admin*. 1996 Mar 31;2(1):97-114. <http://www.ndsl.kr/ndsl/search/detail/article/articleSearchResultDetail.do?cn=JAKO199628835723165>
5. Brady DJ, Cornett E, DeLetter M. Cost reduction: what a staff nurse can do. *Nurs Econ*. 1998;16(5):273-4.
6. Hong YM. A study on the consciousness of economic ethics in nursing students. *J Korean Acad Nurs Admin*. 2003 Sep 30;9(3):429-45. <http://www.dbpia.co.kr/Journal/ArticleDetail/NODE06641265>
7. ParkGJ,ImGM.Factorsaffectingthecost-reduction practice of clinical nurses. *The Korean Journal of Health Service Management*. 2016;10(2):49-58. DOI:10.12811/kshsm.2016.10.2.049
8. Lee TW. Economic awareness, economic knowledge, and attitude toward cost-effectiveness in nursing of hospital nurses. *J Korean Acad Nurs Admin*. 2003 Feb 30;9(1):103-12. <http://www.dbpia.co.kr/Journal/ArticleDetail/NODE06641240>
9. Song GN, Song SN, Hwang US, Gu BN, Choe HS, Lee SY. Case report on the activities for cost reduction and performance improvement in the central supply room in a university hospital. *Journal of Korean Society of Quality Assurance in Health Care*. 1999;6(1):150-60.
10. Choi MO. Factors affecting nurses' cost-reduction practice: focused on economic consciousness & attitude and knowledge on insurance cost [master's thesis]. Daejeon, South Korea: Eulji University; 2009.52p.
11. Gang GH, Han YH. A study on performance measurement indicators of nursing department in a hospital. *The Journal of Korean Nursing Administration Academic Society*. 2009;15(1):106-15.
12. Ntlabezo ET, Ehlers UVJ, Booyens USW. South African nurse managers' perceptions regarding cost containment in public hospitals. *Curatiosis*. 2004;27(3):34-42.

Periodontal Disease and CRP Relatedness in Korean Adults

Jin-ho Chun¹, Jung-hwa Lee², Yu-hee Lee³

¹Department of Preventive Medicine, Inje University School of Medicine, Korea; ²Department of Dental Hygiene, College of Nursing and Healthcare Sciences, Dong-Eui University; ³Department of Dental Hygiene, Taegu Science University, Daegu, Korea

ABSTRACT

Background/Objectives: Healthy teeth and oral health are essential to keep health. With more attention to oral health in the ageing era, periodontal disease, the main factor which impedes oral health, draws more attraction. This study tries to observe an association between periodontal disease and C-reactive protein (CRP) in Korean adults, to reevaluate the importance and necessity of oral healthcare in national health promotion, and to provide the grounds for follow-up research.

Method/Statistical analysis: From the raw data of the 6th 2015 National Health and Nutrition Examination Survey, 3,760 samples that meet the conditions of this study were selected as study subjects. With the use of SPSS (ver 22.0), weight based complex sampling analysis was conducted with the study subjects. Depending on the prevalence of periodontal disease, average value analysis, Chi-square test and OR (95% CI) were compared in terms of CRP. To evaluate the influence of CRP periodontal disease on a rise in a CRP value (more than 1.0 mg/L), multinomial logistic regression analysis was conducted.

Findings: Regarding CRP distribution, less than 1.0 mg/L accounted for 72.5%; more than 1.0 mg/L 27.5%; the average value (range) was 1.20 (0.09~20.01) mg/L. The average value of CRP was 1.38 mg/L when there was the prevalence of periodontal disease, and was 1.13 mg/L where there wasn't periodontal disease (P=.010). The rate (%) of more than CRP 1.0 mg/L was significantly higher when there was the prevalence of periodontal disease than when there wasn't periodontal disease (OR (95% CI) = 1.57 (1.32~1.87), P<0.0001). According to the multinomial logistic regression analysis, after the correction of the study subjects' characteristics, OR (95% CI) of high CRP (more than 1.0 mg/L) was 1.26 (1.04~1.53) when there was the prevalence of periodontal disease. The prevalence of periodontal disease significantly influenced a rise in a CRP value (P=.020).

Improvements/Applications: When there was periodontal disease, a CRP value increased. Periodontal disease is a typical oral disease which is not treated carefully despite its high prevalence rate. A rise in a CRP value can influence systemic health. Therefore, it is necessary to enhance the importance of periodontal disease care not only for oral health, but for systemic health promotion. It is urgent to come up with an active plan of periodontal disease care for the whole nation. In addition, it is required to develop a practical support program and activate relevant research.

Keywords: CPI, CRP, Oral disease, Oral health, Periodontal disease

INTRODUCTION

Healthy teeth and oral health are essential to keep health through proper nutrition intake¹, and especially are very important to keep life in the ageing era².

Along with dental caries, periodontal disease is a typical cause of tooth loss and other health disorders. According to Health Insurance Review and Assessment Service, gingivitis and periodontal disease were ranked

Corresponding Author:

Yu-hee Lee
Department of Dental Hygiene,
Taegu Science University, Daegu, Korea
Email: eu1983@naver.com*2

in the second position of insurance common diseases of outpatients³. The increase rate of periodontal disease reached 15.5%, and consequently the rising social and economic burdens for the disease are a critical issue.

Periodontal disease is an oral disease that occurs mainly with one's getting old. It is an inflammatory lesion that triggers tooth loss when the host reaction to the bio-film and bacteria generated in the tooth surface destroys periodontal tissues^{4,5}. Recently, there are many reports that toxin of bacteria, one of multiple causes for periodontal disease, is delivered to a blood vessel and thereby arouses bacteremia or systemic immunoinflammation, or the inflammatory mediator generated by periodontal lesion is moved to the whole body through blood current and influences systemic disease^{6,7}. Periodontal tissues play a role to store bacteria, their byproducts, and inflammation and immunity mediators, and their influence is given to other organs through blood vessels, and consequently they can become the risk factor of cardiovascular disease⁸.

In order to prove that inflammation serves as a critical role for pathological mechanism, inflammatory markers, such as C-reactive protein (CRP), fibrinogen, and serum amyloid A (SAA), are used. Nevertheless, CRP useful at actual clinical settings attracts attention as an objective marker^{9,10}. Sanders et al.^[11] and Fitzsimmons et al.¹² reported that CRP was found in periodontal disease patients' gingival cervical fluid and saliva. Paraskevas et al.¹³ revealed that patients with periodontal disease had a higher value of CRP in serum than patients without the disease. Periodontal disease is a chronic inflammatory disease. Reportedly, patients with periodontal disease had increased inflammatory markers like CRP and the treatment of periodontal disease reduced the degree of systemic inflammation¹⁴.

As such, with rising attention to periodontal disease, many relevant studies have been conducted. Nevertheless, there are a few reports about object big data using the inflammatory marker 'CRP'. Therefore, this study tried to utilize the big data of the 6th 2015 (3rd year) National Health and Nutrition Examination Survey in order to observe an association between periodontal disease and CRP in Korean adults and reemphasize the importance of oral health care including periodontal disease care in the pursuit of health promotion and thereby to suggest the grounds for follow-up research.

MATERIALS AND METHOD

Study subjects: The raw data of the 6th 2015 (3rd year) National Health and Nutrition Examination Survey was used. Of 7,380 samples, 5,945 adult samples were first extracted with the exception of 1,435 persons aged less than 19. And then, 2,185 adult samples with missing values in main variables were excluded. Finally, 3,760 adults were used as study subjects.

Research performance: This study was conducted after the review procedure of the Institutional Review Board of Inje University (INJE 2017-04-015).

From the raw data of the 6th 2015 National Health and Nutrition Examination Survey, oral healthcare types, values of periodontal status examination CPI, periodontal disease prevalence, and CRP measures were utilized.

Data analysis: Since the raw data of National Health and Nutrition Examination Survey were extracted by two-phase stratified cluster sampling, rather than simple random sampling, this study conducted complex sample analysis. In other words, complex sampling was conducted in the way of applying stratified and cluster variables and putting weight of questionnaire and examination survey.

To find the study subjects' oral healthcare patterns, periodontal disease prevalence, average CRP, frequency analysis and descriptive statistical analysis were conducted. To compare the average value of CRP depending on periodontal disease prevalence, independent sample t-test was conducted. To find a CRP value depending on periodontal disease prevalence, Chi-square test was conducted. To observe the influence of periodontal disease on a rise in a CRP value, regression analysis was conducted.

For statistical analysis, this study utilized SPSS ver 22.0 (IBM corp., Armonk, NY, USA).

RESULTS AND DISCUSSION

RESULTS

Oral health and care characteristics: The latest 1-year oral examination rate was 33.1%, and the experience rate of dental clinic visit was 53.5%. The latest 1-year gum disease treatment rate was 13.0%. Regarding the number of toothbrushing times, 0-1 time accounted for 9.4%; 2

times 16.9%; and more than 3 times 73.7%. Regarding the use of oral care products, dental floss accounted for 25.3%; interdental brush 21.2%; gargle 22.0% [Table 1].

Table 1: Oral health and care characteristics (N = 3760)

Variables	Group	N (%)
Oral examination	Yes	1228 (33.1)
	No	2532 (66.9)
Visit dental clinic	Yes	2038 (53.5)
	No	1722 (46.5)
Gum disease treatment	Yes	535 (13.0)
	No	3225 (87.0)
Toothbrushing frequency (times per day)	0-1	395 (9.4)
	2	607 (16.9)
	3	1333 (37.1)
	4 or more	1425 (36.6)
Use of floss	Yes	875 (25.3)
	No	2885 (74.7)
Use of interdental brush	Yes	724 (21.2)
	No	3036 (78.8)
Use of gargle solution	Yes	855 (22.0)
	No	2905 (78.0)

Values are presented as number (weighted %).

Morbidity of periodontal disease: As the result of CPI measurement, the CPI 3 (shallow periodontal pockets) and CPI 4 (deep periodontal pockets) of periodontal tissues were categorized in the periodontal disease prevalence group. When any of six measured regions was involved in shallow periodontal pocket group and deep periodontal pocket group, it was categorized in the periodontal disease prevalence group for all. According to the analysis, periodontal disease prevalence rate was 29.3% (1,254 study subjects) [Table 2].

Table 2: Morbidity of periodontal disease

Variables	Group	N (%)
Periodontal disease	No	2506 (70.7)
	Yes	1254 (29.3)

CRP results of the total subjects: Regarding CRP distribution, less than 1.0 mg/L accounted for 72.5%; 1.0-2.9 mg/L 19.5%; 3.0-9.9 mg/L 6.6%; more than 10

mg/L 1.5%. The mean was 1.20 mg/L. Based on the 1.0 mg/L which is the reference of normal range of a healthy person, less than 1.0 mg/L accounted for 72.5%; more than 1.0 mg/L 27.5% [Table 3].

Table 3: CRP results of the total subjects

CRP	N (%)
<1.0 mg/L	2670 (72.5)
1.0-2.9 mg/L	762 (19.5)
3.0-9.9 mg/L	264 (6.6)
≥10 mg/L	64 (1.5)
M±SE (Min.~Max.)	1.20 ± 0.04 (0.09~20.01)
<1.0 mg/L	2670 (72.5)
≥1.0 mg/L	1090(27.5)

Values are presented as number (weighted %)

CRP: C-reactive protein

Level of mean CRP according whether the periodontal disease: The average value of CRP was compared depending on periodontal disease prevalence. When there was periodontal disease prevalence, the average value of CRP was 1.38 mg/L; when there wasn't periodontal disease prevalence, it was 1.13 mg/L. Therefore, the average value of CRP when there was periodontal disease prevalence was significantly higher (P=.010) [Table 4].

Table 4: Level of mean CRP according whether the periodontal disease

Periodontal disease	CRP (mg/L)	P
No (n = 2506)	1.13 ± 0.05	.010
Yes (n = 1254)	1.38 ± 0.08	

Values are presented as mean±standard error

P by independent sample t-test.

The higher CRP rate (≥ 1.0 mg/L) whether the periodontal disease: The rate (%) of more than CRP 1.0 mg/L depending on periodontal disease prevalence was compared. As a result, the rate (%) of more than CRP 1.0 mg/L when there was periodontal disease prevalence was significantly higher than the rate when there wasn't periodontal disease prevalence (OR (95% CI) = 1.57 (1.32~1,87), P<0.0001) [Table 5].

Table 5: The higher CRP rate (≥ 1.0 mg/L) whether the periodontal disease

Periodontal disease	CRP higher (≥ 1.0 mg/L) [n/N (%)]	OR (95% CI)	P
Yes	428/1254 (34.1)	1.57 (1.32~1.87)	<.0001
No	662/2506 (24.8)	1.00	

The influence of periodontal disease on the rate (%) of more than CRP 1.0 mg/L: According to multinomial logistic regression analysis, in the condition that the study subjects' characteristics were corrected, when there was periodontal disease prevalence, OR (95% CI) of high CRP (more than 1.0 mg/L) was 1.26 (1.04~1.53). Therefore, periodontal disease prevalence significantly influenced the rate (%) of more than CRP 1.0 mg/L ($P=.020$).

When the study subjects were highly aged and involved in smoking group, and had a high BMI, OR (95% CI) of high CRP (more than 1.0 mg/L) was statistically and significantly high [Table 6].

Table 6: Influence of periodontal disease on the higher CRP rate (≥ 1.0 mg/L)

Variable		OR (95% CI)	P
Periodontal disease	No	1.00	.020
	Yes	1.26 (1.04~1.53)	
Gender	Male	1.00	.476
	Female	1.10 (0.85~1.43)	
Age	19-39	1.00	.035
	40-59	0.86 (0.67~1.10)	
	60-	1.15 (0.90~1.47)	
Smoking	No	1.00	.018
	Past	1.13 (0.85-1.51)	
	Current	1.51 (1.13-2.03)	
Drinking	No	1.00	.128
	Yes	0.86 (0.71-1.05)	
BMI (kg/m ²)	18.5-22.9	1.00	.000
	23.0-24.9	1.66 (1.29~2.12)	
	≥ 25	3.44 (2.82~4.21)	
Oral examination	Yes	1.00	.555
	No	1.06 (0.87-1.31)	
Toothbrushing (>3 times) per day	Yes	1.00	.186
	No	1.13 (0.94-1.36)	

DISCUSSION

This study tried to observe an association between periodontal disease and CRP in Korean adults, and to reevaluate and emphasize the importance and necessity of oral healthcare in national health promotion.

Based on the result of CPI measurement, the prevalence rate of periodontal disease that needs treatment was 29.3% of the study subjects. According to Health Insurance Review and Assessment Service, gingivitis and periodontal disease were ranked in the second position of insurance common diseases of outpatients, and the number of patients who had treatment rapidly increased from 8,039,812 in 2011 to 13,435,655 in 2015¹⁴. According to the 2013 OECD statistics of dental expenditure, the average OECD rate was 55%, whereas the average rate in Korea reached 84%¹⁵. Many studies proved that the periodontal disease prevalence rate in Korea was serious. If there is no preparation, it is expected that the prevalence rate rises more and thereby social and economic burdens get heavier.

The average value of CRP was 1.38 mg/dL when there was periodontal disease, and was 1.13 mg/dL when there wasn't periodontal disease ($P=.010$). Therefore, the rate (%) of more than CRP 1.0 mg/dL was significantly higher when there was periodontal disease than when there wasn't periodontal disease (OR (95% CI) = 1.57 (1.32~1.87), $P<0.0001$).

It indicates that the prevalence of periodontal disease leads to a rise in a CRP value in body. Kim et al.¹⁶ and Han et al.¹⁷ reported that the inflammation caused by periodontitis was spread to the whole body through blood circulation and emphasized that periodontal tissues became the moving path of inflammation. Loss et al.¹⁸ conducted comparative research on CRP concentrations between 107 periodontitis patients and 43 persons as a control group and proved that periodontitis had a significant correlation with CRP. Domestically, Lee et al.¹⁹ classified a few of 11 persons into the health group and the experimental group with severe periodontal disease and then measured a CRP value, and consequently revealed that the experimental group had a higher CRP concentration than the health group. This result was consistent with the result of this research.

It was found that the prevalence of periodontal disease lead to an increase in a CRP value. Marcaccini et al.²⁰ reported that in case of a CRP value increased by

inflammatory response, after periodontal treatment, the values of inflammatory markers like MMP-8, MMP-9, and tissue inhibitor of MMP-2 were reduced. Konopka L et al.²¹ also presented the same opinion. Relevant studies showed that after the proper treatment of periodontal disease, a CRP value was decreased. In this study, the subjects who had the prevalence of periodontal disease were compared in terms of CRP depending on oral health patterns, but there was no significant result due to limited data. However, Park et al.²² revealed that calculus index was changed statistically and significantly depending on toothbrushing type. Based on the results of multiple studies, good oral health patterns for oral care is of importance and an effective method needs to be found.

According to multinomial logistic regression analysis, OR (95% CI) of the rate of more than CRP 1.0 mg/L was 1.26 (1.04~1.53) when there was the prevalence of periodontal disease. Therefore, the prevalence of periodontal disease significantly influenced a high CRP value (P=.020). It indicates that the prevalence of periodontal disease leads to an increase in a CRP in body after the correction of the study subjects' characteristics. This result is consistent with the results of many studies in references.

Given all, it was observed that periodontal disease had a significant association with CRP. Periodontal disease is considered to be a critical factor for a rise in a CRP value.

This study has some limitations. National Health and Nutrition Examination Survey, whose data was used in this study, was cross-sectional. There was a limitation to the explanation of causal relationship. Nevertheless, in the circumstance where there is not much research on CRP, this study is meaningful in the point that it first tried to observe an association between periodontal disease and CRP in Korean adults with the use of big data of National Health and Nutrition Examination Survey. In follow-up research, it is expected to utilize more data to overcome the limitations and make a good plan.

CONCLUSION

This study utilized the raw data of the 6th 2015 (3rd year) National Health and Nutrition Examination Survey and observed an association between Korean adults' periodontal disease and C-reactive protein (CRP). The results are presented as follows:

1. The number of patients with periodontal disease prevalence who needed treatment was 1,254(29.3%).
2. Regarding the average value of CRP, when there was periodontal disease prevalence, it was 1.38 mg/L; when there wasn't periodontal disease prevalence, it was 1.13 mg/L (P=.010). The rate (%) of more than CRP 1.0 mg/L was significantly higher when there was periodontal disease prevalence than when there wasn't periodontal disease (OR (95% CI) = 1.57 (1.32~1.87), P<0.0001).
3. According to multinomial logistic regression analysis, periodontal disease prevalence significantly influenced the rate of more than CRP 1.0 mg/L (%) (OR (95% CI)= 1.26 (1.04~1.53), P=.020).

Given the results, a CRP value increased when there was periodontal disease prevalence. Periodontal disease is a typical oral disease which is not treated carefully despite its high prevalence rate. It is necessary to enhance the importance of periodontal disease care not only for oral health, but for systemic health promotion. It is urgent to come up with an active plan of periodontal disease care for the whole nation. In addition, it is required to develop a practical support program and activate relevant research.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: CRP relatedness in Korean adults

REFERENCES

1. Bok HJ, Ahn BS, Lee HS. "The effect of health behavior and oral health behavior on community periodontal index in Korean adult." *Korean J Health Serv Manage.*2013;7: 93-100. (DOI :10.12811/kshsm. 2013.7.2.093)
2. Gilbert GH, Foerster U, Duncan RP. "Satisfaction with chewing ability in a diverse sample of dentate adults." *J Oral Rehabil.* 1998;25(1): 15-27.
3. "Health Insurance Review and Assessment Service." 2016, Retrieved August 2.
4. Cappelli DP, Mobley CC. "Prevention in clinical oral health care." 1th ed. Mosby, St. Louis, 2008, 56-57.

5. Ministry of Health and Welfare: "The Korea National Health and Nutrition Examination." Korea Centers for Disease Control and Prevention, Cheongwon, 2012.
6. Williams RC, Barnett AH, Claffey N et al. "The potential impact of periodontal disease on general health: a consensus view." *Curr Med Res Opin* 2008;24(6):1635-43.
7. Amar S, Han X. "The impact of periodontal infection on systemic diseases." *Med SciMonit*, 2003, 9(12) : RA291-9.
8. "Board of Trustees of the American Academy of Periodontology. Parameter on systemic conditions affected by periodontal disease." *J Periodontol*, 2000, 71(5 Suppl) : 880-3.
9. Ross R. "Atherosclerosis-an inflammatory disease." *N Engl J Med* 1999, 340 : 115-26.
10. Pearson TA, Mensah GA, Alexander RW et al. "Markers of inflammation and cardiovascular disease: application to clinical and public health practice." A statement for healthcare professionals from the Centers for Disease Control and Prevention and the American Heart Association. *Circulation*, 2003, 107:499-511.
11. Sanders AE, Slade GD, Fitzsimmons TR et al. "Physical activity, inflammatory biomarkers in gingival crevicular fluid and periodontitis." *J Clin Periodontal*, 2009, 36: 388-95.
12. Fitzsimmons TR, Sanders AE, Bartold PM, Slade GD. "Local and systemic biomarkers in gingival crevicular fluid increase odds of periodontitis." *J Clin Periodontal*, 2010, 37: 30-6.
13. Paraskevas S, Huizinga JD, Loos BG. "A systematic review and meta-analyses on C-reactive protein in relation to periodontitis." *J Clin Periodontal*, 2008, 35: 277-90.
14. D'Aiuto F, Parkar M, Andreou G, et al. "Periodontitis and systemic inflammation: control of the local infection is associated with a reduction in serum inflammatory markers." *J Dent Res*, 2004, 83(2) : 156-60.
15. OECD Health Statistics 2013.
16. Kim JH, Kim KR, Jin HJ et al. "The Effect of Polycan-Calcium Gluconate Complex on Inflammatory Mediators from Periodontitis Patients." *J Dent HygSci*, 2014, 14(2):223-9.
17. Han SH, Kim KH, Yang SM et al. "Mechanism by which periodontitis may contribute to atherosclerosis." *Journal of Periodontal & Implant Science*, 2002, 32:837-46.
18. Loos BG, Crandijk J, Hoek FJ et al, "Elevation of systemic markers related to cardiovascular diseases in the peripheral blood of periodontitis patients." *J Periodontal*, 2000, 71 : 1528-34.
19. Lee JH, Kwon JS, Park WS et al. "C-reactive Protein Detection in Gingival Crevicular Fluid as an Acute Systemic Inflammation Biomarker in Patients with Severe Periodontitis." *Korean J of Dental Materials*, 2013, 40(4):321-6.(DOI : 10.14815/kjdm.2013.12.40.4.321)
20. Marcaccini AM, Meschiari CA, Zuardi LR, et al. "Gingival crevicular fluid levels of MMP-8, MMP-9, TIMP-2, and MPO decrease after periodontal therapy." *J Clin Periodontal*, 2010,37:180-90.
21. Konopka L, Pietrzak A, Brzezińska-Błaszczak E. "Effect of scaling and root planning on interleukin-1 β , interleukin-8 and MMP-8 levels in gingival crevicular fluid from chronic periodontitis patients." *J Periodontal Res*, 2012, 47: 681-8.
22. HS Park, JS Kim, JM Kim et al. "Oral Hygiene Management and Factor Analysis of the Community People." *Journal of Dental Hygiene Science*, 2010, 10(1):11-6.

Effect of Simulation-based Training for Neonatal Care on Critical Thinking, Critical Judgement, and Problem Solving Ability in Nursing

Hyun A Nam¹, Ae Young Lee², Miok Kim³

¹Assistant Professor, Dept. of Nursing, Howon University, Korea; ²Assistant Professor, Dept. of Nursing, Gangneung Yeongdong University, Korea; ³Assistant Professor, College of Nursing, Dankook University, Korea

ABSTRACT

Background/Objectives: This study aimed to investigate the differences in their critical thinking, clinical judgment, and problem-solving ability between before and after the simulation training of nursing students.

Method/Statistical analysis: Convenience sampling was made among seniors at a single department of nursing who had acquired all the theories in the area of pediatric nursing and finished clinical training and understood the purpose of this study and consented to participation in the study. 46 students (21 experimental and 25 control) participated in Korea. The data was analyzed the SPSS WIN program.

Findings: The experimental group in the study showed greater increase in clinical judgment and problem solving ability in pre-test and post-test than the control group did. However, no statistically significant differences in critical thinking between groups were observed.

Improvements/Applications: It is therefore necessary to give nursing education through simulation training that enables nursing students to practice repetitively in a safe environment with the objective of promoting positive thinking based on knowledge.

Keywords: *Critical thinking, Clinical judgement, Problem solving ability, Simulation, Nursing, Student*

INTRODUCTION

As more severe diseases and a diversity of life-support systems based on the development of modern medical science led to the greater demand for a high-level nursing competence, supplying nursing workforce with competence necessary in clinical practice has become one of the important aspects of the changes in nursing education ^[1]. In this context, the Korean Accreditation Board of Nursing Education^[2] has specified a required curriculum, which includes at least 1,000 hours of clinical training as well as various types of theoretical knowledge needed by nurses, and recommended clinical training in specialized institutions of a certain size

or larger in pursuit of good-quality clinical training. However, training institutions need to bear a heavy burden so that clinical training can meet such a demand at the changing clinical sites^[3], and it is actually difficult for nursing students to perform nursing personally at clinical sites due to patients' better sense of rights and the safety issues.

Nursing training institutions are searching for diverse methods to achieve learning performance, paying attention to the improvement in nurses' critical thinking, in clinical judgment regarding nursing priorities in many different situations^[4], and in problem-solving methods of promoting the ability to settle those situations. As a dynamic process of combining practice and theory by representing a clinical situation similar to the actual one to promote nursing students' participation in a safe environment since the 2000s^[5], simulation-using training has been utilized as an alternative or complementary type of training to clinical training for repetitive training in skills, which nursing students can hardly apply to patients,

Corresponding Author:

Miok Kim

Assistant Professor, College of Nursing
Dankook University, Korea

Email: aprilsea@hanmail.net

and proven to be effective in improving confidence in clinical competence, critical thinking, and problem-solving^[6,7]. This is also highly evaluated because it can make up for the limitations that it is impossible to standardize the experiences of every student in clinical training and that it is impossible to make developmental feedbacks or discussions about the situation concerned right after the experience with the patient^[8].

Nurses are required to be equipped with critical thinking^[9] and clinical judgment, which are important elements affecting the evidence-based decision-making process in many different clinical situations. It is possible to improve these elements through the learning process of using conventional and innovative methods to clarify diverse views concerning different types of unfamiliar issues and finding and asking core questions, which may lead to better solutions, through simulation training^[10].

As the number of high-risk newborn infants is on the increase in the area of pediatric nursing during diverse types of clinical training^[11] and an emergency situation can definitely change the patient's prognosis due to time for treatment by the medical staff and quality nursing^[12], there is a great demand for competent nurses in a newborn emergency situation. However, it is even more likely to be limited not only because of the decrease in the number of patients due to the drop in the birthrate but also because of the ethical issue of a latent threat to the patient's safety^[13]. In particular, it is unlikely to improve competence through personal nursing training for high-risk newborn infants at specific sites in case of hospitalization for artificial ventilation, including oxygen treatment, body temperature maintenance, nutrition, and infection control.

This study aimed to develop a scenario that represented a newborn emergency situation for nursing students about to graduate after acquiring all the theories in the area of pediatric nursing and finishing clinical training, apply it to simulation training, and determine its effects on their critical thinking, clinical judgment, and problem-solving ability.

MATERIALS AND METHOD

Research design: This is a quasi-experimental study of two-group pretest-posttest design that aimed to determine the effects of high-risk newborn nursing simulation training using Newborn Simulator (Newborn Hall human simulator, Gaumard, Miami, Florida, USA).

Simulation-based Training for Neonatal care: This study is simulation Training applied in the second term for seniors with the theme of a situation requiring cardiopulmonary resuscitation due to breath loss at the early stage of nursing for a meconium-stained newborn infant in a delivery room. This theme was chosen not only because early nursing for newborn infants is crucial but also because the most important type of primary nursing is to get breathing started on the basis of the fact that respiratory arrest is an emergency situation that frequently occurs in an intensive care unit for newborn infants and requires nurses to exert their competence.

Two professors of pediatric nursing drafted the scenario by analyzing medical records together with a nurse manager in a newborn room of a university hospital in Seoul and, then, by revising it with the advice of the medical staff in the ward; it was designed to enable them to experience simulation in a similar situation to the clinical site by creating an environment that allowed them to experience a similar situation to the clinical site. The scenario included a delivery model simulator in a delivery room and a standardized patient serving as a doctor and focused on utilization of the newborn simulator following the process of delivery. The simulation template for students, which contained the theme of this simulation, explanation of the situation, the purpose of the training, preparation items, and the training environment, was given to the students concerned before the fourth week of the training. This course was reviewed by a professor majoring in pediatric nursing as well as by two nursing professors full of experiences in simulation.

The program was composed of three sessions-orientation, skill training, and operation and evaluation-and its details are as follows:

Orientation: The first session was composed of orientation and pretest; it contained the explanation of the entire process of simulation and the scenario and the introduction to how to do simulation training test along with test for the core theories in the area of neonatal nursing.

Skill training: Skill training constituted the second session. At this stage, training in core nursing practice required by the scenario was performed in a total of six groups, each of which was composed of three or four persons. For the skill training, three instructors gave the students core skill training in a basic nursing room.

Operation and evaluation of simulation-based training for neonatal care: In the third session, a newborn simulator was used to allow individual students to experience simulation training and evaluate it. It took about 10-15 minutes for each student to get evaluated, and the students were asked to stay in the waiting room before and after the test with the objective of preventing contamination among them. They experienced early neonatal nursing and coping with an emergency situation and were enabled to prepare for presentation necessary for debriefing in the waiting room after the training. During the debriefing session, all the students had time for getting together at a certain place to make presentations and discussions about their own experiences and strengths and weaknesses, consolidate the simulation situation, and give explanation and advice about their coping.

Participants and Data collection: Convenience sampling was made among seniors at a single department of nursing who had acquired all the theories in the area of pediatric nursing and finished clinical training and understood the purpose of this study and consented to participation in the study. 43 students (93.5%) were female and 3 (6.52%) were male; every participant had got simulation training in other subjects. 46 students (21 experimental and 25 control) in a nursing college who met the purpose of this study were finally sampled; the proper sample size for this study was 34 persons, as determined by principal statistical testing using a G*power 3.10 program at the significance level (α) of 0.05, testability ($1-\beta$) 80%, and the medium effect size (d) of 0.5. Of 47 students to whom the same curriculum was applied and who applied for the subject for pediatric nursing simulation training, one who gave no consent to participation in the study was excluded; the post-hoc test found that the sample size was at a proper level with testability 96% and the effect size 0.89. Testability 80% was based on Lee and Kim [6], who analyzed the effects of simulation training in the area of obstetrical nursing. For data collection, the researcher gave the participants explanation about the purport and methods of the study, about the fact that it would not be revealed or used for any other purpose than that of this study, and about confidentiality and anonymity and asked them to give their consent to the participation before starting simulation training; measurement was performed using a self-administered questionnaire before and after starting the training.

Instruments

Critical thinking: The instrument developed by Yoon [14] was used to measure critical thinking. It had a total of 27 items on a five-point scale in seven areas—sound skepticism, intellectual fairness, objectivity, systemicity, carefulness, intellectual enthusiasm/curiosity, and self-confidence—with a higher score meaning a higher level of critical thinking. Cronbach's α was .84 in Yoon [14] and .93 in this study.

Clinical judgement: LCJR, which had been developed by Lasater [15], translated by Shim [16], and adapted by Hah [17], was used to measure clinical judgment. It had a total of 11 items: 3 in the area of cognition (focused observation, differences from expectation, and information pursuit), 2 in the area of interpretation (priority in data and data comprehension), 4 in the area of reaction (calm and confident attitude, clear communication, well-planned intervention/fluency, and skillfulness), and 2 in the area of retrospection (evaluation/self-analysis and willingness to improve). The score for each item ranged from 1 to 4, with the total score of 11-44; the higher score, the higher level of clinical judgment about nursing. Cronbach's α was .88 at the time of its development, .74 in Hah [17], and .87 in this study.

Problem solving ability: Personal-Problem Solving Inventory, which had been developed by Heppner and Petersen [18] and translated and adapted by Kang, Song, and Park [19], was used to measure problem-solving ability. The sub-areas of problem-solving ability were self-confidence, access-avoiding style, and self-control. The instrument had a total of 32 items on a six-point likert scale, with the scores ranging from 1 totally disagree to 6 totally agree; the scores for all the items were added up and divided by the number of the items to obtain the mean, with a higher score meaning better problem-solving ability. For reliability of this instrument, Cronbach's α was .89 at the time of its development and .94 in this study.

Data Analysis: The collected data were statistically processed using SPSS WIN 23.0 and were analyzed as follows:

1. Descriptive statistics, which involved the real number and percentage, was used to analyze the participants' general characteristics.
2. The mean and standard deviation were used to analyze the nursing students' critical thinking,

clinical judgment, and problem-solving ability before and after simulation training.

3. T-test was performed to analyze the differences in the nursing students' critical thinking, clinical judgment, and problem-solving ability before and after simulation training.

RESULTS AND DISCUSSION

The differences in critical thinking, clinical judgment, and problem-solving ability of nursing students between before and after simulation training are as presented in Table 1.

Table 1: Difference of critical thinking, critical judgement, and problem solving ability of nursing students (N= 46)

	Range of scale	Range of score		Pre-test	Post-test	Difference	t (p)
				Mean ± SD	Mean ± SD	Mean ± SD	
Critical Thinking	1~5	27~135	Exp.	64.61 ± 10.13	68.52 ± 11.93	3.90 ± 12.90	.038 (.970)
			Con.	67.87 ± 13.23	72.00 ± 9.07	4.12 ± 16.67	
Critical Judgement	1~4	11~44	Exp.	28.28 ± 4.45	30.90 ± 4.80	2.61 ± 5.08	2.512(.018)
			Con.	36.00 ± 2.82	33.25 ± 3.77	-2.75 ± .31	
Problem Solving Ability	1~6	30~180	Exp.	79.37 ± 7.65	86.75 ± 2.91	7.37 ± 8.21	-2.774(.010)
			Con.	77.14 ± 14.73	68.61 ± 15.43	-8.52 ± 15.27	

Exp. =Experimental group (n=21), Con. = Control group (n=25)

Simulation-based training is a new approach that enables one to use high-level thinking^[20] and is applied to improve clinical competence with a scenario based on an actual clinical situation along with a manikin, medical equipment, and healthcare and education professionals so that participants and students can learn a complicated situation with no serious problem in a safe environment.

While no statistically significant difference was found in critical thinking among the nursing students before simulation training, the score for critical thinking rose by 3.90±12.90 from an average of 64.61±10.13 (ranging from 27 to 135) before the training to 68.52±11.93 after the training in experimental group (t=.038, p=.970). This result seems to be due to the emphasis on critical thinking as principal training performance among the core abilities of nurses to perform principal roles in nursing education at the similar level to the previous studies at the above-average level of critical thinking^[21]. Critical thinking is a sub-area of the foundation skills, competencies, and character qualities, which are core skills required in the era of the Fourth Industrial Revolution, and is emphasized as an area of 4Cs (Critical thinking, Communication, Collaboration, and Creativity), which have been drawn as cognitive competence of the foundation skills^[22]. For nurses, in particular, it is an important factor for clinical competence in evidence-based decision-making^[9]; it is necessary to give continuous education to solve a given problem in pursuit of the best judgment in a clinical situation.

Simulation training made statistically significant differences in clinical judgment, which improved by 2.61±5.08 from an average of 28.28±4.45 (ranging from 11 to 44) before the training to 30.90±4.80 after the training in experimental group (t=2.512, p=.018). This result was at a lower level than 36.44 in Lim^[23], who used the same instrument to train seniors in nursing colleges to do respiratory aspiration nursing, and at a higher level than 25.32 in Kyung and Choi^[24], who applied simulation to deathbed nursing, supporting Jeffries's^[25] ideas that clinical judgment results from critical thinking and that simulation is a realistic, safe method of enabling nursing students to develop clinical judgment. Nursing education institutions aim to produce nursing professionals equipped with clinical competence based on scientific knowledge so that they can promptly exert problem-solving ability through correct clinical judgment when faced with a person having a health problem in many different situations. This study is significant in that simulation training in a similar environment to actual clinical practice has also improved clinical judgment among nursing students in the area of newborn emergency nursing; it is necessary to apply it in diverse and continuous ways so that knowledge acquired from conventional lectures can be utilized at clinical sites.

Simulation training made significant differences in the nursing students' problem-solving ability, which

improved by 7.37 ± 8.21 from an average of 79.37 ± 7.65 (ranging from 30 to 180) before the training to 81.75 ± 2.91 after the training ($t = -2.774$, $p = .010$). This result was at a lower level than 102.42 in Kim and Kim^[26], who used the same instrument to measure problem-solving ability of sophomores in a nursing college taking a lecture regarding basic nursing, and then 3.97 in Cho^[27], who used a similar instrument to measure nursing students' problem-solving ability. However, it is in the same context as Song^[28], who applied simulation with the theme of delivery and found problem-solving ability improved. Problem-solving ability, which requires capability to cope elastically with different levels of problem situations, can depend on grades and themes. However, problem-solving ability is the key to effective coping with and solution to any problem situation, is also considered an essential ability in many different occupation groups, and is particularly emphasized in nursing education^[29]. It is therefore necessary to give nursing education through simulation training that enables nursing students and participants to practice repetitively in a safe environment with the objective of promoting problem-solving ability through positive thinking based on knowledge. To put these results together, applying simulation training to newborn emergency nursing has positively improved the nursing students' critical thinking, clinical judgment, and problem-solving ability. It is said that one may become used to training, including clinical training, and continue with it, feeling that experiences are accumulated for themselves^[30].

CONCLUSION

Several repetitive sessions of training may enable learners to acquire skills and perform with confidence even in a difficult situation. Clinical training has an educational limitation that every student cannot be given standardized experiences of training due to the diversity of participants and situations. Also, more severe diseases and the development of medical technology have required nurses to become more competent. In such a situation, while there are a diversity of complicated attempts and tasks to change nursing education, instructors of nursing students need to make positive reviews and efforts to reach the utmost level of education; to do this, they need to develop and apply a diversity of simulation scenarios positively.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: None declared

REFERENCES

1. Gorski MS, Gerardi T, Giddens J, Meyer D, & Peters-Lewis A. Nursing Education Transformation. *AJN*, 2015;115(4):53-57. <http://dx.doi.org/10.1097/01.NAJ.0000463029.34765.8a>
2. Korean Accreditation Board of Nursing. Accreditation assessment standards for education of Korea (The course of the nursing bachelor's degree). Seoul: Korean Nurses Association (2014).
3. Song JH, & Kim MW. Study on clinical education for nursing in hospitals in Korea. *J Korean Acad Soc Nurs Educ*, 2013;19(2):251-264. <http://dx.doi.org/10.5977/jkasne.2013.19.2.251>
4. Yang JJ. Development and Evaluation of a Simulation-based Education Course for Nursing Students. *Korean J Adult Nurs*, 2008;20(4):548-560.
5. Bland AJ, Topping A, & Wood B. A concept analysis of simulation as a learning strategy in the education of undergraduate nursing students. *Nurse Educ Today*, 2011;31(7):664-670.
6. Lee WS, & Kim M. Effects and Adequacy High-fidelity Simulation-based Training for Obstetrical Nursing. *J Korean Acad Nurs*, 2011;41(4):433-443, <http://dx.doi.org/10.4040/jkan.2011.41.4.433>
7. Han SY. Effects of High-fidelity Simulation-based Education on Nursing Care for Patients with Acute Chest Pain. *J Korea Acad Ind Coop Soc*, 2014;15(3): 1515-1521. <http://dx.doi.org/10.5762/KAIS.2014.15.3.1515>
8. Medley CF, & Horne C. Using simulation technology for undergraduate nursing education. *Journal of Nursing Education. J Nurs Educ*, 2005;44(1):31-4.
9. Feng RC, Chen MJ, Chen MC, & Pai YC. Critical thinking competence and disposition of clinical nurses in a medical center. *JNR*, 2010;18:77-87.
10. Joo GE, Sohng KY, & Kim HJ. Effects of a Standardized Patient Simulation Program for Nursing Students on Nursing Competence, Communication Skill, Self-efficacy and Critical Thinking Ability for Blood Transfusion. *J Korean Acad Fundam Nurs*, 2015;22(1):49-58.

11. Kim SJ, Moon SY, Kim SH, Sim SY. Development of a Tool to Identify Severity of Illness Index in High Risk Newborns. *J Korean Acad Child Health Nurs*, 2007;13(2):136-146.
12. Anderson JM, &Warren JB. Using simulation to enhance the acquisition and retention of clinical skills in neonatology. In *Seminars in Perinatology*, 2011;53(2):59-67.
13. Rystedt H, & Lindstrom B. Introducing simulation technologies in nurse education; A nursing practice perspective. *Nurse Education in Practice*, 2001;1:134-141.
14. Yoon J. Development of an Instrument for the Measurement of Critical Thinking Disposition: In *Nursing [dissertation]*, The Catholic University;2004
15. Lasater K. Clinical judgment development: Using simulation to create an assessment rubric. *J NursEduc*, 2007;46(11):496-503.
16. Shim KK. The Reliability and Validity of the Lasater Clinical Judgement Rubric in Korean Nursing Students [master's thesis]. Kyung Hee University; 2012
17. Ha YK. The Effects of Debriefing Utilizing the Clinical Judgment Rubric on Nursing Students' Clinical Judgment, Knowledge and Self-Confidence [master's thesis]. Seoul National University; 2014
18. Heppner PP, & Petersen CH. The development and implications of a personal problem-solving inventory. *J COUNS PSYCHOL*, 1982;29:66-75. <http://dx.doi.org/10.1037/0022-0167.29.1.66>
19. Kang MH, Song YH, & Park SH. Relationships among metacognition, flow, interactions and problem solving ability in web-based problem based learning. *Journal of Research Institute of Curriculum Instruction*, 2008;12:293-315.
20. Yaeger KA, Kimberly A, Halamek LP, Loutis P, Coyle M, Murphy A, Anderson J, Boyle K, Braccia , McAuley J, Sandre G, &Smith BR. High-fidelity simulation-based training in neonatal nursing. *Advances in Neonatal Care*. 2004;4(6):326-331
21. Shin KA, & Cho BH. Professional Self-Concept, Critical Thinking Disposition and Clinical Competence in Nursing Students. *J Korean AcadFundamNurs*, 2012;19(1):46-56.
22. World Economic Forum. *New vision for education: Unlocking the potential of technology*. Colony/Geneva: World Economic Forum(2015).
23. Lim KC. Simulation-based Clinical Judgment and Performance Ability for Tracheal Suction in Nursing Students. *J Korean AcadSoc Home Care Nurs*, 2017;23(3):330-340.
24. Kyung. KI& Choi JY. Effect of Debriefing Based on the Clinical Judgment Model on Simulation Based Learning Outcomes of End-of-Life Care for Nursing Students: A Non-Randomized Controlled Trial). *J Korean Acad Nursing*, 2017;47(6):842-853. <https://doi.org/10.4040/jkan.2017.47.6.842>
25. Jeffries PR. *Simulation in Nursing Education*. New York, NY; National League for Nursing (2007).
26. Kim YH, &Kim YA. The Influence of Academic Self-efficacy, and Critical Thinking Disposition on Problem Solving Ability of Nursing Students. *Journal of the Korea Academia-Industrial cooperation Society*. 2016;17(9):589-598.
27. Cho GY. The Factor Influencing Problem Solving Ability of Nursing Students in Nursing Simulation Learning. *Journal of Fisheries and Marine Sciences education*, 2017;29(4):1083-1092. <https://dx.doi.org/10.13000/JFMSE.2017.29.4.1083>
28. Song YA. Effect of Simulation-based Practice by applying Problem based Learning on Problem Solving Process, Self-confidence in Clinical Performance and Nursing Competence. *Korean J Women Health Nurs*, 2014;20(4):246-254.
29. Lee WS, Park SH, & Choi EY. Development of a Korean problem solving process inventory for adults. *J Korean Acad Fundam Nurs*, 2008;15(4):548-557.
30. Kim JH, Moon. SY, Lee JE, &Lim ML. A Research on the interactions in practice of the nurse's college students in the nursing college. *J Korean AcadSocNursEduc*, 2001;7(2):207-216.

Moderating Effect of Depression on the Relationship between Subjective Health and Quality of Life in Patients with COPD

Young-Sook Kwon

Associate Professor, Department of Nursing, Joongbu University, Korea

ABSTRACT

Background/Objectives: Chronic obstructive pulmonary disease (COPD) is a chronic disease that deteriorates quality of life (QoL). This study examined how depression moderates the influence of subjective health on QoL in COPD patients.

Method/Statistical analysis: Data set from the 2014 and 2016 Korean National Health Examination Survey (KNHANES) was used. Subjects were 815 COPD patients, aged 41 to 80 years old. QoL was evaluated with EuroQol 5-dimension (EQ-5D). Depression was measured using the Patients Health Questionnaire-9 (PHQ-9). Moderation analysis was performed using depression as a moderator of the relationship between subjective health and QoL.

Findings: The mean EQ-5D index score of participants was 0.93. Disease-related (COPD) characteristic was not significantly related to QoL. The final model (model 3) in regression explained 33.1% of variance in QoL in COPD patients. Subjective health status was a very important factor influencing QoL. Subjective health status \times depression interaction was significant for QoL after adjusting control variables. Depression moderated the association between subjective health and QoL in individuals with COPD.

Improvements/Applications: Early screening and continuous care for depression in patients having COPD in the community could be helpful to alleviate depression and improve QoL.

Keywords: *Quality of life, Subjective health, Depression, Moderating effect, Chronic obstructive pulmonary disease.*

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) involves airflow limitation and respiratory symptoms of the airway and alveolar caused by exposure to deleterious particles or gaseous materials. The most commonly occurring illnesses include cough, dyspnea, and sputum production¹. COPD ranks third among the top 10 global causes of death in 2016². According to cause-of-death statistics of Korea in 2016, chronic lower respiratory diseases including COPD ranked seventh with a death rate of 13.7 per 100,000 population³. In Korea, COPD prevalence is found in 18.0% of adults over 45 years of age⁴. Nevertheless, research efforts on the quality of life (QoL) of COPD patients are lacking in Korea. The global population is aging and exposure to risk factors is expected to increase, leading to an increase in morbidity and mortality. Since COPD is an irreversible chronic disease, it is necessary to establish measures to improve and maintain QoL of patients.

The self-rated health (SRH) is accepted as barometer of health⁵. Previous study⁶ has demonstrated that SRH was significantly related to QoL. It is known to be an important factor affecting QoL among Korean adults. Chronic diseases are associated with poor SRH⁷. According to Jackson et al.⁸, subjects having COPD demonstrated significantly worse SRH in contrast to non-COPD subjects. In Korea, SRH has been utilized to assess the all-inclusive health status of individuals through the Korea National Health and Nutrition Examination Survey (KNHANES) since 1998. Two previous studies^{9,10} using data from the KNHANES has demonstrated that various factors are related to impaired QoL among patients with COPD; however, they did not consider the effect of the degree of subjective health. Evaluating subjective health status in COPD patients living in the community would be useful for comprehensively assessing their overall health status. Nevertheless, studies on the correlation between subjective health and QoL among COPD patients are limited in Korean populations.

Depression is common in COPD patients¹¹. Depression prevalence in COPD is known to range from 18.8%¹² to 41.6%¹³, varying between studies. But it is either untreated or overlooked in persons with COPD¹⁴. Inadequate treatment of depression is associated with poor QoL in COPD patients¹⁵. Thus, monitoring the mental status of COPD patients is of relevant importance. The identification of moderators capable of improving QoL is an important issue in chronic diseases like COPD. Depression was investigated using the Patient Health Questionnaire-9 (PHQ-9) from the 2014 KNHANES, which made this study possible. Therefore, this study was conducted to examine the effect of depression as a link between subjective health and QoL in COPD patients.

MATERIALS AND METHOD

Study participants: The data for this study was extracted from the KNHANES conducted in 2014 and 2016. In 2015, PHQ-9 was not investigated, so the data for 2015 were not used in the analysis. Total participants were 15,700. Of these, 6,641 subjects who received a pulmonary function test (PFT) were selected. In 2014, PFT was performed in adults aged 40 years or above and under 80 years of age. In 2016, PFT was targeted at people aged 40 years or more. For those aged 80 years or older, only those who can be examined were enrolled. The measurements for forced expiratory volume in 1 second (FEV_1), $FEV_1\%$ predicted, and forced vital capacity (FVC) were obtained. The diagnosis of COPD is derived from on the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines¹, which correspond post-bronchodilator FEV_1/FVC of < 0.7 . Using this criteria, a total of 904 peoples were classified as COPD patients. 89 subjects with missing answers were additionally excluded. Thus, 815 COPD patients were finally included in the analysis.

Research instruments: Quality of life (QoL) was utilized as the dependent variable. The EuroQol 5-dimension (EQ-5D)¹⁶ developed by EuroQol Group in 1990, was used to evaluate the level of QoL for participants. EQ-5D calculates the measurement about 5 dimensions (self-care, mobility, pain/discomfort, anxiety/depression, and usual activities). For each aspect, subjects pick out one of 3 severity magnitude (1, no problem; 2, some/moderate problems; 3, severe/

extreme problems). The dimensions are weighed and converted as EQ-5D index. EQ-5D index was administered by Korea Centers for Disease Control and Prevention in 2007. Hong et al.¹⁷ demonstrated that EQ-5D was a practical instrument for evaluating the QoL of COPD patients in Korea. The independent variable included subjective health status. Subjective health status was scored as 1 point for “very good”, 2 points for “good”, 3 points for “normal”, 4 points for “bad”, and 5 points for “very poor” in regards to how the participants thought about their own health. Higher scores indicated worse subjective health status. Depression was utilized as the moderating variable. Depression was estimated using PHQ-9¹⁸, which is a 9 item questionnaire used in primary care for depression screening. From among the questions, “How often did you suffer from the symptoms listed in the last two weeks?” was scored as 0 for “not at all”, 1 for “several days”, 2 for “more than a week”, and 3 for “almost every day”, and the total score ranged from 0 to 27. Higher scores indicated higher degrees of depression. Since the survey on depression (PHQ-9) was not conducted in 2015, 2015 data were excluded from analysis. For the control variables, socio-demographic characteristics (gender, age, marital status, education, household income), health-related characteristics (obesity, smoking, comorbidity, perceived stress, activity limitation), and disease-related characteristic (airway limitation) were included. Comorbid diseases such as hypertension, myocardial infarction, angina, stroke, tuberculosis, asthma, diabetes, renal failure, liver cirrhosis, rheumatoid arthritis, and osteoarthritis were included. Perceived stress was categorized into low (I rarely feel it, I feel a little bit) and high (I feel a lot, I feel very much), in response to the question, “How much stress do you usually feel in your daily life?”. Airway limitation as severity of COPD was divided into four classifications (mild, moderate, severe and very severe).

Statistical analysis: Data were analyzed descriptively to examine characteristics of participants and levels of subjective health status, depression, and QoL. To evaluate differences in QoL by characteristics of participants, t-test or one-way analysis of variance was computed. Hierarchical multiple regression analysis was performed using depression as a moderator for the relationship between subjective health status and QoL. The IBM Statistical Package for the Social Sciences (SPSS) version 24.0 was employed for all data analyses.

RESULT

Socio-demographic characteristics of participants are shown in Table 1. Of the 815 patients total, 70.6% (n = 575) were male and 29.4% (n = 240) were female. For participant age, 38.3% (n = 312) were in their 70s and 35.6% (n = 290) were in their 60s. The mean age was 66.29 years (SD = 9.32). For marital status, 83.2% (n = 678) were living with their spouse, and 4.8% (n = 39) were widowed. 37.8% (n = 308) of participants had graduated

from elementary school or lower, and 32.4% (n = 264) were quartile 1 (lowest) for household income. The relationship between socio-demographic characteristics and QoL of study subjects also are summarized in Table 1. QoL was significantly associated with gender, age, marital status, education, and household income ($p < .001$). Females, aged 80 years and over, who were not living with their spouse, and participants with lower than elementary school education and the lowest (Quartile 1) household income, had significantly lower QoL.

Table 1: Quality of life according to socio-demographic characteristics of participants (N = 815)

Characteristics	Categories	n(%)	M (±SD)	t/F	p
Gender	Male	575(70.6)	0.94 ± 0.10	3.77	< .001
	Female	240(29.4)	0.90 ± 0.13		
Age (year)	40-49	54(6.6)	0.97 ± 0.07	7.44	< .001
	50-59	128(15.7)	0.95 ± 0.08		
	60-69	290(35.6)	0.94 ± 0.10		
	70-79	312(38.3)	0.91 ± 0.13		
	≥ 80	31(3.8)	0.89 ± 0.15		
Marital status	Married, lived with spouse	678(83.2)	0.94 ± 0.10	7.62	< .001
	Separated	4(0.5)	0.83 ± 0.11		
	Divorced	94(11.5)	0.89 ± 0.12		
	Widowed	39(4.8)	0.89 ± 0.17		
Education	≤ Elementary school	308(37.8)	0.89 ± 0.13	16.82	< .001
	Middle school	155(19.0)	0.94 ± 0.10		
	High school	214(26.3)	0.95 ± 0.09		
	≥ College	138(16.9)	0.96 ± 0.10		
Household income	Quartile 1	264(32.4)	0.89 ± 0.14	13.06	< .001
	Quartile 2	226(27.7)	0.93 ± 0.10		
	Quartile 3	158(19.4)	0.95 ± 0.07		
	Quartile 4	167(20.5)	0.96 ± 0.10		

The health- and disease-related (COPD) characteristics of participants are shown in Table 2. 34.1% (n = 278) had obesity (BMI 25 kg/m² or more), 24.5% (n = 200) were current smokers. 58.3% (n = 475) had one or more comorbid disease. 16.3% (n = 133) of subjects reported that their stress felt high. 9.9% (n = 81) of the subjects stated that they are currently limited in daily life or social activities due to health problems or physical or mental disabilities. The severity of COPD measured by airflow limitation was mild in 52.0% (n = 424) and moderate in 43.4% (n = 354). The results of

examining differences in QoL according to health-related and disease-related characteristics also are summarized in Table 2. As for health-related characteristics, there were significant differences by comorbid disease, perceived stress, and activity limitation ($p < .001$). Subjects who had comorbid disease, higher perceived stress, and activity limitation had worse QoL. Obesity and smoking were not significantly associated with QoL. As for disease-related characteristic, there was no difference in QoL by airflow limitation.

Table 2: Quality of life according to health-related and disease-related characteristics of participants (N = 815)

Characteristics	Categories	n(%)	M (±SD)	t/F	p
Obesity (BMI ≥ 25.0 kg/m ²)	Yes	278(34.1)	0.92 ± 0.13	1.95	.052
	No	537(65.9)	0.93 ± 0.10		
Smoking	Yes	200(24.5)	0.93 ± 0.11	-0.26	.789
	No	615(75.5)	0.93 ± 0.11		
Comorbid disease	Yes	475(58.3)	0.91 ± 0.13	-7.18	< .001
	No	340(41.7)	0.96 ± 0.87		
Perceived stress	Low	682(83.7)	0.94 ± 0.10	4.03	< .001
	High	133(16.3)	0.88 ± 0.16		
Activity limitation	Yes	81(9.9)	0.79 ± 0.18	7.40	< .001
	No	734(90.1)	0.94 ± 0.09		
Airflow limitation (FEV ₁ % predicted)	Mild (≥ 80)	424(52.0)	0.93 ± 0.10	0.99	.114
	Moderate (50-79.9)	354(43.4)	0.93 ± 0.11		
	Severe (30-49.9)	31(3.8)	0.88 ± 0.20		
	Very severe (≤ 29.9)	6(0.7)	0.93 ± 0.07		

Means of subjective health status, depression, and QoL are shown in Table 3. The mean of subjective health status was 2.97 (±0.92), means of depression and QoL were 2.42 (±3.86) and 0.93 (±0.11); respectively.

Table 3: Means of subjective health status, depression, and quality of life (N = 815)

	Minimum	Maximum	M (±SD)
Subjective health status	1	5	2.97 (±0.92)
Depression	0	24	2.42 (±3.86)
Quality of life	0	1	0.93 (±0.11)

Table 4 presents correlations among the studied variables. As shown in Table 4, subjective health status ($r = 0.395, p < 0.001$) correlated positively with depression. Subjective health status ($r = -0.421, p < 0.001$) and depression ($r = -0.386, p < 0.001$) correlated negatively with QoL.

Table 4: Correlations of subjective health status, depression, and quality of life (N = 815)

	Subjective health status	Depression	Quality of life
	r (p)	r (p)	r (p)
Subjective health status	1		

Conted...

Depression	.395 ($p < .001$)	1	
Quality of life	-.421 ($p < .001$)	-.386 ($p < .001$)	1

Table 5 presents the results of moderation analysis by regression analysis of variables at three hierarchical steps. As shown in Table 5, gender, age, marital status, education, household income, comorbid disease, activity limitation, and perceived stress were introduced in step 1 as control variables and accounted for 25.8% of the variance in QoL. In step 2, subjective health status was included as the independent variable and depression was included as moderator. These accounted for 32.6% of variance in QoL. Subjective health status × depression was entered in step 3. The final model (step 3) in regression illustrated 33.1% of the variance in QoL. The results demonstrated that subjective health status ($\beta = -.227, p < 0.001$) was significantly and negatively related with QoL after adjusting for control variables. Depression ($\beta = -.096, p < 0.05$) was an independent predictor for QoL. The interaction of subjective health status × depression did reach the conventional level of significance ($\beta = -.094, p < 0.05$). Depression significantly moderated the influence of subjective health status on QoL.

Table 5: Results of regression analysis for moderation (N = 815)

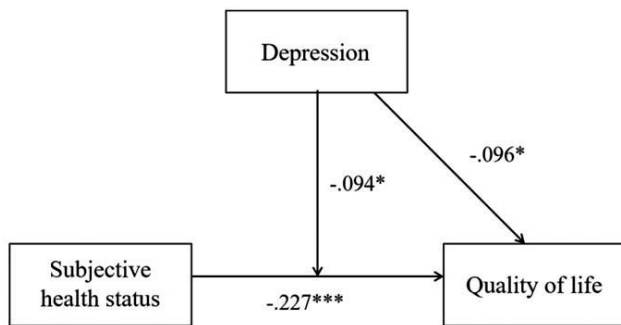
Variables	Step 1		Step 2		Step 3	
	β	t	β	t	β	t
Gender	-.066	-1.958	-.024	-.753	-.028	-.862
Age	-.110**	-3.086**	-.120***	-3.499***	-.123***	-3.602***
Marital status	-.033	-.961	-.022	-.679	-.022	-.667
Education	-.106**	-3.037**	-.083*	-2.467*	-.080*	-2.397*
Household income	-.053	-1.555	-.007	-.198	-.007	-.199
Comorbid disease	-.114***	-3.518***	-.074*	-2.353*	-.076*	-2.447*
Activity limitation	-.327***	-10.348***	-.228***	-7.099***	-.213***	-6.496***
Perceived stress	-.145***	-4.585***	-.066*	-2.053*	-.068*	-2.138*
Subjective health status			-.218***	-6.517***	-.227***	-6.757***
Depression			-.159***	-4.491***	-.096*	-2.189*
Subjective health status \times Depression					-.094*	-2.367*
R ²	.258		.326		.331	
ΔR^2			.068***		.005*	

Note: Dummy variables = gender (0 : male, 1 : female); marital status (0 : married, lived with spouse, 1 : separated, divorced, widowed); education (0 : middle school, high school, \geq college, 1 : \leq elementary school); household income (0 : quartile 2 - quartile 4, 1 : quartile 1); comorbid disease (0 : no, 1 : yes); activity limitation (0 : no, 1 : yes); perceived stress (0 : low, 1 : high).

Dependent variable is quality of life.

* $p < .05$, ** $p < .01$, *** $p < .001$

It was found that subjective health status \times depression interaction model was significant for QoL after controlling for gender, age, marital status, education, household income, comorbid disease, activity limitation, and perceived stress. Also, depression was a significant predictor of QoL. Therefore, depression was shown to have quasi-moderating effect on the relationship between subjective health status and QoL. The relationships between aforementioned variables are shown in Figure 1.



* $P < .05$, *** $P < .001$

Figure 1: Quasi-moderating effect of depression

To interpret specific moderating effects, regression equations were calculated for the relationship between subjective health status and QoL, according to depression. The negative β for subjective health status \times depression implied that the relationship between subjective health status and QoL was strengthened in the high depression group. Subjective health status and QoL by depression are shown in Figure 2. In the high depression group, QoL among patients who perceived their subjective health condition as bad was lower than that of patients who perceived their subjective health condition to be good.

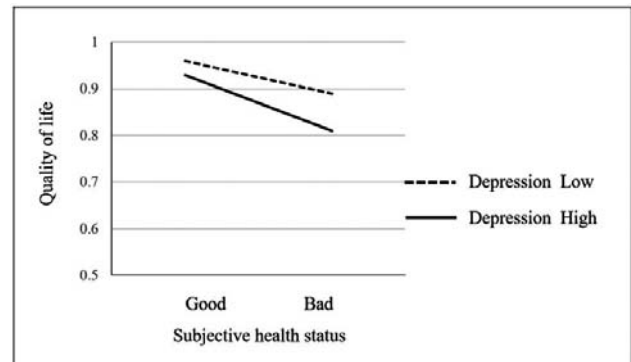


Figure 2: Subjective health status and quality of life by depression

DISCUSSION

The present study was executed to identify the level of QoL and to investigate the moderating effect of depression as a link between subjective health and QoL in 815 patients with COPD. The mean score of EQ-5D index of COPD patients was 0.93 (SD 0.11) in this study. This was similar to the result (0.92) of a previous study¹⁹, which measured QoL in COPD patients based on the KNHANES (2007-2012). Zhou et al.²⁰ reported that health utility for COPD according to EQ-5D ranged from 0.64 to 0.80 in the Chinese population. They also showed that HRQoL of COPD patients in four studies through a systematic review was lower than those with diabetes mellitus (0.79-0.94) and hypertension (0.78-0.93). Females, elderly, and patients with lower education and household income amounts had a lower EQ-5D index score in this study. These results correspond to those of a study¹⁷, which measured QoL using EQ-5D, targeting 2,356 Korean COPD patients. In regression analysis, age and education level remained as variables influencing QoL. As age increased, the self-care fulfillment rate was lower and daily living ability decreased. These results indicate that more nursing interventions are needed for older, less educated COPD patients. In terms of patient characteristics, COPD is more prevalent among the elderly. Education level among the elderly is often low; therefore, it is necessary to construct contents of health education for elderly COPD patients to make them easier to comprehend. Repetitive education will also be helpful. One-quarter (24.5%) of the subjects are currently smoking. In this study, smoking was not associated with QoL. However, smoking constitutes a major risk factor for COPD and is also found to be associated with depression. Therefore, health care providers should actively educate COPD patients to quit smoking. Comorbid diseases appeared to negatively affect QoL among COPD patients^{17,19}. Presence of a comorbid disease was significantly associated with impaired QoL in this study. Therefore, attention should be paid to management of comorbid disease. Activity limitation and poor QoL were strongly associated in this study. Jones²¹ showed that activity limitation was a determinant of impaired QoL in COPD, which was consistent with the consequences of this study. In a study²² carried out in urban China, determinants of QoL among 678 COPD patients included age and disease severity. Some studies^{17,19} showed that severity of airflow obstruction influenced QoL in Korean

COPD patients. However, in this study, COPD severity evaluated by airway limitation was not associated with worse QoL. The majority (95.5%) of subjects had mild to moderate COPD, which accounted for the difference in results. The results of another study¹⁰ showed that, like the results of our study, there was no relationship between airway limitation (FEV₁% predicted) and EQ-5D. Because of the differences in results between studies, further investigation is needed that takes into account various covariates.

With respect to regression analysis, this study ascertained the association between subjective health status and QoL. Moreover, subjective health most strongly predicted QoL. The single-item self-rated health (SRH) question was useful in assessing health condition of COPD patients in the community. Farkas et al.²³ conducted the SRH in 135 stable COPD patients. They reported that 20% of subjects showed poor/very poor SRH, and poor/very poor SRH in patients was associated with depression (CES-D score). However, there are few studies on the connection between SRH and QoL in COPD patients. Studies in other chronic disease, such as rheumatoid arthritis²⁴ have demonstrated an association between subjective health and QoL. Support and heed should be given to COPD patients who evaluate their health condition as not good. Various interventions to improve health status should be implemented to enhance the QoL of patients suffering from COPD.

Lee and Jee⁹ reported that depression was the most important factor related to QoL in male patients with COPD. They suggested that utilization screens and minimization of depression could be beneficial action plan to improve QoL of COPD patients. Depression was a predictor of QoL in the present study. Higher depression of patients correlated to lower levels of QoL. There is another study supporting the results of this study, albeit with a different QoL assessment tool. According to Jang et al.²⁵, depression had influence on both the physical component summary (PCS) score and mental component summary (MCS) score of Short Form 36 (SF-36) Health Survey in severe COPD patients. This study confirmed that the PHQ-9 was useful as a screening implement to identify the degree of depression in patients with COPD in the community. The goal of this study was to verify the moderating effect of depression between subjective health and QoL in COPD patients. The main finding of the present study was that depression moderated a link

between the degree of subjective health and QoL for COPD patients. This implies that patients with higher depression may experience lower QoL given their worse perceived subjective health. Depression impairs health and increases the risk of hospitalization. Repeated hospitalizations result in lowers QoL for patients. Depression often increases as symptoms worsen in patients suffering from chronic illnesses. Therefore, it is recommended that psychological counseling be performed at the time of intervention for symptom control of COPD patients. In addition, we hope further research will proceed to evaluate the moderating effect of depression on the relationship between factors influencing QoL and QoL in COPD patients.

CONCLUSION

In this study, we discovered that the main determinant of QoL in Korean COPD patients was subjective health status. Depression contributed to lower QoL and also played a role as the moderating factor between subjective health and QoL in COPD patients. These findings propose that health care providers caring for COPD patients should make efforts to relieve depression by providing intervention programs and improving QoL.

Ethical Clearance: Not required

Source of Funding: This paper was supported by Joongbu University Research & Development Fund, in 2018.

Conflict of Interest: Nil

REFERENCES

1. Global Initiative for Chronic Obstructive Lung Disease. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease (2018 report). 2018. Available from: <http://www.goldcopd.org/gold-reports/> (website)
2. World Health Organization. The top 10 causes of death. [Internet]. 2018 [updated 2018 May 24; cited 2018 Aug 12]. Available from: <http://www.who.int/en/news-room/fact-sheets/detail/the-top-10-causes-of-death> (website)
3. Statistics Korea. Cause of death statistics in 2016. 2017. Available from: <http://kostat.go.kr/> (website)
4. Jung YM, Lee HY. Chronic obstructive pulmonary disease in Korea: prevalence, risk factors, and quality of life. *J Korean Acad Nurs.* 2011 Apr;41(2):149-56. DOI:10.4040/jkan.2011.41.2.149.
5. Seo HY, Baek JI. Mediating role of subjective stress levels between subjective health status and quality of life (EQ-VAS). *Journal of the Korean Data Analysis Society,* 2013 Dec;15(6):3053-65. <http://uci.or.kr/G704-000930.2013.15.6.011>
6. DeSalvo KB, Blosner N, Reynolds K, He J, Muntner P. Mortality prediction with a single general self-rated health question. A meta-analysis. *J Gen Intern Med.* 2006 Mar;21(3):267-75.
7. Vos HM, Bor HH, Rangelrooij-Minkels MJ, Schellevis FG, Lagro-Janssen AL. Multimorbidity in older women: the negative impact of specific combinations of chronic conditions on self-rated health. *Eur J Gen Pract.* 2013 Jun;19(2):117-22. DOI:10.3109/13814788.2012.755511.
8. Jackson BE, Suzuki S, Coultas D, Singh KP, Bae S. Chronic obstructive pulmonary disease and health-related quality of life in the 2009 Texas Behavioral Risk Factor survey. *Health Educ Behav.* 2013 Aug;40(4):469-79. DOI:10.1177/1090198112460053.
9. Lee HJ, Jee YJ. Related factors of quality of life in male patients with chronic obstructive pulmonary disease. *Korean J Adult Nurs.* 2011 Aug;23(4):309-20. <http://www.dbpia.co.kr/Journal/ArticleDetail/NODE01732292>
10. Bang SY. Quality of life and its related factors in patients with Korea chronic obstructive pulmonary disease. *Journal of the Korean Data & Information Science Society.* 2016;27(5):1349-1360. <http://dx.doi.org/10.7465/jkdi.2016.27.51349>
11. Tsai TY, Livneh H, Lu MC, Tsai PY, Chen PC, Sung FC. Increased risk and related factors of depression among patients with COPD: a population-based cohort study. *BMC Public Health.* 2013 Oct;13:976. DOI:10.1186/1471-2458-13-976.
12. Di Marco F, Verga M, Reggente M, Maria Casanova F, Santus P, Blasi F, et al. Anxiety and depression in COPD patients: the roles of

- gender and disease severity. *Respir Med.* 2006 Oct;100(10):1767-74.
13. Cazzola M, Bettoncelli G, Sessa E, Cricelli C, Biscione G. Prevalence of comorbidities in patients with chronic obstructive pulmonary disease. *Respiration.* 2010;80:112-9. DOI:10.1159/000281880.
 14. Kunik ME, Roundy K, Veazey C, Soucek J, Richardson P, Wray NP, et al. Surprisingly high prevalence of anxiety and depression in chronic breathing disorders. *Chest.* 2005 Apr;127(4):1205-11.
 15. Cully JA, Graham DP, Stanley MA, Ferguson CJ, Sharafkhaneh A, Soucek J, et al. Quality of life in patients with chronic obstructive pulmonary disease and comorbid anxiety or depression. *Psychosomatics.* 2006 Jul-Aug;47(4):312-9.
 16. EuroQol Group. EuroQol - a new facility for the measurement of health-related quality of life. *Health Policy.* 1990 Dec;16(3):199-208.
 17. Hong JY, Kim SY, Chung KS, Kim EY, Jung JY, Park MS, et al. Factors associated with the quality of life Korean COPD patients as measured by the EQ-5D. *Qual Life Res.* 2015 Oct;24(10):2549-58. DOI:10.1007/s11136-015-0979-6.
 18. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med.* 2001 Sep;16(9): 606-13.
 19. Kwon HY, Kim E. Factors contributing to quality of life in COPD patients in South Korea. *Int J Chron Obstruct Pulmon Dis.* 2016 Jan;11:103-9. DOI:10.2147/COPD.S90566.
 20. Zhou T, Guan H, Yao J, Xiong X, Ma A. The quality of life in Chinese population with chronic non-communicable diseases according to EQ-5D-3L: a systematic review. *Qual Life Res.* 2018 Jul;6. <https://link.springer.com/article/10.1007%2Fs11136-018-1928-y>
 21. Jones PW. Activity limitation and quality of life in COPD. *COPD.* 2007 Sep;4(3):273-8.
 22. Wu M, Zhao Q, Chen Y, Fu C, Xu B. Quality of life and its association with direct medical costs for COPD in urban China. *Health Qual Life Outcomes.* 2015 May;13:57. DOI:10.1186/s12955-015-0241-5.
 23. Farkas J, Kosnik M, Zaletel-Kragelj L, Flezar M, Suskovic S, Lainscak M. Distribution of self-rated health and association with clinical parameters in patients with chronic obstructive pulmonary disease. *Wien Klin Wochenschr.* 2009 Jun; 121(9-10):297-302. DOI:10.1007/s00508-009-1170-2.
 24. Paek KS, Kwon YS. Factors influencing health-related quality of life in Korean elderly with rheumatoid arthritis. *Indian Journal of Science and Technology.* 2016 Dec;9S(1). <http://www.indjst.org/index.php/indjst/article/viewFile/109876/77570>
 25. Jang SM, Kim KU, Na HJ, Song SE, Lee SH, Lee H, et al. Depression is a major determinant of both disease-specific and generic health-related quality of life in people with severe COPD. *Chron Respir Dis.* 2018 Jan:1479972318775422. DOI:10.1177/1479972318775422.

The Effect of Muscle Activity according to Pelvic Angle in Different Positions: Randomized Crossover Trial

Sang-Pill Park¹, Hyeon-Ji Son², Dong-Yeop Lee², Ji-Heon Hong², Jae-Ho Yu², Jin-Seop Kim²

¹Student, ²Professor, Dept. Sunmoon University, Korea

ABSTRACT

Background/Objectives: The purpose of this study was to investigate the most effective pelvic tilt exercise in different posture.

Method/Statistical analysis: This study included twenty healthy adults. All subjects performed an different pelvic tilt during sitting and standing in static posture, the experiment was performed three times each, respectively. The angle of the pelvis was measured using a 3D motion analysis system, and muscle activation was measured by EMG. For the data analysis, one way repeated ANOVA was used to compare the muscle activity with changes in pelvic tilt angle, and bonferroni was used for posttest for differences between variables.

Findings: As a result, in the anterior pelvic tilt, the activity of the erector spine muscle was the highest, while the posterior pelvic tilt, transverse abdominis muscle was the most active, when comparing the standing and sitting posture, both erector spinae muscles and both semitendinosus muscles were dominant in a static anterior pelvic tilt, and posterior pelvic tilt posture, for the posterior pelvic tilt in sitting posture, both transverse abdominis muscles were dominant.

Improvements/Applications: It is recommended to perform a pelvic tilt exercise in the correct posture to strengthen muscles. These results may be helpful in selecting more effective exercise methods for clinical treatment.

Keywords: Pelvic, Pelvic tilting, Electromyography, Couple force, Gravity, Position

INTRODUCTION

In modern society, lumbar lordotic angle is increasing due to imbalance of sitting or sustained posture for a long time during work, and the number of people complaining back pain is increasing. Increased lumbar lordotic angle was found to be one of the major causes of back pain, and generally a pelvis tilt exercise is used for lumbar alignment of patients with chronic back pain¹. To reduce back pain, it is important to avoid postures that increase the lumbar lordotic angle. Anterior pelvic inclination posture increases the lumbar lordotic angle while posterior pelvic inclination posture decreases the lumbar lordotic angle. Therefore, posterior pelvic inclination

posture is used as a rehabilitation method to improve the lumbar alignment because it reduces the lumbar lordotic angle that causes back pain^{2,3,4}. The lumbar lordotic angle also brings changes to nearby local muscles. According to studies by Andrew et al. (2009), when the lumbar lordotic angle changes, muscle activity changes when the lumbar lordotic angle changes in the iliocostalis muscle, longissimus muscle, and iliocostalis thoracis muscle transverse abdominis muscle⁵. The previous reported an increase in lumbar lordotic angle when anterior pelvic tilt occurred and a decrease in lumbar lordotic angle when posterior pelvic tilt occurred³. Walker et al. (1987) also examined the relationship between lumbar lordosis and abdominal muscles and pelvic inclination, and it was reported that the back tilt of the pelvis is made by the abdominal muscles and the back tilt of the pelvis reduces the lumbar lordosis⁶. Therefore, it is said that correcting the body by exercising in the correct posture is important for rehabilitation, because it is most effective in improving muscle strength of the abdominal muscles⁶. Previous

Corresponding Author:

Jin-Seop Kim

Professor, Division of Physical therapy,
Sunmoon University, Korea

Email: skylove3373@sunmoon.ac.kr

studies compared the muscle activity of the surface muscle and the deep muscle in the standing posture during pelvis tilt, and in the anterior pelvic inclination posture, the erector spinae muscles were the most active, while in the posterior pelvic inclination posture, transverse abdominis muscle was the most active. In addition, since the pelvis tilt affects the lumbar lordotic angle and the nearby surface muscles and deep muscles according to the posture, it is possible to know which muscles are most activated when the pelvis tilt is performed. Therefore, correcting the body and balancing strength by exercising to change the lordotic angle is especially important for rehabilitation⁷. In many previous studies, muscle activity during pelvis tilt was compared. Drysdale et al. (2004) investigated the activity of abdominal muscles in relation to pelvis tilt⁸. Floyd et al. (2000) reported a change in muscle activity of the erector spinae muscles when tilted in front of the pelvis, suggesting that the erector spinae muscles were activated when tilted in front of the pelvis⁹. Anderson et al. (1995) reported that the iliopsoas muscle increased muscle activity in anterior pelvic tilt using wire electrodes¹⁰. Hodges et al. (1999) reported that the abdominal muscle activity and response rate change with the exercise posture of the limbs¹¹. Workman et al. (2008) investigated the relationship between abdominal muscles and flexor muscles according to pelvic position, and as a result, in the tilt posture in front of the pelvis, the muscle activity of the bending of the hip flexion was increased and the muscle activity of the abdominal muscle was increased in the tilt posture of the pelvis¹². Previous studies have examined the deep muscle and surface muscle activity in pelvis tilt. However, there is a lack of studies comparing the changes in muscle activity of the deep and surface muscles with changes in posture during pelvis tilt. Therefore the purpose of this study was to compare the changes in muscle activity of standing posture and sitting posture during pelvis tilt to show that muscle activity in deep muscles and surface muscles change with the change of posture, to present the basic data to find the most effective posture in exercise therapy in the future.

Table 1: General characteristics of the subject in the study (n = 20)

Division	Subject
Age	21.77 ± 2.10
Height (cm)	173.11 ± 3.62
Weight (kg)	72.33 ± 10.59
Gender	men, n = 10 women, n = 10
^a Average ± Standard deviation	

SUBJECT AND METHOD

Subject: This study was performed on 20 healthy male and female students (10 males and 10 females) attending Chungnam S University. For recruitment of subjects, after being explained the purpose and method of the study, those who voluntarily wrote consent were chosen for the study. The criteria for selection of the subjects were healthy men and women aged 20-30 years who had no experience of back pain and back surgery, and exclusion criteria were 1. have spinal-related disease or experienced disease 2. spinal-related surgical experience 3. neurological disease 4. those with difficulty in daily life due to back pain 5. those with difficulties with pelvis tilt. The physical characteristics of the subjects are shown in Table 1.

Procedures: This study was conducted as a single group study with no control group. In order to prevent compensatory action and to measure the angle of tilt of the pelvis accurately, the subjects were instructed on the front posture and back posture of the pelvis in standing posture and sitting posture. Prior to the experiment, the subjects were measured for height and weight using an automatic BMI measuring stadiometer (BSM 370, Korea, 2011) for modeling using the Visual 3D program, and for 3D motion analyzer marker recognition, body and pelvic thighs were exposed using short tops and shorts. In order to reduce the skin resistance at the electromyographic measurement site, shavings were performed on the measurement site, dead skin was removed with sandpaper, and then cleaned with alcohol cotton. EMG pads were attached to both erector spinae muscles, transverse abdominis muscles, and semitendinosus muscles to measure muscle activity in the subjects' pelvis tilt, and 16 motion analyzer markers were attached to the pelvis and thigh femur bones for pelvis tilt angle measurement.

Different positions: In a standing posture, the distance between the legs was extended to the subject's shoulder width, and after measuring the value in a static posture with both arms crossing the chest, it was proceeded in the order of anterior, and then posterior pelvic tilt. In the sitting posture, as described above, the subject was seated and the distance of the leg was spread to the subject's shoulder width, and both arms were crossed to the chest before proceeding in the same order as the standing posture. The pelvis tilt was performed for 5 seconds and the pelvis tilt was maximized in the last 5 seconds in Figure 4.

Measurement: This study used a three-dimensional motion analyzer (Qualisys system-Qualisys Medical AB 41113, Gothenburg, Sweden) to investigate the dynamic changes of the pelvis tilt angle, and a total of 6 motion capture cameras (Qualisys Oqus 300) were used to measure the motion of the markers in Figure 2. Spherical passive markers reflecting infrared light were used in Figure 3. Marker attachment points were 16 markers, including both sides of anterior upper iliac spine, posterior upper iliac spine, condylar on the lateral femoral bones, condylar on the inner femoral bones, and four each on both sides of the thigh in Figure 5 [13].

OQUS100 (Zero WIRE, Italy, 2009) was also used to examine muscle activity of transverse abdominis muscle (upper anterior iliac spine interior 2 cm), semitendinosus muscle (intermediate between ischial tuberosity and intra-articular bony atrophy), and erector spinae muscles (3 cm lateral side of lumbar vertebrae 3) according to the slope of the pelvis in Figure3. Electromyographic analog signals collected from a total of six-gun channels were sent to the MP150 system and converted to digital signals, then signal analysis and data processing were performed using sEMG software myoresearch 1.06.44 software. For the EMG measurement, the sampling rate was set to 2000 Hz, and the band pass filter was set to 20 to 500 Hz.

according to the pelvic inclination angle of the posture, Bonferroni test was used for the posthoc analysis for the differences between variables, and all statistical significance levels were set at $p < 0.05$.



Figure 2: Motion capture and EMG



Figure 3: 3D marker

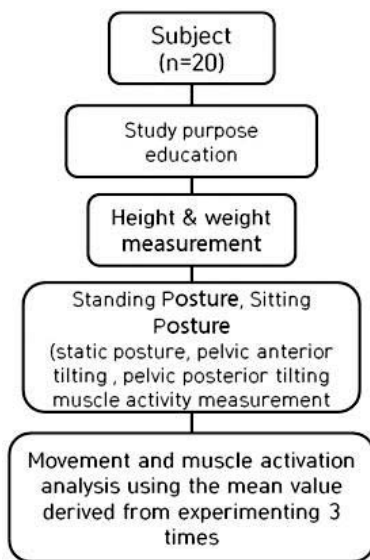
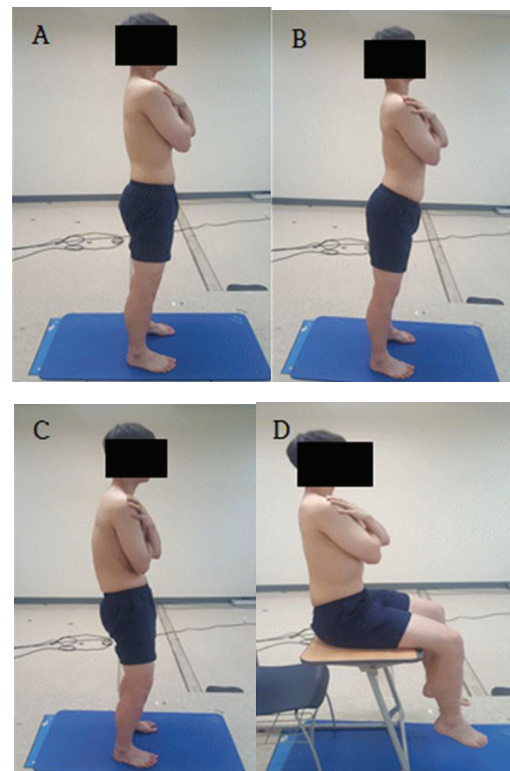


Figure 1: Flow chart

Data analysis: The data were analyzed using IBM SPSS/PC ver.22.0 for window program. The normality test was conducted with Shapiro-Wilk, and the normality test was satisfied. The general characteristics of the subjects were analyzed using distribution and frequency analysis, one way repeated ANOVA was used to compare muscle activation of the transverse abdominis muscle, semitendinosus muscle, and erector spinae muscles



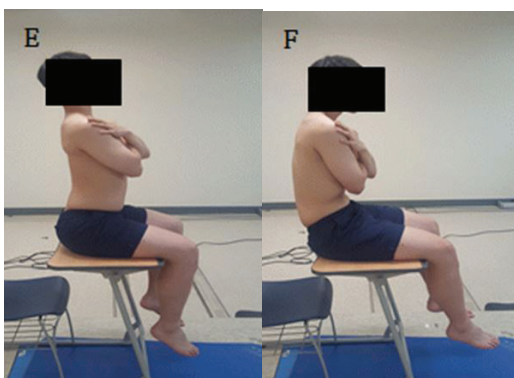


Figure 4: Different posture

RESULTS AND DISCUSSION

The right transverse abdominis muscle showed the highest muscle activity in posterior pelvic tilt in sitting posture with 13.87 ± 3.89 in Table 3. The right transverse abdominis muscle showed statistically significant difference in each posture ($p < 0.05$), however there was no significant difference between standing static posture and sitting static posture ($p > 0.05$) in Figure 5. The right semitendinosus muscle showed the highest muscle activity at standing posture with 6.38 ± 3.10 at posterior pelvic tilt in Table 3. There was no statistically significant difference between standing static posture and sitting static posture, standing static posture and sitting anterior pelvic tilt posture, sitting static posture and sitting anterior pelvic tilt posture ($p > 0.05$), and all other postures showed significant differences ($p < 0.05$) in Figure 5. The right erector spinae muscles showed the highest muscle activity in the anterior pelvic tilt in standing posture with 14.12 ± 7.01 in Table 3. In addition, the right erector spinae muscles did not show any significant difference in standing static posture and sitting static posture, standing static posture and sitting posterior pelvic tilt posture, sitting static posture and sitting posterior pelvic tilt posture ($p > 0.05$), and all other postures showed significant differences ($p < 0.05$). The left transverse abdominis muscle showed the highest muscle activity in posterior pelvic tilt in sitting posture with 14.06 ± 4.07 in Table 3, and each posture showed significant difference ($p < 0.05$) in Figure 5. The left semitendinosus muscle showed the highest muscle activity at standing posture with 6.01 ± 3.03 at posterior pelvic tilt in Table 3. There were no statistically significant differences between standing static posture and sitting static posture, standing static posture and anterior pelvic tilt posture, sitting anterior pelvic tilt posture and sitting posterior

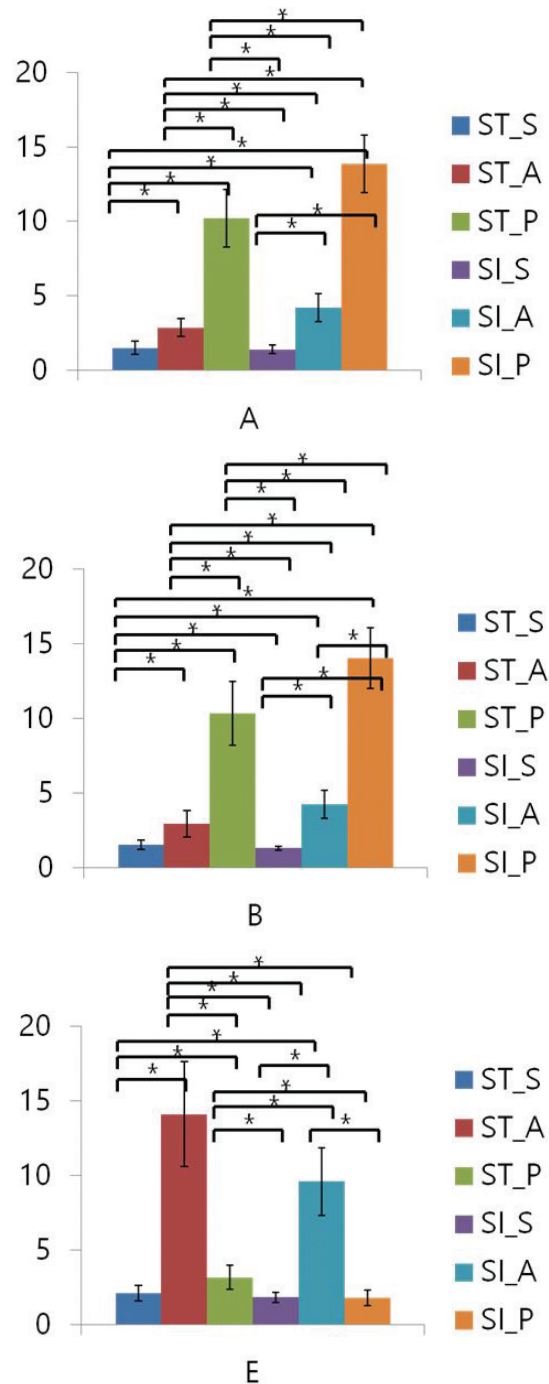
pelvic tilt posture, sitting static posture and sitting anterior pelvic tilt posture ($p > 0.05$) and all other postures showed significant differences ($p < 0.05$) in Figure 5. The left erector spinae muscles showed the highest muscle activity at standing posture with 14.40 ± 6.80 in anterior pelvic tilt. There were no statistically significant differences in standing static posture and standing posterior pelvic tilt posture, standing static posture and sitting static posture, standing static posture and sitting posterior pelvic tilt posture, sitting static posture and sitting posterior pelvic tilt posture ($p > 0.05$), and the other postures showed significant differences ($p < 0.05$) in Figure 5. The average range of anterior pelvic tilt in standing posture was 11.87 ± 7.14 , and the average range of posterior pelvic tilt was 5.37 ± 3.35 . The average range of anterior pelvic tilt in sitting postures was 8.09 ± 4.71 , and the average range of posterior pelvic tilt was 7.74 ± 5.99 in Table 3. The purpose of this study was to evaluate the muscle activity of pelvis tilt angle and slope during pelvis tilt in various postures to investigate muscle activity that change by posture. Measurements were done in static posture in standing posture, anterior pelvic tilt posture, posterior pelvic tilt posture, static posture in sitting posture, anterior pelvic tilt posture, and posterior pelvic tilt posture. Also the muscle activity of both sides of transverse abdominis muscle, semitendinosus muscle, and erector spinae muscles was measured, and changes according to pelvis tilt were explained by comparing the muscle activity by posture. As a result, in the anterior pelvic tilt in standing posture, the left erector spinae muscles showed the highest muscle activity, and second, the right erector spinae muscles showed a significant increase in muscle activity. There was also a significant difference in comparing in standing static posture and standing posterior pelvic tilt posture. At posterior pelvic tilt in the standing posture, the left transverse abdominis muscle showed the highest muscle activity, and second, the right transverse abdominis muscle showed a significant increase. There was also a significant difference in the muscle activity of transverse abdominis muscle in standing static posture and standing anterior pelvic tilt posture. As above, there was a significant increase in erector spinae muscles in anterior pelvic tilt and transverse abdominis muscle in posterior pelvic tilt. The reason for this is that the erector spinae muscles are activated at anterior pelvic tilt as it is attached to the back of the pelvis and the transverse abdominis muscle is activated at posterior pelvic tilt as it is attached to the anterior surface of the pelvis^{14,15,16}. Takaki et al. (2016)

used EMG wire electrodes in standing posture to compare muscle activity in local muscles such as transverse abdominis muscle and multifidus muscle during pelvis tilt, and as a result, in anterior pelvic tilt, the erector spinae muscles and multifidus muscles showed the highest muscle activity and in posterior pelvic tilt, the transverse abdominis muscle showed the highest muscle activity⁷. These results indicate that local muscles such as transverse abdominis muscle and multifidus muscle are involved in anterior pelvic tilt and posterior pelvic tilt⁷. Urquhart et al. (2005) compared the muscle activity of the transverse abdominis muscle, the internal oblique abdominal muscle, and the rectus abdominis muscle of the abdominal muscle using the EMG wire electrode while changing the posture in supine posture and posterior pelvic tilt posture¹⁷. As a result, it was reported that in posterior pelvic tilt, transverse abdominis muscle showed significantly higher increase than external oblique abdominal muscle, internal oblique abdominal muscle, and rectus abdominis muscle¹⁷. The results of previous studies are similar to those of the present study, suggesting that the erector spinae muscles are activated at anterior pelvic tilt in standing postures and transverse abdominis muscles are activated at posterior pelvic tilt. The sitting posture also showed a similar pattern to the standing posture, and anterior pelvic tilt in sitting posture showed the highest muscle activity in the left erector spinae muscles and there was significant increase in the right erector spinae muscles. There was also significant difference when compared with sitting static posture and sitting posterior pelvic tilt posture. In posterior pelvic tilt, the muscle activity increased in the order of the left transverse abdominis muscle and the right transverse abdominis muscle and there was a significant difference when compared to sitting static posture and sitting anterior pelvic tilt posture. As above, sitting posture showed the same result as standing posture. The reason for this is that although there is a difference in the slope of the pelvis between the sitting posture and the standing posture, it seems that the above results are obtained because the position of the active muscle is not changed during anterior pelvic tilt or posterior pelvic tilt^{18,19,20}. In standing posture and sitting posture, standing static posture and sitting static posture were significantly different only in the left erector spinae muscles and it was more dominant in standing static posture. However, there were no significant differences in both transverse abdominis muscles, both semitendinosus muscles and

right erector spinae muscles. When comparing standing anterior pelvic tilt posture with sitting anterior pelvic tilt posture, there was a significant difference in all muscle groups, the left erector spinae muscles showed the highest muscle activity, and all muscle groups including both transverse abdominis muscle and semitendinosus muscle were dominant in standing anterior pelvic tilt posture. When comparing the standing posterior pelvic tilt posture with sitting posterior pelvic tilt posture, it was significant in all muscle groups, and in sitting posterior pelvic tilt posture, the left transverse abdominis muscle showed the highest muscle activity. Both erector spinae muscles and both semitendinosus muscles were dominant in the standing posterior pelvic tilt posture and the right transverse abdominis muscle was dominant in the sitting posterior pelvic tilt posture. As a result, muscle activity in the standing posture is higher than that in the sitting posture. However, in the posterior pelvic tilt posture, it showed higher muscle activity of transverse abdominis muscle in sitting posterior pelvic tilt posture than standing posterior pelvic tilt posture. Looking at previous studies, Munoz et al. (2011) described the relationship between center of gravity, gravity, and trunk muscles when the center of gravity changes and the muscle activity of the body changes as the center of gravity changes by changing torso slope in the sitting posture²¹. As a result, it was reported that muscle activity of the trunk muscles increased as the body slope increased²¹. In addition, according to Takaki et al. (2016), anterior pelvic tilt is relatively easier than posterior pelvic tilt due to posterior pelvic tilt and posterior pelvic tilt, but there are individual differences as posterior pelvic tilt reacts to gravity⁷. In other words, because the posture changes in this study, the muscle activity changes according to the change. Also, because the posterior pelvic tilt is a movement that reacts to gravity, although there is a difference in individual muscle strength, it is thought that the effect of gravity changes as the posture changes, which is closely related to the results of this study. Olson et al. (2005) investigated the effects of gravity on flexion relaxation on standing posture and supine posture on muscle strength²². EMG was attached to the erector spinae muscles, abdominal muscles, and hamstring muscles, and flexion was performed on the standing posture and the supine posture, and the muscle activity of each muscle was measured and compared²². The results showed that the standing posture showed significant muscle activity in the back muscles such as the erector spinae muscles and the hamstring muscle and

significant muscle activity in the abdominal muscles in the supine posture. In other words, when the posture changes, the direction of gravity acting on the body changes, and thus the muscle activity of each muscle is different²². Based on the results of previous studies, In this study, erector spinae muscles and semitendinosus muscle were more active in standing posture than in sitting posture, and this is thought to be because each posture of the standing posture would have activated the back muscles erector spinae muscles and semitendinosus muscles to counteract gravity, and because the force was relatively weaker in sitting posture than in standing posture. Urquhart et al. (2005) reported that the middle and lower transverse abdominis muscles progressed horizontally or downwardly inside the lumbodorsal fascia, inguinal ligament, iliac crest ring, and pubic bone¹⁷. It was reported that the attachment point of the transverse abdominis muscle is consistent with the orientation of the posterior pelvic tilt and the posterior pelvic tilt is caused by the activity of the transverse abdominis muscle²³. In addition, Mansour et al (2011) reported that when the pelvic tilt occurs, motion occurs due to the action of force-couple, anterior pelvic tilt is caused by the trunk muscles and the hip flexor muscles, and posterior pelvic tilt is caused by abdominal muscles and hip joint extensor muscle²⁴. In the present study, transverse abdominis muscle and semitendinosus muscle showed high muscle activity when posterior pelvic tilt was performed, and it is consistent with the previous study where the transverse abdominis muscle was activated when the posterior pelvic tilt occurred and activated with the hip joint muscle by force-couple action. Also, posterior pelvic tilt in sitting posture showed higher muscle activity in transverse abdominis muscle than posterior pelvic tilt in standing posture, and this is thought to be due to the fact that in posterior pelvic tilt in sitting posture, the semitendinosus muscle is less active than the standing posture, and the transverse abdominis muscle is activated on posterior pelvic tilt due to force-couple action. This study has a number of limitations. First, it is difficult to generalize at all ages because it only consisted of adults in their 20s. It is also difficult to generalize as a result of adults of this age group because of the small number of subjects. Second, since the transverse abdominis muscle is the core muscle in the abdomen, it is necessary to measure the result with the wire electrode EMG for the accurate experiment, but accurate measurement may not have been made with the surface electrode EMG. Therefore, it is difficult to

generalize the results of this study. Thirdly, supine posture had to be excluded from 3D motion analyzer due to its characteristics. The supine posture cannot be used because the marker cannot be positioned in the supine posture when the marker of the motion analyzer is attached to the pelvis. It is thought that adding supine posture to the experiment would provide more diverse results of deep and surface muscles in pelvis tilt according to posture. Therefore, continuous study of deep muscles and surface muscles in pelvis tilt supplementing this is needed.



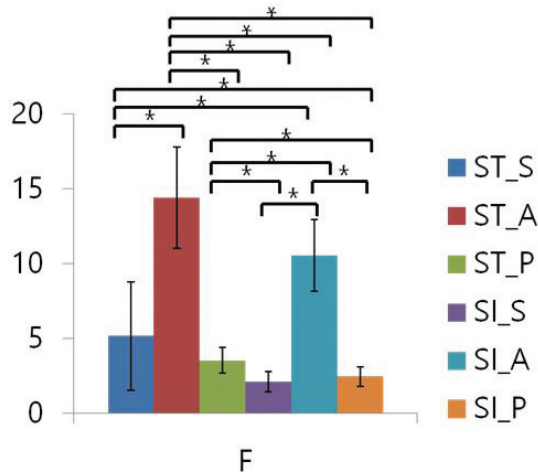


Figure 5: Activity graph of each muscle by posture
A : right transverse abdominis, B : left transverse abdominis, C : right semitendinosus
D : left semitendinosus, E : right erector spine ,F : left erector spine
ST_S : standing static, ST_A : standing anterior tilting, ST_P : standing posterior tilting
SI_S : sitting static, SI_A : sitting anterior tilting, SI_P : sitting posterior tilting

CONCLUSION

As a result of the study, when performing pelvis tilt in standing posture and sitting posture, erector spinae muscle was most active at anterior pelvic tilt, and transverse abdominis muscle was most active at posterior pelvic tilt. Also, when standing posture and sitting posture were compared, significant difference was found in each posture and in standing posture, in pelvis tilt, sitting posture showed higher muscle activity than pelvis tilt. However, at posterior pelvic tilt in sitting posture, standing posture was more dominant than posterior tilt in transverse abdominis muscle. Therefore, when the posture changes, the muscle activity varies, and it is determined that if posture is selectively applied, such as using anterior pelvic tilt in standing posture to strengthen the erector spinae muscles during pelvis tilt exercise and using posterior pelvic tilt in sitting posture to strengthen transverse abdominis muscle, it will be possible to obtain better treatment results.

Ethical Clearance: This study was conducted with approval from Sunmoon University Institutional Bioethics Committee.(SM-201705-028-2)

Source of Funding: This research was supported by Basic Science Research Program through the

National Research Foundation of Korea(NRF) funded by the Ministry of Science, ICT & Future Planning(2017R1C1B5017084).

Conflict of Interest: Nil

REFERENCES

1. Golob AL, Wipf JE. Low back pain. *Med Clin North Am.* 2014 98(3):405-28
2. Delisle A, Gagnon M, Sicard C. Effect of pelvic tilt on lumbar spine geometry. *IEEE Trans Rehabil Eng.* 1997 Dec;5(4):360-6.
3. Levine D, Whittle MW. The Effects of Pelvic Movement on Lumbar Lordosis in the Standing Position. *J Orthop Sports Phys Ther.* 1996;24(3):130-5.
4. James W Day, Gary Smidt, Lehmann. Effect of pelvic tilt on standing posture. *Phys Ther* 1984 64(4):510-516
5. Andrew P. Claus, MPhy, Julie A. Hides, PhD, G. Lorimer Moseley, Paul W. Subtle Changes in Sagittal Spinal Curves Affect Regional Muscle Activity. *Spine* 2009;34(6):E208-14.
6. Walker ML, Rothstein JM, Finucane SD, Lamb RL. Relationships between lumbar lordosis, pelvic tilt, and abdominal muscle performance. *Phys Ther.* 1987;67(4):512-6.
7. Takaki S, Kaneoka K, Okubo Y, Otsuka S, Tatsumura M, Shiina I, Miyakawa. Analysis of muscle activity during active pelvic tilting in sagittal plane. *Phys Ther Res.* 2016;19(1):50-57
8. Drysdale CL, Earl JE, Hertel J. Surface Electromyographic Activity of the Abdominal Muscles During Pelvic-Tilt and Abdominal-Hollowing Exercises. *J Athl Train.* 2004;39(1):32-36.
9. Floyd WF, Silver PH. The function of the erector spinae muscles in certain movements and postures in man. *J Physiol.* 2000;129(1):184-203
10. Anderson E, Oddsson L, Grundstrom H, Thorstensson A. The role of the psoas and iliacus muscles for stability and movement of the lumbar spine, pelvis and hip. *Scand J Med Sci Sports.* 1995;5(1):10-6.
11. Hodges PW, Richardson CA. Transversus abdominis and the superficial abdominal muscles

- are controlled independently in a postural task. *Neurosci Lett.* 1999;265(2):91-4.
12. Workman JC, Docherty D, Parfrey KC, Behm DG. Influence of pelvis position on the activation of abdominal and hip flexor muscles. *J Strength Cond Res.* 2008;22(5):1563-9
 13. Ha Yong K, , Kap Jung K, , Dae Suk Y, , Sang Wook J, , Han Gyeol Ci, , Won Sik C. Screw-Home Movement of the Tibiofemoral Joint during Normal Gait: Three-Dimensional Analysis. *Clin Orthop Surg.* 2015;7(3):303-9
 14. Andersson BJ, Jonsson B, Ortengren R: Myoelectric activity in individual lumbar erector spine muscles in sitting. A study with surface and wire electrodes. *Scand J Rehabil Med suppl* 1974;3:91-108
 15. Blackburn S and Portney L: Electromyographic Activity of Back Musculature During Williams' Flexion Exercises. *Phys Ther* 1981;61:878-885
 16. Okubo Y, Kaneoka K, Imai A, Shiina I, Tatsumura M, Izumi S, Miyakawa S. Electromyographic analysis of transversus abdominis and lumbar multifidus using wire electrodes during lumbar stabilization exercises. *J Orthop Sports Phys Ther.* 2010;40(11):743-50
 17. Urquhart DM, Hodges PW, Allen TJ, Story IH. Abdominal muscle recruitment during a range of voluntary exercises. *Man Ther.* 2005;10(2):144-53.16
 18. Allison GT, Morris SL, Lay B. Feed forward responses of transversus abdominal are directionally specific and act asymmetrically; implications for core stability theories *J Orthop Sports Phys Ther.* 2008;38;228-237
 19. Richardson C, Jull G, Toppenberg R, Comerford M. Techniques for active lumbar stabilisation for spinal protection: A pilot study. *Aust J Physiother.* 1992;38(2):105-12
 20. Vezina MJ, Hubley-Kozey CL. Muscle Activation in Therapeutic Exercises to Improve Trunk Stability. *Arch Phys Med Rehabil.* 2000 81(10):1370-9.
 21. Munoz F, Rougier PR. Estimation of centre of gravity movements in sitting posture: application to trunk backward tilt. *J Biomech.* 2011;44(9):1771-5
 22. Olson M, Solomonow M, Li L. Flexion-relaxation response to gravity. *J Biomech.* 2006;39(14):2545-54
 23. Urquhart DM, Barker PJ, Hodges PW, Story IH, Briggs CA. Regional morphology of the transversus abdominis and obliquus internus and externus abdominis muscles. *Clin Biomech (Bristol, Avon).* 2005;20(3):233-41.
 24. Mansour Sahebozamani Abdolhamid Habibi Yadollah Zibaye Yekta. Rohollah Valizadeh, Comparison of the couple force ratio's of pelvic lumbar girdle in Hyperlordosis & healthy male. *Procedia Social and Behavioral Sciences* 15 (2011) 2353–2356

The Changed of Muscle Activation During Different Visual Sign in Bridging Exercise: Randomized Controlled Trial

Young-Hyen Lee¹, Bo-Eun Lee², Dong-Yeop Lee², Ji-Heon Hong², Jae-Ho Yu², Jin-Seop Kim²

¹Student, ²Professor, Dept. Sunmoon Uninversity, Korea

ABSTRACT

Background/Objectives: The purpose of this study is to propose the effective posture of bridge exercise by comparing and analyzing the muscle activity of the internal oblique abdominal, external oblique abdominal, rectus abdominal and transverses abdominals, when performing bridge exercise with visual blocking and varying the stance.

Method/Statistical analysis: Muscle activity was measured by EMG. the study conducted a study of 30 people who do not have neurological disorder such as fracture, damage to the muscle and ligament, etc. for past 6 months For the experimental group, the stance was set to 100%, 50% and 150% of the shoulder width, the muscle activation was measured total 6 exercises by dividing into visual blocking and the stance and all the measured values were analyzed using ANOVA repeated measurement.

Findings: In the results of this study, all the internal oblique abdominal, external oblique abdominal, rectus abdominal and transverses abdominals showed higher muscle activation during the bridge exercise with visual blocking and representing significant difference. When the bridge exercise was performed with the stance of 50% shoulder width, the muscle activation was the highest and the difference by muscle according to the breadth of foot was varied.

Improvements/Applications: In conclusion, it is deemed that the bridge exercise with visual blocking and narrow foot width will be the more effective posture to improve the muscle activation and to stabilize the body.

Keywords: Base of support, Bridging exercise, Muscle activity, Visual blocking, core muscle, abdominal muslce

INTRODUCTION

Low back pain is the common disease that 80% of modern populations are suffering by the social changes and leading to dysfunction and affects the quality of life^{1,2}. The most important in the prevention and treatment of low back pain is the stability of the vertebra, which is achieved with simultaneous muscle activity. For low back pain, the lumbar stabilization exercise is performed a lot³. The transverse abdominis is the muscle that contributes to the lumbar stabilization a lot with the posture of maintaining the balance of the body and contributes to the stability by contracting first

during the activity. The balance, which is the ability to adapt within base of support, is the process to maintain continuously the posture stability by maintaining the center of gravity. The balance is related to the ability to adjust the body posture within the space⁴. To adjust the balance, the interaction among the vestibular function, sight, proprioceptive sensibility, musculoskeletal system and cognitive ability is required, among which the sight has the greatest impact on the balance^{5,6,7}. As the sensory information of forecasting the posture, this visual information can perceive not only the distance with the hazardous factor from the surroundings and the motion of articular surface occurred in the body but also is the basic element in the daily life, it is the matter to be considered first when treating the patient with Low back pain. When treated, the visual blocking is used a lot, the dependency on the vestibular sense and the propioceptive sensibility, for which it brings the improvement of the vestibular sense and the proprioceptive sensibility. The muscles

Corresponding Author:

Jin-Seop Kim

Professor, Division of Physical therapy,
Sunmoon University, Korea

Email: skylove3373@sunmoon.ac.kr

involved in the stabilization of the body keep the balance when the body is moving and stabilize the lumbar^{8,9}. In the lumbar stabilization, the rectus abdominis and transverse abdominis have great influence and activating the transverse abdominis muscle relieves the pain in the patients with low back pain³. Moon reported that the lumbar stabilization exercise including the contraction of the transverse abdominis muscle and internal oblique abdominis increases the stability of vertebra and is more effective than other therapeutic methods like abdominal exercise, which decrease the pain and dysfunction in the aspect of controlling and improving the neuromuscle¹⁰. The stabilization exercise not only provides the exercise efficiency and is useful to maintain the balanced posture and to improve the muscle strength by increasing the stability of the vertebra and the pelvis when performing the functional posture and the exercise¹¹. In addition, Lehman emphasized the needs of bridge exercise and explained the stabilization exercise is important in the rehabilitation exercise, which requires the body muscle activation with low intensity. Jeon claimed that the bridge exercise is performed to absorb the external forces applied to the lumbar and to prevent the repeated damage to the surround muscles during the movement of four extremities¹². The bridge exercise is the form in the supine position with knees drawn up, is the important motion to perform the kneeling position with the weight loading on the feet, and is useful to promote the pelvic exercise developing the adjustment of sit to stand. In addition, according to O' Sullivan, it reinforces the bottom of vertebra and the extensor of hip joint to prepare the stance phase of walking³, and as a body stabilization exercise having influence both on the upper extremity and the lower extremity, particularly, effective for the activation of abdominal muscle, recently, it plays the important role to adjust the spinal segment and to provide the stability focusing on the treatment for the instability of spinal segment and the lumbar stabilization exercise is applied to the abdominal muscle reinforcement as a new kinematics of the Low back pain. The effects of the bridge exercise are related to the base of support. The bridge exercise showed that its effect is greater by maintaining the stability increasing the activation of transverse abdominis when it is narrow foot width plane than the wide foot width plane³. Since the wider foot width plane, the higher the stability of the body becomes and it is easy to put the center of the body within the base of support, the stability is increased¹³. In addition, it was reported that when the voluntary movement in the

unstable state that the base of support becomes narrow, the adjustment of posture is complex using many muscles and the high muscle activation is shown¹⁴. There are lots of researches on the effects of bridge exercise to improve the Low back pain but the research that identified the effect of the bridge exercise with the visual blocking and width of plane are not sufficient. Therefore, in this study, the efficient bridge exercise method will be proposed by comparing the muscle activation of internal oblique abdominis, external oblique abdominis, rectus abdominis and transverse abdominis by various widths of feet and the visual blocking when exercising bridge.

SUBJECT AND METHOD

Subject: The subjects of this study were 30 participants who do not have musculoskeletal system and neurological disorders such as fracture and the damage to the muscle or ligament, etc. for past 6 months out of the healthy adult male and female students attending S University located in Asan, Chungnam. Before participating in this study, the subjects were told about the contents and the purpose of the study and signed the consent to participate in this experiment. The general characteristics of the subjects are as follows in Table 1.

Table 1. Subject Characteristics

(n = 30)

Characteristics	Value
Gender (Male/Female)	15/15
Age (year)	20.2 ± 0.92
Height (cm)	168.8 ± 11.48
Weight (kg)	68.9 ± 13.72

All values are mean ± standard deviation

Table 2: Classification of bridge exercise

	Exercise Method
EOGL	Eyes open and spread generally legs
EONL	Eyes open and spread narrowly legs
EOWL	Eyes open and spread widely legs
ECGL	Eyes closed and spread generally legs
ECNL	Eyes closed and spread narrowly legs
ECWL	Eyes closed and spread widely legs

Experimental procedure: It is performed in the supine position after attaching the pad on IO, EO, RA and TrA

of the subjects to be measured. When the correct posture was taken, all exercise was performed for 5 seconds and was measured three times for increase the reliability. The muscle activity for 3 seconds was measured excluding beginning and ending 1 second. In addition, to prevent the muscle fatigue of the subjects, 5 minutes of rest were given after 3 interventions. The exercise was performed with 6 postures; the base of support of 100%, 150% and 50% of shoulder width without non-visual blocking and the base of support of 100%, 150% and 50% of shoulder width with visual blocking in Table 2. When performing the bridge exercise, the subjects were instructed to perform pelvic anterior tilting both hands on the floor and to contract S4~S5 of dermomyotome strongly in order to tighten the muscle and the measurer kept instructing to maintain correct bridge exercise. Bridge exercise is raises the waist and hip upward after bending the knees 90° watching the ceiling in the straight supine position. When the waist and the hip were raised, the smooth grade line should be made and the caution should be taken in order not to raise the shoulder bone. In addition, to maintain the

neutral position, the subjects were instructed to maintain straight line from the head, shoulder bone, waist, pelvis, knee to ankle, not to raise the ankle for the stable balance and the exercise was performed with barefoot to maintain same condition. First, the measurement was made in the condition that the exercise was performed standing with feet 100% shoulder width apart without visual blocking. Second, the measurement was made in the condition that the exercise was performed standing with feet 50% of shoulder width apart without visual blocking. Third, the measurement was made in the condition that the exercise was performed standing with feet 150% of shoulder width apart without visual blocking. Fourth, the measurement was made in the condition that the exercise was performed standing with feet shoulder width apart with visual blocking. Fifth, the measurement was made in the condition that the exercise was performed standing with feet 50% of shoulder width apart with visual blocking. Sixth, the measurement was made in the condition that the exercise was performed standing with feet 150% of shoulder width apart with visual blocking in Figure 1, Figure 2.

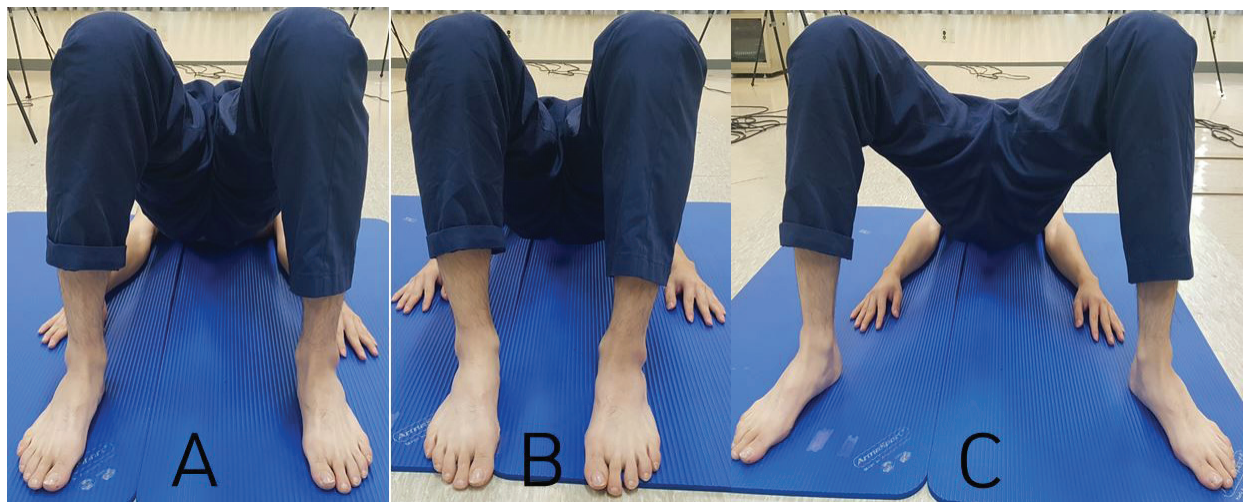


Figure 1: Leg width for Experimental

A : base of support of 100% of shoulder width, B : base of support of 50% of shoulder width, C : base of support of 150% of shoulder width

Measurement: In this study, the EMG (QUS100, Zero Wire EMG, Italy, 2009) was used to measure the muscle activation of IO, EO, RA and TrA while the subjects took posture in Figure 3. Muscle Activation Measuring Equipment (EMG) To measure the muscle activation of IO-TrA(2cm inside of spina iliaca anterior superior) EO(15cm to the lateral from the naval) and RA(2cm to the lateral from below the naval), the EMG QUS100 (Zero Wire EMG, Italy, 2009) was used. To reduce the skin

resistance of the EMG, the EMG was attached on each muscle after shaving the area. The areas attached with the EMG are shown in Figure 4. When the measuring the surface EMG, the sampling rate was 1024Hz, the EMG signal was amplified by 1785 times, the band-pass filter was 20~450Hz and the notch filter was processed with 60Hz. The collected EMG signal was recorded with root mean square (RMS) after full wave rectification.

DATA ANALYSIS

or the data analysis, IBM SPSS/PC ver 22.0 for windows program was used. To find out the muscle activation in the research subjects by visual blocking during bridge exercise, ANOVA repeated measurement was used and for the difference between each variable, Bonferroni method was used as post hoc analysis. The statistically significance level was set to $p < .05$.

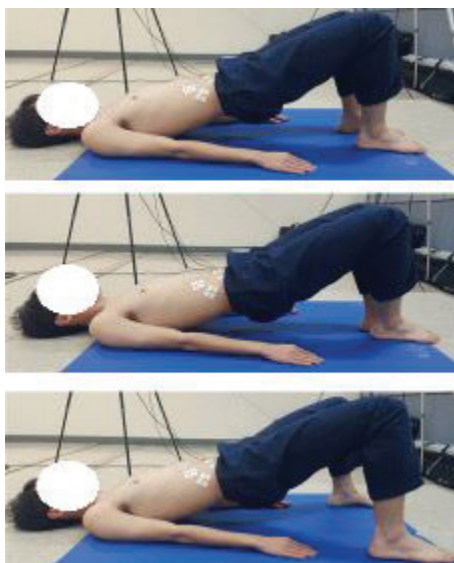


Figure 2: Aspects of the bridge exercise

RESULTS AND DISCUSSION

The difference in the muscle activation of the internal oblique abdominal muscle, external oblique abdominal muscle, rectus abdominal muscle and transversus abdominis muscle was compared according to the visual blocking during the bridge exercise ($p < .05$) in Figure 3, Table 3. In the internal oblique abdominal muscle, the significant difference was found between ECNL/EOGL, ECNL/EOCL, ECNL/EOWL, ECNL/ECGL ($p < .05$) and the statistically significant difference was not found between ECNL/ECWL ($p > .05$) In Figure 4, Table 3. In the external oblique abdominal muscle, the statistically significant difference was found between ECNL/EOGL, ECCL/EONL, ECNL/EOWL, ECNL/ECGL, ECNL/ECWL ($p < .05$) in Figure 4, Table 3. In the rectus abdominal muscle, the statistically significant difference was found between ECNL/EOGL, ECCL/EONL, ECNL/EOWL, ECNL/ECGL, ECNL/ECWL ($p < .05$) in Figure 4, Table 3. This study was intended to compare the impact of the bridge exercise on the

subjects according to the visual blocking and the stance and the difference in the activation of the internal oblique abdominal muscle, external oblique abdominal muscle, rectus abdominal muscle and transversus abdominis muscle. In the results, all the internal oblique abdominal muscle, external oblique abdominal muscle, rectus abdominal muscle and transversus abdominis muscle showed the higher muscle activation when performing the bridge exercise with visual blocking than without visual blocking and when the experiment was conducted by dividing the stance into 100%, 50% and 150% of the shoulder width, the muscle activation was the highest when narrowing the stance into 50% of shoulder width. As such, in the results of exercising all 6 methods by one person, when reducing the stance to 50% of shoulder width with visual blocking, the muscle activation was highest. In general, the muscle activation was higher under unstable condition, which the visual blocking was applied than the stable condition without visual blocking, it is coincided with the preceding studies that the activation of the internal oblique abdominal muscle, external oblique abdominal muscle, rectus abdominal muscle become higher when it is performed in the stable ground than in the unstable ground¹⁵. However, not all muscles showed the significant difference when there is a difference of visual blocking. All the muscles except the internal oblique abdominal muscle did not show the significant difference between EONL and ECWL. All the muscle except the rectus abdominal muscle did not show the significant difference between EONL and ECGL. In addition, the transversus abdominal muscle and the rectus abdominal muscle did not show the significant difference between EOWL and ECGL. In this study, when the stance was reduced to 50% of shoulder width for both with visual blocking and without visual blocking, the muscle activation was the highest. When the stance was reduced, the hip joint is gathered, and as the adductor muscle of hip joint is originate from the to the proximal of pelvis to the bottom of ischium, it served to support or fix the truck muscles attached to the pelvis or fixes or promote the contraction of the muscle inside of abdomen^{15,16}. It contracts strongly the adductor muscle of hip joint and if the bridge exercise is performed, it seems to contribute to the stabilization of truck movement. In addition, it may occur by the difference of the sensory input information due to the difference of supporting area. The somatic sense input is the element having

influence on maintaining the balance. Since in the posture of 150% of shoulder width, two feet are supported with wide area of the floor, lot of sensory input is possible but when the stance is reduced to 50% of shoulder width, as maintaining the balance is difficult due to reduction of supporting area, the activation of internal oblique abdominal muscle and the external oblique abdominal muscle is deemed to be increased. The results of this study showed that the muscle activation was higher in the same stance when the visual blocking was applied than when the visual blocking was not applied. Coddege reported that the balancing ability of the body is increased more when the visual blocking is applied than when it is not applied ¹⁷. Potter and Silverman asserted that the visual system and the somatosensory system work organically for the balance control and if one sensory system may be damaged, other sensory system will work to enable the balance control, through which the body uses the exercise experience and the sensory information organically to adjust the posture and if one information may not be available, it can maintain the posture control by adjusting the dependency to other information ¹⁸. In addition, in the results of research on the posture control according to the sight by Won et., al. the difference in the visual information by the visual blocking has influence on the dependency on the proprioceptive sensibility for dynamic balance control on the balance system and as the visual blocking condition causes the increase of posture sway, it influences on the muscle activation for hip joint and trunk strategy. For such reason, the significant difference in the activation value of the internal oblique abdominal muscle, external oblique abdominal muscle, rectus abdominal muscle and transverses abdominal muscle is deemed to be shown when the base of support was reduced by reducing the stance. When comparing the muscle activations with the difference in the base of support by the visual blocking and the stance, the significant difference in the internal oblique abdominal

muscle is deemed to be shown because the influence of the contraction of adductor muscle of hip joint by the narrow base of support and the influence of insufficient sensory information on the balance control are similar. The significant difference was not shown in the internal oblique abdominal muscle, external oblique abdominal muscle, rectus abdominal muscle and transversus abdominis muscle because the sense of balance was provide when visual blocking was not applied and the stability of struck was complimented when the base of support was increased. This study has several limitations. First, the signal of surface electromyogram was measured assuming that it would be the muscle activation but signal noise would be generated by the movement of muscle during the exercise for the characteristics of the surface electromyogram. Second, since in this study, the muscle activation of the stabilizing muscle of the trunk was evaluated from 30 healthy and normal adults of 20s, it cannot be generalized for the patients with low back pain. In addition, additional research should be conducted with the diverse age group not with 20s. Therefore, additional research conducted with the patients with low back pain in diverse age group is deemed to be necessary. Finally, since this study is not the study conducted on the bridge exercise long-term but is the study measured and compared the muscle activation through temporary posture, the research on the muscle activation change will be needed through the long-term exercise.

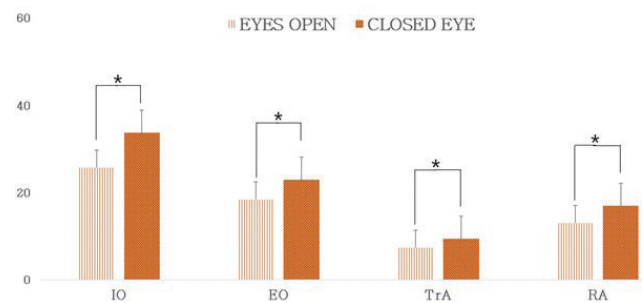


Figure 3: Comparison of muscle activity of IO, EO, TrA, RA According to visual blocking *P<0.05,

Table 3: Muscle activation according to bridge exercise including means and standard deviation (RMS)

BOS	Eyes open			Eyes closed			F
	100%	50%	150%	100%	50%	150%	
IO	22.83 ± 11.42	26.82 ± 11.51	23.66 ± 10.34	26.72 ± 11.68	31.30 ± 13.29	29.34 ± 12.47	7.39*
EO	16.44 ± 9.77	21.24 ± 8.65	17.63 ± 7.43	19.92 ± 10.14	26.71 ± 11.21	22.11 ± 10.04	25.31*
TrA	6.35 ± 3.04	8.90 ± 4.24	7.53 ± 3.21	7.77 ± 4.00	11.59 ± 5.05	9.31 ± 2.87	18.81*
RA	10.60 ± 4.58	15.97 ± 6.76	12.60 ± 5.97	13.86 ± 6.51	21.95 ± 9.11	15.95 ± 7.61	21.41*

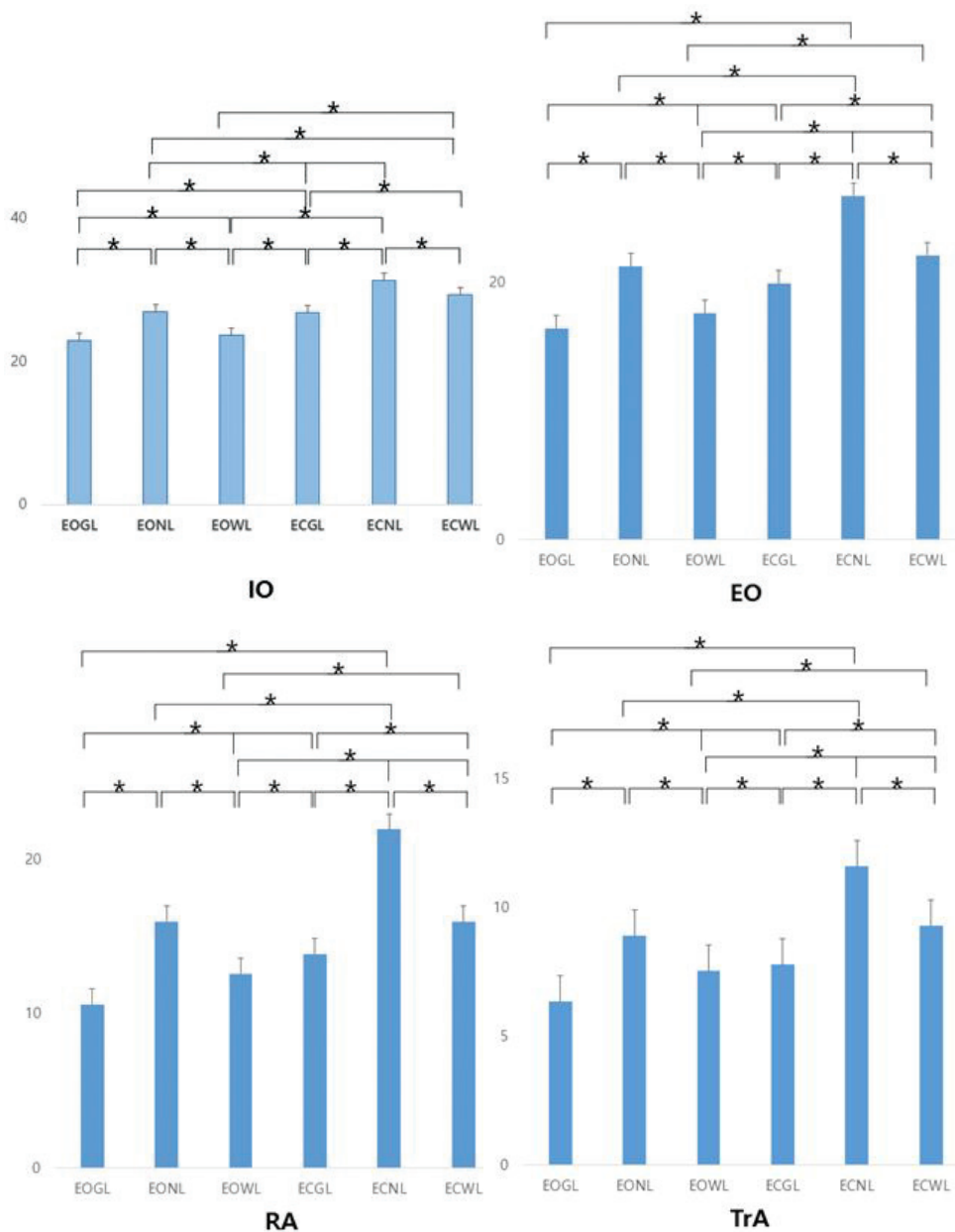


Figure 4: Electromyography activities of abdominis during varying bridge exercise *P<0.05,

CONCLUSION

This study was conducted to find out the influence of the visual blocking and the stance on the muscle activation during the bridge exercise with 30 male and female adults. In the results, when the visual blocking was applied, the activation of the internal oblique abdominal muscle, external oblique abdominal muscle, rectus abdominal muscle and transverses abdominal muscle was increased and when the stance was reduced to 50% of shoulder width, the muscle activation was increased. In the patients with low back pain, the muscles around the vertebra and the abdominal muscles

contributing to the stability of the trunk experience the muscle contraction, too. Therefore, it is expected that the bridge exercise method for stabilization of trunk would be proposed by adding the posture of narrow stance with visual blocking when exercising the bridge for the patients with low back pain.

Ethical Clearance: This study was conducted with the approval of Sunmoon University Research Ethics Board(SM-201705-018-2).

Source of Funding: This research was supported by Basic Science Research Program through the

National Research Foundation of Korea(NRF) funded by the Ministry of Science, ICT & Future Planning(2017R1C1B5017084).

Conflict of Interest: Nil

REFERENCES

1. Luo X, Pietrobon R, Sun SX, Liu GG, Hey L. Estimates and patterns of direct health care expenditures among individuals with back pain in the United States. *Spine (Phila Pa 1976)*. 2004 Jan 1;29(1):79-86.
2. Nykänen M1, Koivisto K. Individual or group rehabilitation for people with low back pain: a comparative study with 6-month follow-up. *J Rehabil Med*. 2004 Nov;36(6):262-6.
3. O'Sullivan PB, Burnett A, Floyd AN, Gadsdon K, Logiudice J, Miller D, Quirke H. Lumbar repositioning deficit in a specific low back pain population. *Spine (Phila Pa 1976)*. 2003 May 15;28(10):1074-9.
4. Cohen H1, Blatchly CA, Gombash LL. A study of the clinical test of sensory interaction and balance. *Phys Ther*. 1993 Jun;73(6):346-51; discussion 351-4.
5. van Asten WN, Gielen CC, Denier van der Gon JJ. Postural adjustments induced by simulated motion of differently structured environments. *Exp Brain Res*. 1988;73(2):371-83.
6. Wernick-Robinson M, Krebs DE, Giorgetti MM. Functional reach: does it really measure dynamic balance? *Arch Phys Med Rehabil*. 1999 Mar;80(3):262-9.
7. Straube A, Paulus W, Brandt T. Influence of visual blur on object-motion detection, self-motion detection and postural balance. *Behav Brain Res*. 1990 Oct 30;40(1):1-6.
8. Carter JM, Beam WC, McMahan SG, Barr ML, Brown LE. The effects of stability ball training on spinal stability in sedentary individuals. *J Strength Cond Res*. 2006 May;20(2):429-35.
9. Marshall PW, Murphy BA. Core stability exercises on and off a Swiss ball. *Arch Phys Med Rehabil*. 2005 Feb;86(2):242-9.
10. Moon JH, Hong SM, Kim CW, Shin YA. Comparison of deep and superficial abdominal muscle activity between experienced Pilates and resistance exercise instructors and controls during stabilization exercise. *J Exerc Rehabil*. 2015 Jun 30;11(3):161-8. doi: 10.12965/jer.150203.
11. Garcia-Vaquero MP, Moreside JM, Brontons-Gil E, et al. Trunk muscle activation during stabilization exercises with single and double leg support. *J Electromyogr Kinesiol* 2012;22(3):398-406.
12. Lehman GJ, Hoda W, Oliver S. Trunk muscle activity during bridging exercises on and off a Swiss ball. *Chiropr Osteopat*. 2005 Jul 30;13:14.
13. Kaminisk TR, Simpkins S, The effects of stance configuration and target distance on reaching. I. Movement preparation. *Exp Brain Res*, 2001;136(4):439-46
14. Aruin AS, Latash ML. Directional specificity of postural muscles in feed-forward postural reactions during fast voluntary arm movements. *Exp Brain Res*. 1995;103(2):323-32.
15. Jang EM, Kim MH, Oh JS. Effects of a Bridging Exercise with Hip Adduction on the EMG Activities of the Abdominal and Hip Extensor Muscles in Females. *J Phys Ther Sci*. 2013 Sep;25(9):1147-9. doi: 10.1589/jpts.25.1147. Epub 2013 Oct 20.
16. Bø K, Stien R. Needle EMG registration of striated urethral wall and pelvic floor muscle activity patterns during cough, Valsalva, abdominal, hip adductor, and gluteal muscle contractions in nulliparous healthy females. *NeuroUrol Urodyn*. 1994;13(1):35-41.
17. Colledge NR, Cantley P, Peaston I, Brash H, Lewis S, Wilson JA. Ageing and balance: the measurement of spontaneous sway by posturography. *Gerontology*. 1994;40(5):273-8.
18. Potter CN, Silverman LN. Characteristics of vestibular function and static balance skills in deaf children. *Phys Ther*. 1984 Jul;64(7):1071-5.

Comparison of Quadriceps Muscle Activities During Plyometric, Open and Closed Kinetic Chain Exercises

Ji-hyeonKim(A)¹, Ji-hyeonKim(B)², Ju-yeon Kim³, Dong Yeop Lee⁴, Jae Ho Yu⁵, Jin Seop Kim⁶, Ji Heon Hong⁷

^{1,2,3}Student, ^{4,5,6,7}Professor, Dept. Physical Therapy, Sun Moon Univeresity, Republic of Korea

ABSTRACT

Background/Objectives: This study was conducted to compare muscle activity of quadriceps muscles during open and closed kinetic chain and plyometric exercise using electromyography.

Method/Statistical analysis: 30 Healthy people agreed to participate in this study to collect data the activity of muscles. Measured data were converted into maximum voluntary isometric contraction percentages and ratio of individual muscles to the sum of each muscle.

Findings: The open-chain exercises, closed-chain exercises, plyometric exercises all showed significant differences ($P < .05$).

Improvements/Applications: As a result of muscular activity, rectus femoris was the most effective in an open-chain exercise, and vastus medialis oblique was the most effective in a closed-chain exercise. The results were thought to be used as a scientific basis for the selective knee extension exercise.

Keywords: *Open-kinetic chain, Closed-kinetic chain, Plyometric exercise, Vastus medialis, Vastus lateralis, Rectus femoris*

INTRODUCTION

A knee joint was a joint responsible for weight bearing, and was one of the largest joints in the body. The role of extra-articular soft tissues such as ligaments, membranes, and muscles was very important because of the high risk of injury due to the unstable and mid-position of the lower extremity¹. In addition, the knee joints provided dynamic and static stability in support of weight in daily life. The stability of the knee was obtained by the soft tissues such as muscles, skin, joints, tendons, and ligaments rather than the structural arrangement in which the bones are located². During activity of daily living such as walking, running, and stair climbing, the knee joint was loaded with more than the weight³. There have been a lot of researches that the knee joint function is weakened and muscle strength

is weakened due to the above reasons. Knee joints were stable only with ligaments and muscles, so they show severe movements and they were a part where injury due to external force was very common. Therefore, general knee-related rehabilitation aimed to prevent joint damage caused by instability⁴.

Excessive use of the knee joint and abnormal movement of the patella reduced the ability to coordinate between the vastus lateralis (VL) and the vastus medialis obliquus (VMO). As a result, it caused patellofemoral pain syndrome (PFPS) and degenerative arthritis of the knee joint⁵. It was important to manage on their own as chronic diseases were caused by PFPS⁶. Quadriceps was one of the most important muscles of the knee joint muscles. This muscle acted as a knee extensor and provides the stability of the lower limb during gait and standing, and was a very important muscle in terms of providing stability of the knee joint⁷. In addition, VL of quadriceps acted more strongly than VMO during lower limb movement, which caused imbalance of external and internal forces during exercise. This imbalance caused lateral displacement of the patella⁸. Therefore, the persistent imbalance between VL and VMO led to PFPS⁹.

Corresponding Author:

Ji Heon Hong

Professor, Division of Physical Therapy,
Sunmoon University, Korea

Email: hgh1020@hanmail.net

When the open kinetic chain (OKC) exercise of the knee joint was applied, the force of the quadriceps increases and the shearing force increases. This exercise was used because of the reduced contact surface between the knee and femur¹⁰. Conversely, closed kinetic chain (CKC) exercise caused co-contraction of the quadriceps, resulting in less shearing force¹¹. It also increased the compression force of the joints and provided a functional muscle recruitment pattern by various joint movements¹². It also used functional muscle recruitment patterns and was said to be functional because it stimulated a proprioception^{3, 13}. In addition, plyometric exercise of quadriceps has been reported to be effective in stabilizing the knee and preventing knee injury¹⁴. During a plyometric exercise, many muscles performed their work for a short time. The activated muscle properly formed a stretching cycle that occurs when the action of fast concentric muscles was switched from fast eccentric muscle action (deceleration)¹⁵.

Previous studies have shown that OKC and CKC exercise are commonly used for rehabilitation in patients with knee pain. However, there was no study to compare the ratio of muscle activity of quadriceps during OKC, CKC and plyometric exercise. Therefore, in this study, the ratio of muscle activity of the VMO, VL and rectus femoris (RF) was compared during OKC, CKC and plyometric exercise.

MATERIALS AND METHOD

Participants: Thirty normal adults (15 males, 15 females; mean age 20.93 ± 1.36) were recruited. The physical characteristics of subjects were as follows [Table 1]. The exclusion criteria for this study were knee ligament, cartilage, or cartilage injury, a history of the knee joint injury or surgery, a traumatic injury of the patellofemoral pain syndrome, a knee dislocation or subluxation history, inflammatory arthritis. This study was conducted according to the protocol approved by the Institutional Review Board of Sun Moon University.

Table 1: Physical characteristics of subjects

Variable	Male (n = 15)	Female (n = 15)
Age(year)	21.6 ± 2.26	20.26 ± 0.45
Height(cm)	175.5±5.82	160.2 ± 3.53
Weight(kg)	78.8 ± 18.25	54.8 ± 8.6
mean ± standard deviation		

Procedure: Subjects participated in three exercise methods. All exercises were performed three times each and mean values were used in the results. The resting between each trial provided a 30-second rest in the OKC and CKC exercise, and a 10-second in plyometric exercise. Before performing OKC exercise, 1 repetition maximum (RM) of each subject was measured using isokinetic exercise equipment (CSMI, Humax Co, USA, Italy, 2010). Each subject performed knee extension for 3 seconds with 60% strength of maximal strength in sitting position. The squat was used to perform OKC exercise. The subject was asked to maintain a squat posture of 0 to 90 degrees of the knee joint for 3 seconds. The depth jump to vertical jump was used for plyometric exercise [Figure 1].

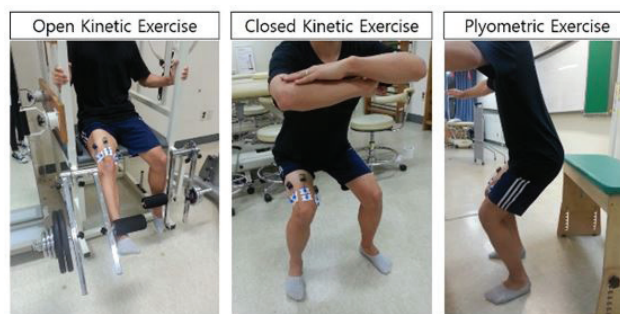


Figure 1: Three exercise methods

Measurement: In our study, surface electromyography (EMG) was used to measure muscle activity during each exercise. Disposable bipolar Ag/AgCl surface electrodes were attached parallel to the muscle fibers of the VMO, VL and RF with a distance of 2 cm between electrodes [figure 2]. The band-pass filter was set at 20-500Hz. Before attaching the electrodes, the skin surface was shaved, and the skin was wiped with ethyl alcohol to reduce the impedance. The obtained muscle activity values were averaged after calculating the root mean square (RMS), and were obtained as the ratio (% MVIC) of the maximum number of muscle contraction of each muscle on the basis of the muscle strength evaluation posture. In order to determine the muscle ratio, the RMS average of each muscle was added up and then quantified as a percentage (%).



Figure 2: The placement surface electrodes of muscles

Statistical analysis: All data was analyzed using SPSS/PC ver. 22.0 for Windows program (SPSS Inc., Chicago, USA). Measured data were converted into maximum voluntary isometric contraction percentages (MVIC %) and ratio of individual muscles to the sum of each muscle (RMS %). One-way ANOVA was used to determine the ratio of muscle activity to muscle activity according to the three exercise methods, and post-test (LSD) was performed. Significance level of all statistics were set as $p < .05$.

RESULTS AND DISCUSSION

Muscle activity: The VMO showed a significant difference in the three exercises, $11.4 \pm 6.16\%$ in the OKC, $17.76 \pm 8.76\%$ in the CKC and $23.03 \pm 14.41\%$ in the plyometric exercise ($p < .05$). The VL showed a significant difference in the three exercises, $15.27 \pm 6.53\%$ in the OKC, $14.14 \pm 7.07\%$ in the CKC and $23.48 \pm 10.38\%$ in the plyometric exercise ($p < .05$). The RF showed a significant difference in the three

exercises, $23.45 \pm 11.05\%$ in the OKC, $17.26 \pm 7.42\%$ in the CKC and $32.59 \pm 21.1\%$ in the plyometric exercise ($p < .05$). Overall, the plyometric exercise had the highest muscle activity [Table 2].

Table 2: The muscle activity (% MVIC) according to each exercise

Muscle	Exercise	%MVIC
VMO*	OKC	11.4 ± 6.16
	CKC	17.76 ± 8.76
	PLY	23.03 ± 14.41
VL*	OKC	15.27 ± 6.53
	CKC	14.14 ± 7.07
	PLY	23.48 ± 10.38
RF*	OKC	23.45 ± 11.05
	CKC	17.26 ± 7.42
	PLY	32.59 ± 21.10

Mean \pm standard deviation, * $p < .05$, VMO: vastus medialis oblique, VL: vastus lateralis, RF: rectus femoris, OKC: open-kinetic chain, CKC: closed-kinetic chain, PLY: plyometric

According to post-test results, there was a significant difference in VMO between OKC and CKC ($p < .05$). However, there was no significant difference between RF and VL ($p > .05$). There was also a significant difference in all muscles in the OKC, CKC and plyometric exercise ($p < .05$). In the CKC and plyometric exercise, there were significant differences in RF and VL ($p < .05$). However, there was no significant difference in VMO ($p > .05$). During plyometric exercise, all muscles showed the greatest force [Table 3].

Table 3: The comparison of the muscle activity (% MVIC) according to each exercise

Muscle	Exercise		I-J	P
	I	J		
VMO	OKC	CKC	-6.36	.027*
		PLY	-11.63	.000*
	CKC	PLY	-5.26	.066
VL	OKC	CKC	6.18	.119
		PLY	-9.13	.022*
	CKC	PLY	-15.32	.000*
RF	OKC	CKC	1.12	.616
		PLY	-8.21	.000*
	CKC	PLY	-9.33	.000*

* $p < .05$, VMO: vastus medialis oblique, VL: vastus lateralis, RF: rectus femoris, OKC: open-kinetic chain, CKC: closed-kinetic chain, PLY: plyometric

Ratio of muscle activity: VMO was $22.24 \pm 6.67\%$ in the OKC, $32.99 \pm 1.70\%$ in the CKC, and $27.97 \pm 6.67\%$ in the plyometric exercise. There was a significant difference between each exercise ($p > .05$). There was a significant difference between the three exercises in RF ($46.89 \pm 9.92\%$ in the OKC, $33.68 \pm 2.74\%$ in the CKC and $41.01 \pm 10.92\%$ in plyometric exercise.) ($P > .05$). However, there was no significant difference in VL ($30.86 \pm 6.79\%$ in the OKC, $33.06 \pm 1.09\%$ in the CKC, and $31.01 \pm 7.62\%$ in the plyometric exercise) ($p > .05$) [Table 4]. According to post test results, the muscle activity ratio showed a significant difference between the VMO and RF three exercises, respectively. ($p < .05$). However, there was no significant difference in VL ($p > .05$) [Table 5].

Table 4: The ratio of muscle activity (%) according to each exercise

Muscle	Exercise	%
VMO*	OKC	22.24 ± 6.67
	CKC	32.99 ± 1.70
	PLY	27.97 ± 6.67
VL	OKC	30.86 ± 6.79
	CKC	33.06 ± 1.09
	PLY	31.01 ± 7.62
RF*	OKC	46.89 ± 9.92
	CKC	33.68 ± 2.74
	PLY	41.01 ± 10.92

mean \pm standard deviation, * $p < 0.05$, VMO: vastus medialis oblique, VL: vastus lateralis, RF: rectus femoris, OKC: open-kinetic chain, CKC: closed-kinetic chain, PLY: plyometric

Table 5: The comparison of the ratio of muscle activity (%) according to each exercise

Muscle	Exercise		I-J	P
	I	J		
VMO	OKC	CKC	-10.75	.000*
		PLY	-5.73	.000*
	CKC	PLY	5.02	.001*
RF	OKC	CKC	13.21	.000*
		PLY	5.88	.012*
	CKC	PLY	-7.33	.002*

* $p < 0.05$, VMO: vastus medialis oblique, RF: rectus femoris, OKC: open-kinetic chain, CKC: closed-kinetic chain, PLY: plyometric

This study was conducted to compare muscle activity of quadriceps muscles during OKC, CKC and plyometric exercise. As a result, there was a significant difference between muscle activity of VMO, VL and RF. In the ratio of muscle activity, VMO, RF showed significant difference in OKC, CKC and plyometric exercise. However, there was no significant difference in the VL. The quadriceps consist of the VMO, VL, RF, and vastus intermedius, which is a group of muscles placed in front of the thigh¹⁶. RF was the main muscle of knee extension and played an important role in walking or standing posture⁷. The VMO contributed to the stabilization of the patella when the patella slid or passed through the intercondylar groove of the femur¹⁷. VL acted as a cooperative force on knee joint movement¹⁵. If the stability and balance of the muscles supporting the knee joint was reduced, a reduction of the contact area of the VMO, VL and imbalance of the patella occurred and was associated with various diseases¹⁸. In the OKC, joint movement was independent. Therefore, movement occurred at the distal part of the joint axis and concentric contraction was dominant at muscle contraction. In addition, more traction and rotational forces were generated, and stability was provided by external means¹⁹. In our results, RF showed the highest ratio of muscle activity and muscle activity in the OKC. This muscle was the primary extensor of the knee joint. It exerted 33% of the force when hip flexion. These functions were mainly used for heel strike during the gait cycle. Also, it had a great influence on stepping motion such as stair climbing and jumping²⁰.

In the CKC, movement of the joints was interdependent, so movement in the distal and proximal joint axes was expected. Recruitment of muscle contraction was simultaneous contraction for dynamic muscle stability. The eccentric contraction was dominant. Many joint compressive forces reduced joint shear forces and provided joint safety. Mechanical receptors were sensitive to change in pressure of the capsules, which increased the firing intensity over the entire range of activity and the activity of mechanical receptors limited moving joints¹⁶. In addition, compression and reduction of translation of tibiofemoral joint²¹ had been reported to include functional features such as the knee joint rehabilitation was more widely applied¹⁸. Irish (2010) found that the ratio of VMO to VL in the OKC and the CKC was 11.8: 1 in the squat exercise, one of the CKC. As a result, it has been reported effective for selective

strengthening of the VMO¹⁷. In this study, VMO showed the highest ratio of muscle activity in the CKC than the OKC. The VMO was one of the weakest physiologically and muscles that appear prematurely²². This muscle was also the main muscle acting actively and directly on patella stability, knee extension, and lateral movement of the patella²³.

Plyometric exercise was intended to provide a higher level of muscle strength by applying greater tension than the normal maximum muscle tension. When expressed in kinetic energy of chemical energy stored in muscles, the elastic properties of muscle were used to enhance the contractility by stretch reflex²⁴. Hakkinen et al. (1989) reported that a group with vertically high jump, a plyometric exercise, was more effective in isokinetic strength and flexibility than the control group. It also reported improved muscle power and muscular strength^{25, 26}. In this study, when the vertical jump was performed, VMO, VL, RF showed the highest muscle activity. On the other hand, there was no significant difference in VL in the ratio of muscle activity and there was a significant difference in VMO and RF. The VL was a knee extensor and served to stabilize the knee joint by balancing and cooperating with the VMO to prevent flexion of the knee joint during heel off^{17, 27}.

By increasing the distance from the axis of the knee joint to the quadriceps tendons, the internal moment arm was formed longer and consequently the role of the lever, which increases the knee extension moment, was changed. PFPS and osteoarthritis were commonly found in knee joints that were more weight-intensive than other joints²⁸. Increased load on the joint resulted in intensified degenerative changes^{29, 30}. Messier et al. (2005) reported that the increase in lower limb weight was closely related to the amount of the knee joint load³¹. Quadriceps weakness occurs in 50-60% of patients with knee disease. In particular, VMO was the first to show atrophy and slow to recover. This weakening led to an imbalance within the quadriceps, which increased the lateral movement of the patella^{26, 32}. Muscle imbalance occurred because the VMO could not counteract the reaction forces produced by the VL and iliotibial bands³³. In other words, the imbalance of the muscles supporting the knee joint caused many diseases.

Therefore, it is necessary to know the ratio of muscle activity of VMO, VL and RF during each exercise compared in this study. The selective enhancement of

the VMO was effective in the CKC, and RF had proved effective in the OKC. Plyometric exercise was also effective to uniformly strengthen the three muscles.

CONCLUSION

The purpose of this study was to compare the muscle activity ratios of the VMO, VL and RF with OKC and CKC, and plyometric exercise. As a result, there was a significant difference in the muscle activity of the VMO, VL and RF between the three exercises. The RF showed the highest muscle activity during the O, while the VMO had the CKC. VL showed similar muscle activity during the three exercises.

Ethical Clearance: Taken from the Institutional Review Board of Sunmoon University

Source of Funding: This study was supported by National Research Foundation of Korea Grant funded by the Korean Government (NRF-2016R1D1A3B03932586)

Conflict of Interest: Nil

REFERENCES

1. Lee SC, Chae JR, Kim HJ. The effect of neuromuscular electrical stimulation and isometric exercise on the strength of the quadriceps femoris muscle. *J Korean Soc Living Environ Sys*. 2009;16(3):239-45.
2. Choi NY, Jang HS, Shin YA. The effect on muscle activation in trunk and low limbs during squat exercise on various instability surface. *Korea sports association*. 2015;54(1):505-14.
3. Neumann DA. *Kinesiology of the musculoskeletal system: found actions for rehabilitation*. 2nd ed. Elsevier health sciences. 2013.
4. Majors RA, Wood FB. Achieving full range of motion after anterior cruciate ligament reconstruction. *The American journal of sports medicine*. 1996;24(3):350-5.
5. Licota DK. Anterior knee pain: symptom or syndrome. *Current women's health reports*. 2003;3(1):81-6.
6. Jeong YH, Kim JI. Effects of a 9-week self-help management, aquatic exercise program on pain, flexibility, balance, fatigue and self-efficacy in the

- patients with osteoarthritis. *Journal of muscle and joint health*. 2010;17(1):47-57.
7. Grabiner MD, Koh TJ, Draganich LF. Neuromechanics of the patellofemoral joint. *Medicine and science in sport and exercise*. 1994;26(1):10-21.
 8. Lee SC. The effect of neuromuscular electrical stimulation and isometric exercise on the strength of the quadriceps femoris muscle. *J Korean Soc Living Environ Sys*. 2009;16(3):239-45.
 9. Hanten WP, Schulthies SS. Exercise effect on electromyographic activity of the vastus medialis oblique and vastus lateralis muscles. *Physical therapy*. 1990;70(9):561-5.
 10. Grabiner MD, Koh TJ, Draganic LF. Neuromechanics of the patellofemoral joint. *Med Sci sports exercise*. 1994;26(9):1076-76.
 11. Grelsamer RP, Klein JR. The biomechanics of the patellofemoral joint. *Journal of orthopaedic & sports physical therapy*. 1998;28(5):268-98.
 12. De L, Toussaint MP, Dieen HM, Kemper JH. Joint moments and muscle activity in the lower extremities and lower back in lifting and lowering tasks. *Journal of Biomechanics*. 1994;26(9):1067-76.
 13. Selseth AD, Dayton A, Codova M, Ingersoll ML, Merrick CD. Quadriceps concentric EMG activity during the lateral step-up exercise. *JSR*. 2009;9(2):123-34.
 14. Timothy E. Hewett. Plyometric training in female athletes decreased impact forces and increased hamstring torques. 1996;24(6):765-773.
 15. Paul E. Luebbbers. Effects of plyometric training and recovery on vertical jump performance and anaerobic power. 2003;17(4):704-709.
 16. Jailania. R, Zakariaa SH, Tokhib MO. The development of quadriceps muscle model for paraplegic. *International symposium on robotics and intelligent sensors 2012. Procedia engineering* 41. 2012;1553-58.
 17. Irish SE, Millward AJ, Wride J, Haas BH, Shum GL. The effect of closed-kinetic chain exercise & open-kinetic chain exercise on the muscle activity of vastus medialis oblique & vastus lateralis. *Journal of strength & conditioning research*. 2010;24(5):1256-62.
 18. Fitzgerald GK. Open versus closed kinetic chain exercise: issues in rehabilitation after anterior cruciate ligament reconstructive surgery. *Phys ther*. 1997;77(12):1747-54.
 19. Hall CM, Brody LT. *Therapeutic exercise, Moving toward function*. Washington, lippin cott williams& wilkins. 1998:449-55.
 20. Heegaard J, Leyvraz PF, Van Kampen A, Rakotomanana L, Rubin PJ. Influence of soft structures on patellar three-dimensional tracking. *Clin orthop relat res*. 1994;(299):235-243.
 21. Witvrouw E, Sneyers C, Lysens R, Victor J, Bellemans J. Reflex response times of vastus medialis oblique and vastus lateralis in normal subjects and in subjects with patellofemoral pain syndrome. *J ortho sports phys ther*. 1996;24(3):160-5.
 22. Salvago D, Domenis R, Lazzer S. Skeletal Muscle oxidative function in vivo and ex vivo in athletes with marked Hypertrophy from resistance training. *J Appl Physiol*. 2013;114(11):1527-35.
 23. Nagamine R, Otani T, White SE, McCarthy DS, Whiteside LA. Patella tracking measurement in the normal knee. *J Orthop Res*. 1995;13(1):95-96.
 24. Steben R & Steben A. The validity of the stretch shortening cycle in selected jumping events. *Journal of sports medicine*. 1981;21(1):28-37.
 25. Hewett TE, Stroupe AL, Nance TA, Noyes ER. Plyometric training in female athletes: Decreased impact forces and increased hamstring torques. *American journal of sports medicine*. 1996;24(6):765-73.
 26. Kisner C, Colby LA. *Therapeutic exercise foundation and techniques*. F.A. Davis Company, 4th edition, 2002.
 27. Neumann DA. *Kinesiology of the musculoskeletal system: foundations for rehabilitation*. Elsevier health sciences. 2013.
 28. Imhof H, Czerny C, Gahleitner A. *Coxarthrosis radiology*. 2002;42(6):416-31.
 29. Levangie PK, and Norkin CC. *Joint structure and function: a comprehensive analysis*, F. A. Davis Company. 2005;4:393-426.

30. Kang MH, Kim JW, Yoon JY, Jang JH, Oh JS. The effect of changes in patellar height using infra-patellar strap on the EMG activity of quadriceps muscles during a squat exercise in adults with patellar Baja, Korean search society of physical therapy. 2012;19(1):37-45.
31. Messier SP, Devita P, Cowan RE, Seay J, Young HC & Marsh AP. Do older adults with knee osteoarthritis place greater loads on the knee during gait? A preliminary study. Archives of Physical Medicine and Rehabilitation. 2005;86(4):703-09.
32. Jin YS and Jeong TG. Effects of neuromuscular electrical stimulation of the vastus medialis on pain and muscle function in patients with knee osteoarthritis. The Journal of the Korea Contents Association. 2012;12(1):329-37.
33. Earl, JE, Schimitz BL, Arnold BL. Activation of the vmo and vl during dynamic mini-squat exercise with and without isometric hip adduction. J Electromyographic Kinesiol. 1992;11(6):381

The Relationship between Social Problem-Solving and Self-Regulation Abilities according to Clinical Practice Experience in Nursing Students

Young-Hee Kim¹, Jung-Hee Jeon²

¹Associate Professor, ²Assistant Professor, Department of Nursing, University of TongMyong, 428 Sinseon-ro, Nam-gu, Busan, Korea

ABSTRACT

Background/Objectives: This study was to investigate the social problem solving ability and self-regulation ability in nursing students according to clinical experience.

Method/Statistical analysis: A self-report questionnaire or face to face interviews were used to collect data from 156 nursing students. In order to measure the social problem-solving ability it used a measuring tool D'zurilla and Nezu had developed. For an assessment tool of the self-regulation ability it used a measuring tool Volition Composite Index that Kuhl and Futhrmann had developed. The statistical method used for data analysis was SPSS windows 21.0 program.

Findings: The main research findings were as follows. Social problem-solving ability of subjects was average $3.15 \pm .33$ points, and self-regulation ability was average $2.48 \pm .29$ points. Social problem solving ability was higher in the students with clinical practice experiences ($3.26 \pm .33$) than those with no experiences ($3.15 \pm .27$), and the difference was statistically significant ($t=2.12, p=.036$). The group of the students with clinical practice experiences showed higher scores in the sub-factors of Negative Problem Orientation ($3.17 \pm .70$), Rational Problem Solving Style ($3.52 \pm .47$), Impulsivity-Carelessness Style ($2.91 \pm .59$), and Avoidance Style ($2.91 \pm .70$), but there were no statistically significant results. The relation between social problem-solving and self-regulation abilities was a significant degree of correlation ($r=.370, p<.001$).

Improvement/Applications: As a result of the research, clinical practice experience is related to social problem-solving and self-regulation ability. This study could help curriculum developments to improve clinical performance ability of students.

Keywords: nursing, students, clinical practice, social problem-solving ability, self-regulation ability

INTRODUCTION

Nursing education is an integrated curriculum of theoretical and practical learning experiences aims to provide students with knowledge, skill, and attitudes required for future professional practice [1]. Clinical practice is a essential element of the baccalaureate nursing education. Nursing students who have experienced clinical practice can integrate theoretical

knowledge and skill needed to solve client's problems with critical thinking and professional intervention [2]. Clinical practices require a great deal of concentration and a strict code of conduct as they are normally performed in hospitals and directly related with human health. One's clinical competency is more dependent on problem solving abilities under diverse circumstances than on superficial knowledge. Social problem solving ability means that to solve problems in the most efficient way possible in everyday life [3]. As one's ability to deal with difficulties that may occur in real life, the social problem solving ability is a cognitive, emotional and behavioral process through which one can adapt to situations encountered in daily lives [4].

According to D'Zurilla and his colleagues [4], social problem solving abilities consist of two components, problem orientation and problem-solving styles. The problem orientation component contains negative and positive elements. Positive problem-oriented person

Corresponding Author:

Jung-Hee Jeon
Assistant Professor, Department of Nursing,
University of TongMyong, Korea
Email: jjh@tu.ac.kr

often consider their issues as a challenge and think of them as motivators to seek solutions to their issues. Individuals showing a negative problem orientation tend to involve variable dysfunctional cognitive styles that form their assessment of a problematic situation. A negative orientation is also clearly linked to continuing negative emotions, such as moods, worry and health complaints. According to the study, poor problem solving skills are associated with more sedentary behaviors and increased alcohol consumption [5].

While having clinical practice education in a complicated hospital setting, nursing students often suffer considerable stress. The clinical practice education at hospital has been a major cause of stress [6]. Such stress can have negative effects on one's study. Actually, there have been a lot of students who suffered extreme stress from clinical practices, lost self-confidence in nursing patients, and even dropped out of school [7].

Human beings sometimes give up or avoid circumstances they are not familiar with. This behavior occurs because self-regulation, among one's internal qualities, responds differently to a situation, depending on individuals [8]. The self in self-regulation refers to the one who takes an essential and leading role in striving for one's goal. Adolescents who have difficulty with self-regulations are more likely to exhibit problematic behaviors such as Internet game addiction, drug addiction and other delinquencies [9], with high levels of depression and social anxiety [10, 11].

Therefore, the purpose of this study is to explore the relationship between clinical practices of nursing students and their social problem solving abilities and self-regulation, and to present empirical data on whether one's social problem solving ability can be improved through self-regulation.

METHOD

Study design: This descriptive study aims to explore the relationship between nursing students' experiences of clinical practices and their social problem solving and self-regulation ability.

Participants: This study conducted a survey with male and female students of the nursing department at four-year universities in Pusan. The number of samples was calculated using the G*power 3.1.2 program. With a significance level (α) of .05, a test power ($1-\beta$) of 80%,

an effect size (f^2) of .15, and the number of predictor variable being 12, multiple regression analysis was conducted in order to find the appropriate sample size. The analysis showed the requirement of 156 subjects, but considering the number of dropouts, 150 students were included in the study.

Instruments

Social Problem-Solving Inventory: The scale of social problem solving ability used in this study is the adaptation by Kim and Kim of the scale developed by D'zurilla and Nezu [4], which consists of two major scales: the Problem Orientation Scale (POS) and the Problem Solving Skills Scale (PSSS). It contains 40 items, and higher scores reflect greater social problem solving abilities. The instrument has a reliability of Cronbach's $\alpha = .90$.

Self-Regulation Ability: For the scale of self-regulation, this study used the simplified version of the Volitional Components Inventory (VCI) by Kuhl and Futhrmann [12], which was adapted by Yoon for factor analysis [13]. The scale is composed of 21 items under the sub-factors of self-regulation and volitional inhibition modes. Higher scores on the scale indicate that a person is more likely to act in accordance with a self-directed plan. The instrument has a reliability of Cronbach's $\alpha = .79$.

Reliability of the Tools: The Cronbach's alpha for the reliability of the social problem-solving ability tool was .814, and the self-regulation ability tool was .782 [Table 1].

Table 1: Reliability of the research tool

Tool	Cronbach's alpha
Social Problem Solving Ability	.814
Positive Problem Orientation	.685
Negative Problem Orientation	.757
Rational Problem Solving	.881
Impulsivity-Carelessness Style	.801
Avoidance Style	.743
Self-Regulation Ability	.782
self-regulation mode	.799
volitional control mode	.747

DATA ANALYSIS

Using the SPSS/WIN 21.0 statistical program, data analysis for the collected data was conducted as follows:

- The levels of social problem solving ability and self-

regulation are calculated with frequencies, percentages, mean values and standard deviations.

- The t-test is performed to analyze how closely related clinical experiences are to social problem solving ability and self-regulation.
- The relationship between social problem solving ability and self-regulation is analyzed with Pearson correlation.

RESULTS AND DISCUSSION

The results of research showed that social problem solving ability level of 3.15±.33 (range 1-5) points. In subcategories, subjects scored 3.56±.54 points for Positive Problem Orientation, 2.94±.68 points for Negative Problem Orientation, 3.48±.44 points for Rational Problem Solving, 3.14±.54 points for Impulsivity-Carelessness Style, and 3.19±.68 points for Avoidance Style [Table 2].

Table 2: Social Problem-Solving Abilities Level

Variable	Range	M ± SD
Problem Orientation Scale		
Positive Problem Orientation	2.00~5.00	3.56 ± .54
Negative Problem Orientation	1.40~4.80	2.94 ± .68
Problem Solving Skill Scale		
Rational Problem Solving	2.35~5.00	3.48 ± .44
Impulsivity-Carelessness Style	1.80~4.70	3.14 ± .54
Avoidance Style	1.57~5.00	3.19 ± .68
Social Problem Solving	2.20~4.20	3.15±.33

The results of research showed that self-regulation ability level of 2.48 ± .29 (range 1-4) points. In subcategories, subjects scored 2.46 ± .47 points for self-regulation mode, and 2.50 ± .44 points for volitional inhibition mode [Table 3].

Table 3: Self-regulation Abilities Level

variable	Range	M ± SD
Self-Regulation Ability	1.77~3.03	2.48 ± .29
self-regulation mode	1.00~3.70	2.46 ± .47
volitional inhibition mode	1.64~3.82	2.50 ± .44

The results of the examination of the relation between social problem-solving abilities, self-regulation abilities and clinical practice are as show in Table 4.

Social problem solving ability was higher in the students with clinical practice experiences (3.26±.33) than those with no experiences (3.15 ± .27), and the difference was statistically significant (t = 2.12, p = .036). The group of the students with clinical practice experiences showed higher scores in the sub-factors of Negative Problem Orientation (3.17 ± .70), Rational Problem Solving Style (3.52 ± .47), Impulsivity-Carelessness Style (2.91 ± .59), and Avoidance Style (2.91±.70), but there were no statistically significant results.

A survey of college students in a study revealed that those with higher self-esteem and less stress tend to have greater social problem solving abilities [14]. A study involving nurses showed that social problem solving ability performs an important role in settling problems by helping the nurses make accurate and prompt decisions [15]. It was also found out that a nurse with higher social problem solving ability is less likely to suffer burnout [16]. These studies demonstrate that one with high social problem solving ability is capable of finding efficient alternatives to deal with difficulties.

Higher scores in the self-regulation mode reflect that one is more likely to stick to a self-directed plan, while higher scores in the volitional inhibition mode mean that one tends to refrain from inefficient and excessive self-control in striving for one’s goal.

Table 4: Social Problem-Solving and Self-Regulation Abilities according to Clinical Experience

Variable	Clinical practice (+)		Clinical practice(-)		t	p
	M	± SD	M	± SD		
Social Problem Solving	3.26	± .33	3.15	± .27	2.12	.036*
Problem Orientation Scale						
Positive Problem Orientation	3.56	± .52	3.57	± .57	0.16	.877
Negative Problem Orientation	3.17	± .70	3.02	± .80	.20	.234
Problem Solving Skill Scale						
Rational Problem Solving Style	3.52	± .47	3.44	± .39	1.23	.221

Conted...

Impulsivity-Carelessness Style	2.91	± .59	2.80	± .48	1.29	.200
Avoidance Style	2.91	± .70	2.74	± .74	1.43	.154
Self-Regulation Ability	2.55	± .35	2.40	± .35	2.63	.009*
Self-regulation mode	2.46	± .42	2.45	± .52	0.11	.910
Volitional inhibition mode	2.62	± .45	2.38	± .39	.53	.001*

In this study, the group with clinical practice experiences had higher scores in both self-regulation and volitional inhibition modes than the group with no experiences did. This finding suggests that compared to the students with no clinical experiences, those who have performed clinical practices make more varied plans and strategies and refrain from inefficient self-control while achieving their goal.

There was positive correlation among social problem solving ability and self-regulation ability (Table 5).

Table 5: Correlation among social problem-solving and self-regulation abilities

Variable	PO	NO	RPS	IC	AS	SRM	VIM
PO	1						
NO	-.273**	1					
RPS	.527***	-.035	1				
IC	-.087	.377***	-2.85***	1			
AS	-.338***	.575***	-.216**	.612***	1		
SRM	.481***	-.254**	.299***	.080	-.173*	1	
VIM	-.004	.387***	.129	.206**	.365***	.183*	1

Note: significant at * $p < .05$, ** $p < .01$, *** $p < .001$

PO=Positive Problem Orientation, NO-Negative Problem Orientation, RPS=Rational Problem Solving Style, IC=Impulsivity-Carelessness Style, AS= Avoidance Style, SRM=self-regulation mode, VIM=volitional inhibition mode.

CONCLUSION

The purpose of this study is to present basic data necessary to improve problem solving abilities of student nurses at hospital by examining the effects of nursing students' experiences of clinical practices on their social problem solving abilities and self-regulation. A survey was conducted with 156 college students of the nursing departments at four-year universities. As a result of it, social problem solving ability and self-regulation ability were above average. In the subcategories of social problem solving ability, the highest level of positive problem orientation was recognized as a challenge rather than as a threat, and the self-regulation ability showed the highest level of volitional inhibition mode. This means ineffective and excessive control self-regulation to achieve the goal. The higher the social problem

solving ability, The higher the self-regulation ability. Social problem solving ability and self-regulation are essential skills for nurses who are required to work in urgent medical situations. To improve such abilities, clinical practice education needs to have a curriculum that enables students to face diverse circumstances, make decisions, and present solutions by themselves. Clinical nursing practice is as equally important as theoretical nursing education. Therefore, it is necessary to develop a program that can improve self-regulation ability in order to cultivate talented people with problem-solving abilities required by society.

Ethical Clearance: Not Required

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Budgen C, Garmoth L. An overview of practice education models. *Nurse Education Today*. 2008;28(3):273-83.
2. Lopez V. Clinical teachers as caring mothers from the perspective of Jordanian nursing students. *International Journal of Nursing Studies*. 2003;40(1):51-60.
3. D'Zurilla TJ, Nezu AM. Social problem solving in adults. In P.C. Kendall (Ed.), *Advances in cognitive-behavioral research and therapy*, Vol. 1. New York: Academic Press;1982. 201-74.
4. D'Zurilla TJ, Nezu AM. Development and preliminary evaluation of the Social problem-solving inventory (SPSI). *Psychological assessment*. *A Journal of Consulting and Clinical Psychology*.1990; 2:156-163.
5. Frauenknecht M, Brylinsky JA. The relationship between social problem-solving and high-risk health behaviors among collegiate athletes. *Journal of Health Education*. 1996; 27(4): 217-27.
6. Elema G, Renata Z. Nursing students' perceived stress, coping strategies, health and supervisory approaches in clinical practice: A Slovak and Czech perspective. *Nurse Education Today*. 2018;65: 4-10.
7. Yu HS. Relationship among stress of clinical practice, practice satisfaction and clinical competence in nursing students. *Journal of the Korean Data Analysis Society*. 2015;17(2):1129-44.
8. Moon KS. Academic Stress and Mental Health of Adolescents: The Role of Self-control and Emotion Regulation. *Korean Journal of Child Studies*. 2008;29(5):285-300.
9. Park HK, Park SY. Father's Parenting Behavior, Son's Emotional Regulation as Related to Son's Aggression. *Family and Environment Research*. 2002;40(8):87-98.
10. Lim YJ. Children's Peer Competence in relation to Maternal Parenting Styles and Children's Emotion Regulation. *Family and Environment Research*. 2002;40(1):113-24.
11. Chyung YJ. Children's Peer Experiences, Familial Support, and Psychosocial Adjustment. *Family and Environment Research*. 2004;42(11):1-15.
12. Kuhl J, Fuhrmann A. Decomposing self-regulation and self-control: The Volitional Components Inventory. In J. Heckhausen & C. S. Dweck (Eds.), *Motivation and Self-regulation across the Life Span*. New York, NY: Cambridge University Press;1998.15-49.
13. Yoon YS. A Study on Self-Regulatory Ability of Adolescents and its Relationship with Personality, Parenting, Behavior Problems, and Life Stress [doctoral dissertation]. Seoul: Sookmyung Women's University; 2007. 63p.
14. Hong YJ. The Effects of Self-Esteem, Stress and Parenting style on Social Problem Solving Ability [master's thesis]. Seoul: Catholic University; 2001. 37p.
15. Shin YH. Influencing Factors for Nurses' Problem Solving Ability Related to Dysfunctional Beliefs and Emotion Regulation Strategy. *Journal of Korean Clinical Research*. 2012;18(3):402-12.
16. Kim MJ. Resilience, Social Problem-solving Ability and Burnout in Clinical Nurses [master's thesis]. Daegu: University of Keimyung; 2014. 28p.

A Study of Awareness and Preference for Oral Scanner of Dental Hygiene Students

Yu-Ri Choi¹, Youn-Soo Shim², Sun-Ok Jang³, Su-Young Park⁴

^{1,3}Department of Dental Hygiene, Hallym Polytechnic University, 48 Janghakgil, Dong-myeon, Chuncheon, Gangwon-Do, Korea; ²Department of Dental Hygiene, Sunmoon University, 70 Sunmoon-ro 221beon-gil, Tangjeong-myeon, Asan-si, Chungcheongnam-do, Korea; ⁴Camp Humphreys 618th Dental Clinic, 96271, Korea

ABSTRACT

Background/Objectives: In recent years, instead of traditional impression methods, have been developed and used as digitalized clinical methods in which computers and machines are responsible for using an oral scanner.

Method/Statistical analysis: A questionnaire survey were conducted on 116 dental hygiene students who agreed to the study by using the self-filling questionnaires method to change awareness and preference before and after oral scanner use. The collected data were analyzed using the SPSS 19.0 program.

Findings: The most important step in the dental practice area is to reproduce the shape of the oral cavity to create a replicate model, which should be accurately impression of the oral condition, and should be satisfied at the same time with less inconvenience and time saving.

In comparison with before use of the oral scanner, it was found that the awareness improved, the treatment process became easier, the oral scanner was more favorable to the use of the oral scanner, and the oral scanner was more effective than the conventional impression I thought it would be correct. People who thought that managing the model before using the oral scanner was not more comfortable and did not care about getting the patient's attention thought that it would be uncomfortable before using the oral scanner. In other words, the preference of oral scanner differs according to recognition difference.

Improvements/Applications: This study confirmed the awareness and prediction inconvenience of dental hygiene students' oral scanner. These results can be used as basic data in the field of dental hygiene education and digital dental education.

Keywords: Oral-scanner, Dental scanner, Digital dentistry, CAD-CAM, dental hygiene

INTRODUCTION

Traditionally, as a method for manufacturing the dental prosthesis, a dental hygienist mixes the impression material with the removed abutment, and then the model material is poured into the impression material considering the elastic recovery time. When the tooth model was sent to the dental laboratory, dental technicians through waxing and casting produced final dentures. In recent years, instead of traditional

impression methods, impression making, modeling, and prosthesis manufacturing, except tooth preparation, have been developed and used as digitalized clinical methods in which computers and machines are responsible for using an oral scanner. In particular, impression making is one of the most important processes in dental practice by creating a replica model that reproduces the appearance in the oral cavity, and it is a process in which accuracy and efficiency must be satisfied at the same time.

Oral scanner is a device for converting patient's oral environment into data, and is an essential tool for digitizing the manual work of impression materials. The oral scanner is divided into an intra-oral scanner that directly scans the patient's oral cavity and surrounding hard tissue and soft tissue, and an oral scanner that scans the patient's oral cavity.

Corresponding Author:

Youn-Soo Shim

Associate Professor, Dept of Dental Hygiene,
Sunmoon University, Korea

Email: shim-21@hanmail.net

The task of oral scanning is a very important step in gathering information in the oral cavity. In the past, we mainly used the model scanner method, which is an out-of-oral scanning method. Model scanners are classified as contact type and non-contact type, and they function as a principle of scanning while directly touching the object to be measured. Contact scanners tend to damage the model during repetitive scans, or less accurate at points smaller than touch points¹. Recently non-contact, direct intra-oral scanning makes used scanners. The method of measuring is to scan the object by recognizing the distance of the object using the light source of the scanner. Triangulation method, confocal laser measurement method, and active wavefront extraction method, and the difference in the extraction method of images is different². It is also divided into ways of taking pictures and editing images.

The image file which is impressed with the oral scanner is designed by computer using CAD/CAM (Computer Aided Design / Computer Aided Manufacturing) to determine the shape of the prosthesis, its adjacent value and its relative value, This is possible. This method has the great advantage of making and installing the prosthesis on the same day.

Guth³ stated that the virtual model obtained by the oral scanner is more accurate than the existing model produced by the impression, and the use of the oral scanner is generalize based on this accuracy. Another researchers proposed that in-office system with CAD software and milling machine could make the restoration after making various impressions in the library after setting the margins by using CAD software after making impressions in the oral cavity⁴. Moreover, it is expect that the use in the dental office will be gradually expand. In addition to the process of making all-ceramics using zirconia, the use of CAD/CAM in the provision of temporary restorations is gradually expanding, so that dental hygienists are required to use oral scans. However, the intra-oral scanning method has a problem that it is necessary to position a camera in the oral cavity within a limited oral cavity, to control complicated environmental factors such as moisture in the oral cavity and saliva, and to ensure accuracy of the data Practical training on use is necessary³.

In order to produce accurate prosthesis using an oral scanner, it is necessary not only to scan the teeth accurately but also to take oral tissue soft tissue

and stability of occlusion in the state of stable central occlusion. In the dental office, many dental hygienists in dental clinics and clinics perform the use of the oral scanner. In the dental clinic, many roles are required for the use of the dental hygienist's oral scanner through duties sharing with the dentist. In the existing dental hygiene education and practical education of the oral scanner is not done properly.

The purpose of this study was to investigate the perception and preference of dental hygiene students about the oral scanner which is gradually being used and to suggest the future direction in dental clinical education.

MATERIALS AND METHOD

Research subjects: In this study, 5 of the second grade students who were not participating in the pre-survey study were pre - investigated, and the structured questionnaire was prepared by supplementing the post-questionnaire.

A questionnaire survey was conducted on 116 dental students and students who agreed to the study by using the self - filling method to change perception and preference before and after oral scanner use.

Methods and data analysis: The collected data were analyzed using the SPSS 19.0 program (SPSS Inc. Chicago, IL, USA). The pre-learning difficulty, prediction discomfort, and preference score of the oral scanner were calculated and the pre- and post- recognition scores of the oral scanner were compared. The results of the one-way ANOVA were used to estimate the difference in prediction discomfort according to the perceived level before and after using the oral scanner. In addition, multiple regression analysis was conducted to analyze the preference factors that affected the predictive discomfort of the oral scanner. The explanatory power of the model was determined through multiple decision coefficients (R²).

RESULTS AND DISCUSSION

Table 1 shows the pre-learning difficulty and the predicted inconvenience of the oral scanner. When comparing the method of using the oral scanner with the method of using the rubber in the impression taking

method, the difficulty predicted by the oral scanner impression was 'Easy' (50.0%). Compared with the impression method using the oral scanner and alginate, the difficulty predicted by the oral scanner impression was the highest (54.3%) in 'Easer'.

Among the impression methods using the oral scanner and rubber, the easiness to predict the oral scanner's impression was 'Easy' (52.6%). Compared with the impression method using alginate, the predicted inconvenience was 'Easy' (56.9%).

Table 1: Difficulty and unpredictability of oral scanner before learning

Variables	Classification	N	%
Difficulty compared with Rubber impression material(Q2-1-1)	Easy	58	50.0
	Same	24	20.7
	Difficult	34	29.3
Difficulty compared with Alginate impression material(Q2-1-2)	Easy	63	54.3
	Same	20	17.2
	Difficult	33	28.4
Discomfort compared with Rubber impression material(Q2-2-1)	Easy	61	52.6
	Same	31	26.7
	Difficult	24	20.7
Discomfort compared with Alginate impression material(Q2-2-2)	Easy	66	56.9
	Same	23	19.8
	Difficult	27	23.3
Total		116	100.0

Table 2 shows the preference of the oral scanner. 90 people (77.6%) responded positively to the question "Do you want to continue to receive information about the digital oral scanner if you have the opportunity?", "You have a positive opinion about the digital oral scanner 97 people (83.6%) responded positively to the question "Do you think it is worth learning even if you invest my time?" In addition, 101 people (87.1%) said, "Do you intend to continue using the digital oral scanner?", "Do you prefer the impression method using a digital oral scanner compared to the conventional impression method?" 97 people (83.6%), 80 people (69.0%) said, "Do you think that there are differences in accuracy between expert and beginner when making a digital impression?", "Do you think that digital impression taking is necessary in school curriculum? 85 people (73.3%) responded positively.

Table 2: Preferences of oral scanner

Variables	Classification	N	%
Do you want to continue to receive information about your digital oral scanner if you have the opportunity?	Yes	90	77.6
	Neutral	24	20.7
	No	2	1.7
2. Do you think it is worth learning even if you invest my time in a digital oral scanner?	Yes	97	83.6
	Neutral	18	15.5
	No	1	0.9
3. Are you willing to continue using your digital oral scanner?	Yes	101	87.1
	Neutral	15	12.9
	No	0	0.0
4. Do you prefer a digital oral scanner impression method when compared to the traditional impression method?	Yes	97	83.6
	Neutral	17	14.7
	No	2	1.7

Conted...

5. Do you think there is a difference in accuracy between an expert and a beginner when making a digital impression?	Yes	80	69.0
	Neutral	28	24.1
	No	8	6.9
6. Do you think that digital impression is essential in school curriculum?	Yes	85	73.3
	Neutral	29	25.0
	No	2	1.7
Total		116	100.0

Table 3 shows the average perception of pre-and post-use oral scanner. The overall average of pre- use oral scans was 2.66, and the overall average of post- use perception was 2.84. Recognition improved by 0.18 after use of oral scanner.

In the pre-use awareness of oral scanner, the item ‘I think the entire treatment process would be simpler’ was the highest at 2.76, and the item ‘I think it was more accurate than the impression method using alginate’ was 2.52 low.

In the post-use awareness of the oral scanner, the question “I am most interested in making an impression using a digital scanner in clinical practice” was the highest at 2.88, and the item “I think it is more accurate than the impression method using rubber” And 2.74 points, respectively.

Table 3: Comparison of perceptual averages before and after using oral scanner

Variables	Before	After
	M ± SD	M ± SD
1. I think it is more accurate than the impression method using rubber.	2.54 ± 0.64	2.74 ± 0.51
2. I think it is more accurate than the impression method using alginate.	2.52 ± 0.68	2.76±0.52
3. I think that model management is more convenient.	2.73 ± 0.48	2.85 ± 0.38
4.I think it can save time than the impression made with rubber.	2.75 ± 0.51	2.83 ± 0.44
5. I think that it can save time than impression making using alginate.	2.75 ± 0.49	2.83 ± 0.44
6. I think the entire treatment process will be simpler.	2.76 ± .047	2.84 ± 0.39
7. I think it will be useful to get the patient’s attention.	2.68 ± 0.54	2.86 ± 0.37
8. I think I can get the patient’s trust.	2.63 ± 0.57	2.85 ± 0.38
9. I think I will be able to master and master in a short time.	2.61 ± 0.60	2.87 ± 0.36
10.I think the degree of proficiency will affect accuracy.	2.63 ± 0.60	2.84 ± 0.44
11.I think overall impression making using a digital scanner is useful in clinical practice.	2.71 ± 0.46	2.87 ± 0.36
12. Overall, I am impressed with the impressions made with digital scanners in clinical practice.	2.66 ± 0.49	2.88 ± 0.35
Total	2.66 ± 0.54	2.84 ± 0.41

Predictive inconvenience by recognition the difference between before and after use of oral scanner is shown in Table 4. Predictive discomfort according to pre-use of oral scanner was significantly different in ‘I think it would be more convenient to manage the model’ and ‘I think it would be useful to get the patient’s interest’ ($p < 0.05$). In other words, before the use of the oral scanner, the subjects were more likely to predict the model inconvenience than those who thought it would be more convenient to get the patient’s attention ($p < 0.05$). There was no significant difference in predictive discomfort according to the degree of recognition after using the oral scanner ($p > 0.05$).

Table 4: Estimation of discomfort before and after use of oral scanner

Variable		Before use	After use
		M ± SD	M ± SD
1. I think it is more accurate than the impression method using rubber.	Yes	1.60 ± 0.78	1.68 ± 0.80
	Neutral	1.97 ± 0.79	1.72 ± 0.77
	No	1.22 ± 0.67	1.50 ± 1.00
	F(p)	4.457	0.139
2. I think it is more accurate than the impression method using alginate.	Yes	1.67 ± 0.80	1.65 ± 0.80
	Neutral	1.87 ± 0.81	1.88 ± 0.76
	No	1.25 ± 0.62	1.40 ± 0.89
	F(p)	2.714	0.967
3. I think that model management is more convenient.	Yes	1.62 ± 0.81	1.64 ± 0.79
	Neutral	1.78 ± 0.70	2.00 ± 0.85
	No	3.00 ± 0.00	1.00 ± 0.00
	F(p)	3.308*	1.717
4. I think it can save time than the impression made with rubber.	Yes	1.60 ± 0.81	1.67 ± 0.81
	Neutral	2.00 ± 0.63	1.92 ± 0.73
	No	1.75 ± 0.96	1.00 ± 0.00
	F(p)	2.156	1.808
5. I think that it can save time than impression making using alginate.	Yes	1.62 ± 0.83	1.65 ± 0.80
	Neutral	1.86 ± 0.63	2.00 ± 0.78
	No	2.00 ± 1.00	1.00 ± 0.00
	F(p)	1.129	2.310
6. I think the whole treatment process will become simpler.	Yes	1.67 ± 0.83	1.65 ± 0.80
	Neutral	1.71 ± 0.62	1.88 ± 0.78
	No	2.00 ± 1.41	1.00 ± 0.00
	F(p)	0.186	0.965
7. I think it would be useful to get the patient's attention.	Yes	1.62 ± 0.81	1.63 ± 0.78
	Neutral	1.68 ± 0.71	2.07 ± 0.82
	No	2.75 ± 0.50	1.00 ± 0.00
	F(p)	3.982*	2.267
8. I think I can get the trust of the patient.	Yes	1.64 ± 0.81	1.65 ± 0.80
	Neutral	1.69 ± 0.73	1.93 ± 0.70
	No	2.20 ± 1.10	1.00 ± 0.00
	F(p)	1.166	1.194
9. I think it will be possible to acquire and master in a short time.	Yes	1.65 ± 0.83	1.66 ± 0.80
	Neutral	1.77 ± 0.76	1.92 ± 0.76
	No	1.57 ± 0.53	1.00 ± 0.00
	F(p)	0.319	1.010
10. I think the degree of proficiency will affect accuracy.	Yes	1.63 ± 0.81	1.66 ± 0.79
	Neutral	1.65 ± 0.67	1.92 ± 0.86
	No	2.29 ± 0.95	1.33 ± 0.58
	F(p)	2.189	0.917
11. I think overall impression making using a digital scanner is useful in clinical practice.	Yes	1.61 ± 0.83	1.66 ± 0.81
	Neutral	1.85 ± 0.70	1.92 ± 0.64
	No	0.00 ± 0.00	1.00 ± 0.00
	F(p)	2.258	1.010
12. Overall, I am impressed with the impressions made with digital scanners in clinical practice.	Yes	1.57 ± 0.81	1.67 ± 0.81
	Neutral	1.89 ± 0.74	1.83 ± 0.72
	No	2.00 ± 0.00	1.00 ± 0.00
	F(p)	2.074	0.589
* : p<0.01			

The results of the multiple regression analysis on the factors that affected the prediction inconvenience of the oral scanner are shown in Table 5. The subjects were more likely to use the oral scanner than the rubber impression method. The explanatory power of the variables was 4.1.

Table 5: Preference factors affecting estimates of discomfort before using oral scanner

Variables	B	S.E	β	t	p*
1. Do you want to continue to receive information about your digital oral scanner if you have the opportunity?	0.121	0.198	0.071	0.611	0.543
2. Do you think it is worth learning even if you invest my time in a digital oral scanner?	0.104	0.231	0.052	0.451	0.653
3. Are you willing to continue using your digital oral scanner?	-1.007	0.330	-0.425	-3.053	0.003**
4. Do you prefer a digital oral scanner impression method when compared to the traditional impression method?	0.390	0.240	0.210	1.627	0.107
5. Do you think there is a difference in accuracy between an expert and a beginner when making a digital impression?	-0.072	0.132	-0.055	-0.545	0.587
6. Do you think that digital impression is essential in school curriculum?	0.202	0.173	0.124	1.165	0.246
R ² =0.091 Adjusted R ² =0.041 F=1.811					
** : p<0.01					

The results of multiple regression analysis on factors affecting discomfort of oral scanner are shown in Table 6. The subjects of the study were more likely to use the oral scanner than the alginate impression method, and the explanatory power of the variables was 4.0.

Table 6: Preference factors affecting predictive discomfort of oral scanner

Variables	B	S.E	β	t	p*
1. Do you want to continue to receive information about your digital oral scanner if you have the opportunity?	0.182	0.207	0.102	0.881	0.381
2. Do you think it is worth learning even if you invest my time in a digital oral scanner?	-0.078	0.241	-0.038	-0.324	0.746
3. Are you willing to continue using your digital oral scanner?	-0.846	0.345	-0.342	-2.456	0.016*
4. Do you prefer a digital oral scanner impression method when compared to the traditional impression method?	0.349	0.250	0.180	1.394	0.166
5. Do you think there is a difference in accuracy between an expert and a beginner when making a digital impression?	0.120	0.138	0.089	0.873	0.385
6. Do you think that digital impression is essential in school curriculum?	0.291	0.181	0.171	1.609	0.111
R ² =0.090 Adjusted R ² =0.040 F=1.804					
* : p<0.05					

The most important step in the dental practice area is to reproduce the shape of the oral cavity to create a replica model, which should be accurately impression of the oral condition, and should be satisfied at the same time with less inconvenience and time saving.

Importantly when applying the digital oral impression technique clinically, it is important to note

that the trueness of how accurately the oral impression data expresses the shape of the actual abutment and the precision of the accuracy of the instrument’s repeatability, And the restoration of the restoration through the CAD-CAM fabrication process⁵. Most of the existing studies approached the technical problems such as the accuracy of the prosthesis using the oral scanner. According to previous studies, the recognition of clinicians has greatly

influenced the use of new digital devices and products in the dental field until they are introduced into the clinic⁶. Therefore, dental practitioners will need to acquire education and skills so that they can think positively about digital equipment in the rapidly developing and changing dental field and utilize them for medical treatment. The purpose of this study was to compare the differences in perception and preference between before and after using the oral scanner for the current dental hygiene students. We predicted that only about 50% would be easy to use before using the scanner directly, and the rest predicted that it would be difficult or difficult to obtain the same impressions as the existing ones. Here was no difference in difficulty between rubber impression material and alginate impression. The preference of oral scanner was very positive and it showed preference to continue using it.

In comparison with before use of the oral scanner, it was found that the awareness improved, the treatment process became easier, the oral scanner was more favorable to the use of the oral scanner, and the oral scanner was more effective than the conventional impression I thought it would be correct. According to many studies, the internal fit and marginal fit of the oral scanner are within the error range, and the reliability and accuracy of the digital impression are confirmed⁷⁻⁹. People who thought that managing the model before using the oral scanner was not more comfortable and did not care about getting the patient's attention thought that it would be uncomfortable before using the oral scanner. In other words, the preference of oral scanner differs according to recognition difference. If you are willing to continue using your mouth scanner, it affects the preference of your mouth scanner. This suggests that the preference for the oral scanner is increase as the user tries to use it continuously in advance.

Patient satisfaction with chair side digital system in dentistry, recognition of dental technician for CAD/CAM, attitude and recognition of Canadian orthodontist for digital photography and digital radiography have been reported both in Korea and abroad. In the study of Park etc.¹⁰, dental hygienists working in dentists were required to recognize and educate digital equipment. In addition, as the number of dental workers demanding the education of dental digital equipment increases, the education of dental digital equipment of dental workers should be activated.

Changes in the pattern of dental care will surely advance rapidly, and thus, it is inevitable that there will be an area destruction of the new treatment area and competition for the new treatment area. Therefore, it is natural that the principle education for the traditional medical treatment method should be practiced. However, it is natural that the school education for the understanding and utilization of the digital dentistry should be performed in parallel with the paradigm change period in which the day is changing differently^{11,12}.

The limitation of this study is that it is not possible to extend the results of the study to the whole dental hygiene department students in some areas. It is difficult to expand the number of the study subjects to expand the sample size, to supplement the diversity of the subjects, and a comparative study is need¹³.

CONCLUSION

The most important issue for the whole period of dentistry is 'the change of dental care by the digital dentist age'. Of these, the fastest rate of change has been introduced clinically and the dental industry's attention is focused on the introduction of 'chairside digital systems'. Especially, the impression through the oral scanner is different from the analog impression system using the impression material and the tray, and the digital impression is a method of directly acquiring the oral information of the patient by using the oral scanner. Due to the continuous supply of oral scanners, CAD-CAM work is being done with only scanned digital data without a clinical model. Therefore, this study confirmed the perception, preference, and prediction inconvenience of dental hygiene students' oral scanner. These results can be used as basic data in the field of dental hygiene education and digital dental education in the future.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Preference for Oral Scanner of Dental Hygiene

REFERENCES

1. Quaaas S, Rudolph, H, Luthardt RG. Direct mechanical data acquisition of dental impressions for the manufacturing of CAD/CAM restorations. *J Dent.* 2007 35(12):903-8.

2. Schenk O. The New Acquisition Unit Cerec AC. *Int J Comput Dent.* 2009;12(1):41-46.
3. Guth JF, Keul C, timmelmayr M, Beuer F, Edelhoff D. Accuracy of digital models obtained by direct and indirect data capturing. *Clin Oral Investig.* 2013;17:1201-8.
4. Jeong YG, Lee WS, Lee KB. Accuracy evaluation of dental models manufactured by CAD/CAM milling method and 3D printing method. *J AdvProsthodont.* 2018;Jun:10(3):245-51. DOI: 10.4047/jap.2018.10.3.245.
5. Lin WS, Harris BT, Morton D. The use of a scannable impression coping and digital impression technique to fabricate a customized anatomic abutment and zirconia restoration in the esthetic zone. *J Prosthet Dent.* 2013;Mar:109(3):187-91. DOI:10.1016/S0022-3913(13)60041-4.
6. S Logozzo, Zanetti EM, Franceschini G, Kilpela A, Makynen A. Recent advances in dental optics- Part I: 3D intraoral scanners for restorative dentistry. *Opt Lasers Eng.* 2014;54:203-21.
7. Berrenderon S, Salido MP, Ferreiroa A, Valverde A, Pradies G. Comparative study of all-ceramic crowns obtained from conventional and digital impression: clinical findings. *Clin Oral Investig.* 2018;Agu:30. DOI: 10.1007/s00784-018-2606-8.
8. Hategan SI, Ionel TF, Goguta L, Gavrilovici A, Negrutiu ML, Jivanescu A. Powder and powder-free intra-oral scanners: digital impression accuracy. *Prim Dent J.* Summer. 2018;7(2):40-3.
9. Iturrate M, Minguez R, Pradies G, Solaberrieta E. Obtaining reliable intraoral digital scans for an implant-supported complete-arch prosthesis: A dental technique. *J Prosthet Dent.* 2018;Aug:7. DOI:10.1016/j.prosdent.2018.03.008.
10. Park SY, An SY, Choi DS, Shim YS. A Study of perception of dental workers on dental digital equipment and the necessity of related education. *Int J Pure Appl Math.* 2018;118(19):709-23.
11. Ola AJ, Azari A. An introduction to dental digitizers in dentistry; systematic review. *J Chem Pharm Res.* 2015; 7(8):10-20.
12. Richard VN. The future of dental devices is digital. *Dent Mater.* 2012;28:3-2.
13. Yuzbasioglu E, Kurt H, Turunc R, Bilir H. Comparison of digital and conventional impression techniques: evaluation of patients' perception, treatment comfort, effectiveness and clinical outcomes. *BMC Oral Health.* 2014;14:10. <http://www.biomedcentral.com/1472-6831/14/10>.

A Reinforcement Method of Healthcare Information System

Seong-Hoon Lee¹, Dong-Woo Lee²

¹Division of Information&Communication, Baekseok University, 115, Anseo-dong, Cheonan, Korea;

²Dept. Of Computer Information, Woosong University, 226-2, Jayang-dong, Dong-gu, Daejeon, Korea

ABSTRACT

Background/Objectives: The health care service environment is changing from existing treatment center to preventive center, from hospital center to home center, from disease center to health center.

Method/Statistical analysis: In this study, we analyzed the current status of domestic and external healthcare information systems and the operation cases of existing healthcare information systems in order to derive strategies for smart healthcare and healthcare information systems. In addition, the standard status of international standards organizations related to medical informatization was also investigated and analyzed.

Findings: The purpose of this study is to develop the information system related to various smart systems to provide patient - centered services along with the development of computing environment, and to establish a smart health care system such as a clothing health management system, a home care system, respectively. This is expected to contribute to the realization of health-care and preventive-oriented service-oriented medical information system, not telemedicine and medical care in future ubiquitous and smart cloud environments.

Improvements/Applications: The service - oriented medical information system proposed in this study will strengthen the competitiveness of hospitals in addition to the rationalization of hospital management, the medical decision - making of medical staff and the support of managerial decision - making.

Keywords: Smart, Healthcare, Information system, Medical service, Mobile computing.

INTRODUCTION

Currently, information technology (IT) is developing into a convergence system by combining related technologies. In particular, medical information industry in ubiquitous environment has attracted new interest in mobile medical information service^{1,2-4}. With the recent development of smart devices, the information environment of mobile users has been developed rapidly and convenience has improved. Recently, the mobile computing environment is becoming commonplace due to the launch of many mobile terminals such as netbook, notebook, iPhone, Galaxy S, iPad and so on. Smart Healthcare refers to a smart device-based healthcare service in consultation. Extensive smart health care refers to all user-centric health care systems and components.

In the medical field, it is necessary to utilize IT to enhance competitiveness and enhance service. With the advancement of computing technology, attention and technology development for telemedicine and home medical care are being activated. Some medical information is being shared through E-Hospital, a hospital information-oriented business centered on large hospitals. The government has created a plan to activate U-Healthcare using information technology infrastructure. In 2008, the Ministry of Health and Welfare also established a mid- and long-term comprehensive plan to activate U-Healthcare^{1,5}.

Medical service refers to various useful services provided to patients and healthcare providers based on their medical activities in relation to disease prevention and treatment activities. Medical care means the enforcement of medical technology, such as medical care, preterm birth, and nursing, performed by a medical person Article 25 of the Medical Law. That is, the term medical treatment refers to an experience and function based on medical expertise, such as examination,

Corresponding Author:

Dong-Woo Lee

Professor, Dept. of Computer Information

Woosong University, Korea

E-mail: dwlee@wsu.ac.kr

optometry, prescription, medication, and surgical operation. Examples of medical practices include diagnosis, medication, injection, transfusion, anesthesia, surgery, treatment, immunization, and patient care.

In recent years, based on electronic medical records (EMRs), domestic hospitals have become increasingly industrialized. In order to provide various statistics and researches of hospitals that are distributed and operated independently in each region, (DW: Data Warehouse). Medical informatization started from electronic medical records. EMR is a solution that can provide the same level of medical services to other medical institutions through informative data such as patient medical records and related DBs even if the patient who is being treated moves to the hospital by informing doctor's medical records.

Medical information is information that is produced and utilized in the process of prevention, diagnosis, analysis, and treatment of diseases in healthcare institutions. As medical science data is digitized, hospital management, medical service, system operation work is shifted to information technology base. And the importance of medical information has been greatly emphasized.

Electronic medical information means that medical records recorded by a medium such as paper, microfilm or optical disk are recorded in the form of an electronic medium without changing the structure of its business processing structure, information range, or information contents. (Medical Image Storage and Transmission System), OCS (Prescription Delivery System), LIS (Clinical Pathology Information System), etc, because it is obliged to keep records of establishments or medical services of medical institutions for the period stipulated in Article 14 of the Enforcement Regulations of Medical Law. , A medical adverse effect monitoring system, a medical imaging system (cardiology), a 3D workstation, and a radiation information system (RIS)¹³.

Today, medical service policy changes and the development of information technology (IT) have led to a new era of environmental change. In other words, the demand for quality improvement of medical services is increasing due to income level and improvement of education, aging of population, improvement of social welfare, change of perception of medical service as basic rights of the people. Moreover, the paradigm of information communication is ubiquitous, smart, cloud

computing environment which can send and receive desired information in real time regardless of anyone, anytime, anywhere, any device , Domestic medical institutions are also investing and interested in Internet-based remote medical services that provide services such as prevention, diagnosis, treatment, and follow-up management at any time and anywhere by connecting these information and communication technologies with medical information systems have. It is expected that customer satisfaction will be improved by realizing accurate point-of-care (POC) of customers in real-time, making accurate diagnosis using various personal care data of customers, and transmitting the information to customers again.

In this paper, we propose a more efficient information system to provide medical service in mobile computing environment and provide medical service in ubiquitous computing environment to achieve such future healthcare service. In the mid / long term, various medical institutions and smart u-Health devices will be linked by using the cloud computing system base, and optimal treatment for individual customers and elderly care services will also be customized. In order to provide smart healthcare services, integration with various information systems of medical institutions linked with various information systems should be integrated.

The composition of this study is as follows. In Chapter 2, the current situation of healthcare information service is reviewed. In Chapter 3, the structure and improvement strategy of smart healthcare and healthcare information system are described. Section 4 discusses conclusions and future research directions.

Background of Change for Medical Information System

Domestic cases: Since the early 1990s, the information technology in the domestic medical and health care system has been promoted, and the computerization of the general hospitals has been almost universal in 2000. As of 2005, digitalization of medical information (EMR, PACS, etc.), which is the core of practical hospital work, is being promoted in dairy information system.

The remote medical field is a medical service that provides medical treatment, diagnosis, consultation, treatment, delivery of medical information, and health education using data communication such as telephone line, private line, ATM, By transmitting radiographic

images, clinical pathology test results, endoscopic images, etc. to each other, medical knowledge and treatment techniques are supported or advised on the treatment direction and the patient is treated according to the guidelines.

In the field of home healthcare services, home healthcare services using home information technology and prevention of illness are becoming more and more possible with the development of ubiquitous technology such as RFID.

From the institutional perspective, the legal environment for medical informatization was created in 2003 by legislating electronic medical records, electronic prescriptions, and telemedicine. This enables electronic records of medical records and prescriptions, and provides the basis for providing remote medical services by eliminating legal barriers to telemedicine.

The Korea IT Industry Promotion Agency (KIDA) reported that in the “Medical Information System Market with Global Competitive Environment,” medical expenditures increased from USD 780 in 2000 to USD 1,318 in 2005, 1.4 times higher than in 2000, “He said. The domestic medical information industry market grew 16.3% in 2006 to about KRW 250 billion in 2007, and it has increased to about 300 billion KRW in 2008 and is continuing to increase. Currently, the domestic medical information system market is dominated by medical image storage and delivery system (PACS), electronic medical record (EMR), and prescription delivery system (OCS).

Meanwhile, the rapid development of IT technology has accelerated the advancement of the medical service industry, and medical information system solutions such as PACS, EMR and OCS have been introduced to medical institutions such as medical clinics. And it is contributing greatly to enhance the convenience of patient’s medical use by rapid processing.

The healthcare information system industry is not limited to the informatization of medical institutions, but it is developing into a total healthcare industry that includes medical devices, solutions, and services as networks for patients, medical institutions, and governments.

Domestic medical information systems companies are accumulating their experience and know-how in developing, constructing and servicing advanced IT

infrastructure and medical information solutions. If you take advantage of these advantages, you will be able to develop U-Healthcare and smart healthcare industry It is expected that it will be able to demonstrate competitiveness in competition with global medical information service companies as well as with global IT companies.

As a major player in the domestic healthcare market, BitComputer, SK Ubiqua, EasyCare, and Infinite Healthcare are among the leading players. In addition, major subsidiaries such as Samsung SDS and LGCNS are making inroads, and GE Healthcare and IBM are adding to this.

Foreign cases: In April 2010, 227 companies, including Intel in the US, Omron in Japan, Panasonic and Sharp, organized a group called Community Health Alliance (CHA), and are actively promoting IT in the following medical sectors. It is looking for a way to utilize the communication module in various medical devices such as blood pressure monitor, electrocardiogram, and scale to observe patient’s condition in real time and share analysis data and use it in treatment method. To this end, we decided to unify communication standards and protocols of various devices.

In Japan, Softbank is focusing on urgent telemedicine services using iPhone. Imaging data can be sent to the doctor’s specialist in the field for immediate advice on the patient’s condition, or a specialist at a university hospital can provide services to novice and other physicians in real time.

The u-Health market in the United States is growing mainly in large companies related to IT, telecommunication, and medical sector. Venture companies are leading the field of medical informatization. The U-Health service market in the United States is about \$ 2.1 billion as of 2010 and is expected to surge more than five times in the next five years, exceeding \$ 10 billion.

The global healthcare market grew from about \$ 3.8 trillion in 2005 to about \$ 4.5 trillion in 2010, to about \$ 6.3 trillion in 2020 and about \$ 8.8 trillion in 2030 Is expected to expand (Medistat Ltd.). The global healthcare market is expected to expand to around \$ 5.9 trillion by 2012, with the u-health market accounting for around \$ 400 billion, an average annual growth rate three times higher than other general healthcare markets (Frost & Sullivan). Developed countries such

as the United States and Japan predict that u-health will become one of core services as the cloud environment is settled in advance, and government, business, , Ultra-small computer, and IPv6.

Healthcare Information System and Smart Healthcare

Status of Healthcare Information Standard:

Representative international standards organizations related to medical informatization are DICOM, IEEE, ISO and CEN, HL7, WHO and SNOMED. In addition, in ITU, medical data notation and messaging-based technologies are being studied in UN / CEFACT and OASIS on wireless communication protocols for medical information.

DICOM was developed by the NEMA / ACR committee as a standard video signal protocol operating on TCP / IP for transmission of medical digital images and incidental medical integrated information, and there are currently 16 standardization standards⁸.

ASTM is a standards body that deals with the certification of product producers and users to use such materials easily by testing the use and characteristics of almost all the products and materials distributed in the US and standardizing the quality of the product. Currently, the E31 Technical Committee is leading healthcare standardization ⁹. ASTM standardization is a standard in the United States, and international standardization standards such as IEEE, ISO, HL7, DICOM, and IETF are applied rather than development of new technical standard for medical informatization.

ISO/TC215 is a medical information technology committee that aims to develop interoperability and compatibility of data between medical devices and to develop standards necessary for digitalization of medical records. 8 working groups (WG) are active as follows¹⁰.

HL7 is a standards body for establishing standards for access to hospital information systems and medical equipment. It currently has 29 branches, including Korea, and is the ANSI de facto standard for electronic exchange of medical information ^{6,7}. HL7 stands for the seven layers of ISO / OSI, which is the highest level. It is a standard that can perform data transmission between systems as efficiently as possible for processing large amount of information of distributed medical information, In order to achieve the goal. Figure 1 shows HL7 standard architecture.

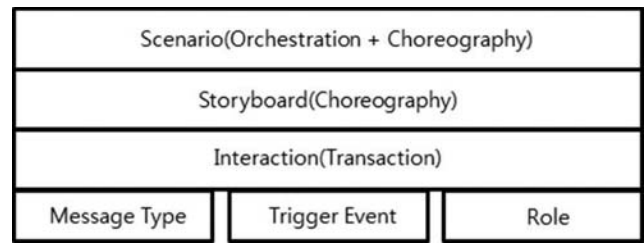


Figure 1: HL7 Standard Architecture

Among the standards for standards interoperability, HL7 and DICOM are the standards related to data transmission. Contents of EMR contents are defined in ASTM. IEEE1073 discussed the framework and transmission and data standards that enable data transmission and sharing between heterogeneous medical devices for the purpose of providing real-time plug-and-play interoperability between medical devices. Currently, ISO / TC215 ISO / IEEE 1073 work is in progress ^[11]. IHE has been established to perform harmonization among these standards, re-interpretation of standards conformance to ensure implementation guide and interoperability. IHE is a kind of facilitation organization for the realization of medical information standardization jointly promoted by HIMSS and RSNA, has more than 100 vendors ¹². Figure2 is a access standard for information sharing of IHE.

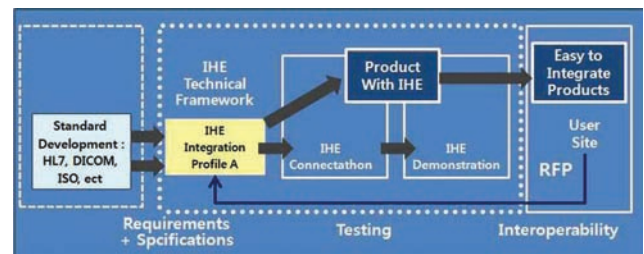


Figure 2: Access Standard for Information Sharing of IHE

Smart healthcare System: The real-time medical system is constructed according to the patient’s mobility and urgent state by checking (sensing) the patient’s condition in real time ^[5]. In the medical and health field, development of services that utilize cloud computing and smart phones is being actively pursued. It automatically collects information related to patient’s behavior or health using sensor of cloud-related terminal and enables real-time information sharing between doctors, patients and disease management providers, thereby enabling customized treatment optimized for individual patients. For example, a variety of health monitoring systems such as a door-eye examination system for a door, a blood

pressure monitor for regular blood pressure monitoring, a health meter for measuring exercise amount, and a fallacy sensing mat are under development.

Personal health guidance, and so on, and it can be treated as a kind of 'information medicine' as a prescription medicine product. The development of portable and mobile medical devices and the development of telemedicine information devices are the strategies to strengthen the emergency medical system, so that the patient's intelligence can be determined intelligently. We want to build a medical information infrastructure to provide medical services.

Apparel Health Management System: In recent years, research and development of a future apparel-type bio-signal measurement system emphasizing the mobility of a patient or a patient's family is actively under way. The development of various types of bio-information measurement modules such as shoes, belts, rings. There is an attempt to do so.

Attempts have been made to incorporate the latest information and communication technologies into the u-health field, such as the development of attachment-type bio-signal detection systems in NASA, HP, and MIT. A remote health diagnosis system capable of communicating with a wearable computer, and a clothing type health diagnosis system such as LifeShirt and LifeGuard capable of measuring and analyzing a biological signal using smart accessories are being developed.

In recent years, research investment related to development of micro devices and micro systems for the purpose of bio-medical information communication applications has been actively made. U-Health e-service platform based on mobile phone and u-Health application service program to measure and manage stress, obesity, and blood sugar are actively being developed in medical related SMEs and venture companies.

Home Care System: Home-care system is required to manage the health of the customer and transmit related data to the service center by using the home bio-information measuring device directly at home, continuously monitoring the health condition, and coping with the emergency situation.

The remote monitoring platform developed by Philips can easily measure body weight, blood pressure, electrocardiogram, blood sugar, etc. using the equipment provided at home and transmit the related biometric

information to the remote station and store it on the data server in the service center via the Internet. The person in charge monitors and manages health.

Welch Allyn of the United States developed a mobile terminal capable of monitoring biometric information and used it as a patient management device. Honeywell HomMed, Viterion, etc. developed a home bio-information measuring instrument and provided various home care services.

Telemedicine using NGI (Next Generation Internet) is being piloted by R & D programs of various federal agencies. TAC (Tactile Air Command) Teleradiology Project in the United States demonstrates remote telecommunication systems using existing telephone lines and suggests the possibility of telemedicine diagnosis.

The company NHS in the EU has started digitizing medical images since 2003 and provides health information through media such as telephone, online, and digital satellite TV through the NHS Direct website.

Medical Expert System: In order to perform accurate professional medical practice, medical information should be shared among professional medical staff and systematically constructed medical care know-how of medical staff. The systematic support of various medical treatment support alternative options for professional medical staff to carry out correct measures according to the condition of the individual patient to improve the narrowed medical treatment, Prevention or reduction of accident rate.

And if the medical information system has been used up to now as it accumulates medical information, the medical expert system extracts new medical information based on accumulated medical information and provides an alternative system for finding improved medical treatment methods do.

Issues and Development Directions: This section looks at the ongoing issues in terms of the technical aspects of medical information and medical services in order to establish a future medical information system and suggests directions for development of medical information services. We will consider the following issues in order to build a stable healthcare information system that is continuously improving and to maximize the utilization of existing systems.

1. Medical Information Standard Process Definition: Static basic process, dynamic selection process, virtual integration process. A static process is a fixed and constantly organized health information process. A dynamic process is an alternative process that is dynamically selected depending on the customer and system context. A virtual process is an unlimited process that is configured to support both static and dynamic processes and an integrated user and developer interface.
2. Development and definition of medical information scenario: We want to find out all application scenarios to support medical information users and normalize them. Accordingly, the function of the healthcare information system is continuously expanded.
3. Definition and Improvement Strategy of Healthcare Information System: We propose an alternative to stabilize the structure of healthcare information system such as distributed structure of health information system, concentrated structure, load balancing structure, and defect recovery structure.
4. Definition of medical information user interface: We want to develop and provide a more structured and convenient interface for various user needs such as system administrator, medical information service user, and medical information demand user with more detailed user configuration.
5. Identification and definition of medical information service environmental monitoring system: Automatically collecting requirements of continuously changing medical information buyer, or detecting, collecting, analyzing, defining, developing, Supply and the like. In particular, we intend to strengthen the healthcare information service by comprehensively gathering information such as healthcare information system environment and healthcare user environment, and constructing system interaction. There is also a need for an information pathway that supports the feedback process to strengthen the healthcare ecosystem.

In order to fix the current smart health welfare policy toward users (health care beneficiary), system administrator (developer and operator), field users (health welfare person), etc., There is a need to

strengthen. Smart Device Utilization Information The need for smart devices in the current policy situation is in terms of convenience, immediacy (real-time performance), efficiency (maximization of investment versus utilization).

Therefore, the Strategy for Strengthening Smart User Health and Welfare Information Service (3S) should be strengthened as follows.

1. Enhance smart app and interface system to realize smart user system.
2. Establish smart database accessibility, establish smart information system, establish linkage with big data, and create roadmap to strengthen utilization and accuracy of analysis and evaluation of healthcare information.
3. Improve social welfare staff terminals and programs to strengthen the smart health welfare field. Furthermore, to propose the optimal alternative of on - site health welfare, we intend to strengthen the smart expert system by presenting intelligent health welfare policies and administrative alternatives in real - time as selective alternatives.

CONCLUSION

Future health care environment is shifting from conventional care to preventive center, from hospital center to living center, from disease center to health center. In addition, the necessity of establishing a service-oriented smart medical information system to support patient-centered smart medical services such as customer-oriented medical care and medical care support that provides services of preventive, diagnostic, therapeutic, and follow-up management anytime and anywhere do.

In this paper, we focus on the six aspects of technology that are needed to support interoperability between various systems to provide patient - centered services and existing systems in hospitals, along with the development of computing environment. Management system, 2) home care system, and 3) medical expert system.

The proposed healthcare information system issue and smart health welfare information policy direction will help to strengthen the competitiveness of the hospital along with the rationalization of the hospital

management, the medical decision making of the medical staff and the decision making of the manager, and the future ubiquitous, smart, We expect to contribute to the realization of telemedicine in the cloud environment and health care centered not on medical care, but also on realization of preventive service centered medical information system.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Kim CS, Kim HG. Trends and Application of Medical Information System in Ubiquitous Environment. *J Radiological Science and Technology*. 2005;28(3):193-201.
2. Kang MK, Song JG, Min SM. Class-based Community System Design for Ubiquitous Medical Information System Construction. *Proceeding of Springer*, 2006:128-130.
3. Lee JP, Choi DS. New Trend of IT Revolution Driven by Cloud Computing. *LG Economic Research Institute*. 2010:25-29.
4. Cho. Challenges and Challenges of Smart Health in the Future. *ICT Forum Korea 2011, Smart ICT Standardization Phase II*. 2011.
5. Cho IK, Kwon HS. Efficient Medical Information Sharing System for Interoperability between PACS Systems. *J Korean Institute of Maritime Information and Communication Sciences*. 2008; :498-504.
6. HL7 Standard Heterogeneous Interface Structure. Wiki.hl7.org
7. Pedersen TB. Warehousing The World-A Few Remaining Challenges. *Proceeding of DOLAP*. 2007.
8. Lee JH Policy Directions for u-Health Trends and Activation. *10-9 Information and Communication Policy Institute*. 2010.
9. Spahni S, Scherrer, J, Sauquet D and Sottile PA. Towards Specialized Middleware for Healthcare Information Systems. *J Medical Informatics*. 1999;53.
10. Beeler GW. HL7 version 3-An Object-oriented Methodology for collaborative Standards Development. *J Medical Informatics*. 1998;48.
11. Blobel B, Holena M. Comparing Middleware Concepts for Advanced Healthcare System Architectures. *J Medical Informatics*. 1997;46.
12. Kimmura M, Yoshihara H, Ando Y, Kawamata F, Tsuchiya F, Furukawa H. MERIT-9:A Patient Information Exchange Guideline using MML, HL7 and DICOM. *J Medical Informatics*. 1998;51.
13. Mishra S, Satapathy SK, Mishra D. Improved search technique using wildcards or truncation. In: *Intelligent Agent & Multi-Agent Systems*, Chennai, India, 2009.

The Affects of Pulmonary Function after Gym Ball Exercise for Sedentary Behavior Students: Randomized Controlled Trial

Hyuk-Goo Chung¹, Yong-Soon Kim², Dong-Yeop Lee², Ji-Heon Hong², Jae-Ho Yu², Jin-Seop Kim²

¹Student, ²Professor, Dept. Sunmoon University, Korea

ABSTRACT

Background/Objectives: The purpose of this study is to examine the affects of pulmonary function after gym ball core exercise for university students with sedentary behavior.

Method/Statistical analysis: Thirty university students with sedentary behavior were recruited. They randomly assigned to SEG or NEG. they also agreed to join this study. Subjects trained for 15minutes, 3days per week for 3weeks. We measured the value before the exercise and after the exercise. We used paired t-test to compare between NEG and SEG. For statically analysis, Independent t-test was used.

Findings: here were no significant differences between pre-exercise and post-exercise in NEG, and PEF, MVV had significant differences in SEG. Also variations in the group showed that significant differences at PEF, MVV statistically.

Improvements/Applications: These results indicate that gym ball exercise had an effect on respiratory function of university students with sedentary behavior.

Keywords: *sedentary behavior, respiratory function, gym ball exercise, core muscle, spirometer*

INTRODUCTION

With the development of information and communication technology, the population working in the tertiary industry has increased as well. This has led many to live a sedentary lifestyle which has brought an increase in patients with diseases that come from the lifestyle. A sedentary lifestyle is when a person spends most of his time excluding sleeping time sitting down. And it refers to all the actions that cause energy consumption sitting down or leaning at something^{1,2}. It usually refers to actions such as using a computer, reading a book, or driving for a long time. In modern society, many diseases derive from the sedentary lifestyle as it causes deterioration to the respiratory function. The most common diseases are back pain, weakness

of the abdominal, dorsal and lower limb muscles, and decreased respiratory function³. Respiratory function plays a very important role in human life, just like heart function. On average, adults have about 4500ml of lung capacity, which is the sum of one breathing volume, inspiratory reserve volume, and breath reserve volume. However, the long sedentary lifestyle can reduce respiratory function, and the posture while one is sitting down lowers the respiratory function which decreases the satisfaction of life⁴. According to previous studies, it is necessary to maintain the correct posture to prevent respiratory depression. Bad postures can lead to failure of body function^{1,2}. The muscles needed to breathe are shortened or stretched and weakened, which can cause problems in the respiratory system. The muscles of the thoracic and abdominal muscles involved in ventilation can be classified into main muscles and secondary muscles. The muscle between the diaphragm and the rib is in the main muscle group, and these muscles are activated both during normal breathing and also while exercising^{5,6}. Minor muscles are activated when breathing and ventilation demands increase. They help the main muscles such as the diaphragm and intercostals

Corresponding Author:

Jin-Seop Kim

Professor, Division of Physical therapy,
Sunmoon University, Korea

Email: skylove3373@sunmoon.ac.kr

muscle. Scalene muscle, sternocleidomastoid muscle, pectoral muscle, abdominal muscles are representative minor muscles. Abdominal muscles are composed of transversus abdominis muscle, external oblique abdominal muscle, internal oblique abdominal muscle, rectus abdominis muscle, abdomen, and abdominal muscles. Abdominal muscles help to breathe more quickly than normal, as ventilation demands increase. Especially during exhalation, the increased pressure of the abdominal cavity can help one exhale, acting on the increased airway requirement^{2,7,8}. Core muscle refers to the complex of the trunk-pelvic-hip joint muscles⁹, which can be divided into the global muscle and the local muscle. The global muscles are apparent and broad muscles such as the rectus muscle, erector spine muscles, external oblique abdominal muscles that are spread out in the abdominal and waist region. These muscles are mainly involved in the movement of the torso. Local muscles are muscle transversus abdominis, multifidus muscle, and multifidus muscle located in the abdominal walls¹⁰. Local muscles are mainly involved in the movement of the whole body and body alignment as well as stability of the waist segment. Core muscles not only aid in stabilization of the trunk, but also include a large number of respiratory muscles. Thus, to improve respiration strengthening exercises is essential. Core muscle strengthening exercise is a very effective treatment for increasing the upper limb

balance of patients with acute, subacute, and chronic periodic paralysis¹¹. According to previous research, it was reported that amongst the various exercise methods core muscle exercise using gym ball strengthens muscular strength of abdominal muscles and improves respiratory circulation function¹². Gym balls are often used as physical therapy tools and can be used safely and entertainingly regardless of age. Additionally, gym balls can be used virtually anywhere while being relatively low in price. Patients can expect the effect of muscle strengthening, flexibility and endurance improvement by doing various postures on the gym ball at the time of treatment¹³. Previous studies performed eight types of core muscle strengthening exercises using gym balls and found that muscle activity was higher when exercise was done utilizing gym ball than general core muscle strengthening exercises¹⁴. However, most of the previous studies only mentioned the comparison of the efficiency of exercise methods using gym balls and its effect on muscle activity¹². Research on how core muscle strengthening exercise utilizing gym balls effect the respiratory system has not been conducted yet. The purpose of this study was to investigate the effects of core strengthening exercise using Gym balls on the respiratory function of college students who have a sedentary lifestyle and to provide reference material for the study of physiotherapy in the respiratory system.

Table 1: General Characteristics of Subjects (n = 30)

Classification	Subject		Significance level
	Experimental Group (SEG)	Control Group (NEG)	t
Age	21.1 ± 1.85 ^a	23.6 ± 1.68	5.98*
Height(cm)	169.9 ± 7.34	168.4 ± 8.16	-1.05
Weight (kg)	64.1 ± 12.1	63.2 ± 10.4	-.274
BMI	21.9 ± 2.7	22.1 ± 2.42	.251
Smoking	Male n = 8 Female n = 7	Male n = 8 Female n = 7	
Gender	n = 4	n = 4	

^aAll values are mean value ± standard deviation (SD) *p<0.05 paret t test value.

SUBJECT AND METHOD

Subject: In this study, we recruited male and female students in their twenties of S college located in the city C who had a sedentary lifestyle and had a full understanding of the experiment's purpose by having listened to the detailed explanation it. There were a total

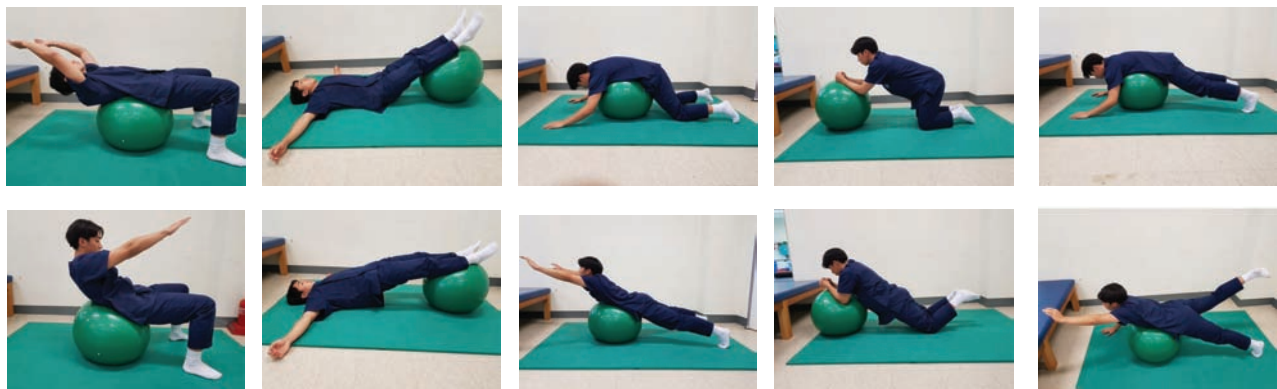
of 30 participants and the subjects of the experiment did not have any cardiopulmonary, neurosurgical or psychological illness. In order to not violate the research ethics, all subjects were fully informed about the study as shown in table 1. The participants then signed the study participation agreement prior to engaging in the experiment.

Intervention: The subjects were randomly divided into the Gym ball Exercise group (SEG) and the Non Exercise group (NEG). The Gym Ball Exercise Group (SEG) exercised three times a week for three weeks. They exercised five different types of exercises and did 3 sets of each of them. The subjects were given 15 seconds rest after a single set and a minute of break after one full session. The Gym ball of the subjects was selected based on if the participant could maintain 90 degrees of hip joint bending and 90 degrees of knee joint bending when sitting on the ball. The Gym ball selection of the subjects is shown in Figure 1. Gym ball exercise is follow in Figure 2. (a) Straight arm crunch with curl up: The subjects held their head straight with their arms extended straight for 15 seconds while lying on the gym ball, (b) Shoulder bridge on gym ball: The subjects layed on the ground floor with their arms spread out and on the ground. Then they held the bridge posture for 15 seconds with both feet on the gym ball, (c) Back extension exercise on gym ball: The subjects lied face down on the gym ball and lifted their upper body up with their arms extended forward. The posture was held

for 15 seconds, (d) Roll-out with plank exercise using gym ball: The subjects put their arms on the gym ball in a sitting position with their knees, rolled forward, and held the plank posture for 15 seconds, (e) Alternative arm and leg extension: The subjects lied face down on the Gym ball for 15 seconds with one arm and the other leg extended straight. They did the same exercise on the opposite side.



Figure 1: Subject's setting position on the gymball



(a) (b) (c) (d) (e)

Figure 2: Gym Ball Exercise Program

(a) Straight arm crunch with curl up (b) Shoulder bridge on gym-ball (c) Back extension exercise on gym-ball (d) Roll-out with plank exercise using gym-ball (e) Alternative arm and leg extension

Measurement: The forced vital capacity (FVC), forced expiratory volume at one second (FEV_1), and the one second rate (FEV_1/FVC), peak expiratory flow, (PEF), and maximal voluntary ventilation, (MVV) were measured using SPIROMETER, Pony FX, A-M system, Europe. All subjects performed preliminary exercises to understand spirometry measurement. Spirometry measurement was repeated three times and the highest value was selected. A 5-minute rest period was provided considering fatigue between measurements. The method

of measuring the spirometry was carried out according to the manual of the manufacturer of the apparatus as follows [Figure 3]. The forced vital capacity (FVC), forced expiratory volume at one second (FEV_1) at one second, the one second rate (FEV_1/FVC), and peak expiratory flow, (PEF) were measured while subjects were allowed to sit comfortably in their chairs with the mouthpieces comfortably put on their lips. After normal breathing was carried out 3 times, they inhaled as fast as possible, and then maintaining a maximum exhale for 6

seconds. The maximal voluntary ventilation (MVV) was measured by repeating the maximum expiration and the maximum inspiration for 12 seconds while comfortably being seated on a chair.



Figure 3: Spirometry measurement

Data analysis: Data analysis of this study was done using SPSS ver. 22.0 and presented with mean and standard deviation using descriptive statistics to identify all measurements and general characteristics of subjects. For the comparison of the measured results, the corresponding sample t test was used and the independent t-test was used to compare the differences between the groups. The significance level was 95% confidence level.

RESULTS AND DISCUSSION

The changes in respiratory function between the groups with the group which performed the core muscle strengthening exercise on the gym balls and the group without intervention were measured. The significance level was analyzed using the paired t-test and the independent t-test as shown in table 2. There was no statistically significant difference in the Non Exercise Group (NEG) in all the measurements ($p > 0.05$). In the Gym ball Exercise Group (SEG), there was not a significant difference in forced expiratory volume at one second (FEV_1) and one second rate (FEV_1/FVC) ($P < 0.05$), but there was a significant increase in the forced vital capacity (FVC) and peak expiratory flow (PEF). ($p < 0.05$) When comparing the difference rate between the two groups there was a increase in the forced vital capacity (FVC), but the increase was not significant. There

was any significant difference in the forced expiratory volume at one second (FEV_1) and one second rate (FEV_1/FVC) between the two group. (>0.05) The measurement of peak expiratory flow (PEF) showed a significant increase with pre-intervention values (6.07 ± 2.96) 47.68) and after intervention value (7.73 ± 3.30). There was also a significant increase in the maximal voluntary ventilation (MVV) with pre-intervention values (128.96 ± 47.68) and after intervention value (145.99 ± 41.01), respectively [Table 2]. The purpose of this study was to investigate the effects of strength exercise using gym balls on the respiratory function of the 30 college students who had a sedentary lifestyle. A significant difference could not be seen in the Non exercise group. The measurement of the Gym ball exercise group did not display a significant difference in forced expiratory volume at one second (FEV_1) one second rate (FEV_1/FVC), and forced vital capacity (FVC). However, there was a significant increase in maximal voluntary ventilation (MVV) and peak expiratory flow (PEF). When comparing the results of both groups, both groups did not show a significant difference in forced vital capacity (FVC), forced expiratory volume at one second (FEV_1) and one second rate (FEV_1/FVC). However, there was a significant increase in the peak expiratory flow (PEF) and maximal voluntary ventilation (MVV) within the gym ball exercise group (SEG). Previous studies have shown that the core muscle strengthening exercise in healthy adults has increased the expiratory flow (PEF) maximal voluntary ventilation (MVV) which matches this research^[4]. In a previous study, they researched patients in their teens with scoliosis who did exercises on the gym ball and patients with chronic stroke who performed the core muscle stabilization exercises. Both scoliosis and chronic stroke patients showed an increase in forced vital capacity (FVC) and forced expiratory volume at one second (FEV_1). 22 women in their twenties who underwent a specific respiratory and general abdominal muscle-strengthening exercise did not show a significant difference in forced expiratory volume.

Table 2: Comparison of respiratory function of Gym ball Exercise group (SEG) and the Non Exercise group (NEG)

	Non Exercise Group (NEG)			Gym ball Exercise Group (SEG)			Significance Level
	Before Intervention	After Intervention	t	Before Intervention	After Intervention	t	Independent t
FVC(L)	3.85 ± 1.03 ^a	3.89 ± 0.87	-.515	3.89 ± 0.93	3.99 ± 0.99	-2.582*	-.739
FEV ₁ (L)	3.05 ± 0.89	3.13 ± 0.80	-1.013	3.36 ± 0.76	3.34 ± 0.81	.283	.891
FEV ₁ /FVC(%)	96.47 ± 10.62	96.40 ± 9.65	.026	98.60 ± 9.92	99.00 ± 8.96	-.187	-.141
PEF(L/sec)	6.53 ± 2.68	6.92 ± 2.41	-1.276	6.07 ± 2.96	7.73 ± 3.30	-4.107*	-2.531†
MVV(L/min)	130.88 ± 42.99	131.55 ± 42.82	-.198	128.96 ± 47.68	145.99 ± 41.01	-5.409*	-3.531†

*p<0.05 paret t test value. †p<0.05 independent t test value ^aAll values are mean value± standard deviation(SD) FVC: Forced vital capacity, FEV₁: Forced expiratory volume at one second, FEV₁/FVC □ One second rate, □PEF: Peak expiratory flow, MVV: Maximal voluntary ventilation

at one second (FEV₁) and one second rate (FEV₁/FVC). There was a slight increase in forced vital capacity (FVC) which was in agreement with this research. As a result of the previous studies, the minimum intervention period was 8 weeks. Therefore, it seems necessary to apply the intervention period and the application time longer. Greer, et al., has suggested that physical activity should be increased by doing various exercises using apparatus to reduce problems that may arise from a sedentary lifestyle. The results of this study suggest that having a sedentary lifestyle may lead to bad body posture which leads to a possible deterioration of function of bodily function. To prevent such deterioration, there must be an increase in physical activity ^{1,17}. Examples of studies on respiratory-related physical activity include a study on observation of asthma patients from 6~12 who performed breathing exercises and a study on healthy college students from ages 26~36 who performed the maximal expiratory exercise (MEE). Through their research they found out that performing the breathing exercises not only increased the respiratory functions, but also the endurance and thickness of the abdominal muscles⁷. These findings confirm that the abdominal muscles are used when respiration is performed on subjects whose respiratory function is impaired, thus supporting the fact that the core muscle strengthening exercise affects respiratory function. It was also found that the relationship between respiratory function and core muscles was confirmed in subjects with respiratory system problems and subjects without problems. Previous studies have reported increased activity of muscle such as the rectus abdominal muscle, external oblique abdominal muscle, when performing core

muscle stabilization exercises using Gym balls^{7,14,18}. This suggests that strengthening the muscular strength and increasing the activity of the lumbar and abdominal muscles stabilizes the diaphragm according to the joint exercise¹⁹ and that the enhancement of the abdominal pressure to assist the respiratory function may also affect the respiratory function. In another previous study, 18 male college students in their 20s were performed a gym ball exercise to strengthen their expiratory muscle, and the results showed that the effect of the exercise on the gym ball to enhance expiratory muscle was effective in improving respiratory function. These studies provide evidence that core muscle strengthening exercises using Gym balls in this study affect respiratory function including aerobic function. Therefore, we can predict that core strengthening exercises using the gym ball may be helpful to improve the respiratory function on subjects with a sedentary lifestyle. The limitations of this study were that it was not possible to control the activities of daily activities of the subjects other than the exercise time. Additionally, the follow-up study was not performed so the follow-up period after the intervention was not confirmed accurately. In addition, there are limitations that do not take into account the physique and physical fitness of the subjects. The intervention period was set to a short period of three weeks. It is also difficult to generalize the results of studies on various age groups by conducting research on university students which is relatively a small age group. We can expect to provide better treatment for respiratory system physiotherapy by studying and comparing more effective and efficient intervention methods through various future studies.

CONCLUSION

The purpose of this study was to investigate the effects of gym ball exercise on the respiratory function of university students who have a sedentary lifestyle. The results showed that exercise with gym ball had a positive effect on the improvement of respiration function of college students with a sedentary lifestyle. Therefore, it is expected that future studies will show various ways of exercising with the gym ball to improve respiratory function of people a sedentary lifestyle.

Ethical Clearance: This study was approved by the Bioethics Institutional Review Board of the Sun Moon University on the usage of human subjects (Approval No. SM-201705-017-2)

Source of Funding: This research was supported by Basic Science Research Program through the National Research Foundation of Korea(NRF) funded by the Ministry of Science, ICT & Future Planning(2017R1C1B5017084).

Conflict of Interest: Nil

REFERENCES

- Greer AE, Sui X, Maslow AL, Greer BK, Blair SN. The effects of sedentary behavior on metabolic syndrome independent of physical activity and cardiorespiratory fitness. *J Phys Act Health*. 2015 Jan;12(1):68-73. doi: 10.1123/jpah.2013-0186.
- Kim MS, Cha YJ, Choi JD. Correlation between forward head posture, respiratory functions, and respiratory accessory muscles in young adults. *Back Musculoskelet Rehabil*. 2017 Aug 3;30(4):711-715. doi: 10.3233/BMR-140253.
- Thorp AA, Owen N, Neuhaus M, Dunstan DW. Sedentary behaviors and subsequent health outcomes in adults a systematic review of longitudinal studies, 1996-2011. *Am J Prev Med*. 2011 Aug;41(2):207-15. doi: 10.1016/j.amepre.2011.05.004.
- Edwards MK, Loprinzi PD1. Experimentally increasing sedentary behavior results in decreased life satisfaction. *Health Promot Perspect*. 2017 Mar 5;7(2):88-94. doi: 10.15171/hpp.2017.16. eCollection 2017.
- Mesquita Montes A, Baptista J, Crasto C, de Melo CA, Santos, Vilas-Boas JP. Abdominal muscle activity during breathing with and without inspiratory and expiratory loads in healthy subjects. *J Electromyogr Kinesiol*. 2016 Oct;30:143-50. doi: 10.1016/j.jelekin.2016.07.002. Epub 2016 Jul 5.
- Hides JA, Miokovic T, Belavý DL, Stanton WR, Richardson CA. Ultrasound imaging assessment of abdominal muscle function during drawing-in of the abdominal wall: an intrarater reliability study. *J Orthop Sports Phys Ther*. 2007 Aug;37(8):480-6.
- Misuri G, Colagrande S, Gorini M, Iandelli I, Mancini M, Duranti R, Scano G. In vivo ultrasound assessment of respiratory function of abdominal muscles in normal subjects. *Eur Respir J*. 1997 Dec;10(12):2861-7.
- Ito K, Nonaka K, Ogaya S, Ogi A, Matsunaka C, Horie J. Surface electromyography activity of the rectus abdominis, internal oblique, and external oblique muscles during forced expiration in healthy adults. *J Electromyogr Kinesiol*. 2016 Jun;28:76-81. doi: 10.1016/j.jelekin.2016.03.007. Epub 2016 Apr 4.
- Akuthota V, Nadler SF. Core strengthening. *Arch Phys Med Rehabil*. 2004 Mar;85(3 Suppl 1):S86-92.
- Marshall PW, Murphy BA. Core stability exercises on and off a Swiss ball. *Arch Phys Med Rehabil*. 2005 Feb;86(2):242-9.
- [26] Yu SH, Park SD. The effects of core stability strength exercise on muscle activity and trunk impairment scale in stroke patients. *J Exerc Rehabil*. 2013 Jun 30;9(3):362-7. doi: 10.12965/jer.130042. eCollection 2013.
- Kim SG, Yong MS, Na SS. The effect of trunk stabilization exercises with a swiss ball on core muscle activation in the elderly. *J Phys Ther Sci*. 2014 Sep;26(9):1473-4. doi: 10.1589/jpts.26.1473. Epub 2014 Sep 17.
- Sekendiz B, Cuğ M, Korkusuz F. Effects of Swiss-ball core strength training on strength, endurance, flexibility, and balance in sedentary women. *J Strength Cond Res*. 2010 Nov;24(11):3032-40. doi: 10.1519/JSC.0b013e3181d82e70.
- [Escamilla RF, Lewis C, Bell D, Bramblet G, Daffron J, Lambert S, Pecson A, Imamura R,

- Paulos L, Andrews JR. Core muscle activation during Swiss ball and traditional abdominal exercises. *J Orthop Sports Phys Ther.* 2010 May;40(5):265-76. doi: 10.2519/jospt.2010.3073.
15. Ishida H1, Kobara K1, Osaka H1, Suehiro T1, Ito T1, Kurozumi C1, Watanabe S1. Correlation between Peak Expiratory Flow and Abdominal Muscle Thickness. *J Phys Ther Sci.* 2014 Nov;26(11):1791-3. doi: 10.1589/jpts.26.1791. Epub 2014 Nov 13.
 16. Kim JJ, Song GB, Park EC. Effects of Swiss ball exercise and resistance exercise on respiratory function and trunk control ability in patients with scoliosis. *J Phys Ther Sci.* 2015 Jun;27(6):1775-8. doi: 10.1589/jpts.27.1775. Epub 2015 Jun 30.
 17. Fanchamps MHJ1, van den Berg-Emons HJG1, Stam HJ1, Bussmann JBJ2. Sedentary behavior: Different types of operationalization influence outcome measures. *Gait Posture.* 2017 May;54:188-193. doi: 10.1016/j.gaitpost.2017.02.025. Epub 2017 Mar 6.
 18. Souza MC1, Jennings F2, Morimoto H2, Natour J3. Swiss ball exercises improve muscle strength and walking performance in ankylosing spondylitis: a randomized controlled trial. *Rev Bras Reumatol Engl Ed.* 2017 Jan - Feb;57(1):45-55. doi: 10.1016/j.rbre.2016.09.009. Epub 2016 Oct 20.
 19. Abraham KA, Feingold H, Fuller DD, Jenkins M, Mateika JH, Fregosi RF. Respiratory-related activation of human abdominal muscles during exercise. *J Physiol.* 2002 Jun 1;541(Pt 2):653-63.

Gene Expression of Pulp Cells from Supernumerary Tooth Through the Passages

Seungwoo Shin¹, Jisun Shin², Jongsoo Kim³, Younsoo Shim⁴, Soyoung Park⁵, Eunsuk Ahn⁶, Jongbin Kim⁷

¹Fellow, ^{2,7}Assistant Professor, ³Professor, Department of Pediatric Dentistry, Dankook University, Korea;

⁴Associate Professor, Department of Dental Hygiene, Sunmoon University, Korea; ⁵Assistant Professor,

Department of Dental Hygiene, Wonkwang Health Science University, Korea; ⁶Assistant Professor, Department of Dental Hygiene, Kyungbok University, Korea

ABSTRACT

Background/Objectives: Evaluate the gene expression of the human dental pulp cells harvested from supernumerary tooth through the passages by using quantitative reverse transcription PCR.

Method/Statistical analysis: Stem cells were harvested from the extracted supernumerary tooth. Primary cells were incubated at 37°C for 7 days. When the cells reached 80% confluency, they were subcultured for the next passage. The same subculture was performed until the 16th passage. Total RNA of dentin sialophosphoprotein(DSPP), ALP, dentin matrix acidic phosphoprotein 1(DMP-1), osteocalcin, and osteonectin were extracted and quantitative reverse transcription PCR was used to measure gene expression.

Findings: The supernumerary tooth is surgically removed at a relatively early age. The tooth can be obtained in an aseptic condition, and it could be extracted at a scheduled time so it could be a new donor of tooth stem cell harvesting. We performed this study using dental stem cells collected from supernumerary teeth. From the 1st passage to 16th passage, more DMP-1 was observed in early passage compared to late passage. More ALP, Osteocalcin, Osteonectin were observed in late passage compared to early passages. DSPP showed constant expression during all passages. Gene expression of ALP, Osteonectin, Osteocalcin, DMP-1, and DSPP showed no difference in the undifferentiated and differentiated groups and between passages through 1st to 16th also.

Improvements/Applications: Stem cells from supernumerary tooth showed high gene expression potential although it reached more than the 8th passage.

Keywords: *sDPSCs, supernumerary tooth, gene expression, qRT-PCR, passage*

INTRODUCTION

Stem cells are unspecialized cells that has a property of self-renewal and it differentiates into various special cells¹. These stem cells exist in adult tissues like blood, skin, adipose tissues, bone marrow, hair follicles, and dental pulp cells²⁻⁷. Because of usefulness in regenerative treatment, there are increasing studies about mesenchymal stem cells. The mesenchymal stem cell

can be obtained from the embryonic or adult stem cell. But obtaining stem cell from the embryo can face ethical issues so in tissue regeneration studies, using adult stem cell takes up a lot^{8,9}. Dental pulp is one of the sources where mesenchymal stem cells(MSCs) can be obtained and from previous studies MSCs can differentiate into many cell types. Dental pulp stem cells(DPSCs) can be the source of induced pluripotent stem cells(iPSCs)¹⁰.

Until now periodontal ligament, dental pulp, apical papilla, exfoliated deciduous teeth, and dental follicle were used as a source of tooth-derived stem cell. The impacted supernumerary tooth is surgically removed at a relatively early age. A Surgically extracted supernumerary tooth can be obtained in aseptic condition, and it could be extracted at a scheduled time

Corresponding Author:

Jongbin Kim

Assistant Professor, Department of Pediatric dentistry
Dankook University, Korea

Email: jbkim0222@dankook.ac.kr

so it could be a new donor of tooth stem cell harvesting. Most of all extracted supernumerary tooth has the dental follicle, pulp, periodontal ligament, and apical papilla. We performed this study using dental stem cells collected from supernumerary teeth to evaluate the gene expression of the human dental pulp cells harvested from supernumerary tooth through the passages by using quantitative reverse transcription PCR.

MATERIALS AND METHOD

Supernumerary tooth extraction: We studied 6- year-old who came to Dankook University Dental Hospital for supernumerary tooth extraction. The patient had no systemic disease or medical history. After receiving approval (H-1506/006/001) from the Institutional Ethics Committee of Dankook University, we conducted supernumerary tooth extraction for dental pulp harvesting. The extraction was performed by a skilled surgeon. After the supernumerary tooth extraction tooth were immediately soaked into the α -minimal essential medium (α -MEM; Gibco BRL, Grand Island, NY, USA) and were transferred to the laboratory.

Isolation and culture of cell: The lower part of the cemento-enamel junction was sawed until it reached close to the pulp using a high-speed handpiece. To prevent infection and tissue damage, sawing was performed under sterile saline. When the high-speed handpiece reached near pulp, breakage was performed to expose pulp. The pulp was harvested using a hand file.

Harvested pulp tissues were finely ground to 1.0 mm³, and then soaked into 3.0 mg/mL Type I collagenase (Sigma-Aldrich Co., St. Louis, MO, USA) and 4.0 mg/mL Dispase (Sigma-Aldrich Co., St. Louis, MO, USA) solution. Pulp tissues were kept in incubator at 37°C with shaking motion for 1 hour and then filtered through a 70 μ m Falcon strainer (CORNING Inc., NY, USA). Filtered cells obtained from Falcon strainer (CORNING Inc., NY, USA) were cultured in α -MEM (Gibco BRL, Grand Island, NY, USA) medium supplemented with 20% FBS (Gibco, Life Technologies Corporation, Carlsbad, Calif., USA), 100 U/mL penicillin, 100 μ g/mL streptomycin (Gibco BRL), 2 mL-ascorbic acid (Sigma, St. Louis, Mo., USA) was added and incubated for 4-6 days. Incubation was done at 37°C with CO₂ level of 5% until a 70 - 80% confluency was achieved. Obtained cells were named as supernumerary dental pulp stem cells (sDPSCs). After 48 hours, every 2-3 days the medium was changed according

to the degree of confluency, and the cells not attached to the culture container was washed with phosphate buffered saline (PBS). When the cells attached to the bottom of the container showed 80% saturation, the cells were separated from the bottom with Trypsin-EDTA (Corning Inc., N. Y., USA) and subcultured in 1/4 of each other. In the same manner, the cells were cultured up to 16th passage.

Application of hard tissue forming differentiator: To evaluate the differentiation amount, harvested stem cells were incubated at a bone morphogenic media. 10 mL α -MEM (Gibco BRL, Grand Island, NY, USA), 10% FBS (Gibco, Life Technologies Corporation, Carlsbad, Calif, USA), 5 mM β -glycerophosphate (Sigma-Aldrich Co., St. Louis, MO, USA), 100 nM Dexamethasone (Sigma-Aldrich Co., St. Louis, MO, USA) and 100 μ M Ascorbic acid (Sigma-Aldrich Co., St. Louis, MO, USA) were mixed. Every 3 days the culture solution was changed. The induction of differentiation was performed for 8 days.

Total RNA extraction and cDNA: Easy-spin total RNA extraction Kit (iNtRON Biotechnology, Gyeonggi-do, Korea) was used to extract Total RNA^{23, 24}. After the extraction, Nanodrop ND-2000[®] (Thermo Scientific, Waltham, MA, USA) was used for total RNA quantification. Total RNA 1 μ g was added to qPCR RT Master Mix kit (TOYOBO Co., Osaka, Japan) and Nuclease-free water was added until it reached 20 μ l. cDNA was synthesized at the temperature of 65°C for 5 minutes, 4°C for 5 minutes and 95°C for 5 minutes.

Real-time polymerase chain reaction (Real-time PCR): Real-time PCR was done from the first passage to the 16th passage stem cells. Additionally, each passage was divided into two groups: one group treated with the differentiator and the other treated with nothing. The RNA expression pattern of alkaline phosphatase (ALP), dentin sialophosphoprotein (DSPP), dentin matrix acidic phosphoprotein 1 (DMP-1), osteocalcin, and osteonectin were analyzed. The relative expression level of each mRNA before and after differentiation was analyzed based on glyceraldehyde 3-phosphate dehydrogenase (GAPDH). Dilution was made up to 25 ng with sterile distilled water. 0.5 μ L of forward and reverse primers (10 pmol/ μ L) and 5 μ L of 2x SYBR Premix Ex Taq[™] (Bio-Rad Laboratories, Hercules, CA, USA) were added. Amplification and fluorescence detection were performed using StepOnePlus[™] Real-time PCR

(AB Applied Biosystems by Life Technology, Waltham, Mass., USA). At the amplification process, initial denaturation was carried out at 95 °C for 20 seconds, annealing was carried out at a suitable temperature. Each primer had 40 cycles with 1 minute each, after

the annealing dissociation was done from 65 °C to 95 °C. The melting curve analysis was also performed. Table 1 shows the used primers. Data were analyzed using StepOnePlus™ (AB Applied Biosystems by Life Technology, Waltham, MA, USA).

Table 1: Sequences of Primer for PT-PCR

Gene		Sequence (5' – 3')	Annealing Temp (°C)
GAPDH	forward	GGAGTCCACTGGCGTCTTCAC	57
	reverse	GCTGATGATCTTGAG GCTGTTGTC	
ALP	forward	CTTGACCTCCTCG GAAGACACTC	60
	reverse	CGCCCACCAC CTTGTAGCC	
OCN	forward	CCTCA CACTCCTCGCCCTATTG	57
	reverse	CGCTG CCCTCCTGCTTGG	
ONT	forward	AGGAG GTGGTGGCGGAAAATC	55
	reverse	GTGG CAAAGAAGTGGCAGGAAG	
DMP-1	forward	CA GGAAGAGGTGGTGAGTGAGTC	63
	reverse	CTG GATTCGCTGTCTGCTTGC	
DSPP	forward	CAG TACAGGATGAGTTAAATGCCAGTG	64
	reverse	CCATTCCCTTCTCCCTTGTGACC	

(GAPDH: glyceraldehyde 3-phosphate dehydrogenase, ALP: alkaline phosphatase, DMP-1: dentin matrix acidic phosphoprotein 1, DSPP: dentin sialophosphoprotein)

RESULTS AND DISCUSSION

Cell morphology after application of hard tissue forming differentiator: Using the optical microscope cell morphology of undifferentiated and differentiated group were observed with the interval of 7 and 14 days. In the early passages, cells grew with the tendency of aggregation in spite of the differentiation inducement. But after 10th passages, the morphology of cells grew similar to fibroblasts with a spindle shape with the constant direction.

Quantitative Reverse Transcription Polymerase Chain Reaction, qRT-PCR: In this study, difference in the ALP between the cells differentiated for 8 days and the undifferentiated was not observed [Figure 1]. Osteocalcin and osteonectin, which are bone formation maker, showed a slight difference in gene expression through passages [Figure 2, Figure 3]. Dentin marker DMP-1 and DSPP showed no significant difference between undifferentiated cells and cells differentiated cells [Figure 4, Figure 5].

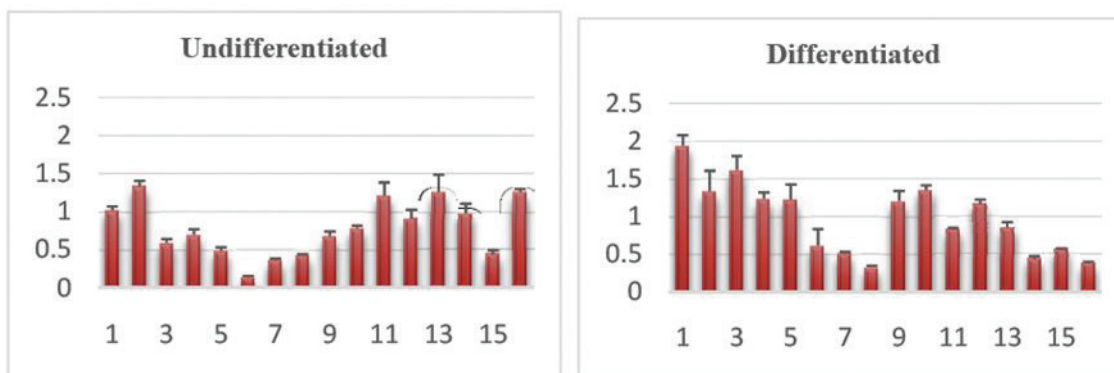


Figure 1: The changes of ALP expression. RT-PCR was used to analyzed the marker. There was little difference between the two groups through all passages. ALP: alkaline phosphatase

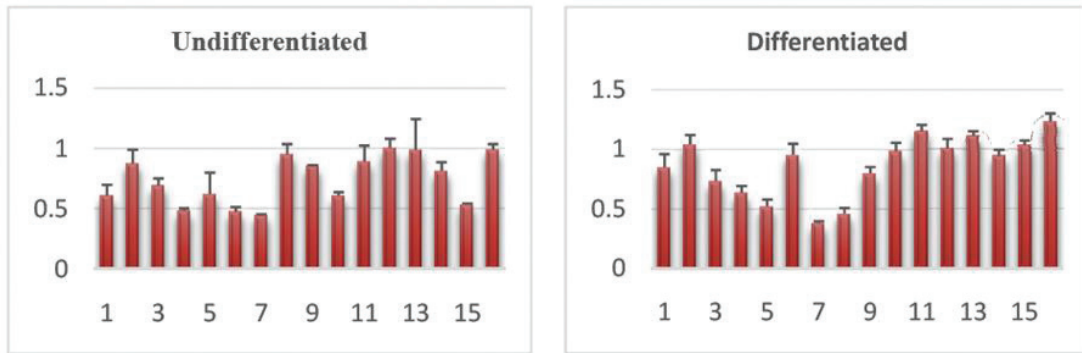


Figure 2: The changes of osteocalcin expression. There was little difference between the two groups through all passages.

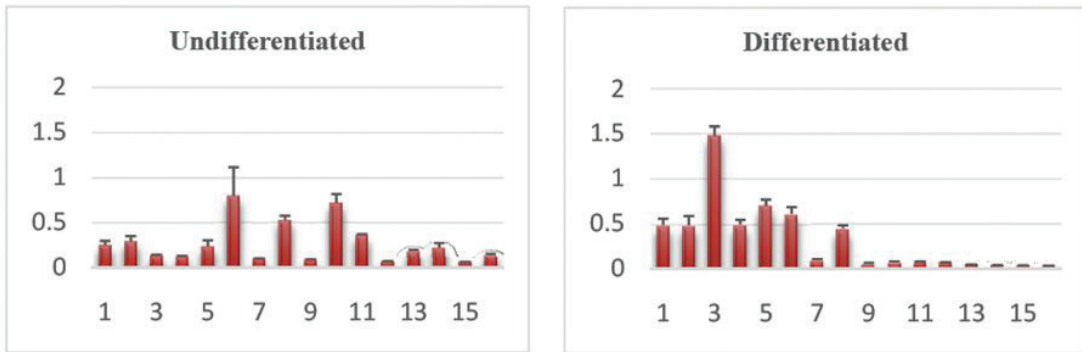


Figure 3: The changes of osteonectin expression. There was little difference between the two groups through all passages.

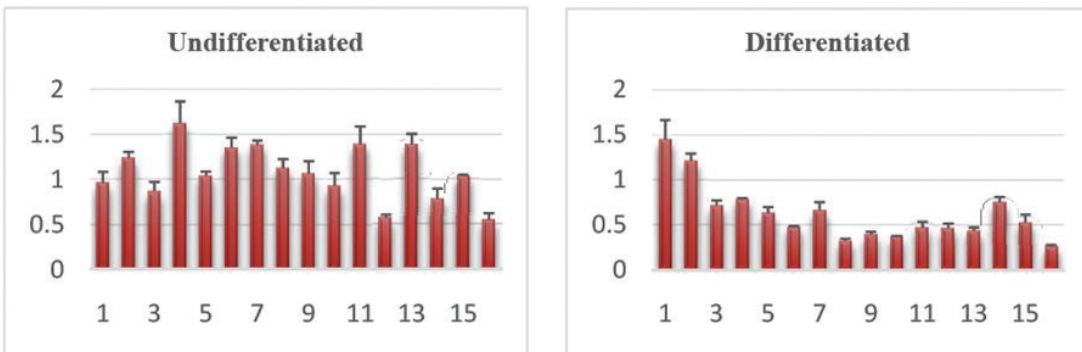


Figure 4: The changes of DMP-1 expression. There was little difference between the two groups through all passages. (DMP-1: dentin matrix acidic phosphoprotein 1)

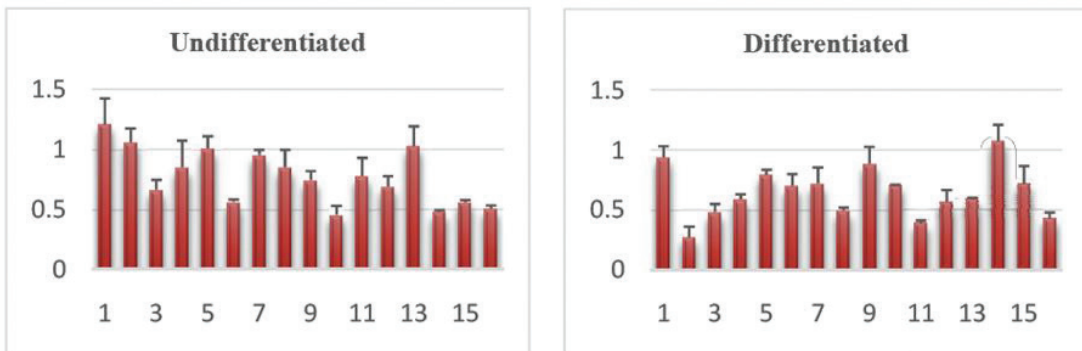


Figure 5: The changes DSPP expression. There was little difference between the two groups through all passages. (DSPP: dentin sialophosphoprotein)

Although there is growing interest and research in tissue regeneration, the number of cells used for tissue regeneration is limited, and in order to overcome the lack of such cells, this study was performed. The source of mesenchymal stem cell can be obtained from the embryonic or adult stem cell. But obtaining the stem cell from the embryo can face ethical issues so in tissue regeneration studies, using adult stem cell takes up a lot^{8,9}.

Adult stem cell can be obtained from many tissues, but harvesting stem cell without tissue damage was a difficult problem. Pulp tissue originates from neural crest but it is similar to mesenchymal stem cell from bone marrow¹¹. Stem cell harvested from tooth is left undifferentiated until adult so multifunctional and primitive cell can be gained from the tooth¹². Above all, tooth-derived stem cell harvested from the 3rd molar, supernumerary tooth, and exfoliated primary tooth are less invasive because extraction is essential. Instead of throwing it away it can be reused. Among the stem cells harvested from the tooth, the stem cell which is gained from the 3rd molar, it is reported that it has less differentiation potential than the stem cells harvested from the supernumerary tooth¹³. And the stem cell harvested from the primary tooth can't complete the dentin-pulp-like complex¹⁴.

Supernumerary tooth is an additional tooth, occurring at a prevalence of 1.0-3%¹⁵. It is recommended that the supernumerary tooth is surgically removed at an early age because it can induce delayed eruption of the adjacent permanent teeth, malocclusion such as rotation, dislocation, and cyst formation¹⁵.

In the previous studies, dental pulp originated stem cells proliferate over 25 passages and has an ability to control the immune system¹⁶.

The purpose of this study was to use supernumerary tooth that has been extracted early ages. The stem cells were cultured until 16th passages and differentiation potential was measured using differentiator.

The mean time taken to cross the passage was 2-3 days, which was considerably shorter than the time spent in the previous study using the impacted third molar. For third molar, it took 7-10 days to cross the passage¹⁷. From these studies, it can be assumed that sDPSCs has young and vigorous differentiation ability.

In *in vitro* situation, ALP activity is commonly used as a tool to measure bone morphogenetic ability. ALP is found in a precursor of osteoblast, as the cells grow

it marks the cells that differentiate to osteoblast¹⁸. In the process of bone formation, the formation of type I collagen starts first. After the matrix maturation stage ALP, osteocalcin and osteonectin appear.

In this study, qRT-PCR showed no difference between the undifferentiated and differentiated group. These results are in contrast to the study which was performed by Lee¹⁹. According to the study by Lee, the ALP activity of DPSCs increased in proportion to the increase in time after 7 days, 14 days, and 21 days. In the study done by Lee, the result was measured 14 days after differentiation, but this study we only had 8 days so it could be assumed that time for the complete differentiation was not enough²⁰⁻²².

CONCLUSION

From the result of this study, sDPSCs has self-renewal ability and it could be a source of stem cell. From the 1st passage to 16th passage, more DMP-1 was observed in early passage compared to late passage. More ALP, Osteocalcin, Osteonectin were observed in late passage compared to early passages. DSPP showed constant expression during all passages. Gene expression of ALP, Osteonectin, Osteocalcin, DMP-1, and DSPP showed no difference in the undifferentiated and differentiated groups and between passages through 1st to 16th also.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Potdar PD, Deshpande S. Mesenchymal stem cell transplantation: New avenues for stem cell therapies. *J Transplant Technol Res.* 2013 Sep;3:2. doi:10.4172/2161-0991.1000122.
2. Potdar P, Sutar J. Establishment and molecular characterization of mesenchymal stem cell lines derived from human visceral & subcutaneous adipose tissues. *J Stem Cells Regen Med.* 2010 Apr;6(1):26-35.
3. Potdar PD, D'souza SB. Isolation of Oct4+, Nanog+ and SOX2- mesenchymal cells from peripheral blood of a diabetes mellitus patient. *Hum Cell.* 2011 Mar;24(1):51-55. doi:10.1007/s13577-011-0011-6.

4. Potdar P, Subedi R. Defining Molecular Phenotypes of Mesenchymal and hematopoietic Stem Cells derived from Peripheral blood of Acute Lymphocytic Leukemia patients for regenerative stem cell therapy. *J Stem Cells Regen Med.* 2011 Apr;7(1):29–40.
5. Potdar PD, Chougule S. Establishment and molecular characterization of breast cancer mesenchymal stem cell line derived from human non-metastasis breast cancer tumor. *Stem Cell Discovery.* 2011 Jul;1(2):21–28. doi:10.4236/scd.2011.12003.
6. Potdar PD, Kumar KS. Establishment and molecular characterization of human dermal mesenchymal like stem cells derived from human scalp biopsy of androgenetic alopecia patient. *Stem Cell Discovery.* 2013 Apr;3(2):77–82. doi:10.4236/scd.2013.32012.
7. Shi S, Gronthos S. Perivascular niche of postnatal mesenchymal stem cells in human bone marrow and dental pulp. *J Bone Miner Res.* 2003 Apr;18(4):696–704.
8. Evans MJ, Kaufman MH. Establishment in culture of pluripotential cells from mouse embryos. *Nature,* 1981 Jul;292:154-156.
9. Almeida-Porada G, Porada C, Zanjani ED. Adult stem cell plasticity and methods of detection. *Rev ClinExpHematol,* 2001 Mar;5(1):26-41 .^[1]_{SEP}
10. Neeraj Malhotra. Induced Pluripotent Stem (iPS) Cells in Dentistry: A Review. *Int J Stem Cells,* 2016 Nov; 9(2):176–185.
11. Gronthos S, Brahim J, Li W, *et al.* Stem cell properties of human dental pulp stem cells. *J Dent Res* 2002 Aug;81(8):531-5.
12. Graziano A, d’Aquino R, Laino G, *et al.* Dental pulp stem cells: a promising tool for bone regeneration. *Stem Cell Rev,* 2008 Feb;4(1):21-26.
13. Huang GJ, Gronthos S, Shi S. Mesenchymal stem cells derived from dental tissues vs. those from other sources: their biology and role in regenerative medicine. *J Dent Res,* 2009 Sep;88(9):792-806.
14. Miura M, Gronthos S, Zhao M, *et al.* SHED: stem cells from human exfoliated deciduous teeth. *Proc Natl AcadSci U S A,* 2003 May;100(10):5807-5812.
15. WH Huang, TP Tsai, HL Su. Mesiodens in the primary dentition stage: a radiographic study, *ASDC J Dent Child,* 1992 May-Jun;59(3):186-9.
16. Lindroos B, Maenpaa K, Ylikomi T, *etal.* Characterisation of human dental stem cells and buccal mucosa fibroblasts. *BiochemBiophys Res Commun,* 2008 Apr;368(2):329-35.^[1]_{SEP}
17. Min JH, Ko SY, Cho YB, *etal.* Dentinogenic potential of human adult dental pulp cells during the extended primary culture. *Hum Cell,* 2011 Mar;24(1):43-50.^[1]_{SEP}
18. Kotobuki N, Hirose M, Funaoka H, *et al.* Enhancement of in vitro osteoblastic potential after selective sorting of osteoblasts with high alkaline phosphatase activity from human osteoblast-like cells. *Cell Transplant,* 2004;13(4):377-383.^[1]_{SEP}
19. Lee JK, Lee JH: A study on differentiation potency of adult stem cells from pulp, periodontal ligament, and dental follicle to osteoblast. *J Korean Assoc Oral MaxillofacSurg,* 2010 Feb;36(1):7-15.
20. Pradeep Kumar Mallick, Debahuti Mishra, Srikanta Patnaik and Kailash Shaw, “A Hybrid Approach for Simultaneous Gene Clustering and Gene Selection for Pattern Classification”, *Indian Journal of Science and Technology,* Volume : 9(21), DOI: 10.17485/ijst/2016/v9i21/94175, June 2016, ISSN (Print) : 0974-6846. ISSN (Online) : 0974-5645.
21. Pradeep Kumar Mallick, Debahuti Mishra, Srikanta Patnaik and Kailash Shaw, “A Semi-Supervised Rough Set and Random Forest Approach for Pattern Classification of Gene Expression Data”, *Int. J. of Reasoning-based Intelligent Systems (IJRIS),* Vol.8, No.3/4, pp.155 – 167, 2016., ISSN online: 1755-0564, ISSN print: 1755-0556.
22. Pradeep Kumar Mallick, Debahuti Mishra, Srikanta Patnaik and Kailash Shaw, “A Novel Supervised Gene Clustering Approach By Mining Interdependent Gene Patterns” *International Journal of Pharma and Bio Sciences,* Volume: 7(4): (B), pp: 20 - 32 ,2016, ISSN 0975-6299
23. Mishra S., Mishra D., SVM-BT-RFE: An improved gene selection framework using Bayesian T-test embedded in support vector machine (recursive feature elimination) algorithm, *Karbala International Journal of Modern Science,* 1(2), pp.86-96, 2015.
24. Mishra S., Mishra D., Enhanced Gene Ranking Approaches using Modified Trace Ratio Algorithm for Gene Expression Data, *Informatics in Medicines Unlocked,* 5, pp. 39-51, 2016.

Keyword Network Analysis for Creativity and Personality of Early Childhood Teachers: Focus on Big Data

Byung-Man Kim¹, Jeong-Jin Youn², Su-Jeong Jeong³, Kang-Hoon Lee⁴

¹Professor, Dept. of Early childhood education, Kyungnam University, Changwon; ²Professor, ³Invited Professor, Dept. of Early childhood Education, Tongmyong University, Pusan; ⁴Doctoral Candidate, Dept. of Early childhood Education, Pusan National University, Pusan, Republic of Korea

ABSTRACT

Background/Objectives: The purpose of this study is to provide basic data for improving the creativity and personality of early childhood teachers by examining the social perception of creativity and personality of early childhood teachers through keyword network analysis.

Method/Statistical analysis: Based on the Big Data provided by Textom, we collected rawDATA with the keyword ‘early childhood teacher + creativity + personality’. The collected data were subjected to a first and second refinement process, and 200 keywords were selected based on the extracted word frequency. A 1-mode matrix was created and a keyword network analysis was conducted.

Findings: As a result of the research, it was found that ‘education’, ‘teacher’, ‘personality’, and ‘creativity’ were common keywords in the social awareness of creativity and personality of early childhood teachers. The results of this study suggest that the social awareness of creativity and personality of early childhood teachers is related to factors related to teacher education (education, teacher, program, professor), creativity and personality related factors (creativity, science, play), personality related factors (personality, parents), It was closely related. Based on these results, we suggested implications for the support for the improvement of creativity and personality of early childhood teachers.

Improvements/Applications: In the future research, it is proposed not only to grasp the tendency, but also to introduce various programs related to creativity and personality in the field of early childhood education

Keywords: Creativity, Personality, Childhood Teacher, Big Data, Network Analysis

INTRODUCTION

In the era of the Fourth Industrial Revolution, it is required to be able to produce new values by fusing various disciplines and technologies. This ability is not an undergraduate education but an area where children can think and learn by themselves and cultivate. This is the time when the need for creativity and personality education to study and learn on their own based on the potentials of children and their right values is becoming more important.

In creativity of creativity, ‘creativity’ emphasizes creative and positive artifacts in the fields of science and arts^[1] or emphasizes the interaction of individuals and the environment^[2,3]. ‘Humanity’ is similar in scope to personality, personality, character, etc.^[4]. In recent years, the importance of moral judgment has been raised by the combination of creativity and humanity through the organic combination of creativity and personality, rather than distinguishing between creativity and personality, and the importance of fusion education has emerged^[5,6,7]. It is arguing for creativity education to cultivate creative talents.

Corresponding Author:

Kang-Hoon Lee
Doctoral Candidate,
Department of Early Childhood Education,
Pusan National University, Korea
Email: darkengal@nate.com

In particular, ‘creative and personality education basic plan’ also teaches creativity and personality education ‘education that is the essence and ultimate goal of future education that fosters talented person who creates new value and livelihood at the same time and comprehensiveness^[8]. In order to improve the

character education of infants, we emphasize focusing on improving basic lifestyle abilities so that free and creative expressions can be made by running basic infant lifestyle and experiential play education course in infancy^[8]. In other words, the necessity of creativity and personality education from the kindergarten education in which the first education is made in early childhood is cultivated in order to cultivate human resources with creativity and personality in the age. In order to raise the personality of creativity, And to strengthen the creativity capacity of the early childhood teachers who are struggling with it. Therefore, it is necessary to discuss basic ideas for improving the creativity and personality of early childhood teachers and ways to further enhance creativity and personality.

The results of this study are as follows. First, the research on the relationship between creativity and personality, personality and specific variables of early childhood teachers^[9,10,11], the perception of early childhood teachers about creativity and personality education^[3, 12], and a program study based on creativity and personality^[13,14]. However, there are few studies on the keyword network based on the big data about creativity and personality of early childhood teachers. There are only a few studies that have analyzed the personality education of young children as big data in early childhood education^[15].

It is important to see how the early childhood teacher in the field perceives and practices the creativity and personality of early childhood, which is the basic stage of education, in keeping with the demands of the times that emphasize creativity. This may be a factor. In this study, we conducted a frequency analysis and a network analysis method focusing on the centrality and the ego network in order to provide basic data for enhancing creativity and personality of early childhood teachers by looking at the social perception of early childhood teacher's personality.

Especially, in this study, it is aimed to provide basic data for enhancing creativity and personality of early childhood teachers by examining the social perception of creativity and personality of early childhood teachers through keyword network analysis. The purpose of this study is to suggest the implications of teacher education for enhancing creativity and personality of early childhood teachers. In order to achieve the purpose of this study, What is the keyword network analysis of the creativity and personality of early childhood teachers as seen through Big Data?

MATERIALS AND METHOD

Research data: In this study, raw DATA was collected around web DATA, which is provided in three domestic and foreign portal sites and two SNS sites using Textom, a big data analysis solution of The IMC^[16]. The collection period is eight years from April 17, 2010 to April 17, 2018, starting in 2010, when meaningful discussions on creativity education in the field of education began to be made. Raw DATA was collected as a core keyword of 'early childhood teacher + creativity + personality'. The collected data is 1,221 web pages of portal site, 1,084 blogs, 1,049 news, 1,030 cafes, 37 knowledge books, 80 articles 27 nodes are large-scale nodes (Node = 4,528) data^[17].

Analysis Tools: This study used Textom, a big data analysis solution developed by 'The IMC', to collect and refine data on creativity and personality of early childhood teachers. In addition, UCINET and NetDraw were used to analyze the network structure between the early childhood teachers' creativity and personality related keywords^[18].

Analysis Tools: For the purposes of this study, data cleaning was performed to derive meaning from rawDATA collected from Textom, and text mining was performed on the first refinement. In addition, Textom's 'Quick Edit' function is used to remove keywords that are not relevant to key keywords, or that are inappropriate for analysis due to single, multiple, or spacing. In the second refinement, synonyms or similar words were nominalized and used for analysis based on representative keywords

Data analysis: In this study, data on the creativity and personality of early childhood teachers were collected using Textom and the 1st and 2nd refinements were conducted through text mining. The frequency analysis was performed based on the refined data through data cleaning, and the top 200 nodes were selected and a 200×200 1-mode matrix data set was created^[18]. The network analysis was divided into a micro level and a macro level^[19], and the procedure is as follows. First, node, density, average connection distance, number of components, diameter, and network centralization were analyzed to identify network attributes. Second, a single sample mean test using bootstrapping was conducted to test the statistical significance of the creativity and personality network of early childhood teachers^[14]. Third, in order to understand the structural characteristics

among the nodes in the network, we analyzed degree centrality, closeness centrality, betweenness centrality, and eigenvector centrality. Fourth, ego network analysis was conducted to analyze the network formed by core keyword, and NetDraw was used to visualize each network.

RESULTS AND DISCUSSION

The frequency of the children’s teacher’s creativity and personality related keywords: As a result of the big data analysis on the creativity and personality related keywords of the early childhood teachers, a total of 7,233 keywords were extracted and the target nodes were selected based on the top 200 keywords. [Table 1] shows the frequency analysis results of the top 50 keywords among the selected keywords.

Table 1: Frequency Analysis of Early Childhood Teachers’ Creativity and Personality Related Keyword (Top 50 Keywords)

Rank	Keyword	N	Rank	Keyword	N	Rank	Keyword	N	Rank	Keyword	N	Rank	Keyword	N
1.	education	8,859	10	body	963	21	parents	653	31	learning	559	41	summer	485
2.	teacher	5,130	12	training	790	22	book	643	32	picture book	558	42	nose	483
3.	personality	3,750	13	activity	775	23	daycare	623	33	literature	554	43	series	481
4.	creativity	2,683	14	guidance	734	24	support	622	34	speciality	528	44	human body	475
5.	science	1,726	15	ability	723	25	professor	614	35	foundation	523	44	olfactory sense	475
6.	kindergarten	1,437	16	development	715	26	sex education	603	36	vacation	519	44	tongue	475
7.	course	1,294	17	manage	710	27	society	594	37	preliminary	517	47	graduate school	466
8.	referrals	1,040	18	important	689	28	instruction	592	38	experience	516	48	training	465
9.	program	1,010	19	study	685	29	school	572	39	eyes	490	49	center	461
10.	institution	963	20	knowledge	660	30	play	568	40	sight	486	50	college	457

As shown in [Table 1], the frequency of the children’s creativity and personality related keywords in the early childhood teachers showed the highest frequency of education(8,859), followed by teachers (5,130), personality (3,750), creativity (2,683), science (1,726), kindergarten (1,437), course (1,294), referrals (1,040), program (1,010) and institution (963). The most important keywords among the top 50 keywords are teacher education related factors (education, teacher,

program, and professor), creativity related factors (creativity, science, and play), personality related factors (personality, parents, and support).

A full network analysis of the creativity and personality of the early childhood teachers

Macro-level overall network analysis of creativity and personality of early childhood teachers: The overall network structure for the creativity and personality of early childhood teachers is shown in [Figure 1].

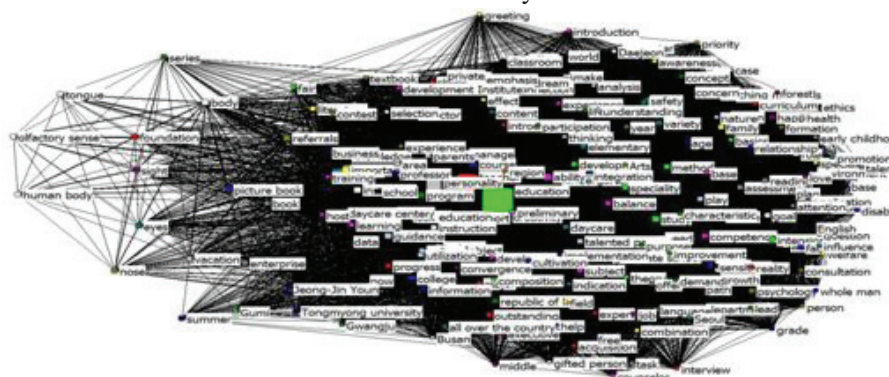


Figure 1: The overall network structure for the creativity and personality of early childhood teachers

As a result of analyzing the structural characteristics of the network for the creativity and personality of early childhood teachers, the nodes were 200, the density was .795, the average connection distance was 158.275, the number of components was 2, the diameter was 2, and the network centralization was 5.700%.

The statistical significance of the whole network on the creativity and personality of the early childhood teachers: As a result of testing the statistical significance of the network for the creativity and personality of early childhood teachers, the average sampling distribution of the network data was 32.2341 and the standard error

was 0.7882. As a result of calculating the Z-score, the probability that the network data for the creativity and personality of early childhood teachers are greater than the Z-score is 0.0002 at $Z = 6.1113$, and the relationship between the network data at the significance level of 5%.

Micro-level whole network analysis of early childhood teacher’s creativity and personality: In order to examine the micro-level network characteristics of early childhood teachers’ creativity and personality, we conducted a centrality analysis of the top 20 keywords, and the results are shown in [Table 2].

Table 2: Analysis of the centrality of early childhood teachers’ creativity and personality (top 20 keywords)

Rank	Degree		Closeness		Betweenness		Eigenvector	
1	education	5.976	education	.992	institution	.538	activity	.840
2	teacher	3.631	personality	.992	science	.486	ability	.820
3	personality	2.636	institution	.992	important	.475	guidance	.790
4	creativity	1.927	teacher	.990	knowledge	.465	education	.570
5	science	1.515	creativity	.990	book	.365	teacher	.454
6	course	1.056	activity	.990	literature	.323	personality	.372
7	referrals	.962	course	.987	referrals	.319	creativity	.268
8	kindergarten	.959	society	.987	picture book	.267	course	.152
9	body	.916	program	.985	personality	.229	kindergarten	.142
10	institution	.911	sex education	.985	education	.229	program	.109
11	program	.758	manage	.982	teacher	.210	training	.090
12	important	.646	school	.982	activity	.198	institution	.084
13	knowledge	.605	kindergarten	.980	creativity	.198	manage	.081
14	training	.599	guidance	.980	school	.195	learning	.076
15	guidance	.604	support	.980	society	.186	study	.074
16	activity	.595	learning	.980	body	.182	professor	.074
17	manage	.590	instruction	.977	vacation	.182	development	.071
18	book	.569	object	.977	course	.182	daycare	.067
19	ability	.539	development	.977	learning	.171	parents	.066
20	picture book	.534	ability	.975	training	.170	sex education	.063

As shown in [Table 2], the results of the centrality analysis of the whole network on the creativity and personality of the early childhood teachers were based on the top 20 keywords and the standardized values were used to take into account the influence of the network scale. The keywords with the highest degree centrality were education (5.976), followed by teachers (3.631), personality (2.636), creativity (1.927), science (1.515), courses (1.056), referrals (.952), Kindergarten (.959), body (.916), and institution (.911). These keywords can

be regarded as keywords with high connection strength within the network for the creativity and personality of early childhood teachers. Especially, the referrals and the body were higher than the frequency ranking in the top 10, and the connection strength was relatively high. The keywords with the highest closeness centrality were education (.992), personality (.992), and institution (.992), followed by teacher(.990), creativity (.990), and activity (.990), course (.987), society (.987), program (.985), and sex education (.985). These keywords are

located at the shortest distance from other keywords and can be regarded as keywords that are likely to be at the center of the network. Especially, in the top 10, personalities, institution, activities, society, and sex education were more influential in the center of the network than the frequency ranking. The keywords with the highest betweenness centrality were institution (.538), followed by science (.486), important (.475), knowledge (.465), book (.365), literature (.323), referrals (.319). These keywords can be regarded as keywords that are likely to act as mediators among multiple keywords. In particular, institution, science, important, knowledge, book, literature, referrals, and picture book in the top 10 are relatively key intermediaries among the other keywords with higher than frequency ranking. The keywords with the highest eigenvector centrality were activity (.840), followed by ability (.820), guidance (.790), education (.570), teacher (.454), personality (.372), creativity (.268). These keywords can be regarded as keywords that are highly related to highly centralized keywords. Especially, it was found that keywords with high activity, ability, and guidance in the top 10 were higher in frequency than those in the top 10.

Analysis of ego network for creativity and personality of early childhood teachers: In order to analyze the relationship between the core keyword and the other keywords in the network, frequency analysis and centrality analysis were performed on the main keywords 'education', 'creativity', and 'personality'.

First, as a result of analyzing the structural properties of the ego network for 'education', the number of nodes was 196, the number of connection lines was 31168, and the density was .815. Also, as a result of analyzing the centrality based on 'education', the degree centrality was 5.976, closeness centrality was .992, betweenness centrality was .229, and eigenvector centrality was .570. Teacher (10,518) was the highest keyword with the highest level of connection with education, followed by personality (8,387), creativity (5,115), course (3,141), kindergarten (2,889). Second, as a result of analyzing the structural properties of the ego network for 'creativity', the number of nodes was 195, the number of connection lines was 31100, and the density was .822. As a result of analyzing the centrality based on 'creativity', the degree centrality was 1.927, closeness centrality was .990, betweenness centrality was .198, and eigenvector centrality was .268. Teachers (10,518) were the most frequently cited keywords with 'creativity', followed

by personality (8,387), and creativity (5,115). Third, As a result of analyzing the structural properties of the ego network for 'personality', the number of nodes was 195, the number of connection lines was 31100, and the density was .822. As a result of analyzing the centrality based on 'creativity', the degree centrality was 1.927, closeness centrality was .990, betweenness centrality was .198, and eigenvector centrality was .268. Education (8,387), teacher (4,290), and creativity (2,253) were the most frequent keywords in terms of personality and connection strength.

CONCLUSION

The purpose of this study is to provide basic data for improving the creativity and personality of early childhood teachers by examining the social perception of early childhood teacher's personality. To do this, we collected rawDATA for 'early childhood teacher + creativity + personality' and conducted network analysis focusing on frequency analysis and centrality and ego network. The results of this study are as follows.

First, the frequencies of children's creativity related keywords were found to be in the order of education, teachers, personality, creativity, science keywords also showed significant factors such as factors related to teacher education (education, teacher, program, and professor), creativity related factors (creativity, science, and play) and personality related factors (personality, parents, and support).

Second, the results of the whole network analysis on the creativity and personality of early childhood teachers are summarized in three. First, analysis of structural attributes for the whole network analysis showed 200, density of .795, average connection distance of 158.275, component number of 2, diameter of 2, networks centralization of 5.700% respectively. Next, in the statistical significance test of the whole network for the creativity and personality of early childhood teachers, the sampling distribution of the network data was 32.2341 and the standard error was 0.7882. In particular, the Z-score was calculated as $Z = 6.1113$, and the probability that the network data about the creativity and personality of early childhood teachers showed a larger absolute value than the Z-score was 0.0002. In addition, 'education', 'institution', and 'activity' among the keywords that appeared in the creativity and personality of early childhood teachers are high in the centrality indicators such as connection centrality, proximity center,

respectively. In addition, keywords such as 'science' and 'creativity' are the main keywords with high degree centrality and betweenness centrality, and 'guidance' is the main keyword with high degree centrality, closeness centrality, and eigenvector centrality. In other words, the main keywords of the creativity and personality of early childhood teachers can be seen as 'education', 'institution', 'activity', 'science', 'creative', and 'guidance'. Based on these keywords, we can identify keywords with high connection strength to personality.

Third, the result of ego network analysis on the creativity and personality of early childhood teachers, the results of this study are as follows: First, 'science' and 'activity' are important keywords in all ego networks. In addition, we found that the frequency of children's creativity and personality was significantly higher in both groups. In other words, activities related to creativity and personality of early childhood teachers means that education should be done through appropriate instruction of teachers in creative activities such as science.

The quality of education does not exceed the quality of teacher. In ego network analysis, 'education' has the strongest connection with 'teacher', and 'creativity' has a close relationship with the creativity and personality of 'teacher' Finally, 'personality' has a strong connection with 'education', so personality needs to be formed through education.

In this study, it is meaningful to grasp the key keywords related to creativity and personality by using keyword network analysis and to grasp specific tendency of creativity personality of early childhood teachers. Future research suggests that rather than just grasping the tendency, it suggests programs related to creativity and creativity in the field of early childhood education. In addition, it is suggested that a creativity and personality program for early childhood teachers should be provided in order to enhance the creativity and personality of not only infants but also teachers.

Ethical Clearance: Not required

Source of Funding: This work was supported by the Ministry of Education of the Republic of Korea and National Research Foundation of Korea (NRF-2017S1A5B6067046)

Conflict of Interest: creativity and personality of early childhood teachers: Focus on big data

REFERENCES

1. Weisberg RW. Creativity and knowledge: A challenge to theories. In R. J. Sternberg (Ed), handbook of creativity (pp. 226-250). New York: Cambridge University Press; 1999.
2. Csikszentmihalyi, M Creativity: Flow and the psychology of discovery and invention. New York: Cambridge University Press; 1996.
3. Sawyer RK. Explaining creativity: The science of human innovation. New York: Oxford University Press; 2006.
4. Choi IS, Kim JS. Kindergarten teachers' perceptions of and practices in creativity and character education. The Korean Society for Early Childhood Education & Care. 2014 Sep;9(3):73-98.
5. Kim WD. Fundamental solution of creative personality education. Se Jong: Issues & Policy; 2010. P.1-12.
6. Moon YL, Choi IS, Gwak YJ, Lee HJ, Lee HS, Lee JH, et al. A study on activating creativity and character education for rearing creative competent people who practice consideration and sharing. Seoul: Korea Foundation for the Advancement of Science & Creativity; 2010.
7. Park CS. The creative character education evolved in school. Korean Society for Creativity Education. 2010 Dec;10(2): 61-72.
8. Ministry of Education (2009). Human resource development through harmonization of creativity and consideration. Ministry of Education.
9. Lee YM. Creative Personality and Teacher Efficacy of Pre-service Kindergarten Teachers. Korean J of Childcare & Education. 2009 Dec;5(2):1-20.
10. Shim SY, Moon SY. Association between Teachers' Conceptions of Art Education and Children's Creative Personality-Mediating Effects of Teachers' Role of Creativity Improvement. Korean Journal of Childcare and Education. 2015 Jul;11(4): 109-125.
11. Hong JM, Yun SK. The Relationship Between Pre-service Early Childhood Teachers' Creative Personality and Ego-resilience. The Journal of Humanities and Social science. 2018 Feb;9(1):321-332.

12. Suh HJ, Kim HJ. Teachers' Perception & Current State of Early Childhood Creativity & Character Education. *The Journal of Korean Teacher Education*. 2016 Sep; 33(3): 345-374.
13. Lee, KM, Choi YJ, Park SJ. Development of Creativity and Personality Educational Program for Pre-service Early Childhood Teachers and Its Effects. *Korean Journal of Children's Media*. 2013 Aug;12(2):73-96.
14. Shin SS, Kim JI, Youn JJ. Vulnerability Analysis of the Creativity and Personality Education based on Digital Convergence Curation System. *Journal of the Korea Convergence Society*. 2015 Aug;6(4): 225-234.
15. Choi HJ, Choi YC. A Study on Children's Creativity and Character based on Big Data. *Journal of Children's Literature and Education*, 2016 Dec;17(4):601-627.
16. Textom (2018). Big Data Analysis Solution(Textom). <http://www.textom.co.kr>, Bring to Textom on April 19, 2018.
17. Lee SS. Network analysis methods. Seoul: Nonhyung; 2013.
18. Borgatti SP, Everett MG, Johnson JC. Analyzing social networks. Thousand Oaks, CA: Sage Publications; 2013.
19. Hwang HI, Lee KH. A network analysis of early childhood teachers' happiness based on big data. *International Journal of Korea Open Association for Early Childhood Education*. 2017 ;3: 73-90.

The Influence of Social Support on Stress Coping among Nursing Students

MiJin Kim¹, Younghee Jeong²

¹Assistant professor, Dept. of Nursing Science, Daejeon Institute of Science and Technology, Korea;

²Associate professor, Dept. of Nursing Science, Woosong College, Korea

ABSTRACT

Background/Objectives: This study was conducted to investigate the differences of social support and stress coping in terms of gender and the effect of social support on stress coping among nursing students.

Methods/Statistical analysis: 135 college students were the respondents of the study. The scales used were social support tool, modified by Moon, which was developed by Park and a Korean version of the Stress Coping Strategy (K-CSI) developed by Amir Khan. Independent t-test and hierarchical multiple regression were used to analyze the data with SPSS 23.

Findings: The results of this study showed no gender difference of social support and stress coping in nursing college students. The support of parents, friends, and professors who were social support explained 27.1% of stress coping. Parental support ($t=2.033$, $p=.044$) and friends' support ($t=2.493$, $p=.014$) were found to have a positive effect on coping with stress. On the other hand, the support of the professor was positive but not statistically significant ($t=1.72$, $p=.086$), respectively. Assessing the relative impact of variables that can improve stress coping, the support of a friend ($\beta=.257$) showed the greatest influence on stress, followed by parent support ($\beta=.183$), and the support of the professor ($\beta=.175$) came third.

Improvements/Applications: Therefore, to improve the coping ability of nursing college students, it is necessary to establish a social support system that is to maintain friend support and finding strategies to improve the support of the parents and professors as well.

Keywords: Social support, stress, coping skill, nursing students, adaptation

INTRODUCTION

The number of male nurses has been increasing steadily due to increased awareness of professionalism of nursing profession, increase job opportunities, job stability, and high pay, and the number of students who want to be in the nursing department has also been increasing for the past years, regardless of gender¹. As far as research is concerned, male nursing college students as a minority group have experienced much more stress due to gender role conflict, alienation, female-oriented nursing education environment, and

competitive atmosphere and this situation leads to practical maladaptation^{2,3}. In addition, due to the social stereotypes of females due to the characteristics of nurses, it is reported that male nursing college students do not have a high level of adaptation to college life⁴. However, in recent years, the increase in the admission rates of male nursing students and the public perception of male nurses are improving⁵ and it is necessary to examine whether there is still a difference in stress coping between male and female nursing students.

Regardless of sex, it is important to cope with stress because if not properly controlled, because it could negatively affect college life adaptation with decrease learning motivation and grades as well⁶, thus it is necessary to cope with stress properly more than anything. Adaptation to college life means an appropriate response to the demands of college life in terms of academic, interpersonal, and emotional aspects

Corresponding Author:

Younghee Jeong

Associate professor, Department of Nursing Science,
Woosong College, Korea

Email: jeongyh@wsi.ac.kr

while living in a university environment⁷. Adaptation is a very important issue for college students because adaptation to college life is not only for the development of intellectual functioning but also for improvement of personality formation and social assimilation ability before going out to society.

On the other hand, it is reported that social support has a high impact on stress coping and coping style, and it is reported that the more social support is received from the significant others, the more actively cope with the problem situation^{8,9}. Social support is also an important variable that helps nursing students adapt to the new environment and actively prepare for their careers and affects their ability to cope with stress¹⁰. The improvement of coping ability to stress is the most influential variable in the adaptation of college life¹¹ so that it is necessary to examine the impact of social support in detail to improve coping skills for successful college life.

Therefore, the purpose of this study was to examine the difference between social support and stress coping in terms of gender of nursing college students and to examine the effect of social support on stress coping. In particular, social support has been used as a basic data to improve the coping ability to stress for college life adaptation by examining whether the meaning of support of others is more influential on stress coping.

MATERIALS AND METHOD

Research Design: This study is a descriptive study to investigate the effect of social support of nursing college students on stress coping and 135 nursing students included in the study. The structured questionnaires were distributed who agreed to participate in the study and signed the consent form accordingly. The analysis was conducted using SPSS 23, and independent sample T-test was used to examine differences in social support and stress coping among male and female nursing students in terms of gender. The hierarchical multiple regression analysis was used to examine the effect of significant social support among others.

Measurement Tool

Social Support: To measure social support, Park Ji-won¹² developed a social support measurement tool, modified by Moon Jae-young¹³, and verified the validity and reliability. A total of 12 items consist of three subscales: parent support, teacher support, and friendship support. It is composed of 5 point Likert scale from 'not at all' to 'very agree' 5 points and the higher the score, the higher the degree of social support. In this study, Cronbach's α was .94 ~ .97 as shown in Table 1.

Table 1: The Composition of Measurement Tools for Each Variable

Measurement Tool	Sub Factor	Item Number	Number of questions	Reliability
Social Support	Parents' support	1, 2, 3, 4	4	.964
	Professors' support	5, 6, 7, 8	4	.937
	Friends' support	9, 10, 11, 12	4	.972
	Total		12	.942
Stress Coping	Seeking Social Support	1,5,6,12,14,19,23,24,25,31,32	11	.87
	Problem Solving	2,3,8,9,11,15,16,17,20,29,33	11	.87
	Avoidance	4,6,10,13,18,21,22,26,27,28,30	11	.93
	Total		33	.972

Stress Coping: Stress coping was measured using the Korean version of the Stress Coping Strategies (K-CSI) developed by Amirkhan (1990)¹⁴ and adapted by Shin Hye-jin and Kim Chang-Dae (2002)¹⁵. This tool consisted of total 33 items and there are 11 items of the Seeking Social Support, 11 items of the Problem Solving, and 11 items of the Avoidance. The participants were asked to recall and respond about one of the stress incidents that occurred during the last six months. The avoidance 11 items were calculated by inverting the

negative items. The higher the score, the higher the level of stress coping. The reliability of the instrument in this study was .87 ~ .90 in Cronbach's α as shown in Table 1.

RESULTS AND DISCUSSION

Results of the Research

The General Characteristics of the Participants: The average age of the nursing students participating in this study was 21.04 years, 57 (42.2%) male and 78 (57.8%)

female students as shown in Table 2. The social support perceived by respondents was 45.91 for male and 44.3 for female respondents and it was found that those male students were somewhat higher. The stress coping of males (M = 70.77) were higher than that of females (M = 69.8).

Table 2: The General Characteristics of the Participants

Variables	Category	N(%)	M(SD)
Age			21.04 (2.558)
Gender	Male	57 (42.2)	
	Female	78 (57.8)	
Grade	Freshman	36 (26.7)	
	Second	78 (57.8)	
	Senior	21 (15.6)	
Social Support	Male		45.91 (9.18)
	Female		44.3 (7.72)
Stress Coping	Male		70.77 (6.55)
	Female		69.8 (7.71)

The Differences in Social Support and Stress Coping by Gender: As shown in Table 3, the results showed that there was no significant difference in social support and stress coping in terms of gender.

Table 3. The Differences in Social Support and Stress Coping by Gender

	Mean (SD)		t	p
	Male (n = 57)	Female (n = 78)		
Social Support	45.91 (9.18)	44.3 (7.72)	1.100	.273
Stress Coping	70.77 (6.55)	69.8 (7.71)	.763	.447

The Effect of Parent Support, Professor Support, and Friend Support on Stress Coping: The effects of social support on stress were divided into sub-variables of parent support, support of professor, and support of friend, and we examined the effect of hierarchical regression on stress coping as shown in Table 4. Model 1 explained 16.2% of parents' support for stress coping. This means that the higher the level of parent support, the better the stress coping (t = 5.086, p = .000). Model 2 is an additional regression of the support of the professor in Model 1, which is 7.3% better than Model 1. In addition, parent support (t = 2.823, p = .005) and Professor support (t = 3.555, p = .001) had a positive effect on stress coping. Model 3 explained that 27.1% of stress coping as a result of further regression of the support of friends in Model 2 and the result found to be 3.5% better than Model 2. It was also found that the parent support (t = 2.033, p = .044) and friend support (t = 2.493, p = .014) were found to have a positive effect on stress coping and the support of the professor was positive, however, it was found to be not statistically significant (t = 1.72, p = .086).

Table 4: The effect of Parent Support, Professor Support, and Friend Support on Stress Coping

Independent Variables	Model 1			Model 2			Model 3			
	SE	β	T(p)	SE	β	T(p)	SE	β	T(p)	Tolerance limit
Constant	2.64	-	21.554 (.000)	2.93	-	17.669 (.000)	2.955	-	16.976 (.000)	
Parent Support	.162	.404	5.086 (.000)	.18	.248	2.823 (.005)	.184	.183	2.033 (.044)	.688
Professor Support				.206	.312	3.555 (.001)	.239	.176	1.73 (.086)	.536
Friend Support							.222	.257	2.493 (.014)	.524
Statistic	R ² =.163, Adjusted R ² =.157, F=25.866, p=.000			R ² =.236, Adjusted R ² =.224, F=20.386, p=.000			R ² =.271, Adjusted R ² =.254, F=16.199, p=.000, Durbin-Watson=1.802			

When the relative influence of variables that could improve stress coping was assessed, friend support (β = .257) was the most influential variable for stress and the followed by the parents' support (β = .183) and the third was the support of the professor (β = .175).

The tolerance limits are all 0.1 or more, which means that there is no problem in multi-collinearity. Durbin-Watson is 1.802, very close to the reference value of 2 and not close to 0 or 4, which means that there is no correlation between the residuals. Therefore, it can be interpreted that regression model was appropriate.

DISCUSSION

The purpose of this study is to investigate whether there is a difference in social support and stress coping between male and female college nursing students and to examine the effects of social support on coping with the stress of successful university life.

The results showed that there was no statistically significant difference in the social support and stress coping between male and female nursing students. This is not consistent with previous studies^{2,3} and⁴, which reported that male nursing college students experienced more stress and had lower levels of adaptation to college life in women-centered nursing. This reflects the social reality in which the number of male nurses in Korea as well as the United States continues to increase, in line with the social atmosphere of choosing a career in accordance with their aptitudes¹⁶ and the problem that the male nurse has still difficulty in adapting to their job as a nurse. There is still some room for rethinking that being a nurse is still an inherent occupation for women. With the increasing number of male nurses, the university is now developing a practical environment and curriculum for male students, and in a hospital where male nurses are naturally accepted as occupations, it is necessary to continue doing research on the stress, social support and work adjustment of male nursing college students and male nurses.

It was also found that the social support of nursing college students had a very positive effect on stress coping. Especially, the support of parents, professors, and friends who are meaningful others constituting social support is the most influential variable. This is because social support plays a decisive role in improving mental health throughout life and it suggests that the important sources of social support may vary according to the stages of development¹⁷. In other words, parental support is most important at the beginning of life, and the same peer groups are an important source of social support in the late childhood and early adolescence. In adulthood, social support has been diversified as spouse, friend, and colleagues. The results of this study are

supported by the fact that college students are the source of important social support from friends and colleagues at the beginning of adulthood. Therefore, it is necessary to investigate the ways to increase the support of friends who are important sources of social support for university life by enhancing adaptation to college life.

CONCLUSION

This study has shown that the social support of nursing students has a positive effect on stress coping and nursing students' social support positively influenced stress coping regardless of gender, and their coping and support is the same. Among social support, friend's support was the most influential variable. Continuous research is needed to find ways to increase the support of parents and professors as well as the support of friends in order to improve college life adaptation and stress coping.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Meadus RJ, Twomey JC, and editors. Men student nurses. "The nursing education experience" Nursing Forum; Wiley Online Library, 2011.
2. Lou JH, Li RH, Yu HY and Chen SH. "Relationships among self-esteem, job adjustment and service attitude amongst male nurses: A structural equation model" *Journal of Clinical Nursing*, 2011, 20(5-6):864-72.
3. Dyck JM, Oliffe J, Phinney A, and Garrett B. "Nursing instructors' and male nursing students' perceptions of undergraduate, classroom nursing education" *Nurse Education Today*, 2009, 29(6):649-53.
4. Stott A. "Issues in the socialisation process of the male student nurse: implications for retention in undergraduate nursing courses" *Nurse Education Today*, 2004, 24(2):91-7.
5. O'Lynn CE. "Gender-based barriers for male students in nursing education programs: Prevalence and perceived importance" *Journal of Nursing Education*, 2004, 43(5):229-36.

6. Magnussen L and Amundson MJ. "Undergraduate nursing student experience" *Nursing & health sciences*, 2003, 5(4):261-7.
7. Lee SJ and Yu JH. "The Mediation Effect of Self-Efficacy between Academic and Career Stress and Adjustment to College " *The Korean Journal of Educational Psychology*, 2008, 22(3):589-607.
8. Friedlander LJ, Reid GJ, Shupak N and Cribbie R. "Social support, self-esteem, and stress as predictors of adjustment to university among first-year undergraduates" *Journal of college student development*, 2007, 48(3):259-74.
9. Hefner J and Eisenberg D. "Social support and mental health among college students" *American Journal of Orthopsychiatry*, 2009, 79(4):491-9.
10. Lee GW, Moon IO and Park SK. "The Relationship between Social Support, College Adjustment and Academic Adjustment among Nursing Students" *The Journal of Korean Society for School Health Education*, 2013,14(2):15-27.
11. Jeon HO and Yeom EY. "The influence of gender role conflicts, academic stress coping ability, and social support on adaptations to college life among male nursing students" *The Journal of the Korea Contents Association*, 2014,14(12):796-807.
12. Park JW. "A Study to Development a Scale of Social Support", Seoul: Yonsei University, 1985.
13. Moon JY and Jung KS. "The Effect of Internship Satisfaction Rates and Social Support on Employment Strategies of College Students: The Mediating Effect of Career Decision Self-efficacy" *Korean Journal of Youth Studies*, 2018, 25(1):365-89.
14. Amirkhan JH. "A factor analytically derived measure of coping: The Coping Strategy Indicator" *Journal of personality and social psychology*, 1990,59(5):1066.
15. Shin HJ and Kim CD. "A Validation Study of Coping Strategy Indicator(CSI)" *The Korean Journal of Counseling and Psychotherapy*, 2002, 14(4):919-35.
16. An ES and Chu SK. "Study on Male Nurses' Gender Stereotype and Job Satisfaction" *Journal of Korean Academy of Nursing Administration*, 2011,17(1):14-21.
17. Hamdan-Mansour AM and Dawani HA. "Social support and stress among university students in Jordan" *International Journal of Mental Health and Addiction*, 2008, 6(3):442-50.

Antimicrobial Activity of Various Solvent Extracts of *Auricularia auricula-judae* Against Oral Bacteria

So-Ra Han¹, Sang-Cheol Yu¹, Joo-Ho Lee², Sang-Hee Jung³, Kun-Ok Lim⁴, Tae-Jin Oh^{1,2,5}

¹Department of Life Science and Biochemical Engineering, Graduate School, SunMoon University, Korea;

²Genome-based BioIT Convergence Institute, Korea; ³Department of Dental Hygiene, Gangneung Yeongdong University, Korea; ⁴Department of Dental Hygiene, ⁵Department of Pharmaceutical Engineering and Biotechnology, SunMoon University, Korea

ABSTRACT

Background/Objectives: The present study was conducted to investigate the antimicrobial potential of acetone, ethanol and ethyl EA of *A. auricula-judae* against the growth of nine oral bacteria that cause dental caries and periodontal diseases.

Method/Statistical analysis: The extracts of *A. auricula-judae* showed the antimicrobial activity against the tested oral bacteria. EA extract showed more antimicrobial activity than acetone and ethanol extracts. The highest antimicrobial activity of ethyl acetate extract from *A. auricula-judae* was obtained against *A. viscosus*, which resulted in an inhibition zone of 11.68 to 14.40 mm. This extract exhibited MIC values ranging from 0.23 to 3.75 mg/ml.

Findings: The present study aimed to verify the roles of *A. auricula-judae* as a natural product with antimicrobial potential for oral diseases by investigating the antimicrobial activities of various solvent extracts of *A. auricula-judae* against oral bacteria causing dental caries and periodontal diseases. The ethyl acetate extracts from *A. auricula-judae* showed the antimicrobial activity against nine oral bacteria better than different solvent. The present study aimed to verify the roles of *A. auricular-judae* as natural product with antimicrobial potential for oral diseases by investigating the antimicrobial activities of various solvent extracts of *A. auricular-judae* against oral bacteria causing dental caries and periodontal diseases.

Improvements/Applications: This *Auricularia auricula-judae* may be considered as an effective natural source of antimicrobial agent for the prevention of oral pathogens.

Keywords: Antimicrobial activity, growth inhibition, *Auricularia auricula-judae*, minimum inhibitory concentration, oral pathogen

INTRODUCTION

The human oral cavity harbors many different microorganisms, some of which are oral pathogens that cause bad breath and pain due to dental caries, cavities, and periodontal diseases. In Korea, oral diseases are the

second most common disorder. The prevention and post-treatment management of dental caries and periodontal diseases are particularly important, as these conditions can cause permanent damage to oral health^[1]. Recent studies reported a correlation between oral pathogens and pneumonia, cardiovascular diseases, and other general diseases in the human body, indicating that specific care is needed for periodontal health^[2, 3]. In addition to the most well-known oral pathogen *Streptococcus mutans*, numerous other bacteria including *Streptococcus sobrinus* and *Actinobacillus actinomycetemcomitans* are known to cause various oral diseases such as cavities, dental caries, gingivitis, and periodontitis^[4,5]. Dental caries are caused when oral bacteria, including

Corresponding Author:

Tae-Jin Oh

Professor, Department of Pharmaceutical Engineering and Biotechnology,

SunMoon University, Korea

Email: tjoh3782@sunmoon.ac.kr

S. mutans adhere to the dental surface where they produce acid during growth, and periodontitis occurs when gingivitis is untreated, leading to the destruction of alveolar bones^[6,7]. Additionally, in dental caries, *S. mutans* produces glucan from sugar molecules used as substrates to adhere to the tooth surface and causes tooth decay. When glucan attached to the tooth surface is left untreated, it becomes more difficult to remove by brushing, and as glucan interferes with the diffusion of organic acids produced by bacteria, the development of dental caries is promoted^[8]. Although oral diseases may affect the health of not only the oral cavity but also the human body, most people tend to overlook the importance of oral health, indicating the need for increased awareness and appropriate measures for preventing and treating oral diseases.

To prevent and treat oral diseases, it is essential to inhibit the growth and activities of pathogens in the oral cavity. Currently, physical methods such as brushing or use of floss are common, but in most cases, the growth and activities of pathogens are inhibited by chemical methods such as antibiotics which control plaques or enhance inhibitory effects^[9]. However, continuous use of antibiotics may lead to resistance in the oral cavity and resident bacteria are removed with the pathogens. Thus, to develop methods for inhibiting only the pathogens and not the resident bacteria, many studies have focused on natural extracts^[10,11].

Mushrooms are consumed as food and contain abundant nutrients such as proteins with essential amino acids, carbohydrates, lipids, and vitamins. Globally, they are used for a variety of purposes, and recent studies have examined the bioactivities of mushrooms. Lingshi mushrooms have been studied for their antioxidant effects and ability to suppress tumor cell growth^[12], and *Sparassis crispa* were examined for their effects on immunocyte activation and their anticancer effects^[13]. In addition to studies of medicinal mushrooms, common edible mushrooms including *Lentinus edode* have been evaluated for their antiplatelet and antithrombotic effects^[14] and *Hericium erinaceum* was shown to prevent dementia and is involved in nerve cell development^[15].

Auricularia auricula-judae belongs to the family *Auriculariales* in the phylum Basidiomycota. This species is mainly found in the wild growing on old broad-leaved trees across Asia, mostly in Korea, Japan, and China. *Auricularia auricula-judae* are often used as

a functional food ingredient, as they are rich in proteins as well as potassium, calcium, phosphorous, and fibers. Numerous studies have examined the bioactivities of *A. auricula-judae* in the prevention of osteoporosis^[16] and cardiovascular diseases^[17]. Recently, the antimicrobial and antioxidant activities of *A. auricula-judae*^[18] were reported. The present study aimed to verify the roles of *A. auricula-judae* as a natural product with antimicrobial potential for oral diseases by investigating the antimicrobial activities of various solvent extracts of *A. auricula-judae* against oral bacteria causing dental caries and periodontal diseases.

MATERIALS AND METHOD

Materials: The sample of *A. auricula-judae* used in this study was in powder form and purchased from Chamsolwon agricultural association (Gyeongbuk, Korea).

Preparation of *A. auricula-judae* extracts: A 48-h solvent extraction at room temperature was carried out with 50 g of *A. auricula-judae* powder dissolved in 400 mL solvent. After filtration (Advantec No. 2, Advantec MFS, Inc., Tokyo, Japan), a rotary evaporator (EYELA A-1000S, Tokyo Rikakikai Co., Tokyo, Japan) was used to concentrate the sample. The solvents used were acetone, ethyl acetate, and ethanol; dimethyl sulfoxide was used as the concentrate to maintain a constant volume. The extracts were uniformly prepared at a minimum concentration of 50 mg/mL and stored at 4°C prior to the experiments to ensure accuracy.

Evaluation of antimicrobial activity against oral bacteria

Microbial strains: All oral bacteria strains used in this study are presented in Table 1. The nine representative strains of oral bacteria were purchased from the Korean Collection for Type Cultures (KCTC, Jeollabuk-do, Korea) and used in the experiments. The medium from Brain-Heart Infusion (BHI, BD Biosciences, Franklin Lakes, NJ, USA) and Trypticase Soy Broth (TSB, BD Biosciences) were used, and an optimum condition for each strain was selected for cultivation. All strains were inoculated into the broth and cultured at 37°C in an anaerobic incubator (5% CO₂) for 24 h and diluted prior to the experiments.

Table 1: List of microorganisms used for anti-microbial activity

Strain	KCTC No.	Media
<i>Staphylococcus aureus</i>	1927	BHI
<i>Streptococcus mutans</i>	3065	BHI
<i>Streptococcus sanguinis</i>	3284	BHI
<i>Streptococcus sobrinus</i>	3308	BHI
<i>Streptococcus criceti</i>	3640	BHI
<i>Streptococcus rattii</i>	3655	BHI
<i>Streptococcus anginosus</i>	3983	TSB
<i>Actinomyces viscosus</i>	5531	TSB
<i>Actinomyces israelii</i>	9054	TSB

BHI: Brain-Heart Infusion, **TSB:** Trypticase Soy Broth using from BD Biosciences

Disk diffusion method: The antimicrobial potential of *A. auricula-judae* was evaluated by the disk diffusion method. The nine strains precultured following inoculation into the broth were uniformly diluted to a standard turbidity of 0.5 McFarland (approx. 1.0×10^8 CFU/mL) and then smeared on prepared agar plates using sterilized cotton buds. Next, 30 μ L extract was placed on a paper disk (ϕ 6 mm, Whatman AA discs, Whatman International, St. Louis, MO, USA) (2.1 mg/disc) for absorption, and the disk was dried and placed on the smeared agar plate for adherence. After more than 12-h cultivation in an anaerobic incubator, the size of the inhibition zone formed around the disc was measured. From the measured sizes, the results were obtained using a Vernier caliper (0–150 mm, Color World, China). The experiment was repeated three times to confirm the antimicrobial activity of the *A. auricula-judae* extracts. As a positive control, 100 μ g/mL of ampicillin was used.

Estimation of growth inhibition rate and minimum inhibitory concentration against oral bacteria: For the nine strains of oral bacteria against which the extracts showed antimicrobial activities, the minimum inhibitory concentration (MIC) was determined using the broth dilution method. The concentration of each solvent extract of *A. auricula-judae* was prepared at a maximum of 15 mg/mL using sterilized distilled water, after which two-fold serial dilution was carried out until a minimum concentration of 0.03 mg/mL was reached prior to the experiments. For the experiments, each precultured strain was prepared in a concentration of 5×10^5 CFU/mL. Next, 100 μ L of the diluted strain was aliquoted into

the wells of a 96-well plate and then 60 μ L of extract and 40 μ L of broth were added. After 24-h cultivation at 37°C in an anaerobic incubator, the optical density was measured at 600 nm. The concentration at which the optical density revealed microbial inhibition was determined as the MIC.

Inhibition curve of oral bacteria: Various solvent extracts of *A. auricula-judae* were added to the nine strains of oral bacteria, and growth inhibition curves were drawn according to concentration and time. The solvent extracts with MIC values of 3.75, 2.63, 1.88, and 0.04 mg/mL were used, and the method described above was used for MIC estimation. The optical density was measured at 600 nm at 3, 6, 8, 10, 12, and 24 h of incubation. As a positive control, dimethyl sulfoxide was used.

Statistical analysis: For statistical analysis, the significance was evaluated at $p < 0.05$ by analysis of variance and Duncan's multiple range test using SPSS Statistics 23 (SPSS, Inc., Chicago, IL, USA). All experiments were repeated three times, and the results were expressed as the mean \pm standard deviation.

RESULTS AND DISCUSSION

Solvent extraction yield of *A. auricula-judae*: Various solvent (acetone, ethanol, and ethyl acetate) extracts of *A. auricula-judae* were used to test for antimicrobial potential. The results showed different extraction yields for each solvent extract: 1.64% for acetone extract; 1.50% for ethanol extract; 0.86% for ethyl acetate extract. Thus, various solvents exhibit clearly different final extraction yields despite the use of equal amounts of powder. Among the three solvents, acetone showed the highest yield, while the use of ethyl acetate led to the lowest extraction yield.

Evaluation of antimicrobial activity against oral bacteria

Antimicrobial activity of solvent extracts from *A. auricula-judae*: In the disc diffusion assay, inhibition zones were created by the various solvent (acetone, ethanol, and ethyl acetate) extracts of *A. auricula-judae* against the nine strains of oral bacteria, and the sizes of the inhibition zones were measured; the results are presented in Fig. 1. The results show inhibition zones of over 10 mm in diameter which were visually discernible

for all three solvent extracts against the nine strains of oral bacteria. Notably, all three extracts of *A. auricula-judae* exhibited the strongest antimicrobial activity against *A. viscosus*. Although the ethyl acetate extract displayed the highest activity of 14.40 ± 2.75 mm, closely followed by 14.17 ± 3.92 mm of acetone extract and comparatively lower activity of 11.81 ± 1.44 mm by ethanol extract, our results confirmed that all three extracts showed the strongest antimicrobial activities against the *A. viscosus* strain. Furthermore, when the activity against *A. viscosus* was compared with that against the control (100 µg/mL of ampicillin), no significant difference was observed for any of the extracts.

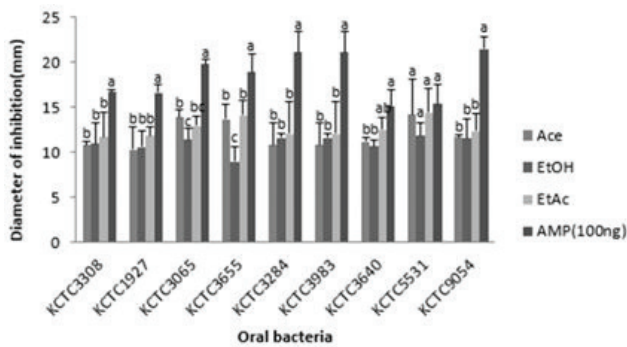


Figure 1: Anti-microbial activity of solvent extracts from *Auriculariaauricula-judae* against oral bacteria.

† The results represent the Mean±SD of values obtained from three independent experiments. Ampicillin (100 ug/ml) was used as a positive control. Ace: acetone, EtOH; ethanol, EtAc: ethyl acetate, KCTC; Korean Collection for

Type Cultures. a,b,cMeans with different letter are significantly different at $p < 0.05$ by Duncan’s multiple range test

Estimation of MIC: To determine the MIC to inhibit the growth of oral bacteria, the broth dilution method was used. Each solvent extract of *A. auricula-judae* was diluted by 2-fold to 0.03–15.00 mg/mL before 24-h cultivation. The optical density was measured, and the minimum concentration at which microbial growth was inhibited was considered as the MIC. The results are shown in Table 2. Although the MIC differed according to the tested strain and solvent used, the inhibitory effects were mostly within the range of 0.23–3.75 mg/mL. Among the three extracts, the ethyl acetate extract, displayed the lowest MIC of 0.23 mg/mL against *A. viscosus*, while the MICs of ethanol and acetone extracts were 0.94–1.88 mg/mL, which are slightly higher than that of the ethyl acetate extract. In accordance with the results of the disc diffusion experiments, all three extracts exhibited lower MICs against *A. viscosus* compared to other strains, but their MICs against *S. mutans* were identical at 3.75 mg/mL. For *S. aureus*, *S. ratti*, *S. sanguinis*, *S. sobrinus*, *S. viscosus*, and *A. israelii*, the acetone and ethanol extracts showed identical MICs, while the ethyl acetate extract showed a lower MIC. In summary, the ethyl acetate extract exhibited the lowest MIC, and all three extracts showed the lowest MIC against *A. viscosus*, supporting the results of the disk diffusion experiments.

Table 2: Minimum inhibitory concentration (MIC) of solvent extracts from *Auriculariaauricula-judae* against oral bacteria

Bacterial Strain (KCTC No.)	MIC (mg/ml)		
	Acetone	EtOH	EtAc
<i>S. aureus</i> (1927)	1.88-3.75	1.88-3.75	0.94-1.88
<i>S. mutans</i> (3065)	3.75	3.75	3.75
<i>S. sanguinis</i> (3284)	1.88-3.75	1.88-3.75	0.94
<i>S. sobrinus</i> (3308)	3.75	3.75	1.88
<i>S. criceti</i> (3640)	0.94-1.88	1.88-3.75	0.94-1.88
<i>S. ratti</i> (3655)	1.88-3.75	1.88-3.75	1.88
<i>S. anginosus</i> (3983)	1.88	1.88-3.75	0.94-1.88
<i>A. viscosus</i> (5531)	0.94-1.88	0.94-1.88	0.23
<i>A. israelii</i> (9054)	1.88	1.88	0.47-0.94

Inhibition curve of oral bacteria: Based on the results of the disk diffusion experiments and MIC estimation, the extracts of *A. auricula-judae* exhibited the highest

antimicrobial activity against *A. viscosus*. Thus, by drawing an inhibition curve, the inhibition rates according to the extract concentration and time were

determined. Each solvent extract at 3.75, 1.88, 0.94, and 0.03 mg/mL determined as MICs was cultivated with the bacteria for 3, 6, 8, 10, 12, and 24 h, and optical density was measured at each time point. As a positive

control, the same method was used in the absence of extract. Figure 2 shows a comparison of the results for the control and test groups.

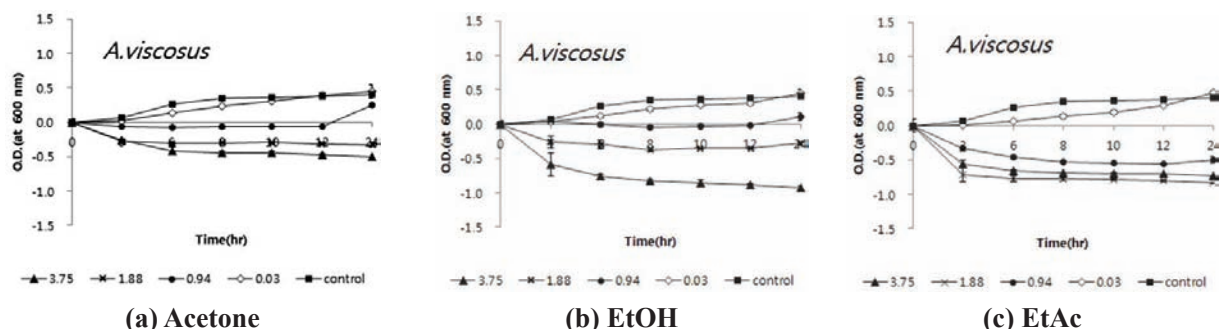
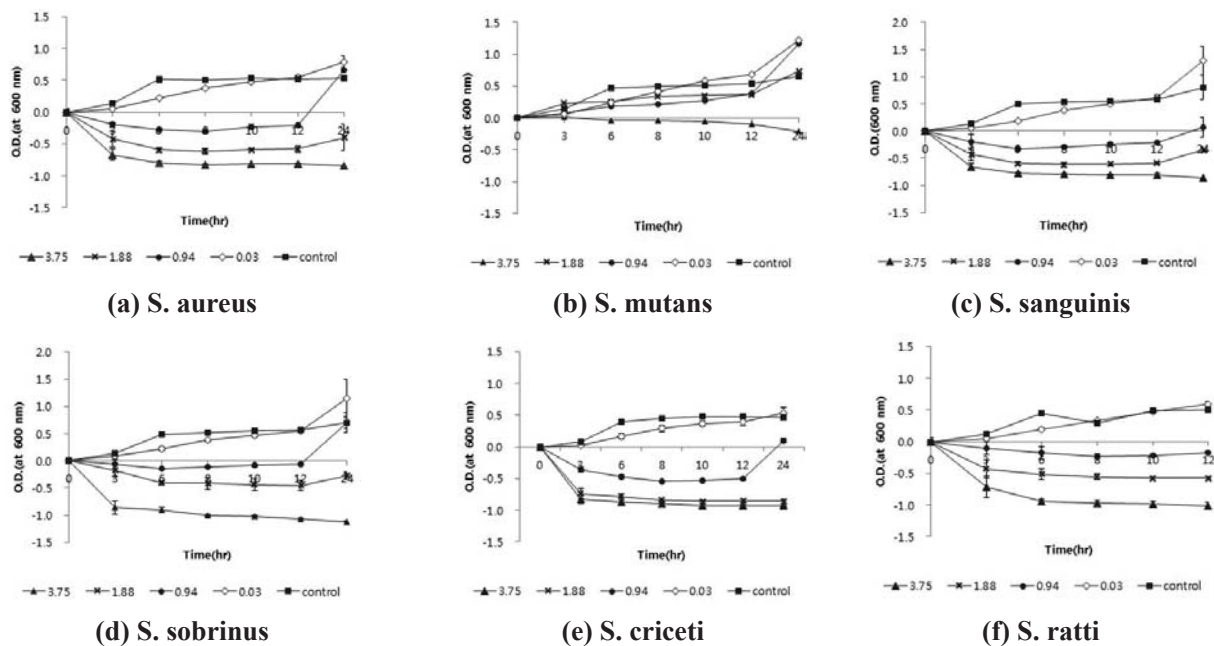


Fig. 2: Inhibitory effect of solvent extract from *Auricularia auricula-judae* on growth of *A. viscosus* among oral bacteria

The control group to which the extracts of *A. auricula-judae* were not added showed steady growth of bacteria until 3–6 h, reaching a plateau after 8 h. In contrast, the groups to which acetone extracts or ethanol extracts were added showed clear inhibitory effects on microbial growth from the early phase of cultivation at concentrations 3.75 and 1.88 mg/mL. Nevertheless, although the growth inhibition of *A. viscosus* at concentrations 0.94 and 0.03 mg/mL continued until 12 h, no inhibition was observed after 12 h. The ethyl acetate extract strongly inhibited microbial growth at concentrations of 0.94–3.75 mg/mL; however, at 0.03 mg/mL, slow bacterial growth was observed in the absence of inhibitory effects. Among the three extracts, the ethyl acetate extract exhibited slightly stronger inhibition of certain strains. Thus, inhibition curves were drawn for the eight strains other than the *A. viscosus* strain. The inhibitory effects of ethyl acetate extract on the eight strains over time are shown in Fig. 3. For *S. aureus*, the ethyl acetate extract clearly inhibited microbial growth at concentrations greater than 1.88 mg/mL. While the initial growth was inhibited at 0.94 mg/mL, the bacteria displayed exponential growth after 12 h. At 0.03 mg/mL, despite the inability to completely block microbial growth, growth was lowered until 12 h compared to the control group. The concentration of ethyl acetate extracts which strongly inhibited oral bacteria from the early phase of cultivation was determined. For the strains *S. sanguinis*, *S. criceti*, *S. ratti*, and *A. israelii*, strong inhibition was observed at concentrations greater than 0.94 mg/mL. Strong inhibition against *S. sobrinus* and *S. anginosus* was observed at concentrations greater than 1.88 mg/mL, and against *S. mutans*, inhibitory effects were detected at 3.75 mg/mL.



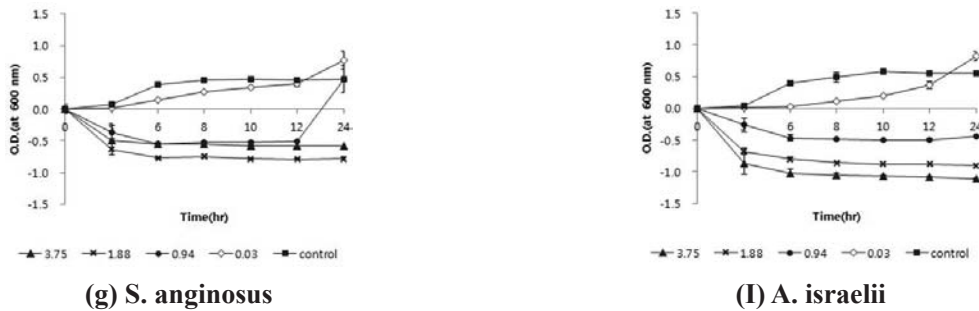


Fig. 3: Effects of ethyl acetate extracts from *Auricularia auricula-judae* on the grown of oral bacteria

DISCUSSION

In the human oral cavity, several known strains of resident bacteria prevent other pathogenic bacteria from inhabiting the oral cavity while strengthening the immune system to ensure constant immunity. However, as certain specific bacteria cause oral diseases such as dental caries and periodontal diseases, it is essential to inhibit the growth of oral pathogens to prevent and treat such diseases [19, 20]. However, continuous use of antibiotics for preventing oral diseases may lead to resistance in the human body and is likely to drive not only pathogens but also beneficial resident bacteria away from the oral cavity. Thus, many studies have attempted to develop diverse methods for inhibiting only the pathogens using natural extracts [21].

The present study was conducted to investigate the antimicrobial potential of acetone, ethanol, and ethyl acetate extracts of *A. auricula-judae* against the growth of nine oral bacteria that cause dental caries and periodontal diseases. All extracts of *A. auricula-judae* strongly inhibited the nine oral bacteria. Particularly, the strongest antimicrobial activity was observed against *A. viscosus*, a representative periodontal pathogen reported to cause periodontitis during dental plaque formation [22]. An inhibition zone similar to that of the control (100 µg/mL of ampicillin) was observed for *A. viscosus*. Compared to the strong antimicrobial activity against *A. viscosus* exhibited by the extracts of *Lentinusedodein* a previous study performed by our lab [23], the extracts of *A. auricula-judae* showed far stronger inhibitory effects on *A. viscosus* and other strains of oral bacteria.

Based on the results of measuring antimicrobial activities, the MIC for oral bacteria was determined. The experiments tested each solvent extract with a two-fold serial dilution using distilled water until concentrations of 0.03–15.00 mg/mL were reached. The results showed

that a minimum concentration of 3.75 mg/mL was required for the extracts to inhibit the growth of all nine tested oral bacteria. Additionally, in agreement with the results of the disk diffusion experiments, the ethyl acetate extract showed the strong inhibition against *A. viscosus* at concentrations as low as 0.23 mg/mL. These results suggest that the *A. viscosus* strain requires a minimum concentration of 0.03 mg/mL of *A. auricula-judae* extract for its inhibition; compared to the results of our previous study of *Coriolus versicolor* [24], the extracts of *A. auricula-judae* showed stronger antimicrobial activities. Furthermore, examining the inhibition rates from the ethyl acetate extract of *A. auricula-judae* against other oral bacteria confirmed that most oral bacteria were inhibited at a minimum concentration of 3.75 mg/mL.

Mushrooms have potential activities against dental caries, and studies have reported that various mushrooms exhibit not only regulatory effects on the formation of plaque or calculus on dental surfaces but also inhibitory effects on glucan elongation that may cause calculus. Mushrooms have also been reported to contain several phenolic compounds that can suppress glucosyltransferase [25]. Most studies of *A. auricula-judae* have investigated its antioxidant effects in addition to its bioactivities towards polysaccharides using DPPH (1,1-diphenyl-2-picrylhydrazyl), total polyphenol content, and ferric reducing ability of plasma assays [26, 27]. Previous studies support the strong antimicrobial potential of *A. auricula-judae* on oral bacteria, as shown in this study. Thus, *A. auricula-judae* shows outstanding potential as an eco-friendly antimicrobial material for the development of products based on natural substances including cosmetics and oral products. The present study investigated only the presence or absence of antimicrobial activities of *A. auricula-judae* extracts against oral bacteria, and future studies are needed to identify the antimicrobial substances contained in *A. auricula-judae* by isolating these molecules from the extracts.

CONCLUSION

The present study was conducted to investigate the antimicrobial potential of acetone, ethanol and ethyl EA of *A. auricula-judae* against the growth of nine oral bacteria that cause dental caries and periodontal diseases. All extracts of *A. auricula-judae* strongly inhibited the nine oral bacteria. Particularly, the strongest antimicrobial activity was observed against *A. viscosus*, a representative periodontal pathogen reported to cause periodontitis during dental plaque formation. An inhibition zone similar to that of the control (100 µg/mL of ampicillin) was observed for *A. viscosus*. Compared to the strong antimicrobial activity against *A. viscosus* exhibited by the extracts of *Lentinus edode* in a previous study performed by our lab, the extracts of *A. auricula-judae* showed far stronger inhibitory effects on *A. viscosus* and other strains of oral bacteria.

Ethical Clearance: Not required

Source of Funding: This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT) (NRF-2017R1C1B5018385).

Conflict of Interest: Auricularia auricula-judae Against Oral Bacteria

REFERENCES

1. H. S. Beak, S. K. Kang, Q. S. Auh, Y. H. Chun & J. P. Hong. "Effect of Antibacterial Effects of Myrrh, Rhatany, Chamomilla against to Oral Microorganisms." J. Oral Med. Pain. 2013 May; 38(4), 299-312.
2. J. Beck, R. Garcia, G. Heiss, P. S. Vokonas and S. Offenbacher, Periodontal disease and cardiovascular disease. J. Periodontol. 1996 Oct;67(10), 1123-1137.
3. X. Li, K. M. Kolltveit, L. Tronstad and I. Olsen, "Systemic diseases caused by oral infection." Clin. Microbiol. Rev. 2000Oct ;13(4)547-558.
4. J. J. de Soet, C. van Loveren, A. J. Lammens, M. J. Pavicić, C. H. Homburg, J. M. ten Cate and J. de Graaff, "Differences in cariogenicity between fresh isolates of Streptococcus sobrinus and Streptococcus mutans." Caries Res. 1991;25(2)116-122.
5. Y. K. Min, J. K. Jeon, S. G. Kim and K. W. Chang, "Inhibitory effects of Schizandrachinensis extracts on the growth and adsorption to saliva-coated HA beads of some oral bacteria." J. Korean Acad. Dent. Health.2001Jun; 25(2):165-183.
6. S. Hamada, T. Koga and T. Ooshima, "Virulence Factors of Streptococcus mutans and Dental Caries Prevention." J. Dent. Res. 1984 Mar;63(3)407-411.
7. S. J. Hwang, S. N. Kim, S. Y. Chang, W. H. Ha, I. S. Kim, B. H. Jin, D. I. Paik and H. D. Kim, "Gingivitis suppression effect of the de novo dentifrice containing curcuma xanthorrhiza, bamboo salt and various additives." J. Korean Acad. Dent. Health. 2005; 29(4) 451-462.
8. S. H. Nam, D. S. Jang and M. S. Yang, "Inhibition of Teeth Decalcification and Glucosyltransferase Activity by Juniperusrigida S. et Z." J. Korean Soc. Food Sci. Nutr. 1998Dec;27(6)1148-1151.
9. G. C. Chae, Q. S. Auh, Y. H. Chun and J. P. Hong, "Antibacterial activity of artemisacapillaristhumb on oral bacteria." J. Oral Med. Pain. 2009Jan;34(2)169-177.
10. J. Lawless, Shafesbury, "The Illustrated Encyclopedia of Essential Oils." Shaftesbury, UK: Element Books Ltd. 1995
11. Lis-Balchin M. "Essential oils and aromatherapy: their modern role in healing." J. R Soc Health 1977; 117(1)324-329.
12. S. I. Oh and M. S. Lee, "Effects of antioxidative stress, antimutagenicity and cytotoxicity of cancer cells in fractional extracts from Ganodermalucidum." Karst. Korean J. Food Cookery Sci. 2005;21(6)759-768.
13. I. K. Kim, Y. C. Yun, Y. C. Shin and J. Y. Yoo, "Effect of Sparassisrispa Extracts on Immune Cell Activation and Tumor Growth Inhibition." J. Life Sci. 2013 Aug; 23(8) 984-988.
14. G. Y. Kim, H. W. Jeong, D. J. Jeong, H. B. Song and H. G. Lee, "Effects of Shiitake Mushroom on Anti-platelet Aggregation and Anti-thrombotic." Korean J. Orient. Physiol. Pathol. 2013Apr;27(2)239-245.
15. B. J. Ma, J. W. Shen, H. Y. Yu, Y. Ruan, T. T. Wu and X. Zhao. "Hericenones and erinacines:

- Stimulators of nerve growth factor (NGF) biosynthesis in *Hericiumerinaceus*.” Int. J. Fungal Biol. 2010 Apr;1(1)92-98.
16. J. S. Lee, R. M. Ahn and H. S. Choi, “Determinations of ergocalciferol and cholecalciferol in mushrooms.” Korean J. Soc. Food Sci. 1997 May; 13(2)173-178.
 17. G. Song and Q. Du, “Structure characterization and antitumor activity of an α β -glucan polysaccharide from *Auriculariapolytricha*,” Food Res. Int.2012Jan;45(1)381-387.
 18. S. C. Yu and T. J. Oh, “Antioxidant Activities and Antimicrobial Effects of Extracts from *Auriculariaauricula-judae*.” Korean Soc. Food Sci. Nutr. 2016 Mar;45(3)327-332.
 19. B. Rosan and R. J. Lamont, “Dental plaque formation.” Microbes Infect. 2000Nov;2(13)599-1607.
 20. G. E. Minah and W. J. Loesche, “Sucrose metabolism by prominent members of the flora isolated from cariogenic and non-cariogenic dental plaques.” Infect. immun. 1997Jul; 17(1)55-61.
 21. S. Y. Lee, J. G. Kim, B. J. Baik, Y. M. Yang, K. Y. Lee, Y. H. Lee and M. A. Kim, “Antimicrobial effect of essential oils on oral bacteria.” J. Korean Acad. Pediatr. Dent. 2009, Nov;36(1)1-11.
 22. S. J. Park, S. C. Kim and J. R. Lee, “Antimicrobial effects of sophorae radix extracts against oral microorganisms.” Korean J. Herbol. 2010;25(2)81-88.
 23. S. R. Han, K. O. Lim and T. J. Oh, J. “Antimicrobial activities against oral bacteria and growth inhibition against *Actinomycesviscosus* using *Lentinusedodes* various extracts.” Korean Soc. Dent. Hyg. 2015, Aug;15(4)735-741.
 24. B. L. Kim, K. O. Lim, S. R. Han, K. H. Kim and T. J. Oh, “Antimicrobial activities of various extracts of *Coriolus versicolor* against oral bacteria” J. Korean Soc. Dent. Hyg. 2017, Feb;17(1)111-122.
 25. N. Shouji, K. Takada, K. Fukushima and M. Hirasawa, “Anticaries Effect of a Component from Shiitake (an Edible Mushroom).” Caries Res. 2000Mar;34(1)94-98.
 26. Y. S. Kho, S. Vikineswary, N. Abdullah, U. R. Kuppusamy and H. I. Oh, “Antioxidant Capacity of Fresh and Processed Fruit Bodies and Mycelium of *Auriculariaauricula-judae* (Fr.) *Quél*” J. Med. Food.2009 Mar; 12(1)167-174.
 27. L. Tang, Y. Xiao, L. Li, Q. Guo and Y. Bian Curr. “Analysis of genetic diversity among Chinese *Auriculariaauricula* cultivars using combined ISSR and SRA Pmarkers.” Microbiol. 2010Aug;61(2)132-140.

The Effect of Oral Spray Mist Containing Pine Needle Extract in Reducing Halitosis and Compounds Inducing Halitosis

Jung-Eun Park¹, Jong-Hwa Jang²

¹Research Scholar, Dept. of Preventive and Social Dentistry, School of Dentistry, Kyung Hee University, Republic of Korea; ²Associate Professor, Dept. of Dental Hygiene, College of Health Science, Dankook University, Republic of Korea

ABSTRACT

This study aimed to assess the effect of oral spray containing pine needle extract in suppressing halitosis, by analyzing the concentration of volatile sulfur compounds (VSCs) inducing halitosis and organic acids within saliva. The concentration of VSCs inside the oral cavity after the spray usage was measured using Sensor Gas Chromatograph ODSA- P2, and the analysis of organic acids within saliva was performed using HPLC Dionex ion chromatography system (GP50 gradient pump, ED 50 conductivity detector) with mobile phase under following conditions: NaOH 100mM with flow rate of 1.0mL/min, injection volume of 10 μ l, and temperature of 20°C. In the experimental group, the levels of H₂S and CH₃SH were remarkably reduced by 80.87% and 89.42% respectively. In addition, the analysis of organic acids within saliva showed suppressive effect by 63.46-97.05% after 4 weeks. Therefore, it seems that using oral spray mist containing pine needle extract can partially suppress VSCs and organic acids within saliva that are associated with halitosis.

Keywords: HPLC, halitosis, oral spray, pine needle extract, saliva

INTRODUCTION

Bad breath, also known as halitosis, is caused by volatile sulfur compounds (VSCs) being released during exhalation. This chemical compound is composed of hydrogen sulfide (H₂S), methyl mercaptan (CH₃SH), and dimethyl sulfide (CH₃)₂S^{1,2}. In the modern society, halitosis is becoming an important issue attracting more attention, as it can induce both social and emotional disorder at individual level. To remove foul odor within the oral cavity, both physical method with removal of bacteria attached to the biofilm and chemical method applying antibiotic materials are performed in parallel. With harmfulness of different chemical compounds being reported, the utility of natural compounds is steadily increasing recently^{3,4}. The natural compounds included in mouthwash and oral health-related

products include the extracts from various materials such as manuka honey⁵, clove oil⁶, propolis⁷, ginger⁸, and pine needles^{9,10}. Especially pine needle extract, like inorganic elements such as potassium, calcium, magnesium and phosphorus and vitamin A, C, K, enzyme, and minerals, pine needle extract among them contains useful substances for discharging waste from the body and improving metabolism¹¹. Accordingly, it is widely known that the pine needle extract has cell antioxidant effect to decrease active oxygen in the body¹² and antibacterial effect against gram-positive and negative bacterium¹³. Thus, the extract is good for removing oral halitosis in a mouth due to antibacterial effect against gram-positive and negative bacterium and removing inflammation owing to antioxidant effect in oral mucosa. Based on these previous observations, the evaluation of oral spray containing pine needle extracts as a suppressant of halitosis should be performed. The measurement of halitosis can be done using traditional tools such as halimeter¹⁴, oral chroma¹⁵, B&B checker¹⁶, and gas chromatography¹⁷.

Corresponding Author:

Jong-Hwa Jang

Associate Professor, Dept of Dental Hygiene
College of Health Science, Dankook University, Korea
Email: jhj@dankook.ac.kr

Since multiple variables may exist in the process of obtaining gas from oral cavity and analyzing the sample, we aimed to simultaneously perform the analysis of

VSCs inside the oral cavity and the assessment of compounds within saliva that can induce halitosis, in order to objectively evaluate the effect of oral spray in suppressing halitosis.

If the concentration of organic acids in the oral cavity is evaluated from these perspectives, we can more objectively evaluate the suppressive effect of oral spray containing pine needle extracts.

Therefore, in this study, we aimed to evaluate the effect of pine needle extracts in suppressing oral halitosis by analyzing the concentration of VSCs (hydrogen sulfide (H_2S), methyl mercaptan (CH_3SH), and dimethyl sulfide ($(CH_3)_2S$)) after oral spray usage and assessing the organic acids (lactate, acetate, propionate, formate, butyrate, and pyruvate) within saliva that can induce halitosis

MATERIALS AND METHOD

Subjects: The subjects of this study included 10 healthy adults (male and female), who do not have dental implants, dental caries, diabetes, gingivitis, or metabolic syndromes, divided into two groups: 5 subjects in the control group and 5 subjects in the experimental group. This study was approved by the institutional research ethics board of Dankook University, Republic of Korea (No. 2017-03-033). Quantitative analysis of the concentration of VSCs and organic acids within saliva (lactate, acetate, propionate, formate, butyrate, and pyruvate) was performed before and after the oral spray usage.

Synthesis of oral spray: The oral spray containing pine needle extract was fabricated for the experimental group, which consists of a base solution (100g) including 10% glycerin, 5% xylitol, and 350 μ l peppermint/lemon scent solution, 5% pine needle extract and 2% Japanese apricot extract. The oral spray for the control group only included the base solution of the spray used for the experimental group. The subjects were instructed to spray 3 times into the oral cavity 1 hour after their meal and brushing their teeth. VSCs measurement and saliva collection were performed 30 minutes after the spray usage.

Measured of sensor gas chromatograph: The contents of volatile sulfur gas such as H_2S , CH_3SH and $(CH_3)_2S$

was measured by Sensor Gas Chromatograph ODSA-P2 (FIS Inc., Hyogo, Japan). In order to collect the oral gas, subjects bite syringe during for 30 seconds. After syringe pumping for 2 times, 2 ml of collect the patient's oral air and inject to machine after stabilizing for 1 hours. The measurement of concentration (ppb) of each sulfur compound took for 4 minutes.

Saliva collection and pre-treatment: After the VSCs measurement has been completed, the subject's saliva (500 μ g) was collected in an Eppendorf tube. Collected saliva was centrifuged under 1200 rpm for 5 minutes, and the supernatant was diluted by 15-fold in distilled water. This solution was then treated using syringe filter (hydrophobic polytetrafluoroethylene (PTFE) membrane; pore size: 0.20 mm; Advantec MFS, Inc., Tokyo, Japan) to eliminate bacteria and enzymes.

Analysis of organic acids using HPLC: Standard organic acid products (lactate, acetate, propionate, formate, butyrate, and pyruvate) and mobile phase (NaOH 100mM) were purchased from Sigma Aldrich (St. Louis, MO, USA). Deionized water ($\geq 18 \mu\Omega$) used for mobile phase synthesis and sample dilution was synthesized using MILLI-Q Water system from Millipore (Bedford, MA, USA). The equipment used for the analysis of organic acids was Dionex ion chromatography system (GP50 gradient pump, ED 50 conductivity detector), and the software used for analysis was Chromeleon version 6.8. The column used for the analysis was Dionex IonPac AG11-HG column (50mm \times 4mm), protected by the guard column of IonPac AS11-HG (250mm \times 4mm). The mobile phase used was NaOH 100mM, with flow rate of 1.0 mL/min, injection volume of 10 μ l, and temperature of 20°C.

RESULTS AND DISCUSSION

The outcome for validation of analysis method for organic acids is shown in Table 1. The linearity of calibration curve for concentration range of 0.12 – 2.5mM assessed by R^2 value was ≥ 0.971 , indicating that the regression model based on coefficients of determination for each ingredient – obtained by the concentration and area values – exhibits $\geq 97\%$ linearity.

Table 1: Linear range, linear equation and correlation coefficient (r^2) for organic acid.

Compound	Linear range(mM)	Linear equation	r^2
Lactate	0.12 - 2.5	$y = 0.0023x + 0.6273$	0.9868
Acetate	0.12 - 2.5	$y = 0.0012x + 0.4722$	0.9816
Propionate	0.12 - 2.5	$y = 0.0011x + 0.4499$	0.9718
Formate	0.12 - 2.5	$y = 0.0031x + 0.295$	0.9990
Butyrate	0.12 - 2.5	$y = 0.0011x + 0.3542$	0.9816
Pyruvate	0.12 - 2.5	$y = 0.001x - 0.0036$	0.9980

* $y=ax+b$ y is the peak area and x is sample concentration

The concentration of VSCs in the oral cavity before and after the use of oral spray containing pine needle extracts is shown in Table 2. In both the control group and experimental group, concentrations of all chemical compounds with exception of $(CH_3)_2S$ were reduced 4 weeks after the usage. More specifically, the experimental group exhibited remarkable reductions of H_2S by 80.87% and CH_3SH by 89.42%. On the other hand, the concentration of $(CH_3)_2S$ was increased in both the control group and the experimental group at 4 weeks after the usage.

Among volatile sulfur compounds, only $(CH_3)_2S$ makes a difference depending on the involved bacteria and environment inside the mouth as a cause to affect the result of experiment. According to the conventional theories, gram-negative anaerobic bacteria like *Porphyromonas gingivalis*, *Tannerella forsythia*, *Treponema denticola*, and *Fusobacterium nucleatum* related to a periodontal disease causes most of VSCs^{18,19}, but it is newly reported that the bacteria inside the mouth such as *Solobacteriummoorei* gram-positive bacterium^{20,21} and *Actinomyces* living in biofilm attached to a tongue cause halitosis in the mouth²². Thus the difference between the subjects in the distribution of bacteria in their mouths and the health condition in their periodontal tissues leads to the difference in the result. It turns out that VSCs decreased more in the experimental group than in the control group.

Table 2: Mean concentration (ppb) of volatile sulfur compounds before and after using oral spray for 10 subjects

	Compound		1 week	2 weeks	4 weeks
	Control	H_2S	mean \pm SD	68.68 \pm 40.98	59.28 \pm 77.31
$\Delta^a(\%)$				13.70	58.65
CH_3SH		mean \pm SD	3.00 \pm 4.26	5.10 \pm 7.20	2.16 \pm 2.12
		$\Delta^a(\%)$		-70.00	28.00
$(CH_3)_2S$		mean \pm SD	7.62 \pm 6.84	28.40 \pm 18.36	10.24 \pm 8.89
		$\Delta^a(\%)$		-272.70	-34.38
Experimental	H_2S	mean \pm SD	63.04 \pm 58.48	19.24 \pm 28.38	12.06 \pm 14.09
		$\Delta^a(\%)$		69.48	80.87
	CH_3SH	mean \pm SD	16.26 \pm 36.36	19.40 \pm 33.16	1.72 \pm 3.85
		$\Delta^a(\%)$		-19.31	89.42
	$(CH_3)_2S$	mean \pm SD	10.52 \pm 16.90	2.44 \pm 3.34	11.48 \pm 2.98
		$\Delta^a(\%)$		76.81	-9.13

^a Increment and decrement concentration of volatile sulfur compounds compared to 1 week

In the experimental group, we observed reduction in several organic acids by 42.51 – 100.00% in Week 2 compared to Week 1. However, this value was decreased to 63.46 – 97.05% in week 4. These results were in agreement with the outcome that the reduction of $(CH_3)_2S$ among VSCs was greater in week 2 compared to week 4.

Furthermore, the suppressive effect of organic acids was observed in week 2 and 4 even in the control group, suggesting that the base solution contained in both oral sprays may exhibit fermentative effect of the microbes associated with halitosis or induction of halitosis.

In addition, there were differences among different organic acids. In week 4, we observed larger amount of acetate and formate being suppressed in the experimental group compared to the control group. Therefore, the oral spray containing pine needle extract can exhibit antibacterial effect in larger area and suppress more organic acids compared to the spray used in the control group.

The result of analyzing volatile sulfur compound and various organic acids shows that both volatile sulfur compound and organic acids decrease more coincidentally in the experimental group than in the control group and the decreased

amount for a week interval is almost equal. It is revealed based on the result that VSCs and organic acids are related each other as a metabolite to the bacteria inside the mouth.

However, due to small number of subjects in this study, there may be limitations in generalizing our findings. Moreover, there were subjects with no butyrate or pyruvate found in their saliva. As reported in the previous study, various biological factors among different individuals may cause these differences²³.

In addition, many variables occur in collecting saliva and gas in the mouth. Individual habit, ingested foods, bacteria distribution inside the oral and other variables can make a difference of the result. Thus, if considering halitosis, environment inside the oral and bacteria together in the next experiments, the more objective result will be drawn.

Table 3: Mean concentration of organic acids before and after using oral sprays for 10 subjects

	Compound		1week	2weeks	4weeks
Control	Lactate	mean ± SD	2.65 ± 5.43	1.99 ± 3.78	0.06 ± 0.13
		Δ ^a (%)		24.90	97.75
	Acetate	mean ± SD	15.58 ± 7.01	12.68 ± 11.10	6.17 ± 5.50
		Δ ^a (%)		18.61	60.38
	Propionate	mean ± SD	2.06 ± 1.42	2.24 ± 1.38	0.45 ± 0.65
		Δ ^a (%)		-8.75	78.17
	Formate	mean ± SD	1.16 ± 1.23	0.90 ± 0.34	0.29 ± 0.30
		Δ ^a (%)		23.09	75.13
	Butyrate	mean ± SD	0.62 ± 0.81	0.41 ± 0.36	N.D.
		Δ ^a (%)		34.08	100.00
	Pyruvate	mean ± SD	0.04 ± 0.10	0.03 ± 0.07	N.D.
		Δ ^a (%)		33.08	100.00
Experimental	Lactate	mean ± SD	2.49 ± 5.26	0.13 ± 0.17	0.09 ± 0.10
		Δ ^a (%)		94.86	96.52
	Acetate	mean ± SD	10.63 ± 8.14	6.11 ± 3.10	3.88 ± 4.95
		Δ ^a (%)		42.51	63.46
	Propionate	mean ± SD	1.99 ± 2.39	0.38 ± 0.34	0.60 ± 0.59
		Δ ^a (%)		80.92	70.07
	Formate	mean ± SD	1.47 ± 1.64	0.14 ± 0.20	0.20 ± 0.34
		Δ ^a (%)		90.63	86.22
	Butyrate	mean ± SD	0.81 ± 0.98	N.D	0.02 ± 0.05
		Δ ^a (%)		100.00	97.05
	Pyruvate	mean ± SD	N.D	N.D	N.D
		Δ ^a (%)		0.00	0.00

^a Increment and decrement concentration of volatile sulfur compounds compared to 1 week N.D. not detected.

CONCLUSION

This study analyzed VSCs and organic acids in saliva using quantitative analysis in order to check the effect to eliminate halitosis after using the oral spray containing the pine needle extract. After 4 weeks in the experimental group, the result of analyzing VSCs shows that H₂S (80.87%), CH₃SH(89.42%), (CH₃)₂S (-9.13%) fell and organic acid inside the oral, Lactate (96.52%), Acetate (63.46%), Propionate (70.07%), Formate (86.22%), Butyrate (97.05%), Pyruvate (not detected) also dropped.

In sum, the findings show that the halitosis spray containing the pine needle extract used in this experiment reduces volatile sulfur compound and the substances causing halitosis.

Ethical Clearance: Not required

Source of Funding: This work was supported the Ministry of Science and ICT of the Republic of Korea and the National Research Foundation of Korea (NRF-2017R1A2B4012865).

Conflict of Interest: Nil

REFERENCES

- Brening RH, Sulser GF, Fosdick LS. The determination of halitosis by use of osmoscope and the cryoscopic method. *J Dent Res.* 1939 Apr;18:127-32.
- Tonzetich J. Production and origin of oral malodor. a review of mechanisms and methods of analysis. *J Periodontol.* 1977 Jan;48(1):3-20.
- Johnes AA, Kornman KS, Newbold DA, Maxwell MA. Clinical and microbiological of controlled release locally delivered minocycline in peritonitis. *J Peridontol.* 1994 Nov;65(11):1058-66.
- Mandel ID. Chemotherapeutic agents for controlling plaque and gingivitis. *J Clin Periodontol* 1988 Sep 15(8):488-98.
- Yim N, Ha do T, Trung TN, Kim JP, Lee S, Na M, et al. The antimicrobial activity of compounds from the leaf and stem of *Vitisamurensis* against two oral pathogens. *Bioorg Med Chem Lett.* 2010 Feb;20(3):1165-8.
- Moon SE, Kim HY, Cha JD. Synergistic effect between clove oil and its major compounds and antibiotics against oral bacteria. *Arch Oral Biol.* 2011 Sep;56(9):907-16.
- Kim KE, Kang JO, Park YD. Effect of Mouthrinse Containing Propolis on Oral Malodor. *Int J ClinPrev Dent.* 2014 Sep;10(3):179-84. doi: 10.15236/ijcpd.2014.10.3.179.
- Kim HD, Lee HJ, Kim MY, Park HM, Moon DH. Analysis for halitosis inhibition activity of ginger extract. *J Kor Soc Oral Health Sci.* 2013 Oct;1(1):1-9.
- Yoon HS, Kim HJ. A clinical experimental study on tooth whitening effectiveness in toothpaste of containing natural extracts. *J Korean Soc Dent Hyg* 2018 Jan;18(1):19-29.
- Bae KH, Lee BJ, Jang YK, Lee BY, Lee WJ, Jang DS, et al. The effect of mouthrinse products containing sodium fluoride, cetylpyridinium chloride (CPC), pine leaf extracts and green tea extracts on the plaque, gingivitis, dental caries and halitosis. *J Korean Acad Oral Health* 2001; 25(1):51-9.
- Chung HJ, Hwang GH, Yoo MJ, Rhee SJ. Chemical composition of pine sprouts and pine needles for the production of pine sprout tea. *Korean Soc Food Culture.* 1996; 11(5): 635-41.
- Packer L, Rimbach G, Virgili F. Antioxidant activity and biologic properties of a procyanidin rich extract from pine (*Pinusmaritima*) bark, pycnogenol. *Free radicBiol Med.* 1999 Sep; 27(5-6):704-24.
- Park CS, Kwon CJ, Choi MA, Park GS, Choi KH. Antibacterial activities of cordyceps spp., mugwort and pine needle extracts. *Kor J Food Preservation.* 2002 Mar; 9(1):102-108.
- Deutscher H, Derman S, Barbe AG, Seemann R, Noack MJ. The effect of professional tooth cleaning or non-surgical periodontal therapy on oral halitosis in patients with periodontal diseases. A systematic review. *Int J Dent Hyg.* 2018 Feb; 16(1):36-47. doi: 10.1111/idh.12306.
- Sinjari B, Murmura G, Caputi S, Ricci L, Varvara G, Scarano A. Use of Oral Chroma™ in the assessment of volatile sulfur compounds in

- patients with fixed prostheses. *Int J Immunopathol Pharmacol.* 2013 Jul-Sep; 26(3):691-7.
16. Dadamio J, Laleman I, De Geest S, Vancauwenberghe F, Dekeyser C, Coucke W, Quirynen M. Usefulness of a new malodour-compound detection portable device in oral malodour diagnosis. *J Breath Res.* 2013 Dec; 7(4):046005. doi: 10.1088/1752-7155/7/4/046005.
 17. Lee DY, Huang WC, Gu TJ, Chang GD. Quantitative and comparative liquid chromatography-electrospray ionization-mass spectrometry analyses of hydrogen sulfide and thiol metabolites derivatized with 2-iodoacetanilide isotopologues. *J Chromatogr A.* 2018 Jun; 1552:43-52. doi: 10.1016/j.chroma.2018.04.008.
 18. Salako NO, Philip L. Comparison of the use of the Halimeter and the Oral Chroma™ in the assessment of the ability of common cultivable oral anaerobic bacteria to produce malodorous volatile sulfur compounds from cysteine and methionine. *Med PrincPract.* 2011; 20(1):75–9. doi: 10.1159/000319760.
 19. Kurata H, Awano S, Yoshida A, Ansai T, Takehara T. The prevalence of periodontopathogenic bacteria in saliva is linked to periodontal health status and oral malodour. *J Med Microbiol.* 2008 May; 57:636–42. doi: 10.1099/jmm.0.47706-0.
 20. Haraszthy VI, Gerber D, Clark B, Moses P, Parker C, Sreenivasan PK, et al. Characterization and prevalence of *Solobacteriummoorei* associated with oral halitosis. *J Breath Res.* 2008; 2(1):017002. doi: 10.1088/1752-7155/2/1/017002.
 21. Vancauwenberghe F, Dadamio J, Laleman I, Van Tornout M, Teughels W, Coucke W, et al. The role of *Solobacteriummoorei* in oral malodour. *J Breath Res.* 2013 Dec; 7(4):046006. doi: 10.1088/1752-7155/7/4/046006.
 22. Washio J, Sato T, Koseki T, Takahashi N. Hydrogen sulfide-producing bacteria in tongue biofilm and their relationship with oral malodour. *J Med Microbiol.* 2005; 54(Pt 9):889–95.
 23. Park YD, Jang JH, Oh YJ, Kwon HJ. Analyses of organic acids and inorganic anions and their relationship in human saliva before and after glucose intake. *Arch Oral Biol.* 2014 Jan; 59(1):1-11. doi: 10.1016/j.archoralbio.2013.10.006.

Upper Arm Muscle Activation During Rowing Exercise According to Different Pulling Positions

Da-HyeGu¹, Ayano Vargas¹, So-Yun Jin¹, Dong Yeop Lee², Jae Ho Yu², JinSeop Kim², Ji-Heon Hong²

¹Student, ²Professor, Dept. Physical Therapy, Sun Moon Univeresity, Republic of Korea

ABSTRACT

Background/Objectives: The purpose of this study is to compare the muscle activation of the upper limb muscle according to the position changes when performing rowing ergometer exercise.

Method/Statistical analysis: 20 healthy males who voluntarily agreed with the sufficient explanations about the purpose and method of this study were participated. Subjects were given a Navel, Chest, and Neck position. They did warm up for 20 seconds, rowing for 1 minute and cool down exercise for 30 seconds. Also they were given resting time for 1 hour between each of the pulling positions. One-way ANOVA was used to analyze the study data and LSD correction was used for the Post-hoc.

Findings: There was no significant difference in flexor and extensor carpi radialis when three of the positions were compared, but there was a significant difference in posterior deltoid, middle deltoid and biceps brachii. Every muscle showed with highest activation in the Neck position.

Improvements/Applications: In conclusion, the position can be selectively applied to increase muscle strength of the upper limb muscle considering the change of the specific muscle activation according to the change of position.

Keywords: Rowing Ergometer, Muscle Activation, Upper Limb, Electromyography

INTRODUCTION

A rowing ergometer was a device made to approach the motion of rowing and developed to reenact the loading conditions of rowing athletes^{1, 2}. This machine was designed for rowing athletes, used as standardized tests, research equipment, and utilized for land-based training^{1, 3, 4}. In rowing, there were two ways to row and one of them was called sculling. Rowing ergometer was commonly used by rowing athletes as a sculling ergometer, in a manner in which they used two paddles to increase the thrust of a rowing boat⁵. Jones (2010) reported that many scholars were interested in researches about the biomechanics of elite level rowing, however, it had not been enlarged to researches about

rowing ergometer for recreation and amateur users⁶. More studies were required on how to use the rowing ergometer to determine which muscles were activated while using this device, and not the training required for accelerating rowing speed or injury prevention of athletes. The difference between rowing ergometer and rowing in the water was that the sheet of flywheel and foot stretcher had a fixed base while the seat moves back and forth on the rail⁷. There was a difference between the terms in a contribution of the body during the exercise phase. At the starting and ending point of the catch phase, the rowing ergometer was relatively stronger in pulling the oars¹. In the catch phase, full flexion of the lower limb, as well as the lumbar spine and the full extension of upper limb joints, had shown according to the detailed analysis of the position of exercise in the rowing ergometer.

As the elbow and shoulder joints bend, the ankle, knee, hips and lumbar spine were stretched at the same time during the driving phase. Therefore, the full extension of the lower limb and lumbar spine, and the

Corresponding Author:

Ji Heon Hong
Professor, Division of Physical Therapy
Sunmoon University, Korea
Email: hgh1020@hanmail.net

full flexion of the upper limb was the finishing phase of this exercise. While in the recovery phase, the flywheel was moving from the finish phase to the catch phase and this process was repeated from the beginning^{2, 5, 6}. Biomechanically, when comparing the body that was the main axis of force during the catch phase, the lower leg started with the contribution of 50% and it gradually increased to 40~50% in the latter half, as well as the beginning stage of arm reaches almost 80%, the contribution then raised to 60% while pulling the flywheel^{1, 8}. Therefore the activation of the arm happened for a short period of time, however, the researches of the arm was insufficient due to the reason that most of the researches were more interest in the kinematics and activity of the leg and body. In the case of rowing ergometer, it was important to know the speed, height, and pulling angle when determining the physical fitness requirements for work of rapid pulling, as the motion of the flywheel could pull out the movement freely comparing it to the rowing⁹. In addition, when Herring (2007) observed the impact of maximum static force during a push or pull motion depending on how the height and distance of the hand from the body differs, the strength of the muscles was influenced as the distance and height increased¹⁰. According to these prior articles, it was necessary to analyze and compare the muscle activation of the upper limb according to the angle of arm movement in rowing ergometer. The total of the muscles used during rowing ergometer exercise were 23, including the upper and lower extremity muscles, on the other hand, the muscles in the upper extremity were only 9 of them was being used^{4, 11}. There was a certain similarity of elbow flexors in a reaction of the shoulder, elbow extensor, and shoulder extension¹². Tomasz (2015) found that the muscle response was placed in the activated muscle of shoulder and elbow joint¹². However, studies on the activation of the wrist muscles during exercise were inadequate.

Most researches respondents were mainly professional rowing athletes, however, there were only a few cases of researches about muscle efficiency of non-athletes. In addition, despite the high flexibility of arm positions, researches about the different kinds of arm movement was insufficient. Therefore, the purpose of this study was to compare and analyzed the activation of the arm muscles which vary according to the positions of pulling during rowing ergometer exercises.

MATERIALS AND METHOD

Participants: In this study, 20 healthy male adults were present. Before taking part, all subjects were given sufficient explanations about the purpose and method of this study. Then, those who voluntarily acceded to the conditions participated in this study. The characteristics of the subjects are as follows [Table 1]. The study was conducted in accordance with the procedure approved by Sunmoon University Institutional Review Board.

Table 1: General Characteristics (n = 20)

Division	Subject
Age (year)	22.75 ± 2.51
Height (cm)	173.85 ± 4.67
Weight (kg)	67.95 ± 10.47

All values are mean ± Standard Deviation(SD)

Experiment Procedures: This study was conducted as a single group. In order to minimize the resistance or friction of the electrode before the experiment, a short-sleeved t-shirt was suggested to wear during the experiment. To prevent unnecessary amplification, the EMG cables were taped on the assigned muscles and then using an EMG marker (EMG marker: Posterior deltoid – 2 cm below the scapular spine, and parallel position to the muscle fibers¹³. Middle deltoid about 3cm below the acromion, parallel to the muscle fibers¹³. Biceps Brachii - middle of muscle fiber and in parallel side¹³. Flexor carpi radialis - 1/3 point from styloid process of radius to medial epicondyle of elbow¹⁴. Extensor carpi radialis - 3cm point away from distal side of lateral epicondyle with forearm in pronation position¹⁵. the maximum voluntary contraction (MVC) was measured [Figure 1].

The subjects were asked to sit on rowing ergometer with their ankles and feet fixed using a strap and educated about each position to perform while doing the experiment. The basic positions and timing of arm when pulling the handle of rowing ergometer are divided into 3 positions; the Neck position that reaches until Adam's apple, the Chest position that reaches until the body of the sternum, and the Navel position that reaches until the belly button of the participants. Each position had been educated before starting the actual experiment [Figure 2]. After doing warm-up exercise with Neck position for 30 seconds, the participants then perform the experiment using the rowing ergometer as strong and fast as they can

during 1 minute to measure the maximum activity of each muscles using EMG then they did the cool down exercise for 30 seconds and lastly, to avoid muscle fatigue after exercise, 1 hour of rest time given before proceeding to the next position and was given between each position.



Figure 1: The attached location of EMG electrodes

Measurement Equipment: In this study, a Water-rower rowing machine and Electromyography (EMG, QUS100, Zero WIRE EMG, Italy, 2009) were used [Figure 3]. All subjects asked for wore short sleeve t-shirts and the EMG were attached to each muscle. The maximum voluntary contraction of the subjects was measured, and after educating the participants about the positions, they performed the rowing ergometer exercise with each position and the muscle activation during the exercise was recorded.



Figure 2: The position of exercise A: starting position B: Neck position C: Chest position D: Navel position

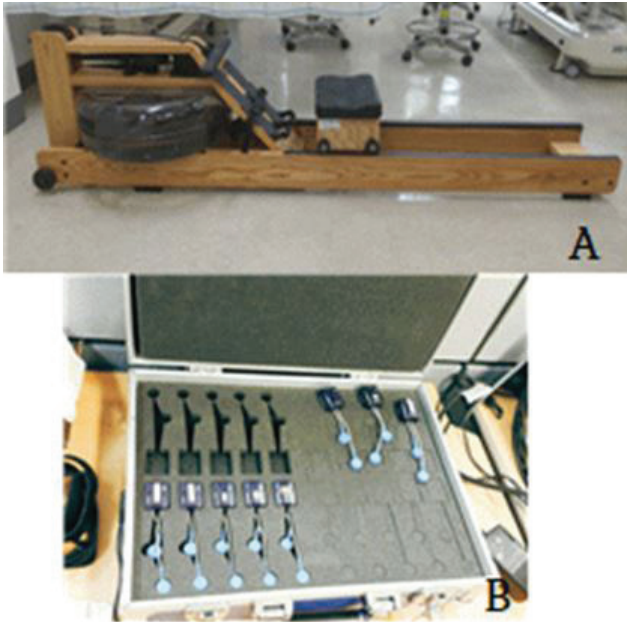


Figure 3: Instrumentation A: Water-rower rowing machine B: Electromyography (EMG)

Data Analysis: For the analysis of the study data, SPSS / PC ver.18 for windows program (SPSS INC, Chicago, IL) was used. We used one-way ANOVA to compare the muscle activations for every position when performing rowing ergometer through electromyography device. The basic positions and timing of the arm when pulling the handle of rowing ergometer were divided into 3 positions which were the Neck position that reaches until Adam’s apple, the breast position that reaches

until the body of sternum, and the Navel position that reaches until the belly button of the participants had been educated before starting the actual experiment.

RESULTS AND DISCUSSION

According to different types of rowing position, the muscle activation of some muscles showed a significant difference. Through the SPSS ver. 18 programs, we used one-way ANOVA to analyze the significant difference of muscle activation in each muscle. [Table 2] shows the mean and difference of the percentage of muscle activity. As shown in the statistical analysis, the posterior deltoid, middle deltoid, and biceps brachii were significantly different when three of the positions were compared ($p < .05$). On the other hand, Flexor Carpi Radialis and Extensor Carpi Radialis did not show any significant differences according to the different pulling positions ($p > .05$). Via post-hoc results of the three muscles that show significant differences in variance analysis, the posterior deltoid did not show any significant difference between Chest and Navel position ($p > .05$). However, there was a significant difference between the Neck and Chest position, as well as the Neck and Navel position ($p < .05$). Also, the middle deltoid and Biceps brachii showed significant differences between Neck and Chest position, Chest and Navel position, Neck and Navel position ($p < .05$) [Table 3].

Table 2: Mean and significant probability of muscle activation according to position

Muscle	Neck position	Chest position	Navel position	p
Post.D	44.93 ± 20.32	33.03 ± 15.40	26.31 ± 14.49	.005*
Mid.D	42.01 ± 14.80	22.21 ± 11.35	12.60 ± 7.10	.000*
BB	53.69 ± 24.74	40.16 ± 19.96	23.14 ± 14.71	.000*
FCR	113.72 ± 107.77	100.51 ± 93.45	77.53 ± 92.23	.520
ECR	32.38 ± 19.35	28.33 ± 20.84	21.90 ± 14.30	.217

* $p < .05$, mean ± standard deviation, Post. D: posterior deltoid, Mid.D: middle deltoid, BB: biceps brachii, FCR: flexor carpi radialis, ECR: extensor carpi radialis

Table 3: Mean and significant probability of muscle activation between three positions

Muscle	I	J	(I-J)	p
Post.D	Neck position	Chest position	11.90	.035*
	Neck position	Navel position	18.62	.001*
	Chest position	Navel position	6.72	.226

Conted...

Mid.D	Neck position	Chest position	19.80	.000*
	Neck position	Navel position	29.41	.000*
	Chest position	Navel position	9.60	.013*
BB	Neck position	Chest position	13.52	.044*
	Neck position	Navel position	30.55	.000*
	Chest position	Navel position	17.02	.012*
FCR	Neck position	Chest position	13.21	.680
	Neck position	Navel position	36.19	.473
	Chest position	Navel position	22.98	.260
ECR	Neck position	Chest position	4.05	.500
	Neck position	Navel position	10.48	.285
	Chest position	Navel position	6.44	.084

* $p < .05$, Post. D: posterior deltoid, Mid.D: middle deltoid, BB: biceps brachii, FCR: flexor carpi radialis, ECR: extensor carpi radialis

The purpose of this study was to compare the muscle activation of the arm muscles, which vary according to the pulling position during rowing ergometer exercise. During rowing ergometer exercise, 20 healthy men adults were performing with three positions which divided into Neck, Chest, and Navel position, at the same time using surface EMG, the muscle activation of the posterior deltoid, middle deltoid, biceps brachii, flexor carpi radialis, and extensor carpi radialis were compared. As a result, there were significant values according to each position in several muscles.

In middle deltoid showed significant differences in Neck and Chest position, Neck and Navel position, and Chest and Navel position. Witt et al. (2014) suggested that deltoid muscle activation theoretically increased when the external moment arm increases, as the function of this muscle were shoulder abduction and elevation¹⁶. Rebecca L. et al. (2010) reported that the activation of middle deltoid increased when the angle of the shoulder flexion increased and showed high activation of the muscle when it was approximately at 90 degrees¹⁷. This study proposed that there was a difference in activation as the angle of shoulder abduction increases from the lowest position which was the Navel position, to Chest and the highest position, Neck position. Escamilla et al. (2009) reported that the posterior deltoid muscle showed high activation in shoulder external and internal rotation, respectively. Furthermore, there was no effect in abductor through the difference of moment arm at 0–90degree angle of shoulder abduction, however, as

the contribution of movement was greatly changed as the angle increases¹⁸. The handle of a rowing ergometer was pulled with the movement of shoulder internal rotation and forearm pronation. In this study, the angle of shoulder abduction gradually increased in the order of Navel, Chest, and Neck position, and the position in finish phase was approaching to the horizontal abduction from shoulder extension. Therefore, the posterior deltoid showed high activation in all positions, especially in Neck position. Although, the difference between the Chest and Navel position was not statistically significant for reason that the angle of the shoulder between the two positions was within the range that could not sufficiently decrease the moment arm.

The same as the middle deltoid, biceps brachii that showed significant differences in Neck and Chest position, Neck and Navel position, also Chest and Navel position through the post-hoc test result. Antony et al. (2010) observed that the activation of biceps brachii increases when the angle of shoulder abduction and flexion also increased¹⁷. David et al. (2000) reported that the biceps brachii showed less activation in internal rotation, however more activation was shown in external rotation¹⁹. In addition, Sakurai et al. (1998) confirmed that the angle of the shoulder and elbow various abduction, as well as flexion during shoulder internal and external rotation, shows the activation of biceps brachii²⁰. The biceps brachii showed high activation in the external rotation than in internal rotation in most of the shoulder movements. The same as the two previous muscles, it

seems that the activation of biceps brachii activates with the angle of shoulder abduction from Navel to Neck position. On the other hand, as the position of arm get higher, the hand during finish phase increases together with shoulder external rotation. For that reason, it shows that there are a significant difference and increases in activation of biceps brachii.

Flexor and extensor carpi radialis showed high activation in every position, but no significant difference was found. Domizio et al. (2010) reported that the activation of flexor and extensor carpi radialis includes the forearm muscles increases when the pulling strength is used for gripping and defecting²¹. In addition, the activation increases when conducting it in pronation compare to neutral and supination. Koshland et al. (2010) observed that the elbow and wrist flexor including flexor carpi radialis were activated in similar order when the wrist is fixed then flexing the elbow²². High activation was observed in flexor and extensor carpi radialis through gripping the handle of rowing ergometer and pulling it and flexing the elbow at the same time. However, there were differences in activation but not significant among the three positions of this study. The reason for this is the angle of elbow flexion and extension influenced by the two muscles showed differences. It seems that the angular change of the wrist did not occur significantly in every position.

The results of this study showed that there was no significant difference in muscle activation between the flexor and extensor carpi radialis in each position. However, there were significant differences between deltoid and biceps brachii as the position changed. For this reason, it was found that Neck position is more effective for the alternative strengthening of the deltoid muscle and biceps brachii.

A limitation of this study would be although it was conducted with 20 healthy adult men, there were difficulties in examining the changes of muscle activation in women and generalizing the whole age group. The same result may not be obtained in the non-dominant arm since only the muscle activation of a dominant arm is measured. There is a limitation in obtaining the objectively results of this study because the subjects could not present an objective and quantified angle of shoulder abduction. The aim of this study was to observe the muscle activation of upper limb muscles according to different pulling positions, however since only specific

muscles were measured, there is a need to study the activation or relationship of other muscles.

CONCLUSION

The purpose of this study is to compare the muscle activities of the posterior deltoid, middle deltoid, biceps brachii, flexor carpi radialis, and extensor carpi radialis according to the position changes when performing rowing ergometer exercise, and to propose which position is more effective when it comes to strengthening the muscle. As a result, deltoid and biceps brachii muscles showed the highest activation in the Neck position, while in the Navel position shows lower activation. The flexor and extensor carpi radialis show high activation in all of the 3 pulling positions, nonetheless, there was no influence on muscle activation when changing the position. Therefore, in this study, the position can be selectively applied to increase muscle strength of the upper limb muscle considering the change of the specific muscle activation according to the change of position.

Ethical Clearance: Taken from the Institutional Review Board of Sunmoon University

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Lamb DH. A kinematic comparison of ergometer and on-water rowing. *Am J Sports Med.* 1989 May;17(3):367-73.
2. Colloud F, Bahuaud P, Doriot N, Champely S, Cheze L. Fixed versus free-floating stretcher mechanism in rowing ergometers: mechanical aspects. *J Sports Sci.* 2006;24(5):479-93.
3. Kramer JF, Leger A, Paterson DH, Morrow A. Rowing performance and selected descriptive, field, and laboratory variables. *Can J Appl Physiol.* 1994 Jun;19(2):174-84.
4. Shaharudin S, Zanutto D, Agrawal S. Muscle Synergies of Untrained Subjects during 6 min Maximal Rowing on Slides and Fixed Ergometer. *J Sports Sci Med.* 2014 Dec;13(4):793-800.
5. Strahan AD, Burnett AF, Caneiro JP, Doyle MM, O'Sullivan PB, Goodman C. Differences

- in spinopelvic kinematics in sweep and scull ergometer rowing. *Clin J Sport Med.* 2011 Jul;21(4):330-6.
6. Jones JA, Allanson-Bailey L, Jones MD, Holt CA. An ergometer based study of the role of the upper limbs in the female rowing stroke. *Procedia Engineering.* 2010 Jun;2(2):2555-61.
 7. Fleming N, Donne B, Mahony N. A comparison of electromyography and stroke kinematics during ergometer and on-water rowing. *J Sports Sci.* 2014 Jan;32(12):1127-38.
 8. Jurimae T, Perez-Turpin JA, Cortell-Tormo JM, Chinchilla-Mira IJ, Cejuela-Anta R, Maestu J, et al. Relationship between rowing ergometer performance and physiological responses to upper and lower body exercises in rowers. *J Sci Med Sport.* 2010 Jul;13(4):434-7.
 9. Arun G, Dan B. One-handed dynamic pulling strength with special reference to speed, handle height and angles of pulling. *International Journal of Industrial Ergonomics.* 1990 Nov;6(3):231-40.
 10. Herring S, Hallbeck MS. The effects of distance and height on maximal isometric push and pull strength with reference to manual transmission truck drivers. *International Journal of Industrial Ergonomics.* 2007 Aug;37(8):685-96.
 11. Turpin NA, Guevel A, Durand S, Hug F. Effect of power output on muscle coordination during rowing. *Eur J Appl Physiol.* 2011 Dec;111(12):3017-29.
 12. Tomiak T, Gorkovenko AV, Tal'nov AN, Abramovych TI, Mishchenko VS, Vereshchaka IV, et al. The Averaged EMGs Recorded from the Arm Muscles During Bimanual "Rowing" Movements. *Front Physiol.* 2015 Nov;6:349.
 13. Dickerson CR, Hughes RE, Chaffin DB. Experimental evaluation of a computational shoulder musculoskeletal model. *Clin Biomech (Bristol, Avon).* 2008 Aug;23(7):886-94.
 14. Zehr EP. Considerations for use of the Hoffmann reflex in exercise studies. *Eur J Appl Physiol.* 2002 Apr;86(6):455-68.
 15. Barr AE, Goldsheyder D, Ozkaya N, Nordin M. Testing apparatus and experimental procedure for position specific normalization of electromyographic measurements of distal upper extremity musculature. *Clin Biomech (Bristol, Avon).* 2001 Aug;16(7):576-85.
 16. de Witte PB, Werner S, ter Braak LM, Veeger HE, Nelissen RG, de Groot JH. The Supraspinatus and the Deltoid - not just two arm elevators. *Hum Mov Sci.* 2014 Feb;33:273-83.
 17. Antony NT, Keir PJ. Effects of posture, movement and hand load on shoulder muscle activity. *J Electromyogr Kinesiol.* 2010 Apr;20(2):191-8.
 18. Escamilla RF, Yamashiro K, Paulos L, Andrews JR. Shoulder muscle activity and function in common shoulder rehabilitation exercises. *Sports Med.* 2009 Aug;39(8):663-85.
 19. David G, Magarey ME, Jones MA, Dvir Z, Turker KS, Sharpe M. EMG and strength correlates of selected shoulder muscles during rotations of the glenohumeral joint. *Clin Biomech (Bristol, Avon).* 2000 Feb;15(2):95-102.
 20. Sakurai G, Ozaki J, Tomita Y, Nishimoto K, Tamai S. Electromyographic analysis of shoulder joint function of the biceps brachii muscle during isometric contraction. *Clin Orthop Relat Res.* 1998 Sep;(354):123-31.
 21. Di Domizio J, Keir PJ. Forearm posture and grip effects during push and pull tasks. *Ergonomics.* 2010 Feb;53(3):336-43.
 22. Koshland GF, Hasan Z, Gerilovsky L. Activity of wrist muscles elicited during imposed or voluntary movements about the elbow joint. *J Mot Behav.* 1991;23(2):91-100.

The Effects of Stepping Exercise on Body Composition and Blood Lipids of Female Obese Students

Ki-Yeol Yang¹, Bum-Il Min², Seong-Gon Kim³, Jong-Eon Kim⁴, Hyun-Woo Kim⁵

¹Vice-principle, Hwayang High School. Korea; ²Professor, Dept. Nambu University. Korea; ³Professor, Dept. Gwangju National University of Education, Korea; ⁴Professor, Dept. Chodang University, Korea; ⁵Professor, Dept. Chosun University, Korea

ABSTRACT

Background/Objectives: Students are increasing their obesity rates due to decreased physical activity and increased instant food intake due to study. The purpose of this study is to investigate the effect of stepping exercise on body composition and blood lipid in order to find a way to participate at any time with pleasant music.

Method/Statistical analysis: In this study, 16 obese middle school students with body fat percentage of over 30% were divided into 8 stepping group and 8 control group. The stepping exercise group participated in the exercise for 1 week 45 minutes and 5 times a week for 10 weeks. The control group continued their daily lives without participating in any specific exercise program. All data measured in this study were averaged and standard deviations were calculated for all variables using the SPSS win12.0 statistical program. The difference test before and after intervention was compared by T-test. The difference between groups was analyzed using repeated measures analysis. The statistical significance was $p < .05$.

Findings: After 10 weeks of exercise, fat free mass was significantly increased in the exercise group ($p < .01$). Body weight and % body fat were significantly decreased ($p < .01$) as the exercise duration was longer, and also significantly ($p < .05$) between groups. Changes in blood lipids significantly decreased total cholesterol (TC), triglyceride (TG) and low density lipoprotein cholesterol (LDL-C) in the exercise group ($p < .01$). High density lipoprotein cholesterol (HDL-C) increased significantly after exercise ($p < .01$), and differences between exercise groups ($p < .05$) also appeared.

Improvements/Applications: The results of this study showed that changes in body composition and blood lipids that were not observed after 5 weeks of exercise were changed after 10 weeks of exercise. However, it suggests that students should also change their dietary habits with exercise to achieve complete obesity.

Keywords: Female obese students, Stepping exercise, Aerobic exercise, Body composition, Blood lipid

INTRODUCTION

Today, rapid economic growth and technological advancement have positive effects such as abundant and convenient living and disability in modern people, while obesity has been triggered due to decreased movement and excessive nutrition^[1]. The Ministry of Education of the Republic of Korea^[2] showed that the

obesity rate of elementary, middle, and high school students rapidly increased from 11.2% in 2008 to 14.7% in 2012, 16.5% in 2016 and 17.3% This growth rate is due to the increase of instant food intake which is low in physical activity due to the development of modern society and education centered on entrance examination, and high calorie but low nutrition. In particular, obesity in female students causes gonorrhoea and increases the risk of small stature, breast cancer, obesity, diabetes and cardiovascular disease. The Ministry of Education has decided to add HDL-C, LDL-C, and TG along with blood glucose, TC, and GPT to the National Obesity Management Comprehensive Measures(2018-2022)^[3]. In order to make changes, we decided to expand the

Corresponding Author:

Bum-Il Min
Professor, Dept of Sports and Leisure,
Nambu University, Korea
Email: m7839@nambu.ac.kr

school club food service standards revision and sports club support to match the level and interest of girls with low physical activity.

However, in spite of various policies, the decline in physical fitness and the rate of obesity continue to increase, making the policy less effective^[4]. The reasons for this are: lack of exercise due to decreased physical activity of adolescents, low budget compared to national policies, lack of time and space to participate in obesity related programs, lack of professional leaders to carry out obesity related programs, And lack of time due to study^[5]. Especially, adolescent middle school students show changes in appearance and body shape due to hormonal changes due to secondary sex. In this case, weight and fat increase, and thus they do not fit with physical and social needs, resulting in lack of self-confidence due to loss of self-esteem^[6].

As a method of exercise for preventing obesity, fat should be used as an energy source at low intensity and exercise frequency should be high^[7]. It has been reported that regular participation of aerobic exercise improves the risk factors such as cholesterol, hypertension and obesity and improves cardiovascular function to prevent cardiovascular diseases such as coronary artery disease, arteriosclerosis, hypertension and heart disease and improve health and fitness^[8]. It has been reported that

participation in regular exercise programs significantly reduces body fat and body weight, and improves fat, muscle strength, and oxygen uptake^[9].

There are walking, jogging, jump rope, aerobics, dancing, swimming, and bicycle^[10] and which can participate in time, place, object, and climate regardless of climate, and can be economical and simple^[11]. In the low intensity exercise of about 50% of the VO² max, exercise of about 200~300kcal energy consumption is suitable for obesity resolution^[12]. Because of Regular aerobic exercise is used because body fat is used to improve blood lipid levels and energy during low intensity exercise^[13].

The purpose of this study is to propose a stepping exercise with low risk of injury, which is not related to the environment such as the weather, as a physical activity method, to obesity middle school students as a method of reducing obesity in adolescents.

MATERIALS AND METHOD

Subjects: The subjects were female students with over 30% obesity. And 8 stepping exercise group and 8 control group were selected by simple radio assignment method. The physical characteristics of the subjects are shown in [Table 1].

Table 1: Physical characteristics of subjects

Group \ Item	Age (years)	Weight (kg)	Height (cm)	Fat (%)
E.G	15.38 ± .51	64.60 ± 4.56	160.80 ± 3.83	36.58 ± 1.72
C.G	15.08 ± .72	63.71 ± 8.48	162.21 ± 5.06	36.38 ± 3.53

E.G : Exercise Group ; C.G : Control Group

Exercise program: The stepping exercise group participated in the preliminary experiment one week before the experiment to adapt to The movement exercise, and after 45 minutes(08:15~09:00), 5 times a week(Mon, Tue, Wed, Thu and Fri) and stepping exercise for 10 weeks. Exercise program 0~5 weeks from 20.3cm step box to 51~60% HRmax level, march basic step to 9 basic movements, 6~10 weeks to 61-70% HRmax level turn basic step, over the step 16 kinds The exercises were mixed and exercised to exciting music(100~110bpm). [Figure 1].

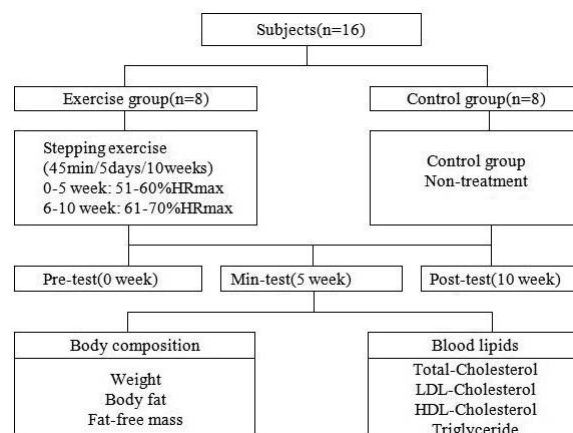


Figure 1: Experimental Design

Exercise intensities were determined by using the telemetry heart checker system($THR = [HR_{max} - HR_{rest}] \times THR\% + HR_{rest}$). The control group continued their daily activities without participating in any special exercise program during the experiment. Measurements and analyzes were carried out at 3 weeks, 0 weeks, 5 weeks, and 10 weeks. the exercise program are shown in [Table 2].

Table 2: 0-5weeks and 6-10weeks exercise program

Intensity	Stage	Time	Intensity	Stage	Time
	Warm-up (arm, leg, shoulder)	10min		Warm-up (arm, leg, shoulder)	10min
0-5weeks/days 51-60%HRmax	March Basic step Side up, Side kick Back up, Back turn March box turn V step Side v step	30min	6-10weeks/days 61-70%HRmax	Turn basic step Over the step Triangle Back turn Side basic step Side basic knee up Side basic kick	30min
	Cool-down (arm, leg, shoulder)	5min		Cool-down (arm, leg, shoulder)	5min

Statistical analysis: All data measured in this study were averaged and standard deviations were calculated for all variables using the SPSS win12.0 statistical program. The difference test before and after intervention was compared by T-test. Differences between groups were analyzed using repeated measures analysis. In the present study, the least significant difference test(LSD) was use for the post-test of the estimated mean, and the significance level was $p < .05$.

RESULTS AND DISCUSSION

The purpose of this study was to investigate the effects of long term stepping exercise program on body composition(fat free mass, body weight, % body fat), serum lipids(TC, HDL-C, TG, LDL-C). Results of analysis according to group(stepping exercise group, control group)and time(0week exercise, 5week exercise, 10week exercise) as follows.

Changes in body composition: The body is composed of water, protein, minerals and fat. Body composition is differentiated into fat composed of body fat, moisture, muscle, bone and residual chemicals^[14]. In the previous study, the body composition of obesity women showed a significant difference in the BMI values after 12 weeks of exercise^[15] the change of body composition are shown in [Table 3].

Table 3: The change of Body Composition

Item \ Time	Group	0week ^a	5week ^b	10week ^c	F
Fat free mass	EG	40.91 ± 1.84	41.67 ± 2.03	45.09 ± 1.66	203.58**
	CG	42.06 ± 3.24	41.63 ± 3.39	41.33 ± 3.92	2.81
	t	.87	.20	2.49	
% fat	EG	36.58 ± 1.72	34.26 ± 1.23	27.46 ± 2.47	98.93**
	CG	36.38 ± 3.53	36.32 ± 3.41	36.96 ± 3.41	1.86
	t	.14	1.61	5.80	
Body weight	EG	64.60 ± 4.56	63.35 ± 4.23	57.64 ± 3.55	40.70**
	CG	63.71 ± 8.48	64.51 ± 7.53	64.15 ± 8.46	2.51
	t	.26	.37	2.31*	

Mean ± SD, $p < .05$ *, $p < .01$ **

In the present study, body weight decreased 10.77% in the stepping exercise group after 10 weeks of exercise and showed a significant difference ($P < .01$) in the group treatment time. Post test results showed a difference between 0 weeks, 5 weeks and 10 weeks. The control group did not change. These results were consistent with the results of a 12-week combined exercise after weight loss^[16] and a decrease in body weight after 12 weeks of Pilates exercise^[17]. However, there was no change in body weight after participating in elementary school 12-week combined exercise program^[18]. The difference between these previous studies and the results is thought to be the difference in the dietary intake and exercise intensity of the group

Fat free mass increased 10.24% in the stepping group after 10 weeks of exercise and showed a significant difference ($P < .01$) in the group treatment period. Post-test results showed a difference between 0 weeks, 5 weeks and 10 weeks. The control group did not change. These results suggest that increased fat free mass after aerobic exercises^[19] 12 and long-term aerobic exercise and muscular resistance training in adolescents increased % fat mass^[20].

% Body fat decreased by 24.43% in the stepping exercise group after 10 weeks of exercise and showed a significant difference ($P < .01$) in the group treatment time. Post test results showed a difference between 0 weeks, 5 weeks and 10 weeks. The control group did not change. These results are consistent with the findings^[21] that the body fat percentage decreased after endurance exercise. Positive changes in body weight, fat mass, and body fat percentage were consistent with studies of persistent resistance and combined exercise, such as decreased body fat percentage and increased fat mass in obese people^{[22][23]}.

The positive changes in body composition are the decrease in body weight due to the increase in activity, the change in body fat and the decrease in body weight due to the improvement of basal metabolism and fat dissolving ability during stabilization^[21].

Changes in blood lipid: Blood lipids increase the incidence of hypertension, arteriosclerosis, coronary artery disease and heart disease. The change of blood lipids are shown in [Table 4].

Table 4: The change of Blood Lipids

Item \ Time	Group	0 week ^a	5 week ^b	10 week ^c	F
TC	EG	153.50 ± 13.86	148.63 ± 14.20	138.38 ± 15.72	72.02**
	CG	157.13 ± 15	158.38 ± 13.64	157.75 ± 12.64	.38
	t	.50	.18	0.01**	
HDL-C	EG	46.13 ± 4.19	49 ± 5.31	52.25 ± 4.2	34.18**
	CG	46.75 ± 2.37	48.13 ± 2.47	47.75 ± 2.49	2.10
	t	.32	.42	2.60*	
LDL-C	EG	91.1 ± 5.19	85.2 ± 7.67	73.95 ± 11.7	19.03**
	CG	92.62 ± 8.36	91.57 ± 8.88	92.52 ± 8.89	.29
	t	.43	1.53	3.57**	
TG	EG	110.13 ± 4.73	108.25 ± 4.86	90.50 ± 3.29	90.52**
	CG	108.63 ± 7.24	109.13 ± 7.49	105.88 ± 6.51	2.05
	t	.49	.27	5.95**	

As a result, TC decreased 9.85% in the stepping exercise group after 10 weeks of exercise and showed a significant difference ($P < .01$) in the group treatment time. Post - test results showed a difference between 0 weeks, 5 weeks and 10 weeks. The control group did not change. The results of the study showing

positive changes in blood lipids in all types of exercise patterns^[24] support the results of this study. These results can be seen as a result of promoting the regulation of metabolism, such as increased lipid lipoproteinase, activation of oxidative enzymes in muscle mitochondria, and increased myoglobin concentration^[25].

HDL-C increased by 13.26% in the stepping exercise group after 10 weeks of exercise and showed a significant difference ($P < .01$) in the group treatment time. Post test results showed a difference between 0 weeks, 5 weeks and 10 weeks. The control group did not change. The results of a significant change in HDL-C in elementary school children after 12 weeks of exercise support the findings of this study^[25].

The TG was decreased by 17.82% in the stepping exercise group after 10 weeks of exercise and showed a significant difference ($P < .01$) in the group treatment time. Post test results showed differences between 0 and 5 weeks, 5 and 10 weeks. The control group did not change. The results of previous studies that showed a significant change in TG after long term exercise support this study^[21].

LDL-C decreased by 18.82% in the stepping exercise group after 10 weeks of exercise and showed a significant difference ($P < .01$) in the group treatment time. Post test results showed a difference between 0 weeks, 5 weeks and 10 weeks. The control group did not change. Previous studies in which the aerobic exercise of middle-aged women led to a significant change in LDL-C support this study^[10]. These results suggest that exercise may increase basal metabolism, fat-dissolving ability, and muscle mass, thereby decreasing LDL-C.

CONCLUSION

The results of the step box exercise conducted by obese middle school students showed that body composition and blood lipid were both positive. The results of this study showed that the step box exercise, which moves up and down the box with a height of 20.3cm, uses the glycogen and the blood lipid as the kinetic energy while using the femoral muscle, gastrocnemius muscle, and gluteus muscle as the major muscles in the body. It can be seen that blood lipids have changed positively. Therefore, step box exercise to students while they listen to their favorite music was found to be effective exercise methods for reducing obesity and promoting health.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Blood Lipids of Female Obese Students

REFERENCES

1. Back SH. The effects of complex exercise program on obese risk factors and fitness level changes in the obese [dissertation]. [Seoul] Yonsei University; 2008. 1 p.
2. Ministry of Education. Student Health Survey Sample Statistical Foot for 2017. Seoul. Ministry of Education Press. c2018 Mar 1. P. 2.
3. Kwon HJ. Add 'Metabolic Syndrome Screening' to prevent obesity in young people next year [internet]. Seoul : News1; c2018 [revised 2018 Sep 1; cited 2018 Jul 26]. Available from: <http://news1.kr/articles/?3382647>
4. Ju jy. Effects of Circuit Exercise on Physical Fitness, Body Composition, and Blood Lipids in Obese Middle School Females [dissertation]. [Seoul] Korea National University of Education; 2017. 2 p.
5. Rhim YT. The role of school education in solving obesity in adolescents. Journal of Korean Society for the Study of Physical Education. 2012. 17(3). p. 91-104.
6. Joo SJ. Effects of a Combined Exercise Program on Changes in Health-Related Physical Fitness and Blood Lipid in Obese High School Girls [dissertation] [Gwangju] Chosun University; 2012. 2 p.
7. American College of Sports Medicine. Guidelines for Exercise Testing and Prescription. Philadelphia(PA). Lippincott Williams & Wilins Press. c2010. p. 48-98.
8. Morris JN. Vigorous in leisure time, protection against coronary heart disease. The Lancet. 316(8206), p. 1207-10.
9. Kim KJ, Kim SH. Association of weekly frequency exercise participation with body composition and inflammatory markers in Korean woman. The Korean Journal of Obesity. 2007. 16(2). p. 65-75.
10. Nam CU, The Effect of Aerobic Exercise, Behavior Modification Treatment on the Body Composition, Blood Lipids, and Leptin Level in Obese Middle-Aged Women [dissertation] [Gwangju] Chonnam National University; 2004. 19 p.

11. Fox EL, Mathewx DK, Bairstow JN. Interval training for lifetime fitness. New York(NY) : Dial Press; c1980. p. 122-8.
12. Riebe D, Ehrman JK, Liguori, G, Magal M. ACSM's guidelines for exercise testing and prescription Guidelines for exercise testing and prescription. Philadelphia(PA): 2018. p. 205-19.
13. Romijin JA, Coly EF, Sidossis LS, Gastaldelli A. Regulation of endogenous fat and carbohydrate metabolism in relation to exercise intensity and duration. *The American Physiological Science*. 1993. 265(3/1). p. 3880-91.
14. Jang KT, Kim MJ, Kim SY. The Effects of Low Intensity and Moderate Intensity Exercise Program on Blood Pressure, Body Composition and Serum Lipids in Middle-aged and Older Female Hypertensives. *Journal of Sport and Leisure Studies*. 2002. 18(2). p. 1357-67.
15. Ha CH, Ha S, So WY. Effects of a 12-week Combined Exercise Training Program on the Body Composition, Physical Fitness Levels, and Metabolis Syndrome Profiles of Obese Women. *Journal of Korean Public Health Nursing*. 2012. 26(3). p. 417-27.
16. Lee SC, Heo MY, Noh SD. The Effects on body composition and metabolic syndrome factors of the 12weeks combination exercise program by age groups on obese women. *The Korean Society of Sports Science*. 2017. 26(1). p. 1111-22.
17. Lee JH, Baik YS. The effect of a 12-week Pilates exercise program in women over 65. *The Korean Journal of Sport*. 2018. 16(2). p. 551-60.
18. Park SJ, Baik YS. The effect of a Physical fitness program in primary school children for 12 weeks. *The Korean Journal of Sport*. 2018. 16(2). p. 505-13.
19. Lee JH. Effect of Aerobic Weight Training on Immunity Function, Body Composition and Serum Lipids in Obese High School Girls. dissertation [Busan] [Kyungsoong University] 2004; 41 p.
20. Park SG, Kwon YC, Jang JH. The Effects of combined Training on Cardiopulmonary Function, Abdominal Fat and Femoral Muscle Volume in Middle School Students. *Korea Sport research*. 2006. 17(3). p. 227-36.
21. Kim SH. The effect of body composition, blood lipids and anabolic hormone on aerobic exercise and resistance exercise in obesity girl students [dissertation] [Gwangju] Chonnam National University; 2001. 38 p.
22. Eric TP, Roman VD, Walter FD, Martin B, Philip AA. Effects of resistance training and endurance training on insulin sensitivity in non-obese, young women: a controlled randomized trial. *Journal of Clinical Endocrinol Metabolic*. c2002. 85. p. 2463-8.
23. Vestergaard HS, Cummings DE, Pepe MS, Breen PA, Matthys CC, Weight DS. Postprandial suppression to ingested caloric load but does not predict inter-meal interval in humans. *Journal of Clinical Endocrinol Metabolic*. c2007. 89. p. 1319-24.
24. Park BJ, Kim SK, Choi JH. Effects of running and running Combined with Weight Training on Health-related Fitness and Blood lipid Profile in Obese Middle School Girls. 2016. 14(2). P. 295-304.
25. Kim MK, Lee MK, Park JS. Effects of 12-week exercise type of GH, IGF-1 and blood lipid profiles in elementary students. *AJMSC with art, Humanities and Sociology*. c2017. 7(10). p. 693-701.

Academic Resilience, Academic Stress, Self-leadership of Korea Nursing Students

Gye-Hyun Jung¹, Mi-Kyung Kang²

¹Department of Nursing, Deajeon University, 62 Daehak-ro, Dong-gu, Daejeon; ²Department of Nursing, Chungwoon University, Daehakgil, Hongseong-eup Hongseong-gun, Chungnam, Republic of Korea

ABSTRACT

Background/Objectives: The purposes of this study were to identify the degree of self-leadership, academic stress and academic resilience of Korean nursing students and apprehend influential factors to academic resilience.

Method/Statistical analysis: Data collection was conducted from December 28, 2017 to January 20, 2018, through a self-report questionnaire to 243 nursing students of Korea. Data were analyzed by frequency, percentage, mean and standard deviation, t-test, ANOVA, Pearson's correlation and multiple regression using IBM SPSS/WIN 22.0.

Findings: This study result confirmed that self-leadership showed a statistically significant positive correlation with academic resilience and academic stress showed a negative correlation with academic resilience among nursing students of Korea. The significant predictors of academic resilience for nursing students of Korea were self-leadership, perceived health status, academic stress. The explanatory power of these variables was 43.9%.

Improvements/Applications: The findings of this study suggest that the approach to the nursing curriculum reflection and program development so as to improve academic resilience of Korea nursing students. And when developing a program to improve academic resilience, the subjective health status of nursing students should also be considered.

Keywords: nursing, student, academic resilience, academic stress, self-leadership

INTRODUCTION

Korean nursing students experience emotional independence from their parents at the time of admission to the university, and various interaction and stress from physical, mental, and social relationship with their peers¹. Also, nursing education in Korea aims to cultivate practical and professional nurses who can integrate and apply knowledge related to health and apprehension about man based on scientific knowledge², but nursing students are under a lot of academic stress³.

Academic stress refers to inconvenient mental status such as mental, psychological burden, nervousness, anxiousness, concern, fear, depression and nervousness from studying and grade⁴. Korean nursing students experience academic stress due to tight schedule, intensive theoretic education, various and unfamiliar clinical practice environment and even due to financial concern⁵. Academic stress affects negatively to the psychosocial life of nursing student², could lead to termination of studying⁶, and even causes a vicious cycle of disabling acquirement of professional ability after graduation⁷. Thus, there is a need to develop teaching-learning strategy that could relieve academic stress of nursing students, and in particular, Korean nursing students need to develop their capabilities to overcome academic stress.

Self-leadership is one of the most important capabilities to handle academic stress⁸. Self-leadership, the process of influencing oneself, highlights

Corresponding Author:

Mi-kyung Kang

Assistant Professor, Department of Nursing,
Chungwoon University, Korea

Email: bladeghost@hanmail.net

fundamental autonomy of man that influence oneself to give motivation to achieve a goal after setting one's own goal⁹. Those with high level of self-leadership could create more innovative and creative performance in tasks or problem solving process¹⁰. Thus, self-leadership is an essential element for Korean nursing student to adjust to desirable college life, and prepare professional capabilities as a nurse after graduation.

Meanwhile, academic resilience refers to a feature that generates successful result by overcoming excessive academic stress condition such as failure, low accomplishment and pressure in school and positively adjusting to the situation¹¹. According to previous researches about academic resilience, it is an important element that reduces academic stress of nursing students, and it was confirmed that higher academic resilience leads to positive adjustment to academic stress, higher academic performance and higher accomplishment in interpersonal relationship and occupation¹². Also, higher academic resilience improves problem solving and communicative ability², which enables positive adjustment to college life¹³. Thus, academic resilience is an important variable for Korean nursing students to positively adjust to situations involving massive amount of learning and unfamiliar practices to deal with academic stress.

However, researches that studied the relationship between self-leadership which enables students to handle academic stress in various situations and academic resilience which enables positive adjustment to situation are very insufficient. Thus, this study aims to apprehend academic stress, self-leadership and academic resilience of Korean nursing students, verify the influence of academic stress and self-leadership to academic resilience to provide basic data to development of education program for improvement of academic resilience of nursing students.

MATERIALS AND METHOD

Study design: This study is a descriptive research study to confirm the degree of self-leadership, academic stress and academic resilience of Korean nursing students and apprehend influential factors to academic resilience.

Study subject: The study conducted convenient sampling targeting nursing students from 3 universities located in C city, and D metropolitan city of Korea. To

confirm the adequacy of sample size of subjects, the study used G*Power 3.1.4 program. Based on significance level .05, effect size .15, and test power .95 for multiple regression analysis, the minimum number of sample was 172. The study applied 243 subjects for final analysis.

Study tool

Academic stress: Academic stress was measured using SAS (Scale of Academic Stress) developed by Park and Park¹⁴. This tool is composed of 45 questions with Likert's 6-point scale from 'strongly disagree (1 point)' to 'strongly agree (6 point)', higher point referring to heavier stress. The Cronbach's α , the credibility of tool was .96 in Park and Park's study¹⁴ and it was .96 in this study

Self-leadership: As for the self-leadership, the study used a survey which was revised and interpreted by Shin, Kim and Han¹⁵ considering conditions in Korea based on RSLQ (Revised Self-Leadership Questionnaire) developed by Neck and Houghton¹⁶. This tool is composed of 35 questions with Likert's 5-point scale from 'strongly disagree (1 point)' to 'strongly agree (5 point)', higher point referring to higher self-leadership. The Cronbach's α , the credibility of tool was .81 in Yang and Moon's study¹⁷ and it was .86 in this study.

Academic resilience: Academic resilience was measured by tool developed by Park and Kim¹⁸. This tool is composed of 29 questions with Likert's 5-point scale from 'strongly disagree (1 point)' to 'strongly agree (5 point)', higher point referring to higher academic resilience. The Cronbach's α , the credibility of tool was .84 in Nho's study¹⁹ and it was .94 in this study.

Data collection method and procedure: Data was collected from January 15 to February 28, 2018, and it took about 15~20 minutes to answer the questionnaire. Before the research, the researchers visited the nursing departments of four universities and explained to the director of the nursing department about the purpose of the study and the progress of the study. After that, the researchers explained to the nursing students the purpose and progress of the study and collected the data to nursing students who agreed. 261 Korean nursing students responded to questionnaire and total 243 copies excluding 18 copies with insincere or wrong answers were used in analysis.

Data analysis: The collected data was analyzed through IBM SPSS/WIN 22.0 program. General characteristics and

descriptive statistics of variables of Korean nursing students were analyzed in frequency, percentage, average and SD. The difference of academic resilience in accordance with general characteristics of Korean nursing students was analyzed using t-test or one ANOVA, sheffit's test. Correlation among self-leadership, academic stress, and academic resilience of Korean nursing student was analyzed using Pearson's correlation coefficients. Analysis on influential factors to academic resilience of Korean nursing student was conducted by using Stepwise Multiple regression.

Ethical consideration of the study: The study subjects were explained about the purpose of study, and those who agreed to participation self-report questionnaire. The subjects were able to start the questionnaire after signing the study agreement. In addition, the study consent formulated that the data collection is anonymous and that the collected data will not be used for research purposes in order to protect the personal information of the subject. The subjects understood that they can terminate the participation at any time and there is no disadvantage in dropping out of the study. Also, they received an explanation about confidentiality of private information.

RESULTS AND DISCUSSION

Results

General characteristics of subjects: The subjects of this study were 243 students, 74.1% of subjects were women and 43.2% were seniors. 56.8% of subjects received 200~30 thousand won per month as petty cash and 46.9% lived in dormitory. 72.8% of subjects did not attend club activity, and as for the subjective health condition, 50.2% were normal as seen in Table 1.

As for the difference in academic resilience of the subjects, gender, grade, GPA (grade point average), satisfaction on major, subjective health condition had significant influence. Post analysis results, male students had higher academic resilience than female students ($t=2.92, p<.005$). Also, academic resilience of senior was higher than freshman and sophomore ($F=4.96, p<.005$). Students with GPA between 3.5~4.0 had higher academic resilience than those with GPA lower than 3.0 ($t=3.46, p<.05$), and those with higher satisfaction on major had higher academic resilience ($t=22.22, p<.000$). The higher the subjective health condition, the higher the academic resilience ($t=14.40, p<.000$) as seen in Table 1.

Table 1: Difference in academic resilience by general characteristics (N = 243)

Characteristics	Categories	N(%)	Academic Resilience		Scheffé
			M ± SD	t/F(p)	
Sex	Female	180(74.1)	105.32 ± 14.92	2.92 (.004)	
	male	63(25.9)	111.68 ± 14.78		
Grade	Freshman ^a	63(25.9)	104.30 ± 14.34	4.96 (.002)	a,b<d
	Sophomore ^b	39(16.0)	103.31 ± 15.85		
	Junior ^c	36(14.8)	103.44 ± 13.33		
	Senior ^d	105(43.2)	111.13 ± 15.05		
Religion	Yes	96(39.5)	107.52 ± 15.63		
	No	147(60.5)	106.60 ± 14.82		
Pocket money (10,000won/m)	Less 20	42(17.3)	106.33 ± 14.90		
	20-39	138(56.8)	107.73 ± 13.30		
	More 40	63(25.9)	105.71 ± 18.73		
Score	More 4.0 ^a	18(7.4)	110.11 ± 18.32	3.46 (.017)	b>d
	3.5~4.0 ^b	105(43.2)	109.25 ± 16.52		
	3.0~3.5 ^c	92(37.9)	105.97 ± 12.45		
	Less 3.0 ^d	28(11.5)	99.68 ± 13.31		
Major satisfaction	Unsatisfaction ^a	34(14.0)	99.09 ± 13.87	22.22 (<.001)	a,b<c
	Moderate ^b	167(68.7)	105.52 ± 13.67		
	Very Satisfaction ^c	42(17.3)	119.10 ± 15.05		

Conted...

Type residency	Parent's house	60(24.7)	109.10 ± 16.07		
	Dormitory	114(46.9)	105.92 ± 15.54		
	Boarding house	69(28.4)	106.77 ± 13.47		
Club activities	Yes	66(27.2)	105.52 ± 15.45		
	No	177(72.8)	107.50 ± 15.00		
Smoking	Yes	9(3.7)	108.11 ± 11.25		
	No	234(96.3)	106.92 ± 15.26		
Regular exercise	Yes	39(16.0)	108.87 ± 18.26		
	No	204(84.0)	106.60 ± 14.46		
Perceived health status	Healthy ^a	88(36.2)	113.26 ± 15.55	14.40 (<.001)	a>b,c
	Moderate ^b	122(50.2)	104.29 ± 14.01		
	Unhealthy ^c	33(13.6)	100.09 ± 11.98		

Level of self-leadership, academic stress, and academic resilience of subjects: Self-leadership of subjects was average 3.41 out of 5. Among its sub-factors, self-clue (3.62) was the highest, and the lowest was self-conversation (3.20). Academic stress of subjects was 2.93 out of 6, and among its sub-factors the highest was GPA (3.16) followed by studying (2.87) and lecture (2.74). Academic resilience of subjects was 3.69 out of 5, and among its sub-factors, employment possibility (3.80) was the highest and the lowest was control studying (3.50) as seen in Table 2.

Correlation among self-leadership, academic stress, academic resilience of subject: Self-leadership of subjects had significantly positive correlation with academic resilience($r=.53, p<.000$), while academic stress had statistically significant negative correlation with academic resilience($r=-.38, p<.001$) as seen in Table 3.

Table 2: Level of self-leadership, academic stress, and academic resilience of subjects (N = 243)

Variables	M ± SD	Range	
Self-Leadership	3.41 ± 0.42	1	5
self-goal setting	3.37 ± 0.67	1	5
Self-compensating	3.41 ± 0.81		
self-punishment	3.38 ± 0.76		
Self-observation	3.50 ± 0.58		
Self-cue	3.62 ± 0.82		
Natural reward	3.27 ± 0.85		
Imagine a successful performance	3.30 ± 0.77		
Self-conversation	3.20 ± 0.73		
Belief and analysis of supposition	3.56 ± 0.59		

Conted...

Academic Stress	2.93 ± 0.83	1	6
grade	3.16 ± 0.96		
Lecture	2.74 ± 0.86		
study	2.87 ± 0.94		
Academic Resilience	3.69 ± 0.52	1	5
Positive Attitude	3.57 ± 0.65	1	5
Self-Control	3.80 ± 0.54		
learning regulation	3.50 ± 0.66		
Task Responsibility	3.76 ± 0.61		
Peer supporting	3.78 ± 0.65		
Parents supporting	3.72 ± 0.72		

Table 3: Correlation among self-leadership, academic stress, academic resilience of subject (N = 243)

Variables	1	2	3
	γ		
1. Self-Leadership	1		
2. Academic Stress	-0.118	1	
3. Academic Resilience	.53**	-.38**	1
* $p<.05$, ** $p<.01$			

Influential factors to academic resilience of subjects:

To apprehend influential factors to academic resilience of subjects, the study conducted multiple regression analysis by setting academic resilience as dependent variable, and gender, grade, GPA, satisfaction on major, subjective health condition that showed significant difference among general characteristics in step 1, and self-leadership, academic stress that had significance correlation in step 2 as independent variables. The range of tolerance to all variables was 0.73~0.92, and the range of VIF (Variance Inflation Factor) was 1.08~1.36 which maintained

multicollinearity. The Durban-Watson statistic was 2.02 which confirmed normal autocorrelation as it is similar to 2. As the result of regression analysis, the influential factor to academic resilience of subjects ($F=48.75, p<.001$) were self-leadership ($\beta=.47, p<.001$), subjective health condition ($\beta=-.21, p<.001$) and academic stress($\beta=-.20, p<.001$)and such factors explained 43.9% of academic resilience of Korean nursing students as seen in Table 4.

DISCUSSION

This study aimed to find out academic stress, self-leadership and academic resilience of Korean nursing students, verify the influence of academic stress and self-leadership to academic resilience to provide basic data to development of education program for improvement of academic resilience of nursing students. The academic resilience of study subjects were 3.69 out of 5 which is similar to 3.67 from Bae and Park’s study², but higher than Shin’s study¹² 3.39. And as for the academic resilience in accordance with general characteristics of study subjects, there were difference in accordance with gender, grade, GPA, satisfaction on major and subjective health condition. This indicates the higher grade, higher GPA, and higher satisfaction on major is related to higher academic resilience which is similar to the result of Shin’s study¹². It seems academic resilience of nursing student differs by region, campus and department’s culture and place of practical training. As Bae and Park² suggested, to improve academic resilience, the students’ capability to overcome difficult and hard academic process, there is a need for not only the inner and outer resource of individual student, but also various learning strategy which will improve nursing students who study together under same objective. In addition, the instructor should be able to have positive thinking and achievement of nursing through feed-back between teacher and learner so as to solve diverse academic stresses of nursing students in developing learning programs to improve academic resilience something to do.

It was confirmed that when the self-leadership is high and academic stress is low, the subject’s academic resilience was high. When comparing academic resilience as the subordinate concept of resilience, it supported Lee’s study¹⁴ result that higher self-leadership leads to higher resilience. This indicates reinforcement of self-leadership capability for positive and constructive thinking can effectively handle stress, difficult situation or academic maladjustment, and that there is a need to consider a student instruction strategy that could improve functional handling ability with clear sense of goal toward career and academic motivation of nursing student through academic resilience.

Influential factors to academic resilience of nursing students were self-leadership, subjective health condition and academic stress ($F=48.75, p<.001$), and explanation power of these variables were 43.9%. This seems to improve capability²⁰ to effectively handle frustration and stress in academic scene through self-leadership¹⁴ to autonomously conduct task in efficient way. Also, when nursing students feel healthy physically, socially, and mentally, they will be able to carry out academic tasks with positive thoughts in new and difficult situations. Therefore, it is necessary to develop educational curriculum so that Korean nursing students can find various ways to solve academic stress efficiently. And, there is a need to develop a curriculum program linked with self-leadership to improve academic resilience of Korean nursing students.

This study result confirmed that self-leadership is the most influential antecedent predicting academic resilience of nursing students. Thus, it confirmed that changing students to discover behaviors to motivate themselves have positive mind and do construct thinking affects ability to effectively handle stress and crisis in academic scene. Also, the study is meaningful as it suggested a specific student instruction strategy to improve academic resilience.

Table 4: Factor affecting academic resilience of nursing students (N = 243)

Variables	Model I				Model II			
	B	SE	β	p	B	SE	β	p
(Constant)								
health	-5.02	1.39	-0.22	<.001	-4.78	1.20	-0.21	<.001
score	-2.66	1.11	-0.14	0.017	-1.68	0.96	-0.09	0.080
grade	-4.65	1.80	-0.15	0.010	-2.10	1.54	-0.72	0.156

Conted...

satisfaction	6.60	1.71	0.24	<.001	2.53	1.51	0.09	0.097
Self-Leadership					0.47	0.05	0.45	<.001
Academic Stress					-0.08	0.02	-0.20	<.001
Adjustic. R ²	0.214				0.439			
F(p)	5.73(<0.05)				48.75(<.001)			

* Dummy variable: grade (4 = 0, other-1)

CONCLUSION

In conclusion, the academic resilience of Korean nursing students were higher when self-leadership was high and academic stress was low. Also, it was confirmed that the influential factors to academic resilience of nursing students were self-leadership, subjective health condition and academic stress, and the explanation power of the variables were 43.9%.

There is a need for aggressive student instruction to improve academic resilience and reduce academic stress of Korean nursing students, and developing and applying curriculum program considering self-leadership would be an effective strategy for academic resilience. In addition, since nursing students are able to solve their academic stress effectively and efficiently in studying nursing when they perceive themselves as healthy, it is important to develop a program to improve academic resilience in order to improve the physical, social and psychological health status of nursing students It should be considered.

This study targeted nursing students from 3 universities in C city, and D metropolitan city of Korea which makes it hard to generalize the result. Thus, this study hereby suggests a follow-up study by expanding number of samples of subjects from each region. Also, this study suggests a multilateral research regarding other influential factors to academic resilience based on the result of this study.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: No conflict of interest has been declared by the authors.

REFERENCES

1. Park JH, Kim EH. Relationship of Academic Stress, Ego-resilience and Health Promoting Behaviors in Nursing Students. *Journal of the Korea Academia-Industrial cooperation Society*.2017;18(9):193-202. <https://doi.org/10.5762/KAIS.2017.18.9.193>
2. Bae YJ, Park SY. Study on Predictors of Academic Resilience in Nursing Students. *Journal of the Korea Academia-Industrial cooperation Society*. 2014;15(3):1615-1622. <http://dx.doi.org/10.5762/KAIS.2014.15.3.1615>
3. Acharya PR, Chalise H. Self-esteem and academic stress among nursing students. *Kathmandu University medical journal*. 2015;13(52):298-302.<https://doi.org/10.3126/kumj.v13i4.16827>
4. Oh MH, Cheon SM. Analysis of Academic Stressors and Symptoms of Juveniles and Effects of Meditation Training on Academic Stress Reduction. *The Journal of Human Understanding and Counseling*. 1994;15: 63-96.
5. Watson R, Gardiner E, Hogston R, Gibson H, Stimpson A, Wrate R, et al. A longitudinal study of stress and psychological distress in nurses and nursing students. *Journal of Clinical Nursing*. 2009;18:270–278. <http://dx.doi.org/10.1111/j.1365-2702.2008.02555.x>.
6. ÖNER ALTIÖK H, ÜSTÜN B. The Stress Sources of Nursing Students. *Educational Sciences: Theory & Practice*. 2013;13(2):760-766. <https://eric.ed.gov/?id=EJ1017246>
7. Quan LH. The effects of biofeedback training on stress and academic resilience of the nursing students. [master's thesis]. South Korea: Seoul National University. 2012. 81p.

8. Lee GY. Levels of self leadership among nursing student in Metropolitan. *Journal of Education & Culture*. 2016;22(6):233-253. <http://kiss.kstudy.com/thesis/thesis-view.asp?key=3492109>
9. Manz CC. Taking the self leadership high road: smooth surface or potholes ahead?. *The Academy of Management Perspectives*. 2015;29(1):132-151. <https://doi.org/10.5465/amp.2013.0060>
10. DiLiello TC, Houghton JD. Maximizing organizational leadership capacity for the future: Toward a model of self-leadership, innovation and creativity. *Journal of Managerial Psychology*. 2006;21(4):319-337. <https://doi.org/10.1108/02683940610663114>
11. Martin AJ, Marsh HW. Academic resilience and academic buoyancy: Multidimensional and hierarchical conceptual framing of causes, correlates and cognate constructs. *Oxford Review of Education*. 2009;35:353-370. <https://doi.org/10.1080/03054980902934639>
12. Shin SH. The Effect of Academic Stress and the Moderating Effects of Academic Resilience on Nursing Students' Depression. *Journal of Korean Academic Society of Nursing Education*. 2016;22(1):14-24. <https://doi.org/10.5977/jkasne.2016.22.1.14>
13. Lee JS. Effect of Self-Leadership and Resilience on College Adjustment in Nursing Students. *Journal of the Korea Academia-Industrial cooperation Society*. 2016;17(10):253-260. <http://dx.doi.org/10.5762/KAIS.2016.17.10.253>
14. Bak BG, Park SM. Development and Validation of an Academic Stress Scale. *Korean Journal of Educational Psychology*. 2012;26(2):563-585. <http://www.dbpia.co.kr/Article/NODE06763900>
15. Neck CP, Houghton JD. Two decades of self-leadership theory and research. *Journal of Managerial Psychology*. 2006;21(4):270-295. <https://doi.org/10.1108/02683940610663097>
16. Shin YK, Kim MS, Han YS. A study on the validation of the Korean Version of the Revised Self-Leadership Questionnaire(RSLQ) for Korean college students. *The Korean Journal of School Psychology*. 2009;6(3):313-340. <http://www.dbpia.co.kr/Journal/ArticleDetail/NODE06372338>
17. Yang NY, Moon SY. Relationship of Self-leadership, Stress and Satisfaction in Clinical Practice of Nursing Students. *Journal of Korean Academy of Nursing Administration*. 2011;17(2):216-225. <http://www.dbpia.co.kr/Article/NODE06641618>
18. Park JY, Kim NR. A study on the development and validity of academic resilience scale for non-traditional student. *The Korea Educational Review*. 2009;15(3):215-239. <http://www.papersearch.net/thesis/article.asp?key=3135293>
19. Noh GO. The Effects of Perfectionism and Academic Resilience on the Level of Students' Satisfaction with Nursing Major. *Journal of Korean Academic Society of Nursing Education*. 2017;23(2):205-213. <http://dx.doi.org/10.5977/jkasne.2017.23.2.205>
20. Kwon JH, Lee YJ. The Effects of Active Coping Strategy on Subjective Happiness in College Student: Mediated Effect of Academic Resilience. *Journal of The Korea Contents Society*. 2017;17(12):104-116. <http://www.dbpia.co.kr/Article/NODE07290999>

The Effects of Smartphone Use on the Mechanical Properties of the Upper Trapezius Muscle and Craniovertebral Angle

Jong-Hoon Moon¹, Sung-Jin Heo², Jin-Hwa Jung³

¹Department of Healthcare and Public Health Research, National Rehabilitation Research Institute, National Rehabilitation Center, 58, Samgaksan-ro, Gangbuk-gu, Seoul, Republic of Korea;

²Research Institute for convergence of Biomedical Science and Technology, Pusan National University Yangsan Hospital, 20, Geumo-ro, Mulgeum-eup, Yangsan-si, Gyeongsangnam-do, Republic of Korea;

³Department of Occupational Therapy, Semyung University, 65, Semyeong-ro, Jecheon-si, Chungcheongbuk-do, Republic of Korea

ABSTRACT

Background/Objectives: This study's purpose is twofold: to investigate the influence of smartphone use on the mechanical properties of upper trapezius muscle (UTM), forward head posture (FHP) and to examine the correlation between time spent using a smartphone, neck pain, and FHP.

Method/Statistical analysis: Thirty adults who average more than one hour of smartphone use per day participated in this study. We measured all participants' degree of the mechanical properties of UT and the craniovertebral angle (CVA) in normal conditions and during smartphone use. The order of experiments for both conditions was counterbalanced. We used Myoton to measure the mechanical properties (tone, elasticity, and stiffness) of UT, and we analyzed the CVA using a digital camera and ImageJ. Paired t test and Pearson correlation analysis were used for the statistical analysis.

Findings: The smartphone use condition was significantly lower in CVA than normal condition ($p < .05$). The smartphone use condition was significantly higher in both tone and stiffness for UT than when in normal condition, and the elasticity was lower ($p < .05$). The average smartphone use time per day was positively correlated with neck pain ($p < .05$), and neck pain was negatively correlated with CVA during smartphone use ($p < .05$). This study's findings suggest that smartphone use might increase the tone of UT and FHP.

Improvements/Applications: This study's findings suggest that smartphone use might increase the tone of UT and FHP.

Keywords: Smartphone, Mechanical property, Trapezius muscle, Forward head posture, Craniovertebral angle

INTRODUCTION

The smartphone has become one of the most important necessities for modern people in the information technology (IT) era; the number of smartphones subscribers in Korea exceeded 43 million in 2016 [1]. Although smartphones provide us with comfortable and efficient lives, they are also closely related to occurrences of conditions such as headaches,

neck pain, dry eye syndrome, anxiety, and smartphone addiction [2-4]. As smartphone use time increases, the induction of psychiatric and biomechanical problems also increases. In particular, it can induce forward head posture (FHP) among users, which is closely related to neck and disk pain [2-5].

Continuous sitting postures increase fatigue in muscles around the spine and aggravate lordosis and kyphosis in the waist and back; this is closely related to the aforementioned FHP [6]. Working in front of a computer for a long time or using a smartphone without moving for a long time increases tension in the neck and shoulder muscles [7]. This continued tension accelerates changes in the cells of skeletal muscles, which then

Corresponding Author:

Jin-Hwa Jung

Department of Occupational Therapy, Semyung University

E-mail: otsalt@nate.com

inhibit the correct support of the cervical spine and induce a load on the ligament that surrounds the corresponding joints [7]. This load excessively elongates the ligament and the ligament around the neck senses the pain very sensitively, thereby perceiving the nociceptive pain strongly [8].

Previous studies have reported that headaches that originate in the musculoskeletal system and neck pain are related, as are neck pain and activity of the upper trapezius muscle (UTM). Oksanen et al. [9] compared muscle activation of UTM during neck flexion among those who had tension headaches and migraines using electromyography (EMG). Their study reported that the tension headache group was related to changes in activities of upper trapezius. Chang and Lee [10] compared the muscle activity in the UTM and neck extensor muscles according to how the smartphone is held and body posture. Thus, study result of Chang and Lee [10] revealed significant differences in the activation of the UTM according to body posture.

Recent studies have examined the importance of the UTM. That is, stress and body fatigue are closely related to the UTM [11], which is controlled by the 3rd cervical vertebrae nerve root and innervated by the accessory nerve, which is the eleventh cranial nerve. Although this nerve is a motor nerve, it passes through the jugular foramen of the posterior cranial fossa alongside the vagus nerve that is responsible for the autonomic nervous system [12]. Two nerves are met in the inferior ganglion of the vagus nerve that passes through the jugular foramen of the posterior cranial fossa. Even though the accessory nerve is a pure motor nerve, it communicates with the vagus nerve; thus, the accessory nerve is closely related to the autonomic nerve's control. The trapezius and sternocleidomastoid muscles, which are innervated by the accessory nerve, experience pain together with frequent muscle tone increases under psychological stress [11-13].

Muscle tone is defined as resistance to passive stretch where the muscle's reflective drive or other effects in relation to muscles' mechanical elastic characteristics are reflected [14]. This muscle tone is affected by changes in the body. Previous research has introduced Myoton as a method of inspecting muscles' mechanical characteristics. The assessment of muscle characteristics using Myoton is less expensive than using surface EMG and simpler, thereby saving measurement time [15]. Myoton measurements showed a statistically significant association with the muscle activities of surface EMG [15, 16].

Although a smartphone is an indispensable necessity, it should be used properly so that modern people manage their healthcare [1-5, 17-19]. Previous studies have suggested the negative effects of excessive smartphones use [20, 21]. However, studies have not been conducted the influences of smartphone use on the mechanical characteristics of the UTM. In addition, correlations among smartphone use period, neck pain, and FHP need verification, which will be foundational data for future studies.

Thus, presents study aims to determine the influences of smartphone usage on the mechanical characteristics of the UTM and FHP and verify the relationship among the smartphone use period, neck pain, and FHP.

MATERIALS AND METHOD

Subjects: Present study involved experiments with 30 adults who used smartphones for more than an hour each day. The selection criteria for participants were as follows: (1) no surgical history in the neck or waist, (2) no history of neurological disease, and (3) no prior surgical procedures. The participant exclusion criteria were (1) less than one hour of smartphone use as self-reported and (2) no severe symptoms whose visual analog scale in neck pain was greater than seven points. The answers to the questions about the smartphone use time were obtained via oral interviews and participants were fully informed of the experiment and gave voluntary consent prior to the experiment. Table 1 presents the subjects' general characteristics. This study was approved by the Semyung University Institutional Review Board.

Table 1: General characteristics of the participants
Participants (n = 30)

Sex, n (%)	Male	15(50)
	Female	15(50)
Age (year) ^a	28.00 ± 2.60	
Height ^a	169.33 ± 7.84	
Weight ^a	61.77 ± 9.33	
Body mass index ^a	21.45 ± 2.15	
neck pain (VAS) ^a	3.17 ± 2.07	
Average time of smartphone use per day (hours) ^a	3.30 ± 2.22	
Footnotes. ^a mean±SD, VAS =Visual Analog Scale.		

Measurements

Myoton: A Myoton device (Tallinn, Estonia) was used to measure mechanical characteristics such as the muscle tone, muscle elasticity, muscle stiffness of participants' UTM. The measurements on the UTM were conducted in the same manner as that used in previous studies. The measurements on the UTM using the Myoton were conducted as follows: Participants were seated correctly and the measuring point of the UTM was marked by a pen at the horizontal midline connected from the acromion to the 7th cervical vertebra spinous process. Then, the probe was positioned to make the ground and muscle perpendicular to each other, followed by pressing the probe properly to enable proper measurement. The mechanical characteristics using Myoton were mostly expressed by muscle tone, muscle elasticity, muscle stiffness. Muscle tone is a quantified mechanical tone in muscles and its unit is Hz. Muscle elasticity refers to the muscle elastic property, and its unit is expressed as a log decrement. The stiffness refers to the level of hardness in muscle and its unit is N/m. The Myoton device's reliability is more than .90, which is very high [22].

Craniovertebral angle: The craniovertebral angle (CVA) was analyzed when the participants were seated to measure the FHP [6]; digital cameras and tripods were used in the analysis, the distance between the participant and camera was set to 0.8 m, and the right side of the participant was shot. The CVA was measured after attaching a marker to the tragus of the ear and 7th cervical vertebra spinous process and measuring the angle between the line parallel to the ground at the 7th cervical vertebra spinous process and the line that connects the tragus of the ear and 7th cervical vertebra spinous process. The analysis employed ImageJ (US National Institutes of Health, USA), and the CVA was measured twice repeatedly so that a mean value could be recorded. The CVA was analyzed when the participants were seated to measure the FHP [6]. Digital cameras and tripods were used in the analysis; the distance between the participants and the camera was set to 0.8 m and the right side of the participant was shot. The CVA was measured after attaching a marker to the tragus of the ear and spinous process of the seventh cervical vertebra and measuring the angle between the line parallel to the ground at the 7th cervical vertebra spinous process and the line that connects the tragus of the ear and 7th cervical vertebra spinous process. The analysis employed ImageJ, and CVA was measured twice repeatedly to record a mean value; this value was used in the statistics.

Procedures: The environment was the same for all participants, and subjects were seated in height-adjustable chairs to give them their most comfortable position. The CVA and mechanical characteristics of the UTM were measured while all participants took two states: seated comfortably and using smartphones. Counterbalancing was used to exclude the order effect of two states in the measurement. In addition, a rest was given between the two states to prevent fatigue. In the comfortable state, participants watched a television in front of them for three minutes. In the smartphone-using state, participants spent three minutes typing the Korean national anthem into the smartphone's message window. One evaluator took a photo to measure the CVA at each state, and measured the mechanical characteristics of the UTM in the right side and left sides. The evaluator was an occupational therapist with a six-year clinical career. The other evaluator who also conducted the analysis was also an occupational therapist; the evaluators had practiced the angle measurement sufficiently prior to the experiment.

Statistical analysis: The collected data were analyzed using Statistical Package for the Social Sciences 22 (SPSS 22). The participants' general characteristics were analyzed using descriptive statistics and the mechanical characteristics of the UTM were compared in a comfortable state and smartphone-using state, using a paired sample t test. Pearson correlation analysis was employed to analyze the correlation among smartphone-use period, neck pain, and FHP. Statistical significance was set at .05.

RESULTS AND DISCUSSION

The CVA was significantly lower in the smartphone-use state than in the comfortable state ($p < .05$) [Table 2]. The muscle tone and muscle stiffness in the UTM on the right and left sides were significantly higher in the smartphone-use state than the comfortable state, whereas the elasticity was significantly lower ($p < .05$) [Table 3]. The correlation analysis result among smartphone usage, pain, and CVAs during comfortable and smartphone-use states revealed that the smartphone-use time correlated significantly positively with neck pain ($p < .05$), but no correlation was found with CVA. Neck pain had a significant negative correlation with CVA during smartphone use ($p < .05$), but no correlation was found with CVA during the comfortable state ($p > .05$). The CVA during the comfortable state had a significant positive correlation with the CVA during smartphone use ($p < .05$) [Table 4].

Table 2: Comparison of forward head posture in two conditions

	Normal condition	Smartphone use condition	t	p
	Mean ± SD	Mean ± SD		
Craniovertebral angle (CVA)	48.37 ± 3.79	35.60 ± 4.90	22.370	<.001**

Footnotes. *p<.05, **p<.01.

Table 3: Comparison of mechanical property on upper trapezius muscle in two condition

Mean ± SD		Normal condition	Smartphone usecondition	t	p
		Mean ± SD			
Tone (Hz)	Right side	18.45 ± 1.10	20.05 ± 1.75	-4.992	<.001**
	Left side	18.01 ± 1.15	19.84 ± 3.68	-2.513	<.018*
Elasticity (Log decrement)	Right side	1.11 ± 0.07	0.99 ± 0.06	9.992	<.001**
	Left side	1.10 ± 0.08	1.01 ± 0.07	4.863	<.001**
Stiffness (N/m)	Right side	336.87 ± 46.29	403.00 ± 44.93	-8.660	<.001**
	Left side	325.73 ± 30.01	395.27 ± 47.14	-9.444	<.001**

Footnotes. *p<.05, **p<.01.

Table 4: Correlation between smartphone use, neck pain, and forward head posture

	Average time of smartphone use	Neck pain (VAS)	CVA in normal condition	CVA in smartphone use condition
Average time of smartphone use	1.000			
Neck pain (VAS)	.560**	1.000		
CVA in normal condition	.089	-.351	1.000	
CVA in smartphone use condition	-.071	-.459*	.770**	1.000

Footnotes. *p<.05, **p<.01; VAS =Visual Analog Scale; CVA =CranioVertebral Angle.

Our study aimed to determine the effect of smartphone use on the mechanical characteristics in the UTM and FHP, and identify the correlation among smartphone-use time, neck pain, and FHP. The analyses of the study results are as follows:

The first study results showed that CVA was significantly lower the smartphone-use state than in the comfortable state. Kim et al. [20] analyzed the change in FHP according to smartphone use with 18 male and female adults; their study results showed that FHP worsened over time. This study verified that FHP was increased more significantly in the smartphone-use state than in the comfortable state even though the difference was not due to any time lapse.

In the second study results, the muscle tone and stiffness in the UTM on the right side and left sides were significantly higher in the smartphone-use state than the comfortable state, whereas the elasticity was

significantly lower. This findings was due to the increase in muscle tone and reduced elasticity in the UTM due to smartphone use. Interestingly, changes in the left trapezius muscle were discovered even though the task was conducted with the right hand; this was due to the unconscious compensation action of the human body to maintain the correct alignment for both sides of the body.

The increase in muscle tone in the UTM is one of the most mobilized compensable muscle movements at the time of functional disorder in the neck and shoulders and movements occur during incorrect posture [23]. In particular, office workers who have to work in a sitting posture for long periods experience increased muscle activity in the UTM, resulting in reduced muscle activities of lower trapezius muscle and serratus anterior muscle. The functional degradation in the lower trapezius and serratus anterior muscle is related to weakening and shoulder pain and increased imbalance of the shoulder joints; FHP increases the neck pain occurrence rate [23, 24].

In the third study results that included a correlation analysis, daily mean smartphone use time was positively correlated with neck pain significantly and neck pain was negatively correlated with CVA significantly during the smartphone-use state. Kim and Kim ^[21] reported that the mechanical characteristics of the UTM and smartphone addition scores of healthy male adults in their 20s correlated significantly. Hyperactivity in the UTM, which was a connecting portion between the neck and shoulder, was correlated with the stress index and pain ^[4]. In this regard, this study exhibited a significant correlation between smartphone use time and neck pain; the correlation between CVA and neck pain during the smartphone-use state implies that pain may be induced further by bad smartphone use habits. In addition, the CVA had a high correlation with the comfort and smartphone-use states, which implied that people with bad posture in normal times also had bad posture during smartphone use.

There was no significant correlation between smartphone use time and CVA; which means that the cause of FHP was not solely related to normal smartphone use time. The causes of the FHP can be varied ^[6]; for example, they can be constant work at a sitting position, computer games, excessive studying, fatigue, or aging. Since various causes are combined, no significant correlation was exhibited in particular ^[7]. The neck pain in this study had no significant correlation with the CVA in the comfortable state. Although neck pain was correlated with CVA in the smartphone-use state, it did not in the comfortable state; the reason for this was varied and included psychological problems ^[11]. In fact, some studies reported that FHP and neck pain had a significant correlation, but other studies reported no correlation. Thus, the authors of this study recommend the need for further research based on the correlation relationship of this study, and a few participants should not be overlooked.

The limitations of this study are as follows: first, the mean age of subjects in this study was 28 years, which was relatively young. Thus, the results in this study cannot be generalized for the entire population. Second, this study only verified the short-term effect, as the smartphone use time was set to three minutes in the experiment. Thus, verifying the change over time in a future study is necessary. Third, the number of samples was rather small for the correlation analysis conducted in

this study. Finally, only subjects with neck pain classed as mild-to-moderate pain were selected in this study; thus, differences in patients with severe pain cannot be discussed.

CONCLUSION

This study aims to determine the effect of smartphone use on the mechanical characteristics of the UTM and the FHP and verify the correlation among the smartphone use period, neck pain, and the FHP. The study results exhibited that the CVA was significantly lower in the smartphone-use state than in the comfortable state ($p < .05$), and muscle tone and stiffness in the UTM on the right and left sides were significantly higher in the smartphone-use state than in the comfortable state, whereas elasticity was significantly lower ($p < .05$). The daily mean smartphone use time was significantly positively correlated with neck pain ($p < .05$) and neck pain was significantly negatively correlated with CVA during the smartphone-use state ($p < .05$). Our study results indicate that smartphone use will increase muscle tone in the UTM and FHP. A highly qualitative level of long-term research is needed in future studies.

Ethical Clearance: Not required

Source of Funding: This work was supported under the framework of international cooperation program managed by National Research Foundation of Korea (Grant Number 201801610001).

Conflict of Interest: Smartphone Use on the Mechanical Properties

REFERENCES

1. Park NS, Lee HJ. Social implications of smartphone use: Korean college students' smartphone use and psychological well-being. *Cyberpsychol Behav Soc Netw*. 2012 Sep;15(9):491-7.
2. Hwang KH, Yoo YS, Cho OH. Smartphone overuse and upper extremity pain, anxiety, depression and interpersonal relationships among college students. *The Korea Contents Association*. 2012 Oct;12(10):365-75. Available from: http://www.koreascience.or.kr/article/ArticleFullRecord.jsp?cn=CCTHCV_2012_v12n10_365

3. Moon JH, Lee MY, Moon NJ. Association between video display terminal use and dry eye disease in school children. *J Pediatr Ophthalmol Strabismus*. 2014 Feb;51(2):87-92. Available from: <https://www.healio.com/ophthalmology/journals/jpos/2014-3-51-2/%7B499cc9fa-879a-4820-ae6b-9e0ecab48efc%7D/association-between-video-display-terminal-use-and-dry-eye-disease-in-school-children>
4. Lee JI, Song HS. The correlation analysis between hours of smartphone use and neck pain in the Gachon university students. *The Acupuncture*. 2014 Jun;31(2):99-109. Available from: <https://www.e-jar.org/journal/view.php?number=2162>
5. Kim SY, Koo SJ. Effect of duration of smartphone use on muscle fatigue and pain caused by forward head posture in adults. *J Phys Ther Sci*. 2016 Jun;28(6):1669-72.
6. Quek J, Pua YH, Clark RA, Bryant A L. Effects of thoracic kyphosis and forward head posture on cervical range of motion in older adults. *Man Ther*. 2013 Jan;18(1):65-71.
7. Brandt M, Sundstrup E, Jakobsen MD, Jay K, Colado JC, Wang Y, et al. Association between neck/shoulder pain and trapezius muscle tenderness in office workers. *Pain Res Treat*. 2014 Mar;21(2): 149-56.
8. Steilen D, Hauser R, Woldin B, Sawyer S. Chronic neck pain: making the connection between capsular ligament laxity and cervical instability. *Open Orthop J*. 2014 Oct;8(1):326-31.
9. Oksanen A, Poyhonen T, Ylinen J, Metsahonkala L, Anttila P, Laimi K, et al. Force production and EMG activity of neck muscles in adolescent headache. *Disabil Rehabil*. 2008 Mar;30(3):231-9.
10. Chang EK, Lee HK. A study on the factors influencing smartphone user satisfaction. *Journal of Consumption Culture Studies*. 2010 Dec;13(4):129-45. Available from: https://scholar.google.co.kr/scholar?hl=ko&as_sdt=0%2C5&q=A+study+on+the+ factors + influencing + smartphone + user + satisfaction. & btnG =
11. Marker RJ, Campeau S, Maluf KS. Psychosocial stress alters the strength of reticulospinal input to the human upper trapezius. *J Neurophysiol*. 2017 Jan;117(1):457-66.
12. Rutecki P. Anatomical, physiological, and theoretical basis for the antiepileptic effect of vagus nerve stimulation. *Epilepsia*. 1990 Jun;31(2):231-9.
13. Tsang SM, Szeto GP, Lee RY. Altered spinal kinematics and muscle recruitment pattern of the cervical and thoracic spine in people with chronic neck pain during functional task. *Electromyogr Kinesiol*. 2014 Jan;24(1):104-13.
14. Leonard CT, Deshner WP, Romo JW, Suoja ES, Fehrer SC, Mikhailenok EL. Myotonometer Intra-and Interrater Reliabilities I. *Arch Phys Med Rehabil*. 2003 Jun;84(6):928-32.
15. Janecki D, Jarocka E, Jaskolska A, Marusiak J. Muscle passive stiffness increases less after the second bout of eccentric exercise compared to the first bout. *J Sci Med Sport*. 2011 Jul;14(4):338-43.
16. Rydahl SJ, Brouwer BJ. Ankle stiffness and tissue compliance in stroke survivors: a validation of myotonometer measurements. *Arch Phys Med Rehabil*. 2004 Oct;85(10):1631-7.
17. Worringham C, Rojek A, Stewart I. Development and feasibility of a smartphone, ECG and GPS based system for remotely monitoring exercise in cardiac rehabilitation. *PloS one*[Internet], 2011 Feb;6(2):e14669. Available from: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014669>
18. Milani P, Coccetta CA, Rabini A, Sciarra T, Massazza G, Ferriero G. Mobile smartphone applications for body position measurement in rehabilitation: a review of goniometric tools. *PM&R*. 2014 Nov;6(11), 1038-43.
19. Waki K, Fujita H, Uchimura Y, Omae K, Aramaki E, Kato S, et al. DialBetics: a novel smartphone-based self-management support system for type 2 diabetes patients. *J Diabetes Sci Technol*. 2014 Mar;8(2):209-15.
20. Kim YG, Kang MH, Kim JW, Jang JH, Oh JS. Influence of the Duration of Smartphone Usage on Flexion Angles of the Cervical and Lumbar Spine and on Reposition Error in the Cervical Spine. *Phys Ther Korea*.. 2013 Feb;20(1):10-17. Available from: http://www.koreascience.or.kr/article/ArticleFullRecord.jsp?cn=JMMCBN_2013_v20n1_10

21. Kim YW, Kim CS, Kim MK. Biomechanical Properties of the Cervical Muscles Depending on Degree of Smartphone Addiction. *Med Sci Sports Exerc.* 2016 May;48(5):895. Available from: <https://insights.ovid.com/medicine-science-sports-exercise/mespex/2016/05/001/biomechanical-properties-cervical-muscles/2675/00005768>
22. Gapeyeva H, Vain A. Principles of applying Myoton in physical medicine and rehabilitation. *Methodical Guide.* Tartu. 2008.
23. Johnson GR, Pandyan AD. The activity in the three regions of the trapezius under controlled loading conditions—an experimental and modelling study. *Clin Biomech.* 2005 Feb;20(2):155-61.
24. Ludewig PM, Cook TM. Alterations in shoulder kinematics and associated muscle activity in people with symptoms of shoulder impingement. *Phys Ther.* 2000 Mar;80(3):276-84.

Proposal for the Improvement of Service Quality of Caregivers

Joo-Young Lee¹, Do-Young Lee²

¹Dept. of Nursing, Seoul Women's College of Nursing, 38, Ganhodaero-ro, Seodaemun-gu, Seoul, Korea;

²Dept. of Nursing, Changshin University, 262, Palyongro, Masanhoewon-gu, Changwon-si, Gyeongsangnam-do, Korea

ABSTRACT

Background/Objectives: This study is a descriptive and investigative study that was conducted to identify the association and correlation among the service quality, organizational characteristics and job satisfaction of caregivers.

Method/Statistical analysis: Subjects of this study were 129 caregivers working at long term care insurance facilities located in city S. SPSS 20.0 program was used for analysis.

Findings: The service quality of caregivers and a significant positive correlation with job satisfaction ($F=.432, P<.001$) and organizational characteristics ($F=.248, P=.007$).

Improvements/Applications: It is hoped that the findings of this research will help improve the service quality of caregivers to make the long term care insurance system more stable.

Keywords: Caregivers, Long term care insurance system, Service quality, Organizational characteristics, Job satisfaction

INTRODUCTION

With progress in medicine and science, life expectancy has grown, leading to an increase in the elderly population and an extension of one's later years ^[1]. Korea, too, has been rapidly entering an aging society. By 2018, Korea becomes an aging society where the share of those aged 65 or older accounts for 14.3% of the total population. By 2026, the share will increase to 20.8%, to make Korean society a super-aged society ^[2,3]. In Korea, caregiving for the elderly was traditionally seen as entirely the responsibility of direct family members. But with the rapid aging of the society, more women entering the work force and changes in the family structure, the need for society to share the burden has been raised. This led to the launch of long term care insurance system. Caregivers that carry out

the tasks within the system are increasingly taking on an important role ^[4].

With the introduction of the long term care insurance system, the elderly can ease the burden imposed on their children while receiving more systematic and professional services that allow for higher quality of life. Moreover, children of aged parents can be relieved of the mental, physical and financial burden of having to take care of their parents to focus on their social and economic activities ^[5]. From these aspects, various attempts and studies to improve the quality of services provided by caregivers of the elderly are needed.

With the launch of the long term care insurance system, caregivers are providing services on the front line. Caregivers provide help with household chores or bodily care either at the elderly people's own home or long term care facilities ^[6]. Therefore, care givers are the direct service providers who are closely associated with the quality of elderly welfare services ^[7]. At a time when approximately a decade has passed since the job category of 'caregivers' was born, there are over 310,000 caregivers currently active on the front line, with 1.33 million licensed people in total ^[6]. They receive a low

Corresponding Author:

Do-Young Lee
Professor, Nursing,
Changshin University, Korea
Email: shinern@cs.ac.kr

salary, work long hours and suffer from job insecurity. Many have pointed out that these factors lead to low quality services provided by them. [8]. The service quality of caregivers will likely be associated with their job satisfaction and organizational characteristics of their job as they carry out such diverse tasks. Improvements need to be made to instill pride in caregivers about the work they carry out.

As such, this study analyzes the association among the service quality, organizational characteristics and job satisfaction of caregivers to provide basic data that can be used for the development of a program that can help improve the service quality of caregivers.

MATERIALS AND METHOD

Design of the study: This study is a descriptive and investigative study conducted to identify the association and correlation among the service quality, organizational characteristics and job satisfaction of caregivers.

Study subjects: Study subjects were caregivers working at long term caregiving facilities located in city S. To select subjects, convenience sampling was used to select 134 caregivers working at long term care facilities. These participants understood the objectives of the study and gave their consent to the questionnaire. Excluding 5 copies of the questionnaire that were not retrieved or that had insufficient responses, the data from 129 subjects were used for final analysis.

RESEARCH TOOLS

Service quality: Service quality refers to the score measured using the SERVQUAL scale of Parasuraman, Zeithmal, & Berry [9]. Using a total of 16 questions divided into 4 sub-categories, the tool consists of 2 questions on reliability, 6 questions on responsiveness and guarantee, 4 questions on empathy and 4 questions on typicity. Measured on a 5 point Likert scale, higher scores indicate a higher quality of services as perceived by the caregiver herself. Cronbach's $\alpha = .876$ in this study.

Job satisfaction: Job satisfaction was measured using the Job Descriptive Index (JDI) scale of Smith, Kendall, & Hulin [10]. It consists of a total of 29 questions in 5 categories, covering job satisfaction (6 questions), work environment (4 questions), job security of the caregiver (6 questions), interpersonal relations with colleagues, supervisors and the elderly (5 questions), and compensation and job changes (8 questions). Measured

on 5 point Likert scale, a higher score indicates higher job satisfaction. Cronbach's $\alpha = .754$ in this study.

Organizational characteristics: Organizational characteristics were measured using the tool that was revised from the original tool developed by Dieterly and Schneider [11]. Consisting of a total of 14 questions, the sub-categories cover autonomy, operational structure of the organization, compensation structure or level, and consideration of the supervisor. Measured on a 5 point Likert scale, a higher score indicates a higher degree of a given organizational characteristic. In this study, Cronbach's $\alpha = .845$.

DATA COLLECTION AND PROCEDURES

Data for the study were conducted using a self-reported structured questionnaire on caregivers working at long term care facilities in city S, from May 2 to May 28, 2017. To abide by ethical standards, the objectives of the study, an explanation was given on the time it will take to fill out the questionnaire, and details regarding privacy protection of study participants before asking for their voluntary consent. A consent form and signature of caregivers wishing to take part in the study were collected. Participants were told that they are free to withdraw from the study at any point in time. They were also informed that the collected data would be used for no other purpose than this study, and the anonymity of the participants will be upheld. It took approximately 10-15 minutes to complete the questionnaire. Participants were given an explanation that the collected data would not be used for any other purpose than this study.

DATA ANALYSIS

The collected data were analyzed using SPSS 20.0. The general characteristics of the participants were analyzed in real numbers and percentages. The service quality, organizational characteristics and job satisfaction of participants were analyzed using the mean and standard deviation. The correlation among the service quality, organizational characteristics and job satisfaction of participants were analyzed using Pearson's correlation coefficients.

RESULTS AND DISCUSSION

General characteristics of study subjects: The general characteristics of study subjects are as seen in Table 1. In terms of gender, there were 117 females (100%). There were 30 people (25.6%) aged 50-59 and 62 people (53%)

aged 40-49. In terms of marital status, there were 105 people (89.7%) who were married and 7 people (6.0%) who were single. In terms of educational background, there were 59 people whose final education was high school (50.4%) and 58 people whose final education was university (49.6%). In terms of religion, 77 people identified themselves as Christian (65.8%) which was the highest share. The most common response given for work experience as a caregiver was 2-3 years, with 53 subjects (45.3%) giving this response. The highest number of people at 97 people (82.9%) took the license test to acquire a license for their profession, and 51 people (43.6%) answered that their health status was average, which was the most common response given.

Table 1: General Characteristics

(N = 117)

Characteristics	Categories	n (%)
Gender	Female	117(100)
	Male	0(0)
Age(years)	40-49	62(53)
	50-59	30(25.6)
	Over 60	25(21.4)
Marital Status	Single	105(89.7)
	Married	7(6.0)
	Divorce or Bereavement	5(4.3)
Final Education	High school graduate	59(50.4)
	College graduate	58(49.6)
Religion	Christian	77(65.8)
	Catholicism	18(15.4)
	Buddhism	6(5.1)
	Other	1(0.9)
	None	15(12.8)
Caregiver Caregivers (years)	1-2	37(31.6)
	2-3	53(45.3)
	3-5	23(19.7)
	Over 5	4(3.4)
Types of Certification	No examination/ By education	20(17.1)
	As a qualification	97(82.9)
Health Status	Very healthy	6(5.1)
	Healthy	34(29.1)
	Usually	51(43.6)
	Bad	26(22.2)

Range of variables for the subjects: The range for service quality was 2.98 ± 0.19 points, while it was 3.31 ± 0.47 points for reliability, 2.82 ± 0.35 points for responsiveness and guarantee, 2.96 ± 0.33 points for empathy and 3.06 ± 0.36 points for typicity. Job satisfaction scored 3.31 ± 0.26 points, while organizational characteristics scored 2.84 ± 0.13 points. The range of all variables concerning the subjects seen in Table 2.

Table 2: Degree of the Variable of the Subject

(N = 117)

Variables	M ± SD	Min.	Max.
Service Quality	2.98 ± 0.19	2.63	3.44
Reliability	3.31 ± 0.47	1.50	4.50
Responsiveness and Guarantee	2.82 ± 0.35	2.33	3.67
Empathy	2.96 ± 0.33	2.50	4.00
Typicity	3.06 ± 0.36	2.25	3.75
Job Satisfaction	3.31 ± 0.26	2.59	4.03
Organizational Characteristics	2.84 ± 0.13	2.60	3.27

The correlation between variables concerning study subjects: The service quality of caregivers was found to have a significant positive correlation with job satisfaction ($F = .432, p < .001$) and with organizational characteristics ($F = .248, p = .007$). In addition, job satisfaction was found to have a significant positive correlation with organizational characteristics ($F = .323, p = .003$) [Table 3].

Table 3: Relationships among the Study Variable

(N = 117)

Variables	Service Quality	Job Satisfaction	Organizational Characteristics
	r(p)	r(p)	r(p)
Service Quality	1	.432 (<.001)	.248 (.007)
Job Satisfaction		1	.323 (.003)
Organizational Characteristics			1

DISCUSSION

This study was conducted to identify the association and correlation among the service quality, organizational characteristics and job satisfaction of caregivers, thereby providing basic data for the development of a program that can improve the service quality of caregivers in preparation of a super-aged society.

First, in this study, service quality had a high correlation with work satisfaction. Despite sufficient fostering of personnel in the field, the low job satisfaction, burnout and stress of caregivers continue. In the study by [7], too, the service quality of caregivers and their job satisfaction had a significant correlation, which is in line with the findings of this study. Among the job satisfaction factors, satisfaction with the work itself had the greatest impact, followed by job security. This indicates that by improving the satisfaction level with the work itself and job security, we can expect the service quality of caregivers at long term care facilities to improve, as well.

Second, in this study, organizational characteristics were found to have a high correlation with service quality and with job satisfaction. In this study, organizational characteristics consist of autonomy, operational structure of the organization, compensation structure and consideration of the supervisor. According to the study by [12], the difficulties at work for caregivers include insufficient salary, heavy work load, physical stress due to work, conflict and stress caused by co-workers, unsatisfactory handling of accidents at work, stress caused by the guardians and ineffective re-training.

A review of preceding studies on the job satisfaction of caregivers shows that in the study by [13], those with a better health status, those who work in caregiving to feel a sense of emotional reward, and those who interact with the elderly whose attitudes are positive had a higher job satisfaction. In the study by [14], overall job satisfaction had the highest correlation with the relationship with colleagues, followed by supervision, work tasks, facilities, general job satisfaction and salary. Moreover, in the study by [15], job satisfaction was higher when employment form was more stable, salary was higher, self-esteem was higher, commitment to the organization was higher, and burnout was lower. Therefore, various programs and training must be attempted to encourage caregivers to autonomously work and feel a sense of

reward and joy, as well as to improve the operation of the organization and the compensation structure. In addition, increased communication with the supervisor at long term care facilities will also help in improving the work environment.

Third, in this study, the sub-factors of service quality were reliability, responsiveness, guarantee, empathy and typicality. Caregivers undergo re-training on a continuous basis to further develop knowledge and capabilities required on the job. Through such specialized training, their qualifications and interpersonal relations improve while work stress decreases, leading to higher job satisfaction and subsequently improved service quality [12]. According to the study by [8], job training at long term care facilities is provided in the same manner, raising the need for a differentiated training according to the type of care facility and job experience of the caregiver. To improve the service quality of caregivers, job training that reflects to support physical activity and provides education to improve the mental and physical functioning of the elderly at the long term care facilities must be provided. At the same time, the content of the training must be associated with the accumulation of work experience so that expertise and capabilities can be built, job satisfaction increased, and better quality care given at the facilities. In addition, according to the findings of a qualitative study on the experience of caregivers engaging in the care of those with dementia, caregivers wish to receive various programs that they can apply to the elderly.

They also discussed their difficulty in dealing with the lack of time to provide quality services, and their wish to receive better understanding from the elderly as well as their guardians, based on education provided to the elderly and their guardians [16]. Therefore, education that takes into account the number of years of experience of the caregiver is needed.

CONCLUSION

Based on the findings of this study that there improved service quality is correlated with job satisfaction and with organizational characteristics, the following can be suggested. First, this study was conducted in a limited area and therefore the findings cannot be generalized to apply to all caregivers. For a more generalized conclusion, expanding the study to include various areas is suggested. Second, a qualitative

study is suggested for a more in-depth understanding of organizational characteristics of caregivers, or the factors that undermine service quality or job satisfaction of caregivers. Lastly, a program to improve the service quality of caregivers based on the findings of this study is suggested.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Park SY, Chun YM, Seong JH, Lee SH. Effects of Elder's Role Performance and Self-esteem on Successful Aging. *Journal of Korean Gerontological Nursing*. 2013;15(1):43-50.
2. Korean Statistical Information Service [Image on internet]. 2010 [updated 2017 Jan 10; cited 2017 Nov 6]. Available from: http://kostat.go.kr/portal/korea/kor_nw/2/1/index.board?bmode=read&aSeq=180000, (website)
3. Kim MK, Park DH, Ahn OH. The care giving burden of primary caregiver based on nursing needs of long-term care insurance grade. *Journal of the Korea Convergence Society*. 2014;5(3):7-16.
4. Lee JS, Park JH. Effectiveness Evaluation of Long-Term Care Service for the Elderly through the Diffusion of Market Principle. *Journal of population and health studies*. 2011;13(4):6.
5. Jung YJ. A Research on the problems and their improvement plans regarding the long-term care insurance system for the elderly. *Journal of Law and Politics Research*. 2016;22(2):319-354.
6. Long term care. [Image on internet]. 2017 [updated 2017 Jan 10; cited 2017 Nov 6]. Available from: <http://www.longtermcare.or.kr> (website)
7. Kim SH, Nam HE, Park SJ. Effects of Care workers' Job Satisfaction on the Quality of their Stay-at-Home aged Welfare Service. *The Journal of the Korea Contents Association*. 2012;12(4):282-290.
8. Kim MH, Yuk HS, Jung MH. Study on Job Training and Job Relevance of Care Workers. *Social Work Practice & Research*. 2015;12(1):103-132.
9. Parasuraman A, Zeithaml V, Berry L. A Conceptual Model of Service Quality and its Implications for Future Research. *Journal of Marketing*. 1985;49(4):41-50.
10. Smith PC, Kendall LM, Hulin CL. *The Measurement of Satisfaction in Work and Retirement: A Strategy for the Study of Attitudes*, Chicago, ILL: Rand McNally Co; 1969. P. 32.
11. Diener DL, Schneider B. The effect of organizational environment on perceived power and climate: A laboratory study. *Organizational Behavior and Human Performance*. 1974;11: 176-183.
12. Nam YH, Kim YS, Kim JC. A study on the phenomenological of caregivers about the work adaptation process. *Journal of Welfare for the Aged*. 2014;64:287-321.
13. Jung MH. A Study on Caretaker's Attitudes Toward the Elderly and Work Satisfaction -Based On Data gathered from Health Caretakers of Geriatric Hospitals. [dissertation]. [Seoul]: Ewha Womans University; 2003. 101p.
14. Oh SJ. A Study on Care-givers' Job Satisfaction at Long-Term Nursing Homes. [dissertation]. [Gyeonggi]: Kyungwon University; 2009. P105p.
15. Lee JY. A Study on the Job Satisfaction of Care-givers-Based on the Urban-Rural consolidated cities of GyeongGi-do. [dissertation]. [Seoul]: Sogang University; 2009. 103p.
16. Baik SH, Lee DY. A Study on Cognitive Activity Program Provided for the Long-term Care Class-five Clients. *Holistic Health Science*. 2016;6(2):33-39.

The Effects of Team-Based Learning Program on the Self-Directed Learning Capability, Learning Transfer and Learning Satisfaction of Nursing Students

Joo-Young Lee¹, Do-Young Lee²

¹Dept. of Nursing, Seoul Women's College of Nursing, 38, Ganhodaero-ro, Seodaemun-gu, Seoul, Korea;

²Dept. of Nursing, Changshin University, 262, Palyongro, Masanhoewon-gu, Changwon-si, Gyeongsangnam-do, Korea

ABSTRACT

Background/Objectives: This study was conducted to apply TBL to classes of university students majoring in nursing studies to improve self-directed learning capability, increase learning transfers and learning ability and improve satisfaction with classes by having the students engage in critical thinking and experience an environment similar to clinical settings.

Method/Statistical analysis: This study is a quasi-experimental before and after research using a non-equivalent control group to verify the effects of TBL on the nursing students' self-directed learning capability, learning transfer and satisfaction with classes.

Findings: The study found that while there was a statistically significant difference in self-directed learning capability and learning satisfaction in TBL classes for nursing students, there was no statistically significant difference in learning transfer.

Improvements/Applications: A strategy involving new instruction and learning methods to improve self-directed learning and learning satisfaction in TBL classes for nursing students is needed.

Keywords: *Team-based learning, Self-directed learning capability, learning transfer, learning satisfaction, student perceptions*

INTRODUCTION

According to General Professional Education of the Physician Report of 1985 by the American Association of Medical Colleges, there needs to be a shift for medical education from one that focuses on the delivery of knowledge to one that is outcome-based. This report thus presents the standards for educational goals by setting the minimum level of achievements that must be met by students after graduation^[1]. Such outcome-based goals required a change in instruction methods, which

led to the adoption of team-based learning (TBL), and a move away from traditional lectures^[2].

The goal of TBL is not knowledge transmission but knowledge application^[3]. Therefore, the instructor must take on the role of developing the curricula and running the class to promote learning, which goes beyond the simply delivery of knowledge. Meanwhile, learners need to go beyond simply memorizing and understanding knowledge to proactively explore, collect and comprehensively analyze information to become an agent of learning who can solve problems^[2]. In addition, TBL sets itself apart from traditional lectures and classes in that it addresses the problem-solving process that may occur in actual clinical settings, based on team activities^[4].

Most preceding studies on TBL were conducted on medical students, their academic achievements or capabilities^[5,6], clinical extrapolation capabilities^[7]

Corresponding Author:

Do-Young Lee
Professor, Nursing,
Changshin University, Korea
Email: shinern@cs.ac.kr

and development of emotional intelligence [8]. Nursing students, too, need to be familiar with the clinical environment and be equipped with clinical extrapolation capabilities just as medical students do. It is important to have the capabilities to apply knowledge to various uses, rather than simply understanding said knowledge. However, TBL in universities of nursing is only carried out for a handful of subjects. Facilities or the development of related curricula are also lacking, as is related studies.

As such, this study was conducted to verify the effects of TBL programs for nursing students on their self-directed learning capabilities, learning transfer and satisfaction with the class.

MATERIALS AND METHOD

Design: This study is a quasi-experimental before and after research using a non-equivalent control group to verify the effects of TBL on the nursing students' self-directed learning capability, learning transfer and satisfaction with classes.

Participants: The subjects of this study were fourth year students majoring in nursing studies at two 4 year universities located in city S. Convenience sampling was done from a total of 82 students enrolled in their fourth year and who were taking the nursing management course. Those who understood the objective of the study and consented to take part in the study but who had no prior experience with TBL were selected. In terms of experimental intervention, to prevent the expansion of intervention, the university in which the subjects of the experiment group and of the control group was made sure to be different. An explanation of the study was given to each university, after which a consent was acquired before conducting the research.

First, students enrolled in universities that were similar to the universities of those in the experiment group were selected, in particular, in terms of the curriculum, number of students, size of the university, educational environment and experience of the instructor of nursing management courses. Of students who were enrolled in the nursing management course, 42 and 40 students respectively, were selected as the experiment group and the control group. A total of 82 subjects were used for the final analysis. The number of sample subjects was calculated as 80 when G*POWER3.1 was used, and the significance level of $\alpha=.05$, an effect size of .65, and a

power of .80 were set for the independent sample t-test. Given the attrition rate, it was decided that a total of 82 subjects each for the experiment group and the control group would be selected.

STUDY TOOLS

Self-directed learning capability: Self-directed learning capability refers to the score measured using the tool developed by Bae & Lee [9]. This tool consists of a total of 21 questions that can be broken down to three categories of cognition, definition and behavior. A higher score indicates a higher degree of self-directed learning capability. In this study, Cronbach's $\alpha=.903$.

Learning transference: Learning transference was measured using 6 questions on a 7 point Likert scale. These questions were used in the study by Choi et al. [10] that focused on the third level out of the four level evaluation model of Kirkpatrick [11], which was the behavior level. A higher score indicates a higher degree of learning transference. At the time the tool was developed, Cronbach $\alpha=.90$, and in this study, Cronbach $\alpha=.895$.

Learning Satisfaction: Learning Satisfaction refers to the score measured using the tool developed by Kim [12]. This tool consists of 10 questions in total, measured on a 6 point Likert scale. A higher score indicates a higher degree of satisfaction with the class. At the time of the tool's development, Cronbach $\alpha=.58$ while in this study, Cronbach $\alpha=.935$.

Data collection process and ethical considerations: To uphold the rights of the study subjects, before data were collected they were informed of the objective and methodology of the study, the gains and losses that may occur from participating in the study, guarantee of privacy, voluntary participation and the freedom to withdraw from the study without concerns for being placed at a disadvantage. Signatures were acquired on a consent form from students who gave their consent to participation in the study. Those in the control group were given at the beginning of the intervention lecture materials that had the same content as in the weekly lectures received by the experiment group. The control group was also given materials on TBL, after the post-test was completed. To minimize the Hawthorne effect, or any other effect caused by the situation or the person conducting the experiment, a double blind device was

applied so that neither the data collator nor the subject would know which group they were a part of.

TBL program procedures: TBL methods were applied to the course on the theory of nursing management, from April 3 to May 12, 2017, for 1 hours per week and for a total of 6 hours in accordance with the established learning goals. After the TBL program was applied, self-directed learning capabilities, leaning transference, self-respect and learning satisfaction were reviewed. Factors affecting the students’ satisfaction with the class would be identified in this manner. The TBL class will be consisted of a total of 3 stages as shown in table 1. The first stage is the pre-class: reading preparation stage. In this stage, notices are given so that students

are encouraged to carry out self-directed learning in accordance with the set learning goals.

The second stage is the readiness assurance stage, where the problem-solving content of the class was verified through an Individual Readiness Assessment Test (IRAT) and Team Readiness Assessment Test (TRAT). The third stage is the stage where course concepts are applied. To confirm problem-solving skills with a focus on cases, students were encouraged to apply the concepts learned through a discussion and collaborative process. Students check the problems on their own and engage in feedback within the team. Immediate feedback from the instructor is offered to the students, and in the wrap-up stage of the class a mini-lecture was offered to do a final review of what was learned.

Table 1: TBL Program

Session	Subjects	time	Phase
1st	<ul style="list-style-type: none"> ● Concept of nursing organizations ● Basic principles of organizations 	100 minutes	<ul style="list-style-type: none"> ● Preparation: Self-directed learning ● Concept verification: IRAT, TRAT(Individual or team-based problem-solving) ● Problem-solving with a focus on cases ● Wrap-up with a mini-lecture
2nd	<ul style="list-style-type: none"> ● Types of nursing organizations ● Concept of job evaluation ● Job description ● Job specification 	100 minutes	<ul style="list-style-type: none"> ● Preparation: Self-directed learning ● Concept verification: IRAT, TRAT(Individual or team-based problem-solving) ● Problem-solving with a focus on cases ● Wrap-up with a mini-lecture
3rd	<ul style="list-style-type: none"> ● Job analysis 	100 minutes	<ul style="list-style-type: none"> ● Preparation: Self-directed learning ● Concept verification: IRAT, TRAT(Individual or team-based problem-solving) ● Problem-solving with a focus on cases ● Wrap-up with a mini-lecture

DATA ANALYSIS

Data collected for the study were analyzed using the SPSS (Statistical Package for the Social Science) WIN 20.0 as follows, to review the effects of TBL. The general characteristics of study subjects were analyzed using frequency, percentage, mean and standard deviation.

1. The homogeneity test for the general characteristics of study subjects was carried out using the X2-test

and Fisher exact test. The homogeneity test for this study variables was done using ANOVA.

2. To review whether self-directed learning capabilities, learning transference and learning satisfaction had a normal distribution, the Kolmogorov-Smirnov test was applied, confirming a normal distribution.
3. An independent t-test was carried out to review the effects on self-directed learning capabilities,

learning transference and learning satisfaction in the control group and the experiment group.

- The reliability of the tools used in the study was verified with Cronbach’s Alpha Coefficient.

RESULTS AND DISCUSSION

Verification of homogeneity for the general characteristics of study subjects and dependent variables:

The general characteristics of the control group and the experiment group are as seen in <Table 2>. In terms of residence, in both groups own home showed the highest frequency, with 33 people (82.5%) for the control group and 33 people (78.6%) for the experiment group. In terms of the type of high school graduated, both groups had a high frequency for liberal arts high schools, with 33 people (82.5%) for the control group and 37 people (88.1%) for the experiment group. Those between the ages of 19 and 25 accounted for the largest share in both groups, with 32 people (80.0%) in the control group and 33 people (78.6%) in the experiment group. In terms of the satisfaction with university life, ‘average’ was the most frequently given response, with 26 people (65.0%) in the control group and 26 people

(61.9%) in the experiment group. Those without a religion accounted for the largest share in both groups, with 19 people (47.5%) for the control group and 25 people (59.5%) for the experiment group. In terms of satisfaction with nursing studies as a major, 22 people in the control group (55.0%) gave ‘satisfactory’ as the most frequent response, while 23 people (54.8%) in the experiment group gave ‘average’ as the most frequent response. Asked how helpful they thought a unilateral lecture by the professor is, in both the experiment group and the control group, 26 people each (65.0%) answered that they don’t know and 20 people each (47.6%) answered that they hadn’t thought too much of it. When asked whether they like the discussions with classmates and presentations, 19 people (47.5%) and 27 people (64.3%) in the control group and the experiment group, respectively, answered that they did not like it very much. There was a high frequency in both groups of those who answered that studying with an autonomously set learning assignment would be somewhat helpful, with 26 people (65.0%) in the control group and 26 people (61.9%) in the experiment group. There was no significant difference between the two groups in terms of general characteristics.

Table 1: General Characteristics and Homogeneity between Experimental and Control Group

Characteristics	Categories	Cont. (n = 40)	Exp. (n = 42)	x ²	p
		n (%)	n (%)		
Residence type	One’s Own House	33(82.5)	33(78.6)	.895	.347
	Lease	2(5.0)	1(2.4)		
	Boarding House	5(12.5)	5(11.9)		
	Other	0	3(7.1)		
Graduated High School Type	Academic High School	33(82.5)	37(88.1)	.035	.851
	Vocational High School Education	1(2.5)	0		
	Specialized High Schools	4(10.0)	1(2.4)		
	Characterization High School	0	2(4.8)		
	Other	2(5.0)	2(4.8)		
Age(years)	19-25	32(80.0)	33(78.6)	.257	.614
	25-30	7(17.5)	6(14.3)		
	30-40	1(2.5)	3(7.1)		
Religion	Christian	13(32.5)	11(26.2)	1.081	.302
	Catholicism	7(17.5)	4(9.5)		
	Buddhism	0	2(4.8)		
	Other	1(2.5)	0		
	None	19(47.5)	25(59.5)		

Conted...

Nursing major satisfaction	Satisfaction	22(55.0)	17(40.5)	1.210	.275
	Usually	16(40.0)	23(54.8)		
	Dissatisfaction	2(5.0)	2(4.8)		
Do you think that the professor's one-way lecture helps you remember the lesson contents?	Yes	10(25.0)	13(31.0)	.142	.708
	It is much more helpful	26(65.0)	20(47.6)		
	I do not know	4(10.0)	9(21.4)		
Do you think that the professor's one-way lecture helps you remember the lesson contents?	I'm afraid.	3(7.5)	2(4.8)	1.523	.221
	I do not like it a lot	19(47.5)	27(64.3)		
	I like to talk and announce	14(35.0)	12(28.6)		
	I like it very much	4(10.0)	1(2.4)		
What do you think about learning to set up learning tasks autonomously?	I do not think it is a good way at all	0	0	.003	.957
	I do not know	10(25.0)	11(26.2)		
	Some will be helpful	26(65.0)	26(61.9)		
	It seems to be very desirable and helpful	4(10.0)	5(11.9)		

Cont. = Control group.; Exp. = Experimental group

Homogeneity test for the dependent variables of the control group and the experiment group: A verification of homogeneity in the dependent variables of the control group and the experiment group showed that there was homogeneity <Table 3>. The control group and the experiment group did not show statistically significant difference in self-directed learning ($t=-.633, p=.531$), learning transference ($t=.136, p=.893$) or satisfaction with the class ($t=-1.443, p=.150$) before the TBL-based program was conducted. Therefore, there was no significant difference in the self-directed learning, learning transference or satisfaction with the class between the two groups before TBL-based program was conducted, and as such, the homogeneity of the control group and the experiment group was confirmed.

Table 2: Homogeneity Test of Self-directed learning, Learning transference and Learning Satisfaction between Experimental and Control Group

Variables	Cont. (n = 40)	Exp. (n =42)	t	p
	M ± SD	M ± SD		
Self-directed learning	78.73 ± 9.04	77.33 ± 10.84	-.633	.531
Learning transference	34.63 ± 4.06	34.76 ± 5.05	.136	.893
Learning Satisfaction	47.68 ± 6.55	45.83 ± 4.83	-1.443	.150

Cont.=Control group.; Exp.=Experimental group

The effect of TBL programs on self-directed learning, learning transference or Learning Satisfaction: Table 3 shows the results of analyzing the effects that TBL programs have on self-directed learning, learning transference or satisfaction with the class. Self-directed learning of the control group scored 77.28 ± 8.64 points, while the experiment group that underwent TBL programs scored 80.98 ± 7.09 , with a statistically

significant difference ($t=2.71, p= .008$). Learning transference of the control group scored 34.98 ± 4.14 points, while that of the experiment group scored 39.64 ± 15.79 points, with no statistically significant difference ($t=1.65, p= .109$). Satisfaction with the class for the control group scored 47.18 ± 5.33 points, while for the experiment group it was 54.26 ± 15.53 points, with statistically significant difference ($t=3.23, p= .002$).

Table 3: Homogeneity Test of Self

Variables	Groups	Pre	Post	Difference	t	p
		M ± SD	M ± SD	M ± SD		
Self-directed learning	Cont. (n = 40)	78.73 ± 9.04	77.28 ± 8.64	10.27 ± 1.62	2.71	.008
	Exp. (n = 42)	77.33 ± 10.84	80.98 ± 7.09	17.03 ± 2.63		
Learning transference	Cont. (n = 40)	34.63 ± 4.06	34.98 ± 4.14	0.35 ± 5.65	1.65	.109
	Exp. (n = 42)	34.76 ± 5.05	39.64 ± 15.79	4.88 ± 16.80		
Learning Satisfaction	Cont. (n = 40)	47.68 ± 6.55	47.18 ± 5.33	-.50 ± 9.39	3.23	.002
	Exp. (n = 42)	45.83 ± 4.83	54.26 ± 15.53	8.43 ± 14.87		

Cont. = Control group.; Exp. = Experimental group

DISCUSSION

TBL is recognized as an instruction method that shifts medical education that was originally instructor-oriented, into one that is more student-oriented with a focus on settings similar to actual clinical settings. As such, this study was conducted as a quasi-experimental before and after research using a non-equivalent control group to verify effects that TBL has on the self-directed learning capabilities of nursing students, their learning transference, self-respect and satisfaction with the class.

The analysis shows that while there was statistically significant difference in self-directed learning and learning satisfaction in TBL classes for nursing students, there was no statistically significant difference in learning transference. Learning transference refers to the application of acquired knowledge, technique and attitude through learning to the scene of practice^[13], and refers to changes through education not only to cognitive elements but also execution. However, in this study, the degree of changes to learning transference after TBL was surveyed and analyzed using a self-reported questionnaire. As such, for a more accurate verification of the findings, measurement of the changes in execution is recommended. In addition, for effective TBL classes, an appropriate educational environment including a computer based test system and round table, are needed^[14]. The application of tools that can promote interaction, such as the use of an audience response system, would also be effective^[15]. Therefore, an environment that can maximize the efficiency of TBL classes would have to be established.

According to preceding studies, TBL has many advantages. Okubo et al.^[7] confirmed through a

problem-solving ability test (P-SAT) before and after a TBL program that the students' clinical extrapolation skills had improved. Borges et al.^[8] confirmed through a Workgroup Emotional Intelligence Profile-Short Version (WEIP-S) that TBL programs also have a positive effect on the development of emotional intelligence in students.

Vasan et al.^[5] compared the scores for the National Board of Medical Examiners before and after medical students undertook TBL programs and found that compared to the traditional instruction methods, TBL had a greater effect on improving academic achievement in students. Moreover, Parmelee & Hudes^[6] noted that TBL improves medical professionalism and feedback capabilities, and offers training to foster students into life-long learners.

TBL is an education method that allows for interaction between the instructor and the student to realize a more student-oriented, integrated education^[16]. This researcher hopes that through active studies on the various media and experiences that can be applied to nursing education, the quality of nursing education can be improved. This study sought to verify the effect that TBL has on self-directed learning capabilities, learning transference, self-respect and satisfaction with the class using university students of nursing as study subjects. While there was statistically significant difference in self-directed learning capabilities and satisfaction with the class, there was no statistically significant difference in learning transference.

CONCLUSION

Based on the findings of this study, follow-up research is suggested as follows. First, while this study

sought to verify the effect that TBL has on self-directed learning capabilities, learning transference, self-respect and satisfaction with the class using university students of nursing as study subjects, a follow-up study should be conducted to identify the various effects that TBL may have. Second, as this study used only nursing students from one university of nursing, research should be continued using a wide range of subjects to verify the effects of TBL. Third, it is suggested that various curricula using TBL be developed, based on the findings of this study.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

- Han JJ. Global doctor's role and outcome-based medical education. *Ewha Med J.* 2013 36: 3-8.
- Parmelee DX. Team-based learning: moving forward in curriculum innovation: a commentary. *Med Teach.* 2010;32: 105-107.
- Haidet P, Levine RE, Parmelee DX, Crow S, Kennedy F, Kelly PA, Perkowski L, Michaelsen L, Richards BF. Perspective: guidelines for reporting team-based learning activities in the medical and health sciences education literature. *Acad Med.* 2012 87: 292-299.
- Introduction to team-based learning [Internet]. Vancouver, Canada: The University of British Columbia; c2009 [updated 2012 April 25; cited 2013 October 5]. Available from: <http://cis.apsc.ubc.ca/services/team-based-learning>.
- Vasan NS, De Fouw DO, Compton S. Team-based learning in anatomy: an efficient, effective, and economical strategy. *Anat Sci Educ.* 2011;4: 333-339.
- Parmelee DX, Hudes P. Team-based learning: a relevant strategy in health professionals' education. *Med Teach.* 2012;34: 411-413.
- Okubo Y, Ishiguro N, Suganuma T, Nishikawa T, Takubo T, Kojimahara N, Yago R, Nunoda S, Sugihara S, Yoshioka T. Team-based learning, a learning strategy for clinical reasoning, in students with problem-based learning tutorial experiences. *Tohoku J Exp Med.* 2012;227: 23-29.
- Borges NJ, Kirkham K, Deardorff AS, Moore JA. Development of emotional intelligence in a team-based learning internal medicine clerkship. *Med Teach.* 2012 34: 802- 806.
- Bae EK, Lee MY. Relationship Between Learning Organization Readiness in HRD Companies and Organizational Commitment Level of Their Employees: Focusing on the Mediating Effects of Employees' Self-Directed Learning Ability. *Andragogy Today: Interdisciplinary journal of adult & continuing education.* 2012 15(4): 205-234.
- Choi KH, Yeo HK, Jeong HK. The effect of Learning Motivation and Academic Self-Efficacy of University Students Majoring Tourism on Learning Flow, Academic Achievement and Learning Transfer. *The Korea Academic Society of Tourism and Leisure.* 2014 26(8): 451-469.
- Kirkpatrick DL. Evaluation of training. in R. L. Craig(ed.). *Training and Development Handbook.* 2nd ed., McGraw-Hill.1976.
- Kim EJ. Effects of Cooperative Learning Session Repetitions and Group Composition on Communication Apprehension. *Korean Educational Psychology Association.* 2003 17(4): 1-22.
- Robinson DG, Robinson JC. *Training for impact: How to link training to business needs and measure the results.* San Francisco: Jossey-Bass. 1989.
- Inuwa IM, Al-Rawahy M, Roychoudhry S, Taranikanti V. Implementing a modified team-based learning strategy in the first phase of an outcome-based curriculum: challenges and prospects. *Med Teach.* 2012;34: e492-e499.
- Fujikura T, Takeshita T, Homma H, Adachi K, Miyake K, Kudo M, Takizawa T, Nagayama H, Hirakawa K. Team-based learning using an audience response system: a possible new strategy for interactive medical education. *J Nippon Med Sch.* 2013 80: 63-69.
- Hur YR, Cho AR, Kim S. Review on the administration and effectiveness of team-based learning in medical education. *Korean J Med Educ.* 2013 25(4): 271-277. DOI:10.3946/kjme.2013.25.4.271

The Relationship between Oral Health Awareness and Successful Aging in Middle-Aged Women

Eun-Sil Choi¹, Young-Soo Lee²

¹Research Scholar, Department of Public Health Sciences, Graduate School, Korea University, Seoul, Korea; ²Associate Professor, Department of Dental Hygiene, College of Health Sciences, Sunmoon University, Asan, Korea

ABSTRACT

Objective: This study aims to assess the relationship between oral health awareness and successful aging in middle-aged women.

Method: The subjects of this study were 198 middle-aged women aged 40-60 years. The dependent variable was recognition of successful aging. The independent variable was oral health awareness. To confirm the effect of oral health awareness on the recognition of successful aging, oral health awareness and the recognition of successful aging were dichotomized using the median value and a logistic regression analysis was carried out.

Findings: After adjusting for confounding variables, the recognition of successful aging was 3.74 times higher in subjects with good oral health awareness than in subjects with poor oral health awareness (OR=3.74, CI: 1.99–7.03)

Improvements: This study will provide evidence to support the idea that improving oral health awareness is important for successful aging.

Keyword: *aging, middle-age, oral health awareness, successful aging, women*

INTRODUCTION

The United States Census Bureau reports that the size of aging population (over 65 years) will double by 2050. ¹ “Successful aging” is a worldwide topic of interest. ²⁻⁴ Although the prognostic factors of successful aging may differ due to cultural heterogeneity, ⁵ subjective health awareness, health condition, and age are reported to be associated with successful aging in general. ⁶⁻⁸

Increasing age results in greater exposure to chronic diseases and more frequent experiences of deteriorating oral health, due to periodontitis and tooth extraction. Oral health in the elderly population is functionally crucial

for proper nutritional (food) intake. Previous studies that assessed the association between successful aging and oral health have demonstrated that elderly people with more natural teeth have better recognition of successful aging. ^{9,10} The symposium led by the Oral Research group in the year 2000, on the topic of “successful aging with oral health maintenance,” demonstrated that oral health maintenance is a crucial factor in successful aging. ^{9, 11,12}

The middle-aged population will begin to exhibit greater interest in health and elderly life in the near future. More specifically, middle-aged women undergo menopause and begin to exhibit increased levels of anxiety and depression. ¹³ Although previous studies have found an association between middle-aged women and preparation for old age in general, ^{14,15} few studies have investigated the relationship between oral health in middle-aged women and recognition of successful aging. Since oral health and aging are closely related, the awareness of middle-aged women of the association between oral health and successful aging should be evaluated.

Corresponding Author:

Young-Soo Lee

Associate Professor, Department of Dental Hygiene,
College of Health Sciences,
Sunmoon University, Asan, Korea-31460

Email: dhyslee@sunmoon.ac.kr

The present study aims to assess the relationship between oral health awareness and successful aging in middle-aged women.

MATERIALS AND METHOD

Subjects and data collection: In this study, a survey questionnaire was completed by 250 middle-aged (40–60 years old) women residing in different regions of the city of Seoul, between June 30, 2014 and September 30, 2014. After excluding inappropriate and incomplete surveys, the responses of 198 subjects were included in the analysis.

Study materials: The dependent variable was recognition of successful aging. A modified version of the measurement tool used to assess the recognition of successful aging—previously developed by In and Kim¹⁶—was used in this study. The survey included 23 questions rated using a 5-point Likert scale, designed to assess individual growth (11 questions), health and economy (7 questions), and the pursuit of meaning in life (5 questions).

The independent variable was oral health awareness, assessed using a modified version of the measurement tool developed by Kim.¹⁷ With a total of 17 questions rated using a 5-point Likert scale, information was collected on the participants' general characteristics, including age (40–60 years), level of education (\leq high school or \geq college), average monthly household income (\leq 300, 301–400, or \geq 401, in ten thousand won), children in the house (yes or no), financial status satisfaction (poor or good), subjective health condition (poor or good), and menstruation (yes or no).

Methods of Analysis: A frequency analysis was carried out to assess the distribution of general characteristics. In addition, the skewness and kurtosis of the key variables—including oral health awareness and recognition of successful aging—were validated. As Kolmogorov-Smirnov and Shapiro-Wilk test results showed a lack of normality, nonparametric analyses were carried out. Differences in the recognition of successful aging based on general characteristics were assessed using the Mann-Whitney test or Kruskal-Wallis test, with a post-hoc multiple comparison conducted if necessary. To confirm the effect of oral health awareness on the recognition of successful aging, oral health awareness and the recognition of successful aging were

dichotomized using the median value and a logistic regression analysis was carried out. Statistical analyses of the collected data were performed using SPSS 22.0 version (IBM Co., Armonk, NY, USA), with statistical significance at $P < 0.05$.

RESULTS

General characteristics of the study subjects and the distribution of key variables: Looking at the general characteristics of the subjects, all of the subjects were 40–60 years old, with 40.4% in the 45–50 group and 31.3% in the 51–55 group. 66.7% of the subjects had \leq high school level of education. In terms of average monthly income, 33.8% of the subjects had \leq 300 while 37.4% had \geq 401 ten thousand won. The remaining 28.8% had an average monthly income of 301–400 ten thousand won. 97% of the subjects had children in the household and 79.3% described their financial status satisfaction as “good.” 85.4% were satisfied with their subjective health condition and 28.8% had experienced menopause (Table 1).

The final scores for the 17 questions about oral health awareness were distributed between 36 and 85, with 71.5 being the median value. The final scores for the 23 questions on recognizing successful aging were distributed between 60 and 115, with 97 being the median value (Table 2).

Differences in the recognition of successful aging: Looking at differences in the recognition of successful aging based on general characteristics, there is clearly a significant difference in the recognition of successful aging associated with average monthly household income ($p < 0.05$). A post-hoc analysis showed no difference between the \leq 300 group and the \geq 401 group, a difference between the 301–400 and \leq 300 groups, and a significant difference between the \geq 401 and \leq 300 groups ($p < 0.05$). When differences in the recognition of successful aging were assessed in relation to oral health awareness, the score for recognizing successful aging was significantly higher in subjects who had higher scores for oral health awareness ($p < 0.001$) (Table 3).

The relationship between oral health awareness and the recognition of successful aging: After adjusting for confounding variables, the recognition of successful aging was 3.74 times higher in subjects with good oral health awareness than in subjects with poor oral health awareness (OR=3.74, CI: 1.99–7.03) (Table 4).

Table 1: General characteristics of the study subjects (N = 198)

Variable	Category	N	%
Age	40–45	27	13.6
	46–50	80	40.4
	51–55	62	31.3
	56–60	29	14.6
Level of education	≤High school	132	66.7
	≥College	66	33.3
Average monthly income (ten thousand won)	≤300	67	33.8
	301–400	57	28.8
	≥401	74	37.4
Children in household	Yes	192	97.0
	No	6	3.0
Financial status satisfaction	Poor	41	20.7
	Good	157	79.3
Subjective health condition	Poor	29	14.6
	Good	169	85.4
Menstruation	Yes	57	28.8
	No	141	71.2

Table 2: Distribution of key variables

Variable	Min.	Max.	Mean ± SD	Median	Skewness	Kurtosis
Oral health awareness	36.0	85.0	70.59 ± 8.57	71.5	-0.728	0.775
Successful aging	60.0	115.0	96.60 ± 12.11	97	-0.483	-0.622

Table 3: Differences in the recognition of successful aging based on the oral health awareness

Variable	Category	Mean ± SD	P*
Age	40–45	95.44 ± 11.63	0.525
	46–50	97.10 ± 12.38	
	51–55	97.90 ± 10.88	
	56–60	93.48 ± 14.15	
Level of education	≤High school	96.06 ± 12.10	0.352
	≥College	97.67 ± 12.16	
Average monthly income (in ten thousand won)	≤300	93.45 ± 12.56 ^a	0.027
	301–400	99.32 ± 11.58 ^b	
	≥401	97.35 ± 11.62 ^a	
Children in household	Yes	96.46 ± 12.02	0.224
	No	100.83 ± 15.57	
Financial status satisfaction	Poor	96.98 ± 13.32	0.618
	GOOD	96.50 ± 11.82	
Subjective health condition	Poor	93.52 ± 14.09	0.229
	GOOD	97.12 ± 11.70	
Menopause	Yes	94.91 ± 12.85	0.286
	No	97.28 ± 11.78	
Oral health awareness	Poor	92.41 ± 11.91	<0.001
	Good	100.78 ± 10.85	

*Using the Mana-Whitney test or Kruskal-Wallis test

[†]Different letters, a and b, have a significantly different meaning in relation to the post-hoc multiple comparison procedure

Table 4: The effects of oral health awareness on the recognition of successful aging

Variable	Category	OR	Lower CI	Upper CI
Age	40–45	≤High school		
	46–50	≥College	0.49	3.44
	51–55	≤300	0.78	6.89
	56–60	301–400	0.49	5.57
Level of education	≤High school	≥401		
	≥College	Yes	0.34	1.35
Average monthly income (in ten thousand won)	≤300	No		
	301–400	Poor	0.83	4.16
	≥401	GOOD	0.85	3.77
Children in household	Yes	Poor		
	No	GOOD	0.37	15.59
Financial status satisfaction	Poor	Yes		
	GOOD	No	0.30	1.51
Subjective health condition	Poor	Poor		
	GOOD	Good	0.60	3.65
Menopause	Yes			
	No	0.49	0.22	1.09
Oral health awareness	Poor			
	Good	3.74	1.99	7.03

DISCUSSION

In this study, we have successfully confirmed the relationship between oral health awareness and the recognition of successful aging in middle-aged women. These results can be used to help middle-aged women prepare for successful aging.

The findings of this study reveal a positive relationship between oral health awareness and the recognition of successful aging in middle-aged women. As no previous study has validated this relationship, a direct comparison could not be made. However, for the elderly population, previous studies have reported that good oral health—either via natural teeth or restorations—is highly associated with successful aging.^{9, 11, 12} The findings of this study confirm the relationship between oral health awareness and the recognition of successful aging, supporting previous studies on elderly subjects. Previous studies by Rowe and Kahn¹⁸ and Tate RB et al¹⁹ have suggested that subjective health condition and satisfactory financial status affect the recognition of successful aging in elderly. Although we observed a similar trend, our findings did not show statistical significance. Since only 28% of the study subjects had undergone menopause, our outcomes may not have resembled those of previous studies assessing elderly female subjects. Kweon and Jeon²⁰ have previously

reported differences in health conditions and successful aging between middle-aged and elderly women, supporting the findings of our study. As very few studies have assessed the relationship between oral health and successful aging in middle-aged women, this study provides fundamental data regarding this relationship. In the future, active studies should be carried out on the middle-aged population preparing for successful aging.

Despite our interesting findings, this study has a few limitations. First, the convenience sampling of selected middle-aged women used in this study cannot represent the entire population of middle-aged women. Second, out of multiple aspects of successful aging, only a few aspects have been measured. Future studies should develop a measurement tool for successful aging that is specifically tailored for the Korean population. Third, multiple variables among the factors of successful aging were not corrected. Nevertheless, we have confirmed the relationship between oral health awareness and the recognition of successful aging in middle-aged women, who will soon reach the elderly period of their lives. With insufficient individual-level interest or municipal/national-level guidelines or policies to support successful aging among middle-aged women, the findings of this study will provide evidence to support the idea that improving oral health awareness is important for successful aging.

CONCLUSION

In this study, we confirmed the positive relationship between oral health awareness and the recognition of successful aging in middle-aged women, with following details:

1. A higher level of average monthly income and better oral health awareness resulted in significantly higher levels of success in aging.
2. After adjusting for confounding variables, better oral health awareness was significantly and positively associated with better recognition of successful aging.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Oral health awareness and successful aging in middle-aged women

REFERENCES

1. Colby SL, Ortman JM. Projections of the size and composition of the US population: 2014 to 2060: Population estimates and projections. *Current Population Reports*. 2015, 25-1143.
2. Depp CA, Jeste DV. Definitions and predictors of successful aging: a comprehensive review of larger quantitative studies. *Am J Geriatr Psychiatry*. 2006,14(1): 6–20.
3. Hogan DB. Models, definitions, and criteria for frailty; *Conn's handbook of models for human aging* (second edition) Amsterdam: Elsevier; 2018. pp. 35–44.
4. Whitley E, Benzeval M, and Popham F. Associations of successful aging with socioeconomic position across the life-course: the West of Scotland Twenty-07 Prospective Cohort Study. *J Aging Health*. 2018, 30(1): 52–74.
5. Nguyen AL, Seal DW. Cross-cultural comparison of successful aging definitions between Chinese and Hmong elders in the United States. *J Cross Cult Gerontol*. 2014,29(2): 153–171.
6. Anton SD, Woods AJ, Ashizawa T, Barb D, Buford TW, Carter CS, David J Clark et al. Successful aging: advancing the science of physical independence in older adults. *Ageing Res. Rev*. 2015,24: 304–327.
7. Katz S, Calasanti T. Critical perspectives on successful aging: Does it “appeal more than it illuminates?” *Gerontol*. 2014,55(1): 26–33.
8. Martin P, Kelly N, Kahana B, Kahana E, Willcox BJ, Willcox DC, Poon, and LW. Defining successful aging: A tangible or elusive concept? *Gerontolo*. 2015,55(1): 14–25.
9. Ghezzi EM, Ship JA. Systemic diseases and their treatments in the elderly: impact on oral health. *J Public Health Dent*. 2000,60(4): 289–296.
10. Kiyak HA. Successful aging: implications for oral health. *J Pub Health Dent*. 2000,60(4): 276–281.
11. Budtz-Jørgensen E, Chung JP, and Mojon P. Successful aging—the case for prosthetic therapy. *J Public Health Dent*. 2000,60(4): 308–312.
12. Walls AW, Steele JG, Sheiham A, Marcenes W, and Moynihan PJ. Oral health and nutrition in older people. *J Pub Health Dent*. 2000,60(4): 304–307.
13. Birkhäuser. Depression, menopause and estrogens: is there a correlation? *Maturitas*. 2002,41: 3–8.
14. Bowling A. Lay perceptions of successful ageing: findings from a national survey of middle aged and older adults in Britain. *Eur J Ageing*. 2006,3(3): 123–136.
15. McCann MP, Ward L, and Winefield H. Successful ageing by whose definition? Views of older, spiritually affiliated women. *Australas J Ageing*. 2008,27(4): 200–204.
16. Cho ME, Kim MJ. The effect of the recognition of successful aging on preparation for old age in middle-aged population with below average income. *Korean Soc Welfare Res*. 2015,44: 25–52.
17. Kim Y. Subjective oral health perception of Korean low socio-economic elderly. *J Korean Acad Oral Health*. 2004: 257-265.
18. Rowe JW, Kahn RL. Successful aging. *Gerontol*. 1997,37(4): 433–440.
19. Tate RB, Lah L, and Cuddy TE. Definition of successful aging by elderly Canadian males: The Manitoba follow-up study. *Gerontol*. 2003,43(5): 735–744.
20. Kweon YR, Jeon HO. Effects of Perceived Health Status, Self-esteem and Family Function on Expectations Regarding Aging among Middle-aged Women. *J Korean Acad Nurs*. 2013, 43(2): 176-184.

Effects of Muscle Facilitation on Motor Activity and Tactile Perception

Sung-Hwa Hong¹, Yun-Tae Kim¹, Dong Yeop Lee¹, Jae Ho Yu¹, Jin Seop Kim¹, JiHeon Hong¹

¹Dept. Physical Therapy, Sun Moon Univeresity, Asan-si, Chungnam, Republic of Korea

ABSTRACT

Background/Objectives: The purpose of this study was to investigate changes in muscle activity and tactile perception ability through muscle facilitation

Method/Statistical analysis: The subjects of this study was consisted of 51 adults (26 males, 25 females) and randomly assigned to 26 experimental and 25 control groups. In both groups, a moving two-point discrimination test was performed on middle trapezius, upper trapezius, sternocleidomastoid, and posterior deltoid. In the experimental group, muscle facilitation was performed for activation of the back muscle. In addition, EMG was used for the two groups to compare before and after muscle activation to the middle trapezius, upper trapezius, and posterior deltoid. after those muscles were re-tested to two-point discrimination.

Findings: In this study, it was found that the muscle facilitation promoted the increase of muscle activity and the sensitivity of two-point discrimination due to simultaneous activation of the motor cortex and sensory cortex ($p < .001^*$). It was also found that activation through muscle stimulation affects the same spinal level as well due to the change in the tactile perception ability of the sternocleidomastoid along the same nerve branch of the middle trapezius. ($p < .0041^*$).

Improvements/Applications: This can interpret that muscle facilitation leads to changes in muscle activation and changes in tactile perception ability. Therefore, the results of this are expected to be the basis for future improvement of motor function and sensory function in patients with brain injuries or those with low function.

Keywords: *Muscle facilitation, Motor activity, Tactile perception, Two-point discrimination, Proprioceptive neuromuscular facilitation, Neuroplasticity*

INTRODUCTION

The nerve was divided into sensory nerves and motor nerves. Sensory nerves transmit the senses received in each receptor to the central nervous system through the nerves, and the motor nerves transmit the signals generated in the central nervous system to the muscles to show the response^{[[Ayatollahi, 2017 #25]1,2]}. Sensory and motor are essential signals and abilities in humans. The type of senses is divided into special senses and general senses. Special senses are senses like vision, smell, and hearing, and general senses are divided into temperature sensory perception, proprioceptive sensation, and tactile sensation. Among, the tactile sensation is given to the spinal cord through the nerve roots and, depending on the type, it is transmitted to the spinal cord or brain. In

addition, the motor systems are commanded by the brain to activate the muscles by signaling each muscle through the nerve roots^[3].

The method of tactile inspection includes static touch sensing, brush movement direction distinction, and benefit identification^[3]. Among them, the two-point discrimination method refers to the distance between two points, which is felt as points on different parts when stimulating the epidermis by stimulating the epidermis^[4]. This test has been proven to be effective in several studies, and it has been shown that the reliability of the test is high^[5]. Sensations are also generally influenced by other factors. These factors are include age, weight, skin temperature, fatigue, and sex^[6-10]. Methods for activating the neuromuscular are based on neuro developmental

therapy (NDT) and proprioceptive neuromuscular techniques(PNF) using spiral and oblique motion patterns using traditional functional and promotional strategies, and Brunnstrom methods using synergistic movement. These techniques selectively apply force to induce the voluntary contraction of the subject in the correct direction to relax the shortened muscles, to activate the restricted joints, and to activate the muscles to cause reinforcement or inhibition^[11]. It is also effective to stimulate the intrinsic receptors in muscles and tendons to improve function, increase muscle activity, balance and flexibility, and to maximize the response of exercise units by increasing muscle strength, flexibility and responsiveness to muscle nerve stimulation^[12]. When a sensory stimulus is given, the signal is transmitted to the brain through the corresponding path through the spinal cord. Pain and temperature sensation reach the postcentral gyrus through the spinal cord and through the lateral spinothalamic tract^[13,14]. The contact identification ability, proprioceptive sensation, and sense of vibration come to the postcentral gyrus through the spinal cord and through the medial lemniscus pathway. These sensations lead to activation of the sensory cortex^[15,16].

Jang et al. analyzed the activity of the sensory cortex and motor cortex when stimulation through the lateral spinothalamic tract and stimulation through the medial lemniscus pathway were given. Simultaneous activation of the motor cortex and the sensory cortex was observed when the stimulus was given through the lateral spinothalamic tract, but when the stimulus was given through the medial lemniscus pathway, the simultaneous activity of the motor cortex and sensory cortex was high. This implies that activation of the motor cortex occurs when stimulation of the tactile or proprioceptive sensation is given, which explains the mechanism of tactile and motor interaction^[17]. In addition, Janda used the term sensory kinematics as the sensory system responsible for the human body and the kinetic system responsible for the movement interact with each other in controlling the movement^[18]. It suggest that sensory and motor have a close relationship with each other and can also affect each other. Thus, although there have been many researches on how the sensory stimulation affects the kinetic system, the research on how the stimulation through the exercise affects the senses has not been studied yet. Ko et al. showed improvement in motor function and sensory function in stroke patients, but motor function was improved, but sensory

function(Two-point discrimination) was not changed^[19]. Han et al. investigated the correlation of Cutaneous nerve following muscle fatigue. In this case, the sensitivity of the sensory nerve was lowered when muscle fatigue was present^[10].

According to the above studies, improving the motor function in patients is interpreted as insignificant change of sensation. However, changes in the activity of the affected sensory nerve due to direct muscle contraction are not known. Thus, there is a lack of studies on the effect of exercise on tactile sensation to date, and it is a fact that there is no fact that has been revealed clearly. Therefore, activation of epidermal sensory by activation of motor and sensory nerves will prove a correlation between motor sense and tactile sense. Therefore, in this study, we will investigate changes in kinesthetic and tactile sensations through muscle stimulation.

MATERIALS AND METHOD

Participants: The subjects of this study were 26 healthy (male 13, female 13) and 25 control (male 13, female 12) adult male and female 51 (male 26, female 25) students in S 20 university in Asan city. The study was carried out in randomize control. Subjects were instructed about the purpose and method of the study before the experiment and consisted of those who agreed to participate in the study and measured in the dominant hand direction. (Neck, back, waist), shoulder and upper limb skeletal system, person without neurological disease, trunk (neck, back, waist), shoulder and upper extremity Those who did not appeal to pain, 20 healthy subjects were selected. This study was approved by Institutional Review Board (IRB) agency bioethics. The overall research process is shown in [Figure 1].

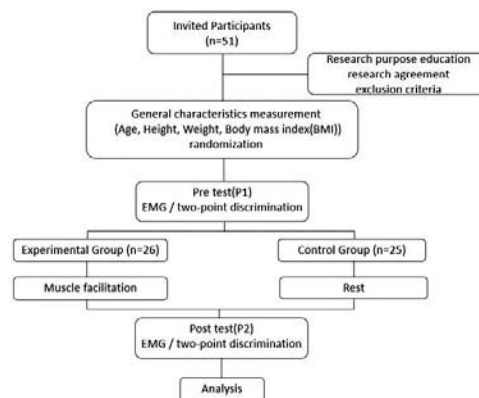


Figure 1: Flow diagram of the process through the phases of the study

Materials

Surface electromyography (sEMG): sEMG (Zero WIRE EMG, EMG OQUS100, Italy, 2009) was used to examine the muscle activity of the back muscle (upper and middle Trapezius muscle) and deltoid posterior muscle. The sEMG analog signals collected from the three channels were converted to digital signals by the MP150 system, and analyzed by computer using sEMG software myoresearch 1.06.44 software.

Two-point discrimination: Precision machined industrial digital vernier calipers were used in this test to see the benefit of the back muscle (upper and middle Trapezius muscle), Sternocleidomastoid muscle(SCM) and deltoid posterior muscle. The electronic calipers can measure up to 0.01mm. In this study, the analysis and data processing were performed up to 0.01mm. (Browne & Sharpe Tesa Eagle Electronic Caliper, Tesa, Renens, Switzerland) [Figure 2].



Figure 2: Digital Vernier Calipers

Muscle facilitation method: The subjects were allowed to keep their forehead in contact with the floor in a prone position. In order to facilitate the movement of the middle trapezius muscle for correct movement, the trainer was instructed to pull the scapular bone retraction, and the shoulder was external rotation for horizontal abduction activation of the middle trapezius muscle and rhomboid muscle^[20]. When the subject reached the end of the horizontal abduction, the examinee is promoted muscle facilitation by promoting the hand to the shoulder scapular and upper arm bones and then giving resistance. Muscle facilitation was performed 7 times for 7 seconds [Figure 3].



Figure 3: Muscle facilitation method

Test Procedure

Two-point discrimination Measurements: The upper trapezius muscle, middle trapezius muscle, posterior deltoid muscle, and Sternocleidomastoid muscle(SCM) were used to measure the two-point discrimination ability. Because exercise intervention focuses on the middle trapezius muscle, basically the tactile test was performed on the skin just above the middle trapezius muscle. The location of the upper trapezius muscle, located in the skin segment (C4) along the middle nerve branch (C2,3,4) of the middle trapezius muscle and used as the joint muscle, was examined and the location of the Sternocleidomastoid muscle(SCM) following the C4 branch of the middle trapezius muscle Respectively. In addition, posterior deltoid muscle position, which is used as a joint muscle, was also examined [Figure 4]. When the two-point discrimination ability examine, dynamic testing was performed^[21]. The skin was scratched about 5 cm over 10 seconds for 2 seconds, and the measurement was made 3 times in total. After each measurement, each patient was allowed to rest for 30 seconds. In the measurement, the distance was recorded by measurement the distance from the wide range to the range of 2 points. The ability to distinguish the muscles before inducing muscle activity through exercise intervention was measured, and the ability to distinguish the benefits was measured after exercise. The mean of the values was measured three times before and after exercise. In recording, when the subject felt one point, he answered ‘one’ and when he felt two points he answered ‘two’.



Figure 4: Two-point discrimination Location A: middle Trapezius muscle, B: upper Trapezius muscle, C: Sternocleidomastoid muscle, D: posterior Deltoid muscle

Surface electromyography (sEMG) Measurements:

In order to compare muscle activity and post-exercise activity before exercise intervention to induce muscle activity and proprioceptive sensory stimulation, measurements were performed once or twice before and after the same as the two-point discrimination ability^[22]. (upper trapezius muscle: middle point of the lateral border in the sagittal plane of the acromioclavicular joint and sternocleidomastoid muscle, middle trapezius muscle: mid-point between the medial border of the scapular and the fifth thoracic bone, posterior deltoid muscle: upper and rear of the humerus). [Figure 5]

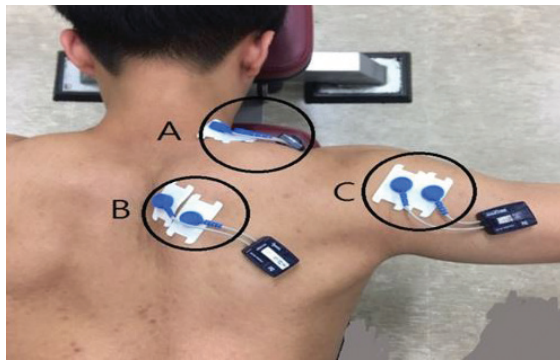


Figure 5: sEMG Location A : middle Trapezius muscle, B : upper Trapezius muscle, C : posterior Deltoid muscle

Muscle activity was measured by raising the horizontal adduction to 100 ° while keeping the internal rotation in the prone position with shoulder joint flexion 90°. After horizontal abduction from the starting posture to 100°, it was intervened at a speed of 5 seconds. The velocity was adjusted to 5 seconds until it returned to the starting position [Figure 6]. The sampling rate was set to 1000 Hz, the root mean square (RMS) value was measured, and the band pass filter was set to 20 to 500 Hz^[23].

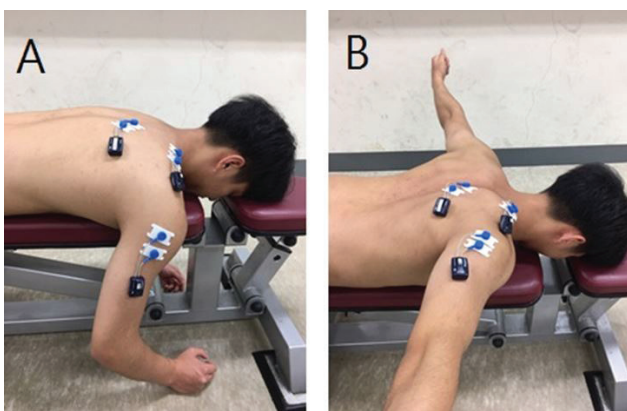


Figure 6: Horizontal abduction posture A: Horizontal abduction start posture B: Horizontal abduction end posture

Statistical analysis: All measurements for this study were calculated using SPSS / PC ver.22.0 for windows programs (SPSS INC, Chicago, IL). The descriptive statistics were used to calculate the characteristics of the subjects and the mean and standard deviation of each variable. The Shapiro-Wilk method was used for the normality test and the normality test was satisfied. The paired t-test was used to compare before and after EMG for muscle stimulation, and statistical significance was set at P<0.05.

**RESULTS AND DISCUSSION
RESULTS**

In the general characteristics of the study subjects, the mean age of the experimental group was 22.19 years, the mean height was 167.56cm, the mean body weight was 61.9kg, and the mean body mass index was 21.87. The mean age of the control group was 21.88 years, the mean height was 167.72cm, the mean body weight was 64.48kg, and the mean body mass index was 22.70 [Table 1].

Table 1: Physical characteristics of subjects (n = 51)

Variable	Experimental Group (n = 26)	Control Group (n = 25)
Age(year)	22.19 ± 2.31	21.88 ± 1.71
Height(cm)	167.56 ± 9.06	167.72 ± 8.82
Weight(kg)	61.9 ± 13.19	64.48 ± 14.00
Body mass index BMI(m ² /kg)	21.87 ± 3.30	22.70 ± 3.08
^a mean ± standard deviation		

As shown in [Table 2], when comparing the advantage recognition ability according to the muscle promotion, there was a significant difference in the difference recognition ability between before and after exercise intervention in the experimental group. When comparing the two-point discrimination ability according to the promotion of muscle in middle trapezius muscle, the discrimination ability of the experimental group was 42.27 ± 12.29 before exercise intervention, and 33.29 ± 14.61 after exercise intervention. 001, and the difference of the two-point discrimination ability before and after exercise in the control group was not significantly different (p <.115). In the upper trapezius muscle, the ability to discriminate the two points according to muscle acceleration was 29.59±12.06 and

15.56±5.82, respectively, in the experimental group. There was no significant difference in the difference of the two-point discrimination ability before and after the exercise intervention in the control group, $p < .272$. In posterior deltoid muscle, the ability to discriminate the two points according to the muscle stimulation was 32.18±13.63 in the experimental group and 14.50±5.14 in the exercise group, and the difference in the two-point discrimination ability was $p < .001$. The difference of the two-point discrimination ability before and after the exercise intervention in the control group was

$p < .172$, but there was no significant difference. In the Sternocleidomastoid muscle (SCM), when comparing the two-point discrimination ability according to the muscle promotion, the discrimination ability of the experimental group was found to be 24.01 ± 10.26 before the exercise intervention, 20.33 ± 13.36 after the exercise intervention, and the difference of the two-point discrimination ability was significant. And the difference of the two-point discrimination ability before and after exercise in the control group was not significantly different ($p < .638$).

Table 2: Two-point discrimination ability due to muscle facilitation

		pre	post	t	p
middel trapezius	Experimental	42.27 ± 12.29	33.29 ± 14.61	5.01	0.001***
	Control	38.85 ± 17.63	41.10 ± 18.68	-1.63	0.115
upper trapezius	Experimental	29.59 ± 12.06	15.56 ± 5.82	5.19	0.001***
	Control	29.75 ± 8.16	31.72 ± 13.64	-1.12	0.272
posterior deltoid	Experimental	32.18 ± 13.63	14.50 ± 5.14	3.94	0.001***
	Control	31.53 ± 12.27	33.48 ± 13.57	-1.41	0.172
sternocleidomastoid (scm)	Experimental	24.01 ± 10.26	20.33 ± 13.36	2.16	0.041*
	Control	23.68 ± 13.10	24.23 ± 12.07	-0.48	0.638
^a mean(kg) ± standard deviation, * $p < .05$. ** $p < .01$. *** $p < .001$.					

As shown in [Table 3], the differences in the two-point discrimination ability before and after EMG compared to before and after EMG according to muscle facilitation showed significant differences in middle trapezius muscle and upper trapezius muscle. In the middle trapezius muscle, EMG before and after exercise intervention was 25.67±11.53 and 31.10±15.70, respectively. EMG differences were significantly different between the groups ($p < .004$). The EMG difference before and after exercise in the control group was not significantly different ($p < .796$). In the upper trapezius muscle, EMG before and after exercise intervention was 16.10 ± 11.78 and 22.00 ± 16.09 after exercise intervention, respectively, and EMG difference was significant in $p < .003$. And the EMG difference before and after exercise in the control group was not significantly different ($p < .173$). There was no significant difference in the EMG difference between the posterior deltoid muscle and the muscle facilitation before and after exercise in the experimental group and $p < .423$ in the experimental group and the difference of EMG before and after exercise intervention in the control group was significant.

Table 3: EMG ability due to muscle facilitation

		pre	post	t	p
middel trapezius	Experimental	25.67 ± 11.53	31.10 ± 15.70	-3.15	0.004**
	Control	22.40 ± 7.64	22.62 ± 8.25	-0.26	0.796
upper trapezius	Experimental	16.10 ± 11.78	22.00 ± 16.09	-3.24	0.003**
	Control	14.60 ± 10.03	13.00 ± 8.27	1.40	0.173
posterior deltoid	Experimental	39.54 ± 19.77	37.09 ± 20.64	0.81	0.423
	Control	38.32 ± 16.55	35.88 ± 13.20	1.70	0.101
^a mean(kg) ± standard deviation, * $p < .05$. ** $p < .01$. *** $p < .001$.					

DISCUSSION

In this study, we investigated the changes of tactile perception and muscle activity according to muscle facilitation. The experimental results showed that the two-point discrimination ability of the experimental group showed a significant difference in middle trapezius muscle, upper trapezius muscle, posterior deltoid muscle, and Sternocleidomastoid muscle (SCM) when comparing the two-point discrimination ability before and after exercise intervention. However, there was no significant difference in the control group. EMG of experimental group showed significant difference in middle trapezius muscle, upper trapezius muscle, and posterior deltoid muscle. However, there was no significant difference in the control group.

Jang et al. investigated the effects of the lateral spinothalamic tract, which transmits sensations of temperature and pain, and the medial lemniscus pathway, which transmits tactility, proprioceptive sensation, and sense of vibration, in 24 healthy adults. The brain activity was analyzed. The activity of sensory cortex and motor cortex were analyzed when brain activity was analyzed. The activation of the sensory cortex was high when stimulated, while the stimulation of the medial lemniscus pathway resulted in simultaneous activation of the motor cortex. This proves that activation of the motor cortex occurs through the input of a proprioceptive sense^[17]. In this study, the sensory cortex and motor cortex were simultaneously activated by exercise intervention. This means that by stimulating the muscles, not only the stimulation of the movement but also the input of the stimuli of the proprioceptive sensation act simultaneously. Kandel reported that when performing exercise tasks, sensory feedback is formed through repetitive exercises and that latent nerve synapses are unmasked, which increases the distribution of cortical neurons in the movement. Since then, the synaptic efficiency of the sensory and corticospinal associations has been increased and the pruning and branching of the dendrites have been increased, resulting in a continuous cortical and subcortical representation of the mastered motor skills. In this study, it was thought that muscle activation resulted in simultaneous activation of the motor cortex and sensory cortex, resulting in greater muscle activity^[24].

Meesesn et al. reported that the motor map representation of the forearm and hand was expanded

when TENS was applied to the abductor pollicis brevis muscle for 3 weeks^[25]. According to meta-analysis, Bolton et al. reported that electrical stimulation is effective in both acute, subacute, and chronic stroke patients, in association with the two exercise principles of repetition and sensory motor integration. And that sensory stimulation is important^[26]. In addition, Thomsom and Stein can stimulate the neuroplasticity of the central nervous system by stimulating the corticospinal tract by sensory input by functional electrical stimulation (FES), and changes in body movements through muscle fiber stimulation can be induced by central nervous system^[27]. These results suggest that electrical stimulation can lead to activation of neuromuscular muscles and this study can also be interpreted as meaningful changes in sensory stimulation and motor sense during muscle facilitation. Ko et al. studied the enhancement of motor function and sensory function when upper extremity rehabilitation exercise program was applied in patients with chronic stroke. As a result, exercise functions such as exercise capacity of the Activities of Daily Living (ADL) were improved, but only some results were obtained in the two-point discrimination ability test and the stroke upper limb function test^[19]. In this case, if the direct stimulation of the stimulation of the muscle was mediated, the study showed that the difference in the sensory function was increased by suppressing the non-affected side of the brain.

The impairment of sensory function due to damage of the brain can attribute to the problems in the damage itself, but it is also caused by the lack of various experiences^[28]. Two-point discrimination is closely related to peripheral and central factors. This means that the receptor areas of the skin receptor can affect the two-point identification process, and the inhibition mechanisms of the central nervous system, including spinal cord, subcutaneous structure and cerebral cortex^[29]. Hebb demonstrated that the new environment creates a change in neural connections^[30]. Although the central nervous system of humans is limited, it has been shown that the structure and function are changed through various stimuli with the ability to regenerate the nerves^[31]. Neuroplasticity of the brain is the result of such a continuous experience that modifies and reorganizes the nerve pathways of the central nervous system^[32, 33]. This suggests that the sensory ability is improved due to the input of sensory stimuli.

Knott and Voss defined irradiation as a reinforcement of the strong side stimulus to the weaker side when the resistance was adapted for therapeutic purposes^[34]. Many studies have adopted cross-training in clinical practice based on this theory, and the application of such indirect treatment has been described as cross-training in clinical practice^[35]. Carroll et al. explained that the mechanism of the irradiation effect is unclear, but it may be the cortex, subcortical, spinal cord, muscular response, or neurogenic response of the brain^[36]. The results of this study also suggest that the middle trapezius muscle intervention has affected the spinal cord irradiation effect as well as the Sternocleidomastoid muscle(SCM) following the same nerve branch. Bretischwerd et al. was reported that when muscle facilitation was applied to the hamstring muscle, the pain of the trapezius muscle and the masseter muscle was reduced and the active mouth opening was increased^[37]. In addition, Espejo et al. reported that when the hamstring muscle proprioceptive neuromuscular stimulation method was applied, the active mouth opening increased by 0.34 cm and the indirect treatment was achieved^[38]. Pollard reported that when the proprioceptive neuromuscular facilitation was applied to the suboccipital muscle, the activated information reached the lower limb through the cerebral cortex - superior colliculus - vestibular nucleus - reticular formation - cerebellar cortex - vestibulospinal tract - reticulospinal tract - corticospinal tract^[39]. The middle trapezius muscle follows c2, c3, and c4 neuronal branch, and Sternocleidomastoid muscle(SCM) follows c2 and c3 neuronal branch. In this study, the tactile perception ability of the Sternocleidomastoid muscle(SCM) following the same nerve branch as middle trapezius muscle changes due to activation through muscle facilitation. And it also affected the level of the spinal cord. Therefore, the results of this study will be the basis for studying the treatment for improvement of motor function and sensory function in future brain injured patients and those with low function.

In this study, the results of long-term training were unknown because the mediation of the muscle facilitation was not continuous. In addition, since the units of the two-point discrimination ability and the units of the EMG are different from each other, it is not possible to accurately analyze how each of the enhanced differences affect each other. Therefore, if we compare these limitations with long-term research intervention, it will be useful for future research.

CONCLUSION

In this research, it was found that muscle facilitation improved muscle activity and sensitivity of Tactile perception ability. This is due to the simultaneous activation of the motor cortex and sensory cortex in the brain due to muscle facilitation. The significant change in the two-point discrimination ability can be attributed to the enhanced sensitivity of the tactile perception ability on the skin. It was also found that after the muscle facilitation, the Tactile perception ability of the Sternocleidomastoid muscle(SCM) following the same nerve branch as the middle trapezius muscle also changed, affecting the same nerve branch.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Facilitation on Motor Activity and Tactile Perception

REFERENCES

1. Ayres AJ, Robbins J. Sensory integration and the child: Understanding hidden sensory challenges: Western Psychological Services; 2005.
2. Brown MC, Hopkins WG, Keynes RJ. Essentials of neural development: CUP Archive; 1991.
3. Tamura Y, Hoshiyama M, Inui K, Nakata H, Wasaka T, Ojima S, et al. Cognitive processes in two-point discrimination: an ERP study. *Clinical neurophysiology*. 2004;115(8):1875-84.
4. Bell-Krotoski J, Weinstein S, Weinstein C. Testing sensibility, including touch-pressure, two-point discrimination, point localization, and vibration. *Journal of Hand Therapy*. 1993;6(2):114-23.
5. Wikstrom EA, Allen G. Reliability of two-point discrimination thresholds using a 4-2-1 stepping algorithm. *Somatosensory & motor research*. 2016;33(3-4):156-60.
6. Ribeiro F, Oliveira J. Effect of physical exercise and age on knee joint position sense. *Archives of gerontology and geriatrics*. 2010;51(1):64-7.
7. Paschalis V, Nikolaidis MG, Theodorou AA, Deli CK, Raso V, Jamurtas AZ, et al. The effects of eccentric exercise on muscle function and proprioception of individuals being overweight

- and underweight. *The Journal of Strength & Conditioning Research*. 2013;27(9):2542-51.
8. Ribeiro F, Moreira S, Neto J, Oliveira J. Is the deleterious effect of cryotherapy on proprioception mitigated by exercise? *International journal of sports medicine*. 2013;34(05):444-8.
 9. Riemann BL, Lephart SM. The sensorimotor system, part II: the role of proprioception in motor control and functional joint stability. *Journal of athletic training*. 2002;37(1):80.
 10. Han J, Park S, Jung S, Choi Y, Song H. Comparisons of changes in the two-point discrimination test following muscle fatigue in healthy adults. *Journal of physical therapy science*. 2015;27(3):551-4.
 11. DeStefano LA. *Greenman's principles of manual medicine*: Lippincott Williams & Wilkins; 2011. P.479.
 12. Klein DA, Stone WJ, Phillips WT, Gangi J, Hartman S. PNF training and physical function in assisted-living older adults. *Journal of aging and physical activity*. 2002;10(4):476-88.
 13. Kahle W, Leonhardt H, Platzer W, Palmer E, Platzer W. *Color atlas and textbook of human anatomy*. Vol. 1, Locomotor system: Thieme; 2004.
 14. Naidich TP, Duvernoy HM, Delman BN, Sorensen AG, Kollias SS, Haacke EM. *Duvernoy's atlas of the human brain stem and cerebellum: high-field MRI, surface anatomy, internal structure, vascularization and 3 D sectional anatomy*: Springer Science & Business Media; 2009.
 15. Carey LM, Matyas TA, Oke LE. Sensory loss in stroke patients: effective training of tactile and proprioceptive discrimination. *Archives of physical medicine and rehabilitation*. 1993;74(6):602-11.
 16. Haines DE. *Fundamental Neuroscience for Basic and Clinical Applications E-Book: with STUDENT CONSULT Online Access*: Elsevier Health Sciences; 2012. P. 256p.
 17. Jang SH, Kwon YH, Lee MY, Lee DY, Hong JH. Termination differences in the primary sensorimotor cortex between the medial lemniscus and spinothalamic pathways in the human brain. *Neuroscience letters*. 2012;516(1):50-3.
 18. Janda V, Jull G. *Muscles and Motor Control In Low Back Pain: Assessment*. :New York: Churchill Livingstone; 1987; p. 253.
 19. Ko M-s, Jeon Y-j. Effects of a Group Exercise Program for the Upper Extremities on Sensory and Motor Function and Activities of Daily Living in Chronic Stroke Patients: A Case Series. *Physical Therapy Korea*. 2015;22(2):59-69.
 20. Smith J, Padgett DJ, Kaufman KR, Harrington SP, An K-N, Irby SE. Rhomboid muscle electromyography activity during 3 different manual muscle tests1. *Archives of physical medicine and rehabilitation*. 2004;85(6):987-92.
 21. Dellon AL. The moving two-point discrimination test: clinical evaluation of the quickly adapting fiber/receptor system. *The Journal of hand surgery*. 1978;3(5):474-81
 22. Edgerton VR, Wolf SL, Levendowski DJ, Jennrich RI, Roy RR. EMG activity in neck and back muscles during selected static postures in adult males and females. *Physiotherapy Theory and Practice*. 1997;13(3):179-95.
 23. Ayatollahi K, Okhovatian F, Kalantari K, Baghban AA. A comparison of scapulothoracic muscle electromyographic activity in subjects with and without subacromial impingement syndrome during a functional task. *Journal of bodywork and movement therapies*. 2017;21(3):719-24.
 24. Kandel ER, Schwartz JH, Jessell TM, Biochemistry Do, Jessell MBT, Siegelbaum S, et al. *Principles of neural science*: McGraw-hill New York; 2000. P. 1227-1246.
 25. Meesen RL, Cuypers K, Rothwell JC, Swinnen SP, Levin O. The effect of long-term TENS on persistent neuroplastic changes in the human cerebral cortex. *Human brain mapping*. 2011;32(6):872-82.
 26. Bolton DA, Cauraugh JH, Hausenblas HA. Electromyogram-triggered neuromuscular stimulation and stroke motor recovery of arm/hand functions: a meta-analysis. *Journal of the neurological sciences*. 2004;223(2):121-7.
 27. Thompson AK, Stein RB. Short-term effects of functional electrical stimulation on motor-evoked potentials in ankle flexor and extensor muscles. *Experimental brain research*. 2004;159(4):491-500.

28. Van de Winckel A, Sunaert S, Wenderoth N, Peeters R, Van Hecke P, Feys H, et al. Passive somatosensory discrimination tasks in healthy volunteers: differential networks involved in familiar versus unfamiliar shape and length discrimination. *Neuroimage*. 2005;26(2):441-53.
29. Tamura Y, Hoshiyama M, Inui K, Kakigi R. Central mechanisms for two-point discrimination in humans. *Neuroscience letters*. 2003;342(3):187-90.
30. Hebb DO. The effects of early experience on problem-solving at maturity. *American Psychologist*. 1947;2:306-7.
31. Rodríguez-González R, Hurtado O, Sobrino T, Castillo J. Neuroplasticity and cellular therapy in cerebral infarction. *Cerebrovascular Diseases*. 2007;24(Suppl. 1):167-80.
32. Dobkin BH. *The clinical science of neurologic rehabilitation*: Oxford University Press; 2003. p. 3-134.
33. Nudo RJ. Plasticity. *NeuroRx*. 2006;3(4):420-7.
34. Voss DE, Ionta MK, Myers BJ, Knott M. *Proprioceptive neuromuscular facilitation: patterns and techniques*: Harper & Row Philadelphia, PA; 1985.
35. Munn J, Herbert RD, Gandevia SC. Contralateral effects of unilateral resistance training: a meta-analysis. *Journal of applied physiology*. 2004;96(5):1861-6.
36. Carroll TJ, Herbert RD, Munn J, Lee M, Gandevia SC. Contralateral effects of unilateral strength training: evidence and possible mechanisms. *Journal of applied physiology*. 2006;101(5):1514-22.
37. Bretschwerdt C, Rivas-Cano L, Palomeque-del-Cerro L, Fernández-de-las-Peñas C, Alburquerque-Sendín F. Immediate effects of hamstring muscle stretching on pressure pain sensitivity and active mouth opening in healthy subjects. *Journal of manipulative and physiological therapeutics*. 2010;33(1):42-7.
38. Espejo-Antúnez L, Castro-Valenzuela E, Ribeiro F, Albornoz-Cabello M, Silva A, Rodríguez-Mansilla J. Immediate effects of hamstring stretching alone or combined with ischemic compression of the masseter muscle on hamstrings extensibility, active mouth opening and pain in athletes with temporomandibular dysfunction. *Journal of bodywork and movement therapies*. 2016;20(3):579-87.
39. Pollard H, Ward G. A study of two stretching techniques for improving hip flexion range of motion. *Journal of manipulative and physiological therapeutics*. 1997;20(7):443-7

An Empirical Study on the Comprehensive Information System for Reducing Physical Symptoms in Colon Cancer Patients

Seong-Ran Lee

Department of Medical Information, Kongju National University, Kongjudaehak-ro, Gongju-si, Chungnam, South Korea

ABSTRACT

Background/Objectives: This research is to verify an empirical study on the comprehensive data system for reducing physical symptoms among population with cancer disease in the colon.

Method/Statistical analysis: A survey has been carried out from January 8th to March 12th, 2018 through face-to-face survey and preparation survey. A total of 132 participants went to proctological surgery at the university hospital in the region of C. The present circumstances of participants were conducted on the chi-square test. The t-test analyzed the difference between improvement and deterioration of physical symptoms.

Findings: The derived content is divided into five categories. 1) For blood types, 33.3 percent of the experimental group was more than 27.3 percent of the control group 2) Constipation was found to be higher at the average of 32.85 ± 1.23 before mediation than the average of 20.57 ± 1.69 after mediation ($t = .362$, $p = .000$). 3) The respondents who had eaten mushroom after application were significantly higher after mediation of the information system than before mediation of the system ($t = -1.75$, $p = .000$). 4) The average number of listening to music was significantly higher the average of 56.72 ± 3.65 after mediation of the system than the average of 25.18 ± 3.37 before mediation of evaluation system ($t = -3.26$, $p = .000$). 5) The recuperative power rate of physical movement revealed an increase in the experimental group over time since the 30 days after mediation. However, as time passed, physical movement was not more recovery in the experimental group than the control group.

Improvements/Applications: Music had proved effective in reducing the physical symptoms of patients. When they listen to music, sound comes to their thalamus stimulate cerebral cortex, which causes emotional reactions.

Keywords: *Symptoms, Music, Blood types, Colon, Movement*

INTRODUCTION

Colon cancer is ranked high in our country after stomach cancer as seen in Figure 1. Colon malignancy is a digestive cancer that affects men and women and the cause of death among cancers [Figure 2]. Colon malignancy is caused by cancer in the colon [Figure 3]. Cancer is a non-generative growth cell that can invade other organs or tissues of the body. Depending on the location of the disease, it is called colon. It can be accompanied by poor appetite and weight loss [Figure 4]. Colon cancer occurs after middle age. There are no symptoms in the early stages of rectal cancer, but as cancer grows, the stool get blood and the stool wanes [Table 1]. People think colon cancer as a disease of old age. In fact, the average age of diagnosis for cancer

patients in the Canada is 68. But Canada and Korea in the last decade, there has been a steady increase in the incidence of cellularity in the layer. For 100,000 people, there are 5.08 men in the East and 4.37 women. There are more men than women by gender in rectal cancer^[1,2].

Early colon cancer is mainly performed by endoscopic mucous membrane or muscular layer. Complications in the procedure itself can cause bleeding, perforation, pain, and infection^[3,4]. The diagnosis of cancer is endoscopic, but in some cases it is not controlled and requires surgery. Colon cancer is only possible to find cancer cells through biopsy. Operation performance is extremely good in the early stages of an operation confined to the work wall. If surgery is not possible, make an artificial anus to defecate and tighten it with radiation. The confirmation

of colon cancer is possible only after the discovery of cancer cells through biopsy. The number of men with colon cancer is 152,617, or 20.8 percent. The number of women with colon cancer is 90,152. In the case of rectal cancer, it shows a high survival rate of 95.4 % if detected early. Colon cancer has a 82.5 % survival rate when it invades the organs, adjacent tissues or lymph nodes outside the colon^[5,6]. If the cancer is transferred to another part of the organ, the survival rate becomes very low at 17.5 %.The primary treatment for rectal cancer is surgery, which must absorb the moisture of the food. If patient does not breathe and spit out phlegm due to pain in the wound immediately after surgery, it is likely to cause complications of pneumonia. Rectal cancer has been uncomfortable in everyday life after surgery. Colon cancer patients have a weakened immune system. They need to strengthen his recovery because he or she is less energetic in everyday life. To this end, it is necessary to apply state-of-the-art system to strengthen resilience^[7,8]. So far, the preceding study focused only on treating colon cancer, but there was no mediation of the system for the resilience of colon cancer. Therefore, this research is to verify an empirical study on the comprehensive data system for reducing physical symptoms among population with cancer disease in the colon. This will reduce the incidence and mortality of cancer.

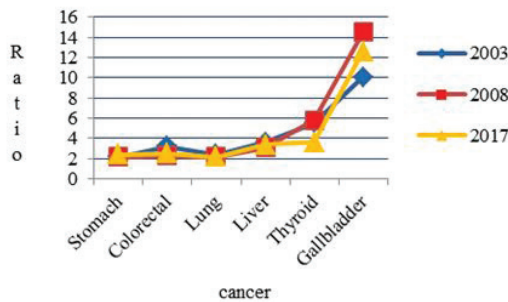


Figure 1: Trend of cancer incidence by year

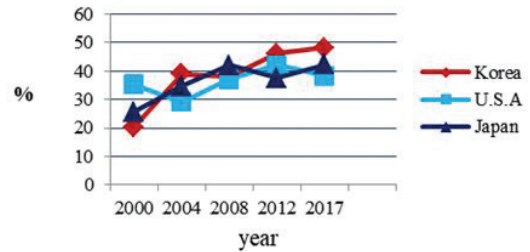


Figure 2: Trend of cancer incidence by country

DATA RESEARCH AND EXTRACTION

Data Research: Survey has been carried out from January 8th to March 12th, 2018 through face-to-face and preparation survey. A total of 132 patients who went to proctological surgery at the university hospital in the region of C. The resilience of the experimental group measured the effectiveness of evaluation system for 45 days

Program for the resilience of experimental group:

This program is classified into various aspects for the resilience of the experimental group. 1) According to the plan, this program applies a systematic information system to patients. 2) This program plans to achieve a successful performance. 3) This program analyzes the data obtained from patients. 4) This program is to examine the patient’s satisfaction with the mediation system. 5) This system measured whether it works or not. 6) The results derived from this program are applied to the medical field.

Extracting survey data: The present circumstances of participants were conducted on the chi-square test. The t-test analyzed the difference between improvement and deterioration of physical symptoms.

Table 1 : Causes, symptoms, diagnosis and complication of the experimental group

Causes and diagnosis	Symptoms and complication
<p>Causes</p> <ul style="list-style-type: none"> ● It can be largely divided into environmental and genetic factors ● High calorie intake, animal fat intake, lack of fiber intake obesity and the occurrence of colon cancer. ● The rate of colon cancer varies depending on regional characteristics. 	<p>Symptoms</p> <ul style="list-style-type: none"> ● Even if there are no symptoms, inconspicuous intestinal bleeding can cause anemia ● In case of cancer, there are changes in bowel movements such as stomach pain, diarrhea or constipation. ● Symptoms of blood bleeding from the anus can occur.
<p>Diagnosis</p> <ul style="list-style-type: none"> ● It is only possible to confirm colon cancer through biopsy to find cancer cells- The diagnosis of colon cancer is, for example, rectal digital examination, colonoscopy 	<p>Complication after surgery</p> <ul style="list-style-type: none"> ● If one does not breathe and spit out phlegm due to pain in the wound immediately after surgery

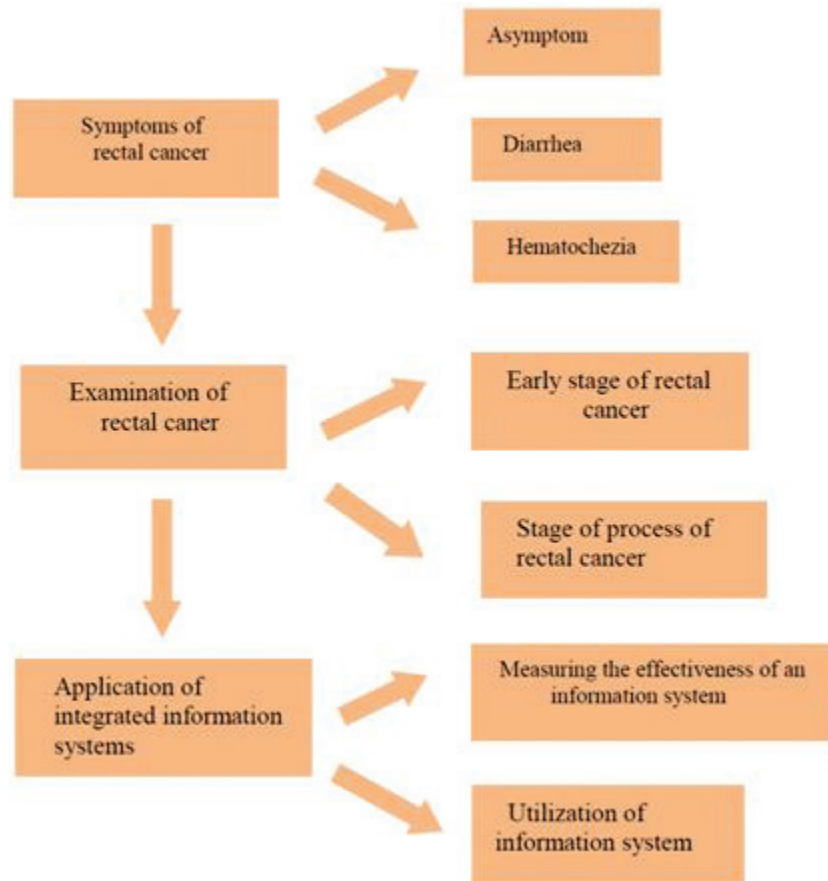


Figure 3: Data step procedures for the program

Data step procedures for the program: This reveals the data step procedures for the program in Fig. 3. 1) It reveals hematochezia, asymptoms, diarrhea, 2) An examination is carried out after the symptoms. 3) This system will measure the effectiveness of the information system. 4) The effectiveness of the information system will be used in other areas.

RESULTS AND DISCUSSION

Present circumstances of participants: The present circumstances of the participants indicate in Table 2. In men, 53.0 % of the target population was significantly more than 40.9 % of the comparative respondents ($X^2=3.76$, $p<.05$). For blood types, 33.3 percent of the target population was higher than 27.3 percent of the comparative population. In the married state, 71.2 % of the comparative population was significantly higher than 68.2% of the target population($X^2=5.72$, $p<.05$).

Table 2: Present circumstances of participants

Variables	Exp. g.	Con. g.	X ²	Variables	Exp. g.	Cong. g..	X ²
	N(%)	N(%)			N(%)	N(%)	
Education				≥3	16(24.2)	13(19.7)	
Below middles.	15(22.7)	13(19.7)	6.4712. 12.83	Marital status			
High school	31(47.0)	35(53.0)		Single	19(28.8)	21(31.8)	5.72*
More than college	20(30.3)	18(27.3)		Married	47(71.2)	45(68.2)	5.72

Conted...

Gender				FH of cancer†			
Men	35(53.0)	27(40.9)	3.76*	Yes	23(34.8)	10(15.2)	1.38* 2.86* 2.86*
Women	31(47.0)	39(59.1)		No	43(65.2)	56(84.8)	
Blood type				BMI (kg/m ²)			
A	22(33.3)	1 18(27.3)	14.19 14.19	<18.5	19(28.8)	21(31.8)	9.219 9. 6.59*
B	15(22.7)	13 13(19.7)		18.5-24.9	13(19.7)	18(27.3)	
AB	11(16.7)	16(24.2)		≥25	34(51.5)	27(40.9)	
O	18(27.3)	19(28.8)		Family living status			
Average monthly income/million				Couple & children	19(28.8)	23(34.8)	12.47
<1	19(28.8)	18(27.3)	8.53 10.54	Husband and wife or couple	33(50.0)	27(40.9)	
1-1.99	13(19.7)	11(16.7)		Alone	14(21.2)	16(24.2)	
2-2.99	18(27.3)	24(36.4)					
Total	66(100.0)	66(100.0)		Total	66(100.0)	66(100.0)	

*P<.05 † FH : Family history

Observation of physical symptoms: The observation of physical symptoms indicates in Table 3. Constipation was found to be higher at the average of 32.85±1.23 before mediation than the average of 20.57±1.69 after mediation (t=.362, p=.000). The experimental group who had been intake vegetable was significantly higher than after mediation of the system than before mediation of it (t=-8.19, p=.000).

Table 3: Observation of physical symptoms

Items	Before	After	t	P
	Mean ± S.D.	Mean ± S.D.		
Anorexia	27.94 ± 0.62	23.82 ± 2.62	2.84	.152
Iron deficiency anemia	24.19 ± 1.51	20.44 ± 4.93	1.92	.076
BW control	29.64 ± 3.84	23.13 ± 0.89	6.31	.049
Constipation	32.85 ± 1.23	20.57 ± 1.69	3.16	.000
Melena	30.41 ± 0.57	18.40 ± 0.77	0.74	.000
Physical pain	27.39 ± 1.82	23.74 ± 3.52	5.26	.362
Diarrhea	23.77 ± 1.93	18.69 ± 0.73	2.81	.002
Carnivorous	18.51 ± 1.34	10.61 ± 1.49	5.14	.000
Daily smoking	12.96 ± 0.77	8.22 ± 2.95	0.73	.054
Daily vegetable	16.53 ± 3.52	24.82 ± 3.47	-8.19	.000
Daily exercise	12.23 ± 1.68	20.56 ± 1.92	-3.47	.001
Alcohol	20.28 ± 3.25	12.57 ± 0.58	1.28	.000

Practice for recovery of disease: The practice for recovery of disease indicates in Table 4. The respondents who had eaten mushroom after application were significantly higher after application of the information system than before application of information system($t=-1.75$, $p=.000$). The respondents who had eaten mushroom showed statistically significantly positive changes of recuperative power in physical activities. It had been decreased the progression rate of colon cancer. The findings were similar with the previous studies on breast cancer^[9-14]. These finding should focus on special areas to improve the resilience of the cancer population. Based on the finding, it is anticipated that this paper may be used as important data for enhancing body's condition in cancer population.

The average number of listening to music was significantly higher the average of 56.72 ± 3.65 after mediation of the system than the average of 25.18 ± 3.37 before mediation of evaluation system($t=-3.26$, $p=.000$). The average number of listening to music was significantly higher the average after mediation of the system than the average before mediation of the system. This result is similar to that in the preceding study that music reduced stomach cancer. Listening to music is effective for cancer population. When patients listen to meditation music, sound comes to their thalamus and limbic system stimulate cerebral cortex, which causes emotional reactions. Therefore, music stimulation works for the patients.

Table 4: Practice for recovery of disease

Items	Pre	Post	t	P
	M. ± S.D	M. ± S.D		
Eating mushroom	32.72 ± 1.58	62.45 ± 1.94	-1.75	.000
Listening to music	25.18 ± 3.37	56.72 ± 3.65	-3.26	.000
mind and body rest	37.75 ± 0.82	41.39 ± 0.71	-5.18	.186
Yoga	18.63 ± 1.65	23.15 ± 1.62	-1.63	.394
Fruit intake	42.04 ± 1.27	65.86 ± 1.59	4.71	.000
Calcium intake	37.29 ± 3.64	52.72 ± 2.69	-1.52	.000
Moderate exercise	29.54 ± 0.75	59.18 ± 0.42	-3.78	.000
Screening	37.62 ± 1.84	63.42 ± 1.97	-6.94	.000
Carnivorous	59.49 ± 0.35	47.95 ± 0.38	1.65	.025
Daily smoking	31.28 ± 0.52	15.42 ± 1.46	0.82	.000
Daily vegetable	47.16 ± 1.84	64.92 ± 1.59	-3.61	.000
Daily exercise	29.84 ± 0.59	58.39 ± 0.75	-1.84	.000
Alcohol	46.19 ± 3.63	32.18 ± 2.73	1.28	.046

Recuperative powers of body movement: The changes in the recuperative powers of physical movement indicate in Figure 4. The recuperative power rate of physical movement revealed an increase in the experimental group over time since the 30 days after mediation. However, physical movement was not more recovery than the control group.

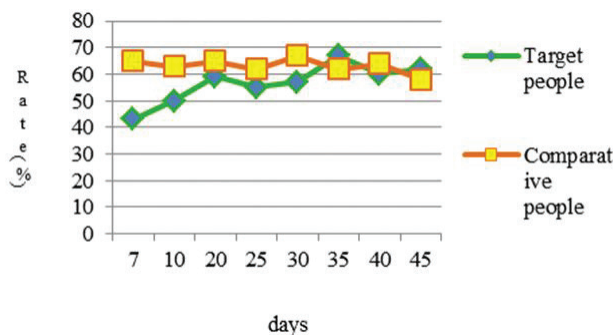


Figure 4: Recuperative powers of physical movement

CONCLUSION

The derived contents are divided into three categories.1) Constipation was found to be higher at the average of 32.85 ± 1.23 before mediation than the average of 20.57 ± 1.69 after mediation ($t=.362$, $p=.000$).2) The average number of listening to music was significantly higher the average of 56.72 ± 3.65 after mediation of the system than the average of 25.18 ± 3.37 before mediation ($t=-3.26$, $p=.000$). 3) The recuperative power rate of physical movement revealed an increase in the experimental group over time since the 30 days. However, as time passed, physical movement was not more recovery in the experimental group than control group.

Therefore, music had proved effective in reducing the physical symptoms of patients. When they listen to music, sound comes to their thalamus stimulate cerebral cortex, which causes emotional reactions.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Comprehensive Information System

REFERENCES

1. Qaisi M, Vorrasi, J, Lubek J, Ord R., Multiple primary squamous cell carcinomas of the oral cavity, *J Oral Maxillofac Surg*, 2014,. Aug, 72(8), 1511-6. DOI :<https://doi.org/10.1016/j.joms.2014.03.012>.
2. Dagmar S, Walid, EA, Erik S, Neighbourhood environment correlates of physical activity, A study of eight czech regional towns, *International Journal of Environmental Research and Public Health*, 2011, 8, 341-357. DOI : <https://doi.org/10.3390/ijerph8020341>
3. Larson EB, Wang, L. Bowen JD, McCormick WC, Teri L, Crane P, Exercise is associated with reduced risk for incident dementia among persons 65 years of age and older, *J of Ann Intern Med*. 2006 144(2), 73-81. DOI: <https://doi.org/10.7326/0003-4819-144-2-200601/170-00004>
4. Yan W, Zengyong,, Duo W, W, Ming Z. Effect of ankle arthrodesis on biomechanical performance of the entire foot, *PLOS One*, 2015, 10(7), 1-22. DOI : <https://doi.org/10.1371/journal.pone.0134340>
5. Liao CT, Fan KH, Kang CJ, Lin, CY, Chang JT, Tsang NM, Huang BS, Chao YK, Lee LY, Hsueh C, Clinical outcomes of patients with resected oral cavity cancer and simultaneous second primary malignancies, *PLOS One*, 2015, 10(9). 1-14. DOI : <https://doi.org/10.1371/journal.pone.0136918>
6. Oliver A, Shergold, Norman A, Fleck, Experimental investigation soft solids by sharp and blunt punches, with application to the piercing of skin, *Journal of Biomechanical Engineering Transaction of the ASME*, 2005, 127(5), 838-886. DOI : <https://doi.org/10.1115/1.1992528>
7. Gardner B, De Bruijn GJ, Lally P, A systematic review and meta-analysis of applications of the self-reports habit index to nutrition and physical activity behaviors, *Annuals of behavioral Medicine*, 2011, 42(2), 174-187, DOI : <https://doi.org/10.1007/s12160-011-9282-0>
8. De Bruijn, G.J, Exercise habit strength, planning and the theory of planned behaviour : an action control approach, *psychology of sport and exercise*, 2011, 12, 106-114. DOI : <https://doi.org/10.1016/j.psychsport.2010.10.002>
9. Hofmann SG, Bitrain, Sensory-processing sensitivity in social anxiety disorder : relationship to harm avoidance diagnostic subtypes, *The Journal of Anxiety Disorder*, 2007, 21(7), 944-954, DOI : <https://doi.org/10.1016/j.janxdis.2006.12.003>
10. Chrousos GP, Stressors, stress and neuroendocrine integration of the adaptive response : The 1997 Hans Selye Memorial Lecture, *Annals of the New York Academy of Sciences*, 1998, 85(1), 311-335, URL : https://academic.naver.com/article.naver?doc_id=256731567.
11. Baron RM, Kenny, DA, The moderator-mediator variable distinction in social psychological research : conceptual, strategic, and spastical considerations, *Journal of PersSocPsychol*, 1986, 51(6), 1173-1182, DOI : <https://doi.org/10.1037/0022-3514.51.6.1173>.
12. Pradeep Kumar Mallick, Debahuti Mishra, Srikanta Patnaik and Kailash Shaw, "A Semi-Supervised Rough Set and Random Forest Approach for Pattern Classification of Gene Expression Data", *Int. J. of Reasoning-based Intelligent Systems (IJRIS)*, Vol.8, No.3/4, pp.155 – 167, 2016., ISSN online: 1755-0564, ISSN print: 1755-0556 .
13. Pradeep Kumar Mallick, Debahuti Mishra, Srikanta Patnaik and Kailash Shaw, "A Hybrid Approach for Simultaneous Gene Clustering and Gene Selection for Pattern Classification", *Indian Journal of Science and Technology*, Volume : 9(21), DOI: 10.17485/ijst/2016/v9i21/94175, June 2016, ISSN (Print) : 0974-6846. ISSN (Online) : 0974-5645.
14. Pradeep Kumar Mallick, Debahuti Mishra, Srikanta Patnaik and Kailash Shaw, "A Novel Supervised Gene Clustering Approach By Mining Interdependent Gene Pattern" *International Journal of Pharma and Bio Sciences*, Volume: 7(4): (B), pp: 20 - 32 ,2016, ISSN 0975-6299.

A Case Study of Word finding Intervention for the Elderly with Alzheimer's Dementia at Home

Soo-Jin Kim

Associate Professor, Department of Special Education, Baekseok University, # 76 Moonam-ro, Dongnam-gu, Cheonan-si, Chungcheongnam-do, 3106,5 Republic of Korea

ABSTRACT

Background/Objectives: Once dementia develops, the cognitive problems associated with memory gradually worsen. The purpose of this study was to provide word finding intervention and to investigate changes in the performance of the subject during the intervention.

Method/Statistical analysis: The subject was an 85 - year - old woman suffering from Alzheimer's dementia, which was progressing from mild to moderate stages. The word finding intervention was composed of 30 sessions. The number of words remembered by the subject was calculated and scored by counting the number of syllables and the number of words per part of speech. Also, changes in other related performances throughout the intervention were observed.

Findings: As the number of words increased throughout the intervention sessions, though there were few dips in the number, it remained relatively high as time progressed than what it was at the beginning of the training. Eventually, the increase in numbers showed a tendency to slow down slightly. The rate of improvement at the beginning of the intervention was faster than the rate at the end of the intervention. Most of the words remembered were mainly composed of two syllable nouns. The errors in the two-digit multiplication and addition persisted throughout the entire intervention. And the letters were not written uniformly throughout the entire intervention.

Improvements/Applications: The results of this study can be used as basic data to provide cognitive intervention in the elderly with Alzheimer's dementia.

Keywords: *Alzheimer, Dementia, Elderly, word finding, Intervention*

INTRODUCTION

In Korea, the number of elderly people with dementia is increasing due to the rapid increase in the elderly population. ¹The number of nursing homes is also increasing due to the increase in number of elderly people with dementia. Meanwhile, the number of families and home care for the elderly with mild and moderate dementia is increasing. The reason for this is that the government is putting the burden of the shortage of facilities and caretakers, to take care of the increasing number of elderly people with dementia, on the family members who are not professionals dealing with this illness prior to addressing the effects of home care. According to National Health Insurance Service, of the 720,000 patients with dementia in Korea, the families are taking care of 520,000 patients. The three main reasons for those who care for patients with dementia at home are as follows: First, they want to

protect their family members at home. Second, they want to be close to the patient. ²And finally, they want to fulfill their duties as a spouse.

Dementia is a chronic progressive disease that is difficult to cure once the onset of dementia occurs. ³The related symptoms of the disease gradually progress as their independence, along with their daily life functions, gradually get lost. As dementia progresses in time, the patient's dependence on others gradually increase. Therefore, families become socially and economically distressed and disadvantaged. In addition to providing medication to treat dementia, the families for the elderly also need to provide rehabilitation treatments that can slow down the symptoms of dementia, in hopes of extending their time at home, and improving the quality of life for the family members. When medication was combined with intervention, it was more effective than

medication alone. ⁴And the success of their cognitive rehabilitation is directly related to the close involvement of their family members to the patient and their involvement in their daily life. ⁵Furthermore, in the case of early dementia, the higher degree of perception of the patient's disability and difficulty, the better cognitive rehabilitation results.

The dysfunction of cognition is the main symptom of dementia⁶ and the patient with this disease will gradually lose their independence of daily life functions. Cognitive disorders cause Alzheimer's disease. While dementia progresses, language deficits are overshadowed by cognitive dysfunction and are not evidently visible. ⁷The cognitive problems that cause such dementia are related to memory. ^{6,8,9} The close link between dementia and language and speech is the cause of the most common symptom of decrease in word memory. ^{9,10}The inability to remember words makes word finding difficult for patients with Alzheimer's dementia. The difficulty of word finding mainly comes from the dwindling of object naming. ¹¹For example, the patient can use an object but cannot remember the names of the object.

The management of dementia depends on the types of dementia. ¹²But the management of Alzheimer's dementia focuses on slowing down the progression of symptoms associated with behavioral problems facing daily life and to help in preserving residual functions. ¹³Rehabilitation to awaken the cognitive function is needed in addition to the medication in slowing down these progressing symptoms caused by dementia. In order to prevent deterioration of the cognitive functions that can be damaged by dementia and to maintain and to improve the cognitive functions, customized rehabilitation methods should be tailored to address the characteristics of each individual case and the symptoms. Therefore, it is necessary to examine whether cognitive rehabilitation reveals changes in cognitive functions and performances in the patient with Alzheimer's disease in order to maintain them and to delay the dysfunctions brought on by dementia. The purpose of this study was to provide word finding intervention for patients with Alzheimer's dementia in order to investigate the changes in cognitive functions and performances during the intervention. Based on the results of this study, using word memory, the findings will assist in predicting the progression of symptoms brought on by dementia, and further provide customized intervention for the patients of this disease.

MATERIALS AND METHOD

In order to provide word finding intervention and to investigate the performances of the subject, this study used the following research methods.

Procedures: In the cognitive intervention, 26 sessions were conducted in the morning once a week for 6 months (from April to September). Then 4 sessions of maintenance period (from October 28 to November 19) were added after 3-weeks of rest. The subject received in total 30 sessions during the cognitive intervention. The main task of the cognitive intervention was word finding. The subject performed these tasks in her home with the researcher during each of these sessions. In this word finding study method, the subject was more familiar with the Bible than the newspaper because she had been copying the Bible regularly. In her regular Bible reading, she chose her most favorite phrases from the Psalms. Then she was asked to write the words from memory, using words from her word memory bank, in the exact order of the letters that make up the phrase. In each 15 minutes sessions, the subject received a total score by calculating the number of words remembered and the number of syllables she wrote. During 26 sessions of intervention and 4 maintenance sessions, the researcher counted the number of words, and the number of syllables, and the number of words in the part of speech remembered by the subject, and also observed the changes in other related performances throughout the intervention.

Subject: The subject was an 85 - year - old woman suffering from Alzheimer's disease, which was progressing from mild to moderate. At the age of 74 she visited the neuropsychiatric office concerned about her unexplained crying when she was alone and feeling lost and wandering around the new house she had moved into. She was diagnosed with geriatric depression and received medication for 2 years. Then after discontinuing the medication for about 6 years, she would often lose things like her cell phone, her hat, and other things in and out of her home. Then it progressed to losing her way to and from the local market which she often went to. Eventually she visited the neuropsychiatric department once again and was diagnosed with Alzheimer's dementia. The subject was given the K-MMSE scores¹⁴ of 21 points at the time of her diagnosis. Her scores were 19 points at the start of this study. She had also been taking medications for diabetes, high blood pressure, and for dementia as well for 5 years. The most serious symptom for her was the loss of short-term memory since the onset of dementia. While

taking her medication, she showed signs of cognitive dysfunctions and minor communication difficulties due to her short - term memory loss. The problem in her communication was that she was using wrong choices of words to express herself. For example, when it was pointed out to her that she had used a wrong word, she would acknowledge that she had made an error. But this pattern continued.

Materials: At the national level, the Jung-ang Center for Dementia developed cognitive training methods related to the memory, locomotion, and language ability of the elderly with dementia, and bundled the methods into two books. They distributed them in a two volume work entitled, ‘9988 ¹⁵A Smart Newspaper Reading: Doo-geun Doo-geun Brain Movement’. The method that ‘Doo-geun Doo-geun Brain Movement’ suggests is a rehabilitation training that utilizes newspaper reading which can be easily done by the patient in daily life. In this study, Open Word Warehouse(No. 17) was used in ‘Doo-geun Doo-geun Brain Movement II’. The training procedure for Open Word Warehouse is to select one or two sentences from the newspaper, remember as many words as possible starting with the letters that make up the sentence, and to write the words from memory for 15 minutes.

Data analysis: In this study, the researcher calculated the total number of words that the subject remembered in each of the 15 minutes sessions. The subject’s performances were then tabulated, and a total score for the words remembered was assigned [Appendix 1], as the scores reflect the number of syllables in the words remembered. The word scores were assigned 1 point per 2 syllable words, 3 points per 3 syllable words, 5 points per 4 syllable words, and 10 points per 5 syllable words.

RESULTS AND DISCUSSION

Word finding intervention was applied to all 30 sessions and the results obtained were summarized and discussed according to the number of words and other performances tabulated in the procedure.

Word finding performance: Word finding performance was applied to calculate the number of words per session and also to calculate the distribution of syllables and parts of speech in the total number of words.

The number of words per session: During the 26 sessions of the intervention, the number of words per session ranged from 28 to 66. The number of words counted in the first session was the lowest, at 28. But then from the second to the 10th session, it showed a rising curve[Picture 1]. From

there the number of words per session fluctuated slightly, but then during the 16th session, the number peaked to 66 words. However, in the 17th session, the number of words dropped down to 45. But then it increased back up to 61 at the 18th session and then decreased to 45 at the 24th session in the 5th month.

The dips in the number of words were observed in the 17th and the 24th sessions. The reason for the decrease in the number of words recorded in the 17th session was due to the fact that the subject was ill. But the condition of the subject was not a factor for the drop in the number during the 24th session. But the following session, the number of words increased to 52 again. The low score in the 17th session can be attributed to her being sick but the result of the other low number of words remains an anomaly. After a rapid decline at the 17th and 24th sessions of the intervention, the degree of recovery was similar overall. Even though the number of words showed couple of dips until the 24th session, yet it increased back up to 58 and remained there until the 26th session.

After the 3-week rest, the number of words decreased to 47 for the 1st session of the maintenance period. But the average number of words was kept at 54 during the 2nd to the 4th maintenance sessions. As a whole, despite the slight fluctuation, the number of words continued to increase and remained constant at over 50 words.

¹The word finding performance varied according to the condition of the subject, yet these results suggest that this kind of training can improve and or maintain word memory. The cognitive enhancement program improved scores before and after the intervention. ¹³The cognitive interventions were important and effective in the early stages of dementia. Further research is needed on how these improvements in word memory exercises affect the expressive language ability in patients with Alzheimer’s dementia.

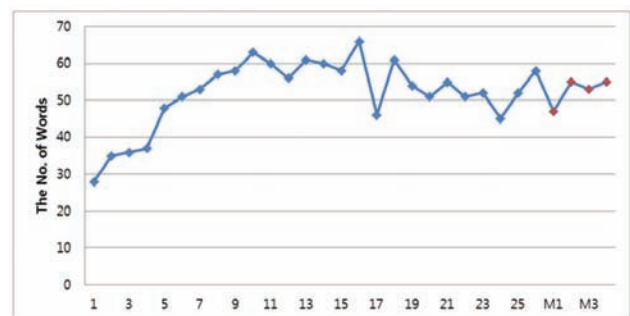


Figure 1: The number of words per session

The classification of words: Of the number of words according to the number of syllables in the entire

intervention, 2 syllable words were the most common accounting for 48.8%, 3 syllable words 39.8%, 4 syllable words 10.6%, and 5 syllable words 0.6%, respectively [Table 1]. One syllable word was not included in the number of words as well as the total scores because the subject needed to find the word that started with that particular syllable in the letter warehouse and then had to write it in the word warehouse.

As for the number of words per part of speech, nouns accounted for 82.8%, verbs 12.8%, adjectives 2.4%, adverbs 2.3% and others 0.1% [Table 1]. The most frequently recalled words were two syllable nouns. This seems to be due to the fact that most frequently used target words in daily life are composed of two syllables.

Table 1: Distribution of the classification of words

Word	Classification	Total number	Percentage (%) [*]
Syllables	2 syllables	763	48.8
	3 syllables	623	39.8
	4 syllables	166	10.6
	5 syllables	10	0.6
Parts of speech	noun	1283	82.1
	verb	201	12.8
	adjective	39	2.4
	adverb	36	2.3
	others	3	0.1

^{*}Rounded to the second decimal place.

¹⁶The increase in the positive response rate of nouns as shown by the results of this study, is similar in comparison to that of the results of the previous study. ⁶The main symptom of Alzheimer’s dementia is dysfunction of cognition. ^{6,7,13}And the cognitive impairment that causes dementia is associated with memory. ^{8,9}And the most common symptom associated with cognitive impairment concerning speech and language is the naming disorder. ^{16,17}The research revealed that the patient’s ability to name things was maintained by the intervention. ¹⁴It should be noted that there was a difference in naming ability according to the severity of the Alzheimer’s dementia.

On the other hand, the patient’s attempt at articulating their thoughts remained normal despite the reduction in their word memory. ^{6,18}This was also consistent with the results of the previous studies. ^{9,19}The speech analysis of

the patients with Alzheimer’s dementia showed that the syntactic and morphological aspects of their speech were preserved though the semantic aspect was impaired.

Other performance: In other performances, the subject’s calculation ability and their writing ability were observed and the following problems were identified during the entire intervention.

Calculation: The subject was able to perform one-digit multiplication. However, she often made errors in performing two-digit calculations. Even when the session was repeated, she still had difficulties in performing this task. Therefore, it was necessary to establish and maintain cognitive training programs to help manage her ability to perform double-digit multiplication.

In performing the calculations during the intervention process, she had difficulties tabulating the scores from her word memory exercise. She struggled in doubling and adding two-digit numbers when calculating the total score [Appendix 1]. When she was uncertain about the results, she was able to recalculate and get the correct score after repeating the task 2-3 times. She, on the other hand, was slow in remembering the multiplication times table, but eventually she was able to recall them accurately. Throughout the intervention, the subject continued to display difficulties in performing calculations. But the duration of the intervention was too short to properly observe why she showed difficulties performing this task. Another factor may have been that she had to perform this task after having performed the grueling task of word memorization. Being tired and stressed, this may have influenced her ability to concentrate in performing the calculations.

Writing: A peculiar thing was observed concerning the nonuniformed penmanship of the subject throughout the intervention sessions. In the beginning of the intervention, when the subject wrote words in the word warehouse [Appendix 1], she wrote them inside the lines and columns provided. However, from the 9th session, she started to go outside the provided lines or cram the words into one given space. In the 14th session, she filled the space with multiple lines with words. Eventually, she was often asked by the researcher to write bigger using larger letters. She initially made the adjustments then reverted back to writing small again. The shapes of her letters were also slightly tilted to the right and the letters became more distorted as the intervention sessions went on. Future research must be done in order to investigate the reasons for these shifts in penmanship.

²⁰The elderlies living at home were more likely to perform their daily activities more so than those living in nursing homes. This seems to be due to the fact that the elderlies living at home can receive ongoing care while they were doing daily activities with their family members. ²¹In addition, active management of Alzheimer’s dementia can improve the quality of life for the patients and for their families. For this reason, more research needs to continue supporting the findings of the previous studies^{13,20}, investigating the factors affecting the cognitive functions of the elderlies with dementia.

CONCLUSION

The results of providing word finding intervention to a subject with Alzheimer’s dementia and the observed changes in her performance during the intervention are summarized below.

First, the number of words during the intervention period increased up until the 16th session and then decreased slightly. The number of words fluctuated, going up and down, throughout the sessions.

Second, most of the words remembered by the subject were mainly composed of two syllable nouns.

The words were measured according to the number of syllables, ordering from 2 syllables, 3 syllables, 4 syllables, and 5 syllables. Meanwhile, the words in parts of speech were in the order of nouns, verbs, adjectives, and adverbs.

Third, in calculating the total scores, the subject showed errors in the two-digit multiplication and addition and these errors persisted during the entire intervention.

Forth, the letters and numbers were not written uniformly filling in the word warehouse and the calculation results. This also persisted throughout the intervention sessions. And the shape of her letters was also slightly tilted to the right.

In conclusion, it is necessary to provide professional rehabilitation methods, information, and materials to the family members of the elderlies suffering with dementia, in order to educate them so that they can apply them effectively in real life. Therefore, future studies require long-term interventions and observations to understand the implications of applying them on patients suffering from dementia. And there is a need for continuous follow-up research to provide customized diagnostic intervention to address properly the patient’s problematic situation.

[Appendix 1] Exercise sheet

Date of training	Year Month Date Day of the week
Letter warehouse	
Word warehouse	
	2 syllable word score(number ____ x 1 point) + 3 syllable word score(number ____ x 3 points) + 4 syllable word score(number ____ x 5 points) + 5 syllable word score(number ____ x 10 points) = Total score

Ethical Clearance: Not required

Source of Funding: This research was conducted with the grant from the Baekseok University in 2018.

Conflict of Interest: Word finding Intervention for Alzheimer’s Dementia

REFERENCES

1. Han EA, Geum MJ. Study on effectiveness of ‘Cognitive Enhancement Program’ for the Prevention of Dementia: Cognitive Impairment Inmates over 60 years. Correction Review. 2014 Mar;62(6):147-166. Available from <http://db.koreascholar.com/article.aspx?code=343465>

2. Alzheimer's Association. Alzheimer's association report: 2017 Alzheimer's disease facts and figures. *Alzheimer's & Dementia*. 2017;13:325-373.
3. Burgener S, Twigg P. Relationship among caregiver factors and quality of life in care recipients with irreversible dementia. *Alzheimer Disease and Associated Disorders*. 2002;16:88-102.
4. Clare L, Wilson BA, Cater G, Hodges JR. Cognitive rehabilitation as a component of early intervention in Alzheimer's disease: a single case study. *Aging & Mental Health*. 2003;7(1):15-21.
5. Clare L, Wilson BA, Cater G, Roth I, Hodges JR. Awareness in early-stage Alzheimer's disease: Relationship to outcome of cognitive rehabilitation. *Journal of Clinical and Experimental Neuropsychology*. 2004;26(2):215-226.
6. Cummings L. *The Cambridge handbook of communication disorders*. New York: Cambridge University Press; 2014. pp. 266-283.
7. Birren JE, Schaie KW. *Handbook of the psychology of aging*. 2nd ed. New York: Van Nostrand Reinhold Co.; 1985. pp. 427-462.
8. Powell AL, Cummings JL, Hill MA, Benson DF. Speech and language alterations in multi-infarct dementia. *Neurology*. 1988;38:717-719.
9. Appell J, Kertesz A, Fisman M. A study of language functioning in Alzheimer patients. *Brain and Language*. 1982;17:73-91.
10. Choi HJ. A comparison of the performances of confrontation naming test and verbal fluency task on patients with prodromal Alzheimer's disease and mild Alzheimer's disease. *Voice Science*. 2008 Jun;15(2):111-118. Available from <http://society.kisti.re.kr/~kass/>
11. Schwartz MF, Marin OSM, Saffran EM. Dissociations of language function in dementia: a case study. *Brain and Language*. 1979;7:277-306.
12. Lichtenberg PA, Murman DL, Mellow AM. *Handbook of Dementia: psychological, neurological, and psychiatric perspectives*. Hoboken, New Jersey: John Wiley & Sons, Inc.; 2003. pp. 403-412.
13. Clare L, Woods RT. Cognitive training and cognitive rehabilitation for people with early-stage Alzheimer's disease: a review. *Neuropsychological Rehabilitation*. 2004;14(4):385-401.
14. Kang Y. A normative study of the Korean-Mini Mental State Examination(K-MMSE) in the elderly. *Korean Journal of Psychology: General*. 2006;25:1-12. Available from <http://www.koreanpsychology.or.kr>
15. Kim K, Shin S. 9988 A smart newspaper reading: doo-geun doo-geun brain movement. Volume II. Seoul: Central Dementia Center; 2015. pp. 42-48.
16. Mo KO, Sung ES, Jeong JH. The effects of semantic feature analysis treatment on naming performance in Korean individuals with early dementia of the Alzheimer's type: using a familiarity of nouns scale. *Communication Sciences & Disorders*. Mar;20(1):34-47. Available from <http://www.kasa1986.or.kr>
17. Clare L, Wilson BA, Carter G, Hodges J, Adams M. Long-term maintenance of treatment gains following a cognitive rehabilitation intervention in early dementia of Alzheimer type: a single case study. *Neuropsychological Rehabilitation*. 2001;11(3/4):477-494.
18. Lee MS, Kim HH. Characteristics of expressive language in normal aging, mild cognitive impairment, and Alzheimer's disease. *Dementia and Neurocognitive Disorders*. 2011 Mar;10:69-79. Available from <http://www.riss.kr/link?id=A103913791>
19. Jin, C, Choi HJ, Lee JY. Usefulness of spontaneous speech analysis scale in patients with mild cognitive impairment and dementia of Alzheimer's type. *Communication Sciences & Disorders*. 2016 May;21(2):284-294. Available from <http://www.kasa1986.or.kr>
20. Ha EH, Park KS. Factors influencing cognitive impairment in elders with dementia living at home. *The Journal of Korea Academy of Fundamentals Nursing*. 2011 Aug;18(3):317-327. Available from <http://www.kafn.or.kr>

The Structural Relationships among Professor's Servant Leadership, Faculty Trust, Learning Flow, and Adjustment to College Life

Boo-Gil Seok¹, Hyun-Suk Park², Yong-Gun Lee³, Hyung-Chul Joo⁴

¹Assistant Professor, Dept. of Beauty Health, ²Assistant Professor, Division of Liberal Arts, Halla University, 28 Halladae-gil, Wonju, Korea; ³Research Scholar, Dept. of Sport Industry Studies, Yonsei University, 50 Yonsei-ro Seoul, Korea; ⁴Research Professor, Dept. of Physical Education, Chungang University, 84 Heukseok-ro Seoul, Korea

ABSTRACT

Background/Objectives: Reducing the drop-out rates may be one of the major concerns in many schools including both secondary and tertiary levels. This study examines how professors' servant leadership affects students.

Method/Statistical analysis: A questionnaire survey was conducted amongst 4-year college students in Korea. The survey consists of 5 parts asking demographic information, servant leadership, faculty trust, learning flow, and adjustment to college life. To secure reliability and validity, confirmatory factor analysis was used. Frequency analysis, correlation analysis, path analysis, and mediating effect analysis were also carried out. The data were analyzed with PASW 18.0 and AMOS 18.0.

Findings: Professors' servant leadership influences students' trust in professors positively. Also, both professors' servant leadership and faculty trust positively affect students' learning flow. Students' learning flow seems positively related to students' adjustment to college life. The results indicate that professors' servant leadership, students' trust in professors, learning flow, and adjustment to college life influence one another. Therefore, it is fundamental to better understand the structural relationships among them to reduce the drop-out rates. Students' learning flow is one of the important antecedents required to help students adjust to college life. Professors' servant leadership plays important role to help students enhance their learning flow. Consequently, a variety of opportunities to train and enhance their servant leadership should be given to professors so that they can help their students find college life enjoyable and meaningful.

Improvements/Applications: Professors' servant leadership leads to enhancing faculty trust and learning flow, and ultimately helps students adjust to college life. Professors' servant leadership plays an important role in assisting their students.

Keywords: *Servant leadership, Faculty Trust, Learning flow, Adjustment to college life, Professors*

INTRODUCTION

School age population has sharply fallen recently in Korea. As a result, it is expected that most colleges will not be able to recruit enough students. It has been forecast that school age population will drop to 380,000 in 2030, which plummets by 55 percent compared to 2012 ^[1]. Low enrollment rates will cause college to be confronted with financial difficulties. Consequently, most colleges in Korea strive to attract high school graduates and prevent current students from dropping out school.

Corresponding Author:

Hyun-Suk Park
Assistant Professor, Division of Liberal Arts,
Halla University, Korea
Email: gardencityny97@gmail.com

To boost the enrollment rates, first and foremost, it is highly required for students to be satisfied with college life in many directions. Many colleges provide their students with various events such as festivals, athletic meeting, and/or field trips so that their students can find the excitement in school and, in turn, become satisfied with college life. However, those events cannot be fundamental alternatives. A number of previous studies have suggested learning flow as one of the antecedents to help students adjust to college life [2][3]. Learning flow is attaining a spiritual state of perfect selflessness that students usually experience when they concentrate on solving tasks given to them during educational activities [4]. When students frequently experience learning flow, their satisfaction level increases and they tend to adjust themselves to college life more smoothly. Learning flow usually improves through trust. When students trust their professors, their learning flow also improves [5][6]. In addition, as trust facilitates interactions between two parties, mutual trust between students and their professors should be established above all else because mutual trust enables them to have productive communication. Mutual trust between students and professors positively influences students' motivation and learning flow [6]. Trust is defined as belief and faithfulness and trust in a leader is highly related to leadership that a leader show [7]. Servant leaders' ethics and modality have an effect on trust between superiors and subordinates [8]. Professors' servant leadership has a positive effect on faculty trust and students' learning motivation [9] and learning motivation stimulates learning flow. In sum, professors' servant leadership generally leads to students' trust in professors, namely faculty trust, as well as their learning flow.

Thus, this study aims to closely investigate the structural relationships among servant leadership, faculty trust, learning flow, and adjustment to college life. The research hypotheses are as follows;

Hypothesis 1. Professors' servant leadership has a positive effect on faculty trust.

Hypothesis 2. Professors' servant leadership has a positive effect on learning flow.

Hypothesis 3. Students' trust in their professors has a positive effect on learning flow.

Hypothesis 4. Learning flow has a positive effect on students' adjustment to college life.

Hypothesis 5. Faculty trust plays a mediating role between servant leadership and learning flow.

MATERIALS AND METHOD

To fulfill the purposes of this study, a questionnaire survey was conducted. To find out the structural relationships among professors' servant leadership, students' trust in their professors, learning flow, and students' adjustment to college life, the study samples were selected by convenience sampling method. The survey was conducted for about two weeks (between November 27 and December 8, 2017). A total of 163 questionnaires were distributed and collected. To include students from various majors, the questionnaires were distributed during liberal arts classes which students are required to take regardless of their majors. After explaining the purposes and the procedures of the research, the participants were asked to answer the questionnaire.

Instrument: The questionnaire consists of the five parts regarding demographic information, servant leadership, faculty trust, learning flow, and adjustment to college life. Except for the demographic information, each item is rated on a 5-point Likert scale. First, the questionnaire items on professors' servant leadership include 11 items from the previous studies [10][11][12][13]. Second, for faculty trust, the 27 items modified from the previous studies are included [14][15][16]. Third, a total of five items are related to learning flow [17][18][19][20]. Last, the 25 items are included to measure the adjustment to college life [21][22].

Data Analysis: A total of 146 questionnaires were used for final data analysis after removing the 17 questionnaires with insufficient information. The data were analyzed with PASW 18.0 and AMOS 18.0. To secure reliability and validity, confirmatory factor analysis and Cronbach's α was used. With the data whose reliability and validity were secured, the path analysis was utilized with structural equation model to prove the research hypotheses and examine the structural relationships among professors' servant leadership, students' trust in their professor, learning flow, and adjustment to college life. The mediation effects were examined by using Baron & Kenny's procedures [23]. The statistical significance was examined by Bootstrapping. The results of confirmatory factor analysis and the reliability are presented in Table 1 and Table 2.

RESULTS AND DISCUSSION

The results of confirmatory factor analysis are presented in Table 1.

Table 1: The results of confirmatory factor analysis

Standards	χ^2	df	CFI	TLI	RMSEA
Indexes	450.471	269	.910	.901	.068

The results of reliability are presented in Table 2.

Table 2: The results of reliability

Factor		Cronbach's α
Servant leadership	Servant leadership	.940
Faculty trust	Sense of closeness	.914
	Expertise	.910
	Leadership	.901
	Instructional ability	.810
Learning flow	Learning flow	.752
Adjustment to college life	Academic adjustment	.804
	Social adjustment	.695
	Emotional adjustment	.949
	Physical adjustment	.752
	Attachment to college	.839

As shown in Table 3, the study model suggested in this study is suitable for examining the structural relationships between the variables.

Table 3: The results of comparison of fit of the research model

Standards	χ^2	df	CFI	TLI	RMSEA
Research model indexes	451.199	271	.912	.902	.068

The research model with overall results of confirming the hypotheses are presented in Figure 1. Also, the detailed results of path analysis to test the hypotheses are presented in Table 4 and Table 5.

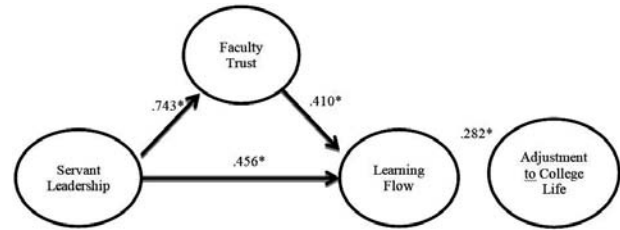


Figure 1: Research model and the results of the hypothesis test

As shown in Table 4, the results of path analysis confirm Hypothesis 1, 2, 3, and 4. That is, professors' servant leadership has a positive effect on students' trust in their professors and students' learning flow. Both professor's servant leadership and students' trust in their professors influence students' learning flow positively. Experiencing learning flow helps students adjust to college life smoothly.

Table 4: The results of path analysis

Hypothesis	Path	β	S.E.	t	p
1	Servant leadership → Faculty trust	.738	.743	8.821	***
2	Servant leadership → Learning flow	.330	.456	3.434	***
3	Faculty trust → Learning flow	.298	.410	3.184	**
4	Learning flow → Adjustment to college life	.317	.282	2.577	*

* $p < .05$, ** $p < .01$, *** $p < .001$

Namely, servant leadership and faculty trust, servant leadership and learning flow, faculty trust and learning flow, and learning flow and adjustment to college life influence one another positively.

Table 5: The results of mediating effect

Path	Direct effect	Indirect effect	Total effect
Servant leadership → Faculty trust	.743		.743
Faculty trust → Learning flow	.410		.410
Servant leadership → Learning flow	.456	.304	.760

Direct effect 60.0%, Indirect effect 40.0%

As shown in Table 5, the results of Bootstrapping indicate that the indirect effect is significant as confidence intervals fall between .62 and .661 on the significance level of .05. Namely, the null hypothesis is rejected, which means the indirect effect is significant. Therefore, faculty trust plays a mediating role between servant leadership and learning flow.

CONCLUSION

This study aims to examine the structural relationships among servant leadership of professor, students trust in professor, learning flow, and adjustment to college life. To this end, a questionnaire survey was conducted and the results indicate that they have the structural relationships and influence one another. The five hypotheses were tested; Hypothesis 1. Professors' servant leadership has a positive effect on faculty trust, Hypothesis 2. Professors' servant leadership has a positive effect on learning flow, Hypothesis 3. Students' trust in their professors has a positive effect on learning flow, Hypothesis 4. Learning flow has a positive effect on students' adjustment to college life, Hypothesis 5. Faculty trust plays a mediating role between servant leadership and learning flow. All the hypotheses were confirmed.

First, professors' servant leadership enhances faculty trust, which means that professors who listen to, support, and empathize with their students gain more trust by their students. Therefore, the paradigm in educational settings should be changed, namely, professor-oriented into students-oriented.

Second, professors' servant leadership increases students' learning flow. Therefore, professors should try to give more opportunities for their students to experience learning flow. Professors also try to promote their students' autonomy so that students take responsibility for their own learning. Student autonomy eventually leads to enhancing students' learning flow.

Third, the more students trust their professors, the more students' learning flow level increases. Professors should find the ways to make their students trust them. Usually, students' trust in their professors grows a lot when they feel that their professors support them in all sincerity and have sound content knowledge of their discipline. Thus, it is important to make students realize that their professors care about them and are fully qualified for the disciplines they teach.

Fourth, when students experience learning flow, they are more likely to adjust to college life easily. This means learning flow actually helps prevent students from dropping out school. Therefore, professors and schools should establish the environment where students easily experience learning flow.

Fifth, faculty trust plays a mediating role between servant leadership and learning flow, indicating professors' servant leadership positively influences students' learning flow both directly and indirectly.

In sum, professors' servant leadership, students' trust in their professors (faculty trust), learning flow, and students' adjustment to college life affects one another. Among those variables, professors' servant leadership plays a primary role. Therefore, a variety of programs and opportunities should be offered to professors so that they can foster their servant leadership.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Ministry of Education. 2014 Planning of fostering colleges leading industrial-educational cooperation. Ministry of Education. 2014.
2. Myoung SM, Lee HK. A relationship of learning flow and dropout in local university students: the mediating effects of college adaption. *Journal of the Korea Society of Computer and Information*. 2015;20(6):21-28.
3. Lee SJ. The effect of flow on learning and self-efficacy on college adaption and academic achievement in undergraduate students. *The Korean Society of Educational Psychology*. 2011;25(2):235-253.
4. Park SI, Kim YK. An inquiry on the relationships among learning-flow factors, flow level, achievement under on-line learning environment. *The Journal of Yeolin Education*. 2006;14(1):93-115.
5. Suh CH. A study on the structural relation of hotel business to ethical leadership, trust in superiors, job satisfaction, and job involvement. *Korean Journal of Hospitality & Tourism*. 2013;22(1):43-59.

6. Back JS, Kim YJ. An analysis on structural relation among teacher trust, commitment to physical education class and satisfaction on class perceived by elementary school students. *Korean Society for the Study of Physical Education*. 2013;18(3):131-142.
7. Podsakoff PM, Mackernzie SB, Bommer WH. Transformational leader behaviors and their effect on followers' trust in leader, satisfaction, and organizational citizenship. *Leadership Quarterly*. 1996;1(2):107-112.
8. Russell RF. The role of values in servant leadership. *Leadership & Organizational Development Journal*. 2000;22(2):150-173.
9. Park HS, Bae JH. Professor's servant leadership, faculty trust, and learning motivation of tourism major students. *Journal of Tourism & Leisure Research*. 2018;30(9):137-156.
10. Laub JA. Assessing the servant organization. [dissertation]. [Boca Raton (FL)]: Florida Atlantic University; 1999.
11. Barbuto Jr JE, Wheeler DW. Scale development and construct clarification of servant leadership. *Group & Organization Management*. 2006;31(3):300-326.
12. Han KH. The effect of servant leadership on team effectiveness: moderating role of team efficacy. *Journal of Business Education*. 2016;31(2):73-97.
13. Lee YG, Seok BG, Joo HC. A relationship among professors' servant leadership, self-leadership, creativity and innovative behavior perceived by college students of physical education major. *The Korean Journal of Physical Education*. 2017;56(2):377-392.
14. Birch SH, Ladd GW. The teacher-child relationship and children's early school adjustment. *Journal of School Psychology*. 1997;35:61-79.
15. Hoy WK, Tschannen-Moran M. Five faces of trust: an empirical confirmation in urban elementary schools. *Journal of School Leadership*. 1999;9:184-208.
16. Lee JG, Ko JH. Study on the student satisfaction and behavior intention according to professor reliance. *Journal of Tourism Management Research*. 2015;19(2):241-263.
17. Agarwal R, Karahanna E. Time flies when you're having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly*. 2000;24(4):665-694.
18. Csikszentmihalyi M. *Beyond boredom and anxiety*. San Francisco: Jossey Bass;1975.
19. Kim NY. The structural relationship among academic motivation, program, organizational support, interaction, flow and learning outcome in cyber education. [dissertation]. [Seoul]:Ewha Womans University;2009.
20. Lee YG, Seok BG, Kim HR. The relationship among the professor's super leadership, self-leadership, learning flow and learning satisfaction as perceived by dance major students. *The Korea Journal of Sports Science*. 2016;25(6):1071-1083.
21. Baker RW, Siryk B. Measuring adjustment to college. *Journal of Counseling Psychology*. 1984;31(2):179-189.
22. Lee YJ. The non-residential student's adaption to college life and career plans. [master's thesis]. Seoul:Ewha Womans University;2000.
23. Baron RM, Kenny DA. The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *Journal of Personality and Social Psychology*. 1986;51(6):1173-1182.

Development of Creativity Program using Disney Animation of Young Children

Rae-Eun Kim¹, Sang-Mee Koo²

¹Assistant Professor, Dept. of Gifted Child Care and Education, ²Assistant Professor, Dept. of Nursing, UI University, Korea

ABSTRACT

In order to develop a 5-year-old creativity program for young children that is applicable to the field of early childhood education, this study selected appropriate animation for a lifestyle theme and then selected various animation types such as drama, game, art, cooking, and science. In order to accomplish the purpose of the study, the following research problems were set up. We developed the creativity program model using Disney animation and to develop developed program teaching model and to select appropriate animation for 11 life subjects applicable to 5 year old young children and then to develop 3-4 creativity program activities. We developed the project plan for 44 program activities. In other words, we developed a program instructional model and developed a total of 40 activities for each 3 to 4 life topics.

10 creativity and early childhood education experts were tested. The teaching and learning activities of each session were composed of ‘ introduction - development - finishing and development ‘. At the introduction stage, we introduced Disney animated fairy tales and made them listen to fairy tales. In the development stage, we explored Disney animated fairy tale situations and explored ways to solve various problem situations. In summary and development phase, we expanded to various activities. Consequently, it is meaningful that this program activity is developed so that it can be applied and utilized in the curriculum at the stage of early childhood education. Nevertheless, rather than applying the activities presented in this program, it should be flexibly implemented in consideration of the situation of each classroom and the interest of young children in connection with the advance activities or extension activities in the field of early childhood education.

Keywords: young children, creativity, program development, creativity program, Disney animation

INTRODUCTION

In today’s rapidly changing world of times and societies, education is continuously demanding a new educational paradigm. We emphasized the importance of creativity development and education, addressing whether the society gives a fair opportunity for the potential creativity to be exercised by the members of the society, whether the society is dead or not.

Creativity is developed through the interaction of the individual’s cognitive abilities, creative abilities,

creative attributes, and creative personality with the environment and tasks¹. Creativity is the ability to make available stored information new, and new things have more meaning than imitation for infants, and their imagination and fantasy become important assets².

Effective teaching and learning for children’s creativity development can be achieved when they form a desirable learning environment based on teacher’s theory and practical knowledge and interact with infants. Therefore, in order to educate young children effectively, it is necessary to utilize proper teaching medium and teaching and learning methods in the advanced information age. Among the various teaching media, animation is a mass media with excellent information transfer effect in the information age. It is a mass media that goes beyond the scope of entertainment according to the development of video media since the 20th century

Corresponding Author:

Sang-Mee Koo
Professor, Department of Nursing,
UI University, Korea
Email: ksm@u1.ac.kr

and goes across various fields such as politics, economy, philosophy, it is firmly established as a genre. In other words, animation is a piece of comprehensive art with both visual and print media characteristics, and it can be an effective teaching medium for children's creativity development as it has educational function as a medium of knowledge and information as well as entertainment function. In particular, there is often a conflict situation in the animation contents, so creativity develops in the process of self-exploration of problem-solving methods in the conflict situation³.

Animation fairy tale is a fairy tale that composes a picture fairy tale together with not only texts and voices but also pictures as animations according to animation production techniques. ⁴suggested the possibility of educational use of animation, which can enhance the learning effect and provide much information to young children by making good use of such animation as a teaching medium. Especially, the most prominent feature of animation is 'Fantasy'. Fantasy, which is the source and the driving force of fairy tales, is not merely a talent to think about whatever happens, but it induces new thoughts and emotions in imaginary world it means power to do.

The educational value of animation can be enjoyed or read by young children who cannot read or write, and you can see facts and situations that cannot be seen through animation. Since animation is expressed through paintings, infant dreams and imaginations can be unfolded because there is no limit to the development of the plot ⁵. In this way, the animation can be easily accessed with interest by the infant. By providing diverse contents over time, it will be able to expand the existing knowledge of the infant, and will be an effective teaching medium for promoting the creativity by promoting the thinking.

In 1982, UNESCO suggested that it is necessary to develop a curriculum that educates teachers about media knowledge and awareness for media education⁶. In order to utilize animations properly in the early childhood education field, it is necessary to show the animation and then expand the contents to link them to activities⁷. However, according to a study by ⁸, early childhood

teachers in Korea show animation to infants frequently, but rather than linking activities to expanding contents of animation, respectively.

The preceding studies on animation related creativity program are few, and it is effective to improve creativity of infant using the animation of imagination animation. The activity of listening to music through animation was effective in promoting the creativity of young children ⁹. In addition, the creativity program using manga and animation was effective in the creativity of the young children and the creative problem solving ability¹⁰, and the camber technique using the animation video appreciation was effective in promoting the creativity of young children. Nonetheless, these previous studies consisted of one type of activities such as superficial - arithmetic thinking, listening to music, language, and story - telling.

Therefore, in order to develop a 5-year-old creativity program for young children that is applicable to the field of early childhood education, this study selected appropriate animation for a lifestyle theme and then selected various animation types such as drama, game, art, cooking, and science. In order to accomplish the purpose of the study, the following research problems were set up.

Research questions 1. What is the model of creativity program using animation of young children?

Research questions 2. What is the activity of creativity program using animation of young children?

METHOD

Process of Program Development: The purpose of this study is to develop an creativity program model using Disney animation and to develop developed program teaching model and to select appropriate animation for 11 life subjects applicable to 5 year old young children and then to develop 3-4 creativity program activities. The development process of the creativity program using Disney animation was completed through the following six steps as shown in Fig 1.

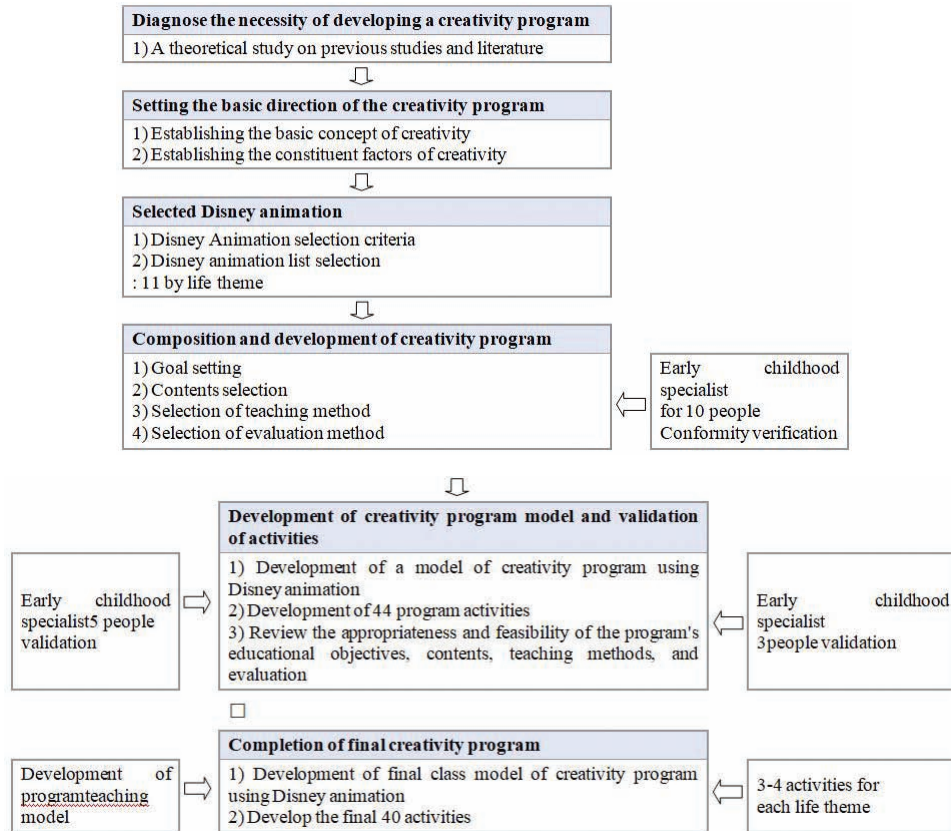


Figure 1: Development process of creative and humanity program using Disney animation

First, the necessity of development of creativity program was examined by examining previous researches and documents related to creativity of young children. Second, we examined the precedents and literature related to creativity and set the basic direction of creativity program developed in this study. In other words, the basic concept of creativity was established and the creativity factor was set. Third, we tried to utilize Disney animation as an effective medium for young children’s creativity development. We set evaluation criteria for selection of Disney animation, and selected 11 Disney animated fairy tale lists based on them. Fourth, after constructing and developing a creative program using Disney animation such as goal setting, content selection, teaching and learning method selection and evaluation method selection based on the 5th year nursing course, respectively. Fifth, we developed a model of creativity program based on Disney animation. Based on this, we developed the project plan for 44 program activities. Sixth, the creativity program using the final Disney animation was developed. In other words, we developed a program instructional model and developed a total of 40 activities for each 3 to 4 life topics.

Contents of Program Model: The model of this program was developed as shown in Fig. 2 using the assimilation education program.

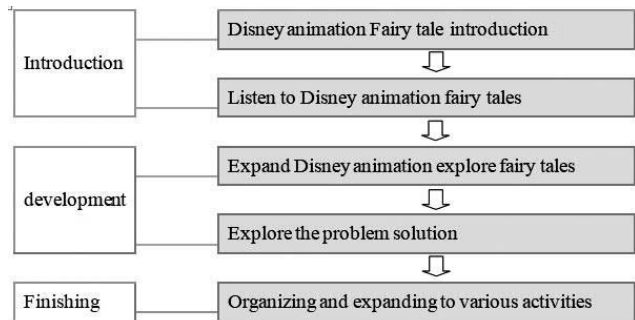


Figure 2: Creativity program teaching model using Disney animation

In this process, 10 creativity and early childhood education experts (professors and teachers) were tested. The teaching and learning activities of each session were composed of ‘introduction - development - finishing and development’. At the introduction stage, we introduced Disney animated fairy tales and made them listen to fairy tales. In the development stage, we explored Disney animated fairy tale situations and explored ways to solve various problem situations. In summary and development phase, we expanded to various activities.

Selected Disney Animation: We tried to use Disney animation to select the animation suitable for the

creativity program activity because most infant teachers are very fond of it. Disney Animation’s selection criteria are based on the creative education elements composed of cognitive elements, inclination elements, and synchronous elements presented by Moon Il-rin and Choi In-su, who set the standard, we used entertainment, education, and appropriateness as criteria. In other words, whether or not recreation affects children ‘, ‘ does it reflect the needs of young children’, ‘does it provide

the right information on the subject’, ‘does it help the young children’ ‘Is it appropriate for three infants?’ And ‘Is it appropriate for the content of the life topic?’.

The selection process of the animation list was firstly calculated 72 of the Disney animations released from the 1970s to the 2013, and based on the contents of the animation and the evaluation criteria set up in the past, through the content validity of three early childhood education experts, were selected for the animation.

RESULTS

Table 1 is the creativity program for young children using Disney animation.

Table 1: The creativity program for young children using Disney animation

Division	Life topic	Animation	Type	Activity name
1	Kindergarten and friends	Toy story	Share your story	Let me introduce you and your friends.
			Body expression	Become a navigation king.
			Role play	Become a Toy Story friend.
			Cooking	I make cookies.
2	Me and my family	Finding Nemo	Body expression	Become Nemo and play a pantomime situation.
			Art	Represent my family as a fish.
			Language	Write a letter in your own favor.
			Music	Open up a celebration for Nemo and Malin.
3	Hometown	Chicken little	Art	I decorate the neighborhood I want to live in.
			Share your story	Find a way to save our neighborhood.
			Role play	It’s bad to be bullied.
4	Animals and plants	Mouse rescue II	Share your story	Find out about rare animals.
			Body expression	Be a mouse rescue animal.
			Language	Make a mouse rescue animal.
5	Health and Safety	Cloudy with a chance of meatballs?	Cooking	I make a good fusion dish.
			Science	Make a blueprint for a food making machine.
			Role play	Become a weather caster to inform the weather of food.
			Music	I make a food advertisement song.
6	Living tools	Super bad	Art	Become a group and a group to create new futuristic tools.
			Science	Make your own invention book.
			Share your story	Learn about the energy of the future.
			Game	Organize the vector and the grove lab.
7	Transportation	Airplane	Game	What airplane am I?
			Active	I can get through.
			Art	I make a plane of the future.
8	Our country	Atlantis: Lost Empire	Language	I make Atlantis country book.
			Share your story	I want to be president.
			Cooking	I make dishes for the Atlantis people.

Conted...

9	Countries around the world	Car 2	Science	Money has disappeared.
			Math	Pair architecture and national flag with country.
			Stacking play	Build a new building.
			Art	Let's make a world travel map.
10	Environment and Life	Well E	Share your story	My earth hurts.
			Art 1	I make well E and Eve.
			Art 2	Let's express our recycled products in masterpieces.
11	Spring, Summer, Fall, Winter	Frozen	Share your story	See the background of the winter kingdom and learn about winter weather.
			Science	Set up your own winter kingdom.
			Body expression	I make musicals in the background of summer.

CONCLUSION

Consequently, first, Disney Animation, which is the teaching medium of this study, is an important medium that connects education and play in this creativity program, and it coincides with the integrated approach to creativity of this study. In other words, intrinsic motivation in an integrated approach is an important factor for creativity. Intrinsically synchronized and concentrated infants can immerse themselves in data and activities they experience, work-play dichotomy, and challenging tasks.

Second, this study used Disney animation as a teaching medium to develop creativity program models and activities that can promote infant creativity in the advanced information society. As a part of the convergent talent education, which has become an issue in the early childhood education field, it provided a teaching and learning method connecting Disney animation media and early childhood education.

Third, the program model developed in this study is applied and applied to the field of early childhood, so that when the early childhood teachers conduct activities of creativity class and various types and areas, they form a 'creative classroom culture' It will help. This study suggests ways to select and utilize diverse media such as animation from the activity - centered activities of early childhood creativity in early childhood education on the aspect of early childhood teachers. In the process, we can expect to cultivate a convergent human resource with three aspects of creativity, cognitive, propensity and motivation.

Fourth, a variety of creative thinking experiences such as exploring the fairy tale situation and exploring problem solving methods in the activity of the infant creativity enhancement program using animation are deepened into the daily life area beyond the creative idea in the virtual space of the young children, It will help you grow into a convergent talent.

Especially, the experience of various conflicts such as moral dilemma and problem situation in creativity promotion activities using animation makes it possible to immerse not only the emotions of the characters of the infants, but also the problem situations, and the infant himself shows up in the animation fairy tale I will have an opportunity to reflect on myself through surrogate experience, such as thinking about and solving what to do.

Fifth, this study linked the activities based on the creativity program model using animations to the theme of life, and selected the animation line that can be handled in the life topic. Therefore, it is meaningful that this program activity is developed so that it can be applied and utilized in the curriculum at the stage of early childhood education. Nevertheless, rather than applying the activities presented in this program, it should be flexibly implemented in consideration of the situation of each classroom and the interest of young children in connection with the advance activities or extension activities in the field of early childhood education.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Disney Animation of Young Children

REFERENCES

1. Amabile, TM. *The social psychology creativity*. New York: Springer-Verlag; 1983.
2. Cho JS, Park DS, Kang YR, Kang YW. The effects of activities using traditional fairy tales on young children's creativity. *Future Preschool Education*. 2014; 21(1): 291-310.
3. Park JS. Influence of fuzzy-arithmetic thinking activities on young children's creativity using a fairy tale animation [mater's thesis]: University of Dong A; 2002. 52p.
4. Lee Y. A discussion on cartoon and animation industry as an educational environment. Spring Conference of Korean Society for Children, Present and future of child-related industries, 1997. 14-18.
5. Chang SY. A study on the improvement of children's art expression ability by animation [mater's thesis]: University of Catholic University of Daegu, 2003. 33p.
6. Langrehr, D. The role of media literacy in the teacher education curriculum. <http://garnet.acns.fsu.edu/~db12291/medialit.html>. 1998.
7. Raines S, Isbell R. *Stories: children's literature in early education*. Albany, New York: Delmar Publisher Inc. 1994.
8. Kang EJ, Hyun EJ. A Study on the actual condition and recognition of animation application of early childhood teachers: focusing on Disney animation. *Journal of early Childhood Education*. 2001. 21(2): 299-317.
9. Seo HA, Kim HJ. The effects of music listening activities which apply animation on the development of creativity in children. *Open Early Childhood Education Research*. 2006. 11(2): 113-131.
10. Park MJ. The effect of creativity program using animation and animation on young children's creativity and creativity problem solving ability [mater's thesis]: University of Soong-sil; 2009. 55p.

Analysis of the Influencing Factors on Life Satisfaction in College Students: A Structural Equation Modeling Approach

Jung-Hyun Choi

Dept. of Nursing, Namseoul University, 91 Daehakro, Seonghwan-eup, Seobuk-gu, Chonan, South Korea

ABSTRACT

Background/Objectives: This study aimed to examine the structural relationships of positive caring, negative feeling, and self-esteem that affect life satisfaction of college students in Korea.

Method/Statistical analysis: This study used data of the seventh KCYSPS (Korean Children and Youth Panel Survey) of 2016. The participants were college 1st year students. The number of participants was 1881 students.

Findings: The participants in this study were 954 females (50.7%) and 927 males (49.3%). The mean age was 19.89 years old. Most participants were included in the middle class of socioeconomic status (63.0%). The participants who visited foreign countries were 322 persons (17.1%). The participants who experienced gambling were 29 persons (1.9%). This study showed positive caring, negative feeling, and self-esteem were prominent variables to predict life satisfaction of college students. Self-esteem was the most influential factor in life satisfaction of college students rather than positive caring and negative feeling. Also, the study showed the mediating effect of self-esteem in the relationship between positive caring and life satisfaction of college students. And it also showed that negative feeling indirectly influenced life satisfaction of college students via self-resilience.

Improvements/Applications: These findings imply that positive caring, negative feeling and self-esteem are important variables of life satisfaction and can be used as important intervention factors which increase life satisfaction among college students.

Keywords: *life satisfaction, self-esteem, positive caring, negative feeling, students, Korea*

INTRODUCTION

According to the Ministry of Education, the 18-year-old school population is expected to decline from 625,000 in 2015 to 500,000 in 2020 and to 440,000 in 2030. This is a decrease of 23.4% and 32.5%, respectively¹. This decline in the school-age population is causing problems such as a reduction of university enrollment quota, increasing dropout rate of college students, and university restructuring. The dropout rate of college students is high during the first year of

admission, and the decline in college life satisfaction and university adaptation is an important variable². Since college students are also members of a society, they should get along well with other people to survive in their environment³. Literature analysis revealed that positive caring, negative feeling, and life satisfaction has been separately investigated in other studies^{4,5}. In this study, the variables of positive caring, negative feeling, and satisfaction has been investigated, and their correlations with one another will be investigated in the structural equation model.

Life satisfaction is the way in which people show their emotions and feelings⁶. Life satisfaction is one of the themes focusing on the positive qualities of human nature psychologically³. Life satisfaction of college students can affect overall university life, employment, and even adulthood in general. Life satisfaction of college students is influenced by individual internal factors,

Corresponding Author:

Jung-Hyun Choi
Professor, Department of Nursing
Namseoul University, Korea
Email: jhc@nsu.ac.kr

family environment factors, and social environment. Self-esteem is explained as an individual's thoughts and feelings that he or she is a valuable and important person⁷ There are not many studies on life satisfaction and self-esteem among early college students. Therefore, studies to research a variety of strategies are needed to improve the life satisfaction of college students at the beginning of adulthood. This study aims to test the developed model whether there is a casual relationship among positive caring, negative feeling, self-esteem, and life satisfaction (See Fig. 1).

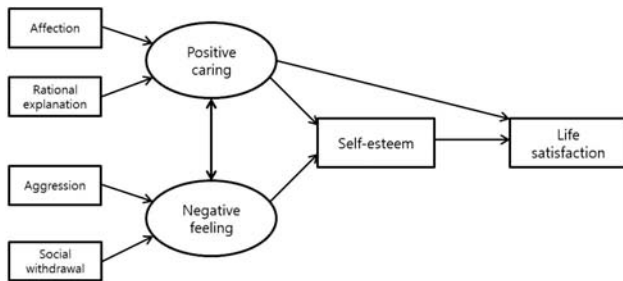


Figure 1: Hypothesized path model

MATERIALS AND METHOD

Participants: Data were collected from the seventh KCYSPS (Korean Children and Youth Panel Survey) of 2016. The participants were college 1st year students. The number of participants was 1881 students.

Study Design: The purpose of the study was to test the hypothesized model connecting positive caring, negative caring, self-esteem with life satisfaction of college students.

Measurement

Life satisfaction: Life satisfaction scales used by Kim and Baek⁸ were used in this study. It was composed of 3 items asking about a degree of life satisfaction (e.g., “I enjoy living”, “I don’t have much worries”). Each item was evaluated with the 4 point Likert scale. A higher score meant a higher level of life satisfaction from students. Cronbach’s alpha coefficient was .79.

Self-esteem: Self-esteem scales made by Rosenberg⁷ were used in this study. It was composed of 10 items asking about a degree of self-esteem (e.g., “I have a lot of good points”, “I am very competent person”). Each item was evaluated with the 4 point Likert scale. The higher score meant a better level of self-esteem from students. Cronbach’s alpha coefficient was .71.

Affection: Affection scales used by Huh⁹ were used in this study. It was composed of 4 items asking about a degree of affection from their parents (e.g., “They respect my opinion.”, “They say they like me.”). Each item was evaluated with the 4 point Likert scale. The higher score meant the more affection from their parents. Cronbach’s alpha coefficient was .73.

Rational explanation: Rational explanation scales used by Huh⁹ were used in this study. It was composed of 3 items asking about a degree of rational explanation (e.g., “Parents explain why instead of forcing to follow their decisions unconditionally.”, “If I make an unreasonable request to my parent, they explain why they do not allow it.”). Each item was evaluated with the 4 point Likert scale. The higher score meant the better level of rational explanation from their parents. Cronbach’s alpha coefficient was .80.

Aggression: Aggression scales used by Cho and Lim¹⁰ were used in this study. It was composed of 6 items asking about a degree of aggression (e.g., “I sometimes find fault with little things.”, “I sometimes interfere with what others do.”). Each item was evaluated with the 4 point Likert scale. The higher score meant the more aggressive level. Cronbach’s alpha coefficient was .81.

Social withdrawal: Social withdrawal scales used by Kim and Kim¹¹ were used in this study. It was composed of 5 items asking about a degree of social withdrawal (e.g., “I feel awkward when there are many people around.”, “I am shy a lot.”). Each item was evaluated with the 4 point Likert scale. The higher score meant the more shy level. Cronbach’s alpha coefficient was .89.

Data Analysis: Data were analyzed using Statistical Package for the Social Sciences and the Analysis of Moment Structures statistical software programs¹².

RESULTS

Demographic characteristics: The participants in the study were 954 females (50.7%) and 927 males (49.3%). The average age was 19.89 years old. Most participants were included in the middle class of socioeconomic status (63.0%). The participants who visited foreign countries were 322 persons (17.1%)(Table 1).

Table 1: General characteristics (N = 1881)

Variable	Category	N (%), Mean ± SD
Gender	Male	927 (49.3%)
	Female	954 (50.7%)
Age	-	19.89±0.34
Economic status	Very wealthy	6 (0.3%)
	Wealthy	96 (5.1%)
	A little wealthy	248 (13.2%)
	Normal	1,185 (63.0%)
	A little poor	232 (12.3%)
	Poor	101 (5.4%)
	Very poor	13 (0.7%)
Drinking	Yes	1,504 (80.0%)
	No	377 (20.0%)
Smoking	Yes	380 (20.2%)
	No	1,501 (79.8%)

Descriptive statistics: Descriptive statistics for participants' life satisfaction, self-esteem, affection,

rational explanation are described as seen in Table 2. The level of life satisfaction and self-esteem was 2.84±.58, 2.94±.45 point each.

Table 2: Descriptive statistics for variables (N = 1881)

Variable	Mean ± SD
Life satisfaction	2.84 ± .58
Self-esteem	2.94 ± .45
Affection	3.11 ± .54
Rational explanation	2.82 ± .58
Aggression	1.80 ± .52
Social withdrawal	2.19 ± .71

Correlation between main variables: Correlations among main variables are described as seen in Table 3. Life satisfaction was significantly positively related to self-esteem ($r = .60, p<.001$), affection ($r = .37, p<.001$), rational explanation ($r = .29, p<.001$). But life satisfaction was significantly negatively related to aggression ($r = -.28, p<.001$) and social withdrawal ($r = .30, p<.001$).

Table 3: Correlation between main variables (N = 1881)

	Affection	Rational explanation	Aggression	Social withdrawal	Self-esteem	Life satisfaction
Affection	1					
Rational explanation	.60***	1				
Aggression	-.22***	-.18***	1			
Social withdrawal	-.12***	-.11***	.37***	1		
Self-esteem	.36***	.25***	-.37***	-.38***	1	
Life satisfaction	.37***	.29***	-.28***	-.30***	.60***	1

* $p<.05$, ** $p<.01$, *** $p<.001$

The model testing: The initial analysis of the hypothesized model revealed adequate fit to the data $\chi^2 = 40.31, df=6, p < .001, TLI = 0.97, CFI = 0.99, RMSEA = 0.06$ (Table 6, Figure1). All specified paths were significant (Table 4). A competing model which have a direct path of the negative feeling to life satisfaction within the model was explored to enhance the model fit. Based on theoretical reasoning and literature review suggesting a significant relationship between negative feeling and life satisfaction (Table 5), the competitive model (final model) has a direct path from the negative

feeling to life satisfaction within the hypothesized model (Table 5, Fig.2). The final model resulted in a substantially better fit to the data ($\chi^2 = 23.86, df = 5, p < .001, TLI = 0.98, CFI = 0.99, RMSEA = 0.04$) (Table 6, Figure 2). Comparing the hypothesized model with the final model ($\Delta\chi^2_{df=1} = 16.45$), the latter is better. Sobel's test suggested that self-esteem partially mediates the relation between positive caring and life satisfaction ($Z=7.13, p<.001$), and self-esteem partially mediates the relation between negative feeling and life satisfaction ($Z=-9.89, p<.001$).

Table 4: Regression weights of hypothesized model

	Estimate (unstandardized)	Estimate (standardized)	S. E	C. R
Positive caring --> Self-esteem	.24	.21***	.03	7.60
Negative feeling--> Self-esteem	-.58	-.55***	.05	-12.93
Positive caring --> Rational explanation	1.00	.67***	-	-
Positive caring --> Affection	1.22	.89***	.07	16.55
Negative feeling--> Social withdrawal	1.00	.60***	-	-
Negative feeling--> Aggression	.74	.61***	.05	14.70
Positive caring --> Life satisfaction	.33	.22***	.03	9.63
Self-esteem --> Life satisfaction	.66	.51***	.03	25.09
***P<.001, *P<.05				

Table 5: Regression weights of final model

	Estimate (unstandardized)	Estimate (standardized)	S. E	C. R
Positive caring --> Self-esteem	.25	.21***	.03	7.85
Negative feeling--> Self-esteem	-.57	-.55***	.04	-13.04
Positive caring --> Rational explanation	1.00	.67***	-	-
Positive caring --> Affection	1.24	.89***	.08	16.25
Negative feeling--> Social withdrawal	1.00	.61***	-	-
Negative feeling--> Aggression	.73	.60***	.05	14.93
Positive caring --> Life satisfaction	.30	.20***	.03	8.83
Self-esteem --> Life satisfaction	.55	.43***	.04	14.33
Negative feeling --> Life satisfaction	-.20	-.15***	.05	-3.91
***P<.001, *P<.05				

Table 6: Model fitness index for hypothesized model and final structure model

Model	χ^2	df	p	TLI	CFI	RMSEA	$\Delta\chi^2$
Hypothesized model	40.31	6	0.00	0.97	0.99	0.06	-
Final Study model	23.86	5	0.00	0.98	0.99	0.04	-16.45

Table 7: Direct and indirect standardized coefficient for the final model

	Standardized direct effect	Standardized indirect effect	Standardized total effect	SMC
Positive caring --> Self-esteem	.21***	-	.21	
Negative feeling--> Self-esteem	-.55***	-	-.55	.43
Positive caring --> Life satisfaction	.20***	.09**	.30	
Self-esteem --> Life satisfaction	.43***	-	.43	.41
Negative feeling --> Life satisfaction	-.15***	-.24**	-.38	
***P<.001, **P<.01				

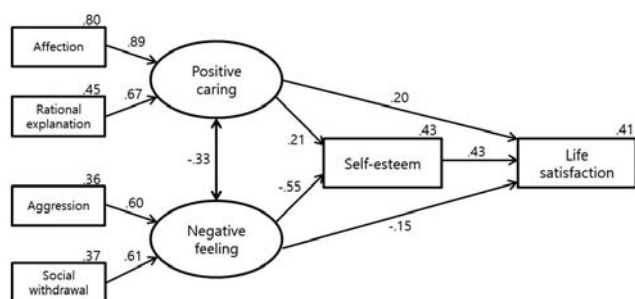


Figure 2: Final study model

DISCUSSION

This study aimed to examine the structural relationships of positive caring, negative feeling, and self-esteem that affect life satisfaction of college students. The structural model developed on the basis of the causal correlations between positive caring, negative feeling, self-esteem and life satisfaction was verified. Firstly, it is turned out positive caring significantly positive affect life satisfaction of college students. This result is partly similar to the previous study about stressing parent positive caring¹³. College students have various stresses such as academic work, job management and friends, but the positive caring they receive from their parent has a significantly positive effect on their life satisfaction, so the importance of raising their children at home is more emphasized. Secondly, negative feeling has an impact on negatively life satisfaction of college students. This result is also supported by the previous study⁴. Life satisfaction is one of the themes focusing on the positive qualities of human nature psychologically³. Individuals with negative feeling seems to blame themselves and others, have a negative self-esteem because of the negative message effects they receive from the environment^{3,14}. When negative feeling such as aggression or social withdrawal increase, it becomes difficult to get close to others or feel intimacy with others, then it reduces social relationships and communication, and the life satisfaction is decreasing as a result. Thirdly, self-esteem was the most influential factor in life satisfaction of college students rather than positive caring and negative feeling^{15,16}.

Fourthly, this study showed the mediating effect of self-esteem in the relationship among positive caring and life satisfaction of college students. Positive caring indirectly influence life satisfaction of college students via self-resilience. The higher the parental positive caring, the higher the self-esteem. And as a result, a level of life satisfaction increases. A person who has been cared with

love and affection at home recognizes himself as a valued person, and a person with such a high self-worth will grow up to be more satisfied with his or her life. Therefore, it is emphasized that affectionate care at home and in school is always important in modern society¹⁷.

Fifthly, this study showed the mediating effect of self-esteem in the relationship among negative feeling and life satisfaction of college students. Negative feeling indirectly influence life satisfaction of college students via self-resilience. As a result, the higher the negative feeling, the lower self-esteem and the lower the life satisfaction. Through the study of a relationship between negative feeling and life satisfaction of college students, it was confirmed that negative feeling was examined as a mediator of self-esteem in the path of negative feeling to life satisfaction. Through this, an important variable that affects life satisfaction of college students was found and that is significant in that it provides a theoretical basis for establishing an intervention strategy to enhance life satisfaction. This study showed that negative feeling has more influence on life satisfaction by mediation of self-esteem than the direct influence to life satisfaction. These results suggest that it is necessary to strengthen self-esteem for adolescents who give up their lives by negative feeling such as aggression or social withdrawal or whose life satisfaction is low. In order to improve the self-esteem of adolescents, academic and practical efforts should be made together.

These findings imply that positive caring, negative feeling and self-esteem are important variables of life satisfaction and can be used as critical intervention factors that increase life satisfaction among college students¹³. Education experts have begun to pay more attention to the evaluation and promotion of self-esteem and life satisfaction of college students⁵.

CONCLUSION

This study aimed to examine the structural relationships of positive caring, negative feeling, and self-esteem that affect life satisfaction of college students in Korea. This study showed positive caring, negative feeling, and self-esteem were prominent variables to predict life satisfaction of college students. Also this study showed the mediating effect of self-esteem in the relationship among positive caring and life satisfaction of college students. In addition, this study showed the mediating effect of self-esteem in the relationship among

negative feeling and life satisfaction of college students. Negative feeling indirectly influence life satisfaction of college students via self-resilience. These results may have insight into the an effect of self-esteem on life satisfaction among Korean college students

Ethical Clearance: Not required

Source of Funding: Namseoul University

Conflict of Interest: Nil

REFERENCES

- Ban SJ. The decline of school age population, government sponsored work expenditure for university, and the regional disparity of higher education. *The Journal of Educational Research*. 2015;14(2):213-42.
- Hong SH. (2015). Life satisfaction of first year Korean university students: in relation to self-esteem and self-efficacy. *Journal of Life-span Studies*. 2015;5(3):17-27.
- TAGAY Ö. Contact disturbances, self-esteem and life satisfaction of university students: a structural equation modelling study. *Eurasian Journal of Educational Research*. 2015;58:113-32. Available from: <https://eric.ed.gov/?id=EJ1070626>
- Kuppens P, Realo A, Diener E. The role of positive and negative emotions in life satisfaction judgment across nations. *Journal of Personality and Social Psychology*. 2008 Jul;95(1):66-75. Available from: <http://psycnet.apa.org/buy/2008-08084-005>
- Oberle, E, Schonert-Reichl KA, Zumbo BD. Life satisfaction in early adolescence: personal, neighbourhood, school, family, and peer influences. *Journal of Youth and Adolescence*. 2011 Jul;40(7):889–901. Available from: <https://link.springer.com/article/10.1007/s10964-010-9599-1>
- Wikipedia [Internet]. Life satisfaction; 2018 [updated 2018 Jun 29; cited 2018 Sep 9]. Available from: http://en.wikipedia.org/wiki/Life_satisfaction.
- Rosenberg M. *Society and the adolescent self-image*. Princeton: Princeton University Press; 1965.
- Kim SY, Baek HJ. The construction of Korean youth happiness index. *Korean Journal of Sociology*. 2008 Oct;42(6):140-173.
- Huh MY. A study for the development and validation of an inventory for parenting behavior perceived by adolescents. *The Korea Journal of Youth Counseling*. 2004 Nov;12(2):170-89.
- Cho BH, Lim KY. Development of learning interests test for career awareness of primary school children. *The Journal of Career Education Research*. 2000;11:231-57.
- Kim SH, Kim KY. The causal relationship of children's behavior problem and the related variables. *Journal of Korean Home Management Association*. 1999 Mar;17(1):155-66.
- Kline RB. *Principles and practice of structural equation modeling*. 2nd ed. New York: Guilford Press; 2005.
- Lu MH, Wang GH, Lei H, Shi ML, Zhu R, Jiang F. Social support as mediator and moderator of the relationship between parenting stress and life satisfaction among the Chinese parents of children with ASD. *Journal of Autism and Developmental Disorders*. 2018 Apr;48(4):1181–8. Available from: <https://link.springer.com/article/10.1007/s10803-017-3448-y>
- Diener, E, Emmons RA. The independence of positive and negative affect. *Journal of Personality and Social Psychology*. 1984;47(5):1105–17. Available from: <http://psycnet.apa.org/record/1985-14548-001>
- Chen W, Zhang D, Pan Y, Hu T, Liu G, Luo S. Perceived social support and self-esteem as mediators of the relationship between parental attachment and life satisfaction among Chinese adolescents. *Personality and Individual Differences*. 2017 Apr;108:98-102. Available from: <https://www.sciencedirect.com/science/article/pii/S0191886916311904>
- Davis AN, Rudy D, Su-Russell C, Zhang C. Chinese and European American undergraduates' perceptions of maternal warmth and negativity as predictors of self-esteem and life satisfaction. *Personality and Individual Differences*. 2018;52(2): DOI.org/10.1177/1069397117718812
- Baumeister RF, Campbell JD, Krueger JI, Vohs KD. Does high self-esteem cause better performance, interpersonal success, happiness, or healthier lifestyles? *American Psychological Society*. 2003 May;4(1):1-44. DOI.org/10.1111/1529-1006.01431

The Structural Relationship between Trust-Forming Factors, Leader Trust, University Trust, University Satisfaction, and Maintenance of Relationship in University Physical Education Courses

Kye-Sok Lee¹, Seung-Yong Kim²

¹Department of Physical Education, Soongsil University, Korea; ²Graduate School of Education, Donga University, Korea

ABSTRACT

Background/Objectives: The purpose of this study was to evaluate relationships between trust-forming factors, leader trust, university trust, university satisfaction, and maintenance of relationship in university physical education courses.

Method/Statistical analysis: Frequency analysis, exploratory factor analysis, reliability analysis, correlation analysis, and regression analysis were conducted to explain participants' characteristics and questionnaire using PASW (ver. 18.0).

Findings: The result of this study was as follows. First, trust-forming factors affecting leader trust were faithfulness and good will and trust-forming factors affecting university trust were faithfulness. Second, leader trust significantly affected university trust. Third, leader trust and university trust all significantly affected university satisfaction. Fourth, university satisfaction significantly affected maintenance of relationship.

Improvements/Applications: A university plays an important role in providing a good quality of service and may need efforts to improve the quality of education services. Also, it is determined that the roles and responsibilities of university faculty members as a leader are important.

Keywords: *Trust-Forming Factors, Leader Trust, University Trust, University Satisfaction, Maintenance of Relationship*

INTRODUCTION

The important purpose of university physical education courses is to improve cognitive, social, and affective abilities through physical activities, so students enable to lead the pleasant life ¹. Therefore, university physical education courses play an important role in encouraging student to promote participation in physical activities as well as experiences for improved quality of life through active participation.

University education needs social relationship between students when education services are provided. In other words, leaders in universities may have the responsibility for social relationship between students because they are education service providers to meet students the most frequently. So, leader trust is an important role to students that receive education service at university.

The studies in regard to leader trust have been continually documented since 1950 ^{2,3,4}. In particular, it is important to build mutual trust between students and leaders and students and universities for active and productive communication ⁵. Furthermore, university trust is important to students who receive education service at the university. Generally, trust in the area

Corresponding Author:

Seung-Yong Kim

Assistant Professor, Graduate School of Education

Donga University, Korea

Email: dragonkim@dau.ac.kr

of relation marketing is essential to build long-term relationship between a company and customer and is an important factor to promote business performance through customer loyalty as a service provider ⁶. However, service trust is classified into content and object multi-dimension ⁷. So, single and multidimensional perspectives to measure trust for education service at university should be considered together.

In counterpoint to the preceding studies provided, this study added a leader trust factor to consider multidimensional perspectives. Thus, the purpose of this study was to find relationship between trust-forming factors, leader trust, university trust, university satisfaction, and maintenance of relationship in university physical education courses. For this study, four hypotheses were provided and research design was suggested to reveal purposes (Figure 1).

Hypothesis 1: Leader trust of university physical education courses will significantly affect multidimensional trust.

Hypothesis 2: Leader trust of university physical education courses will significantly affect university trust.

Hypothesis 3: Multidimensional trust will significantly affect university satisfaction.

Hypothesis 4: University satisfaction will significantly affect maintenance of relationship at university.

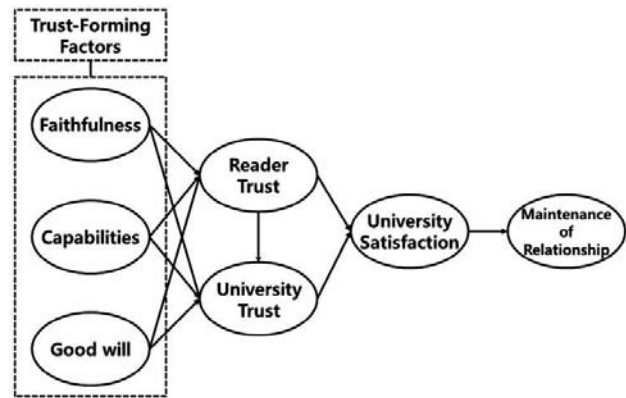


Figure 1: Research model

MATERIALS AND METHOD

Research Subject: Participants included 400 university students who participated in university physical education courses in 2016 and were selected by convenience sampling. The setting was three universities in Seoul, Gyeonggi-do, and Chungcheong-do in Korea. The self-report questionnaire was distributed to students and directly returned from them. The table 1 indicates participants’ demographic characteristics.

Table 1: Demographic characteristics of research subjects

Gender	Frequency	%	Grade	Frequency	%	Area	Frequency	%
Man	189	51.8	a freshman	96	26.3	Seoul	127	24.8
			a sophomore	87	23.8	Gyeonggi	120	32.9
female	176	48.2	a junior	85	23.3	Chungcheong	118	32.3
			a senior	97	26.6			

According to our result, there were 189 males and 176 females. Specifically, there were 96 freshmen, 87 sophomores, 85 junior, and 97 senior. Areas located at universities were Seoul (n=127), Gyeonggi-do (n=120), and Chungcheong-do (n=118).

Inquiry Tool: This study used Likert-type survey and detailed questions are as follows.

First, a questionnaire that inquires about faithfulness, capabilities, good will, leader trust, and university trust was created and based on the existing survey, developed by Sirdeshmukh, Singh, and Sabol ⁸. Second, four

questions for university satisfaction, developed by Oliver ⁹, was included. Third, four questions for maintenance of relationship, developed by Dick and Basu ¹⁰, was included.

Validity and Reliability of Inquiry Tool: Items with factor loadings of more than .5 were selected using varimax in exploration factor analysis (Table 2). This study found that Factor 1, 2, 3 contained items that reflected faithfulness, capabilities, and good will respectively. The accumulated percentage of explained variance was 83.97% (Table 2).

Table 2: Results of exploration factor analysis on Trust-Forming Factors

	Factor 1	Factor 2	Factor 3	h ²
Trust-Forming Factors 1	<u>.846</u>	.310	.255	.877
Trust-Forming Factors 2	<u>.853</u>	.300	.189	.853
Trust-Forming Factors 3	<u>.808</u>	.357	.253	.844
Trust-Forming Factors 4	<u>.781</u>	.318	.331	.821
Trust-Forming Factors 5	.387	<u>.691</u>	.287	.710
Trust-Forming Factors 6	.276	<u>.822</u>	.299	.842
Trust-Forming Factors 7	.320	<u>.822</u>	.298	.866
Trust-Forming Factors 8	.371	<u>.781</u>	.281	.827
Trust-Forming Factors 9	.378	.443	<u>.718</u>	.854
Trust-Forming Factors 10	.308	.382	<u>.814</u>	.903
Eigenvalue	3.410	3.197	1.790	
Variance (%)	34.100	31.969	17.902	
Accumulation (%)	34.100	66.069	83.971	

Cronbach’s alpha on all items was used as a measure of the reliability and ranged from .815 and .95 that had acceptable reliability ¹¹. The reliability analysis is shown in Table 3.

Table 3: Reliability analysis

		Cronbach's α
Trust-Forming Factors	Faithfulness	.938
	Capabilities	.919
	Good will	.859
Leader Trust		.950
University Trust		.917
University Satisfaction		.906
Maintenance of Relationship		.815

Data Processing: Frequency analysis, exploratory factor analysis, reliability analysis, correlation analysis and regression analysis were conducted using PASW (Ver. 18.0).

Correlation Analysis: The correlation analysis was performed to quantify the association between each variable and is presented in Table 4. It was hypothesized that there would be a positive correlation between each variable and our results corresponded with hypothesis. The discriminant validity is achieved when the value of 1 is not included within the 95% confidence interval ¹².

Table 4: Correlation analysis

Dependent	1	2	3	4	5	6	7
Faithfulness	1						
Capabilities	.731**	1					
Good will	.708**	.783**	1				
Leader Trust	.381**	.342**	.412**	1			
University Trust	.283**	.244**	.259**	.539**	1		
University Satisfaction	.290**	.264**	.316**	.633**	.734**	1	
Maintenance of Relationship	.264**	.259**	.287**	.543**	.754**	.665**	1

**p<.01

RESULTS

Relationship between Trust-Forming Factors and Leader Trust: The multiple regression analysis was conducted to find the association between trust-forming factors and leader trust. This study revealed that faithfulness

and good will were important antecedent factors to affect leader trust (Table 5). The power of trust-forming factors explaining a change of leader trust was found to be 18.6%, and in standardized regression coefficient, good will was found to be highest .305, followed by faithfulness (.191).

Table 5: Regression analysis

Dependent	Independent	Standardized Coefficients	t
		β	
Leader Trust	Faithfulness	.191	2.605*
	Capabilities	-.037	-.443
	Good will	.305	3.791***
R ² = .186, F = 27.501, p = .000,			

*p<.05, ***p<.001

Relationship between Trust-Forming Factors and University Trust: The multiple regression analysis was conducted to find the association between trust-forming factors and university trust. This study revealed that faithfulness, capabilities, and good will were important antecedent factors to affect university trust (Table 6). The power of trust-forming factors explaining a change of university trust was found to be 8.7%, and in standardized regression coefficient, faithfulness was found to be highest .193, followed by good will (.107), and capabilities (.018).

Table 6: Regression analysis

Dependent	Independent	Standardized Coefficients	t
		β	
University Trust	Faithfulness	.193	2.484*
	Capabilities	.018	.209
	Good will	.107	1.258
R ² = .087, F= 11.460, p= .000,			

*p<.05

Relationship between Multidimensional Trust and University Satisfaction: The multiple regression analysis was conducted to find the association between multidimensional trust and university satisfaction. This study revealed that leader and university trust significantly affected university satisfaction (Table 7), so leader and university trust were important antecedent factors to affect university satisfaction. The power of multidimensional trust explaining a change of university satisfaction was found to be 61.9%, and in standardized regression coefficient, university trust was found to be .554, and leader trust (.335).

Table 7: Regression analysis

Dependent	Independent	Standardized Coefficients	t
		β	
University Satisfaction	Leader Trust	.335	8.683***
	University Trust	.554	14.375***
R ² = .619, F = 293.598, p = .000,			

***p<.001

Relationship between University Satisfaction and Maintenance of Relationship: The regression analysis was conducted to find the association between university satisfaction and maintenance of relationship. This study revealed that university satisfaction significantly affected maintenance of relationship (Table 8), so university satisfaction was an important antecedent factor to affect maintenance of relationship. The power of university satisfaction explaining a change of maintenance of relationship was found to be 44.2%, and the standardized regression coefficient was found to be .665.

Table 8: Regression analysis

Dependent	Independent	Standardized Coefficients	t
		β	
University Satisfaction	Maintenance of Relationship	.665	16.949***
R ² = .442, F = 287.253, p = .000,			

***p<.001

DISCUSSION

This study revealed that faithfulness and good will are considered as important antecedent factors in regard to leader trust, while leader trust is an important antecedent factor in regard to university trust. In addition, leader and university trust all are considered as important antecedent factors in regard to university satisfaction, while university satisfaction was an important antecedent factor in regard to maintenance of relationship.

In the research by Anderson and Sullivan ¹³, they pointed out that customer satisfaction is a very important

variable in maintaining the relations with a customer. They also argued that the higher a customer-perceived satisfaction, the more a customer's intention to maintain purchase continuously, whereas their intention to transfer to other services comes to decrease, if anything. Even in the research by Lee, Choi, and Han¹⁴, they set forth a view that satisfaction formed by the customers using a commercial sports center has a positive influence on retention of relations with the center.

The satisfaction with the class experience in cultural physical education in college is highly likely to get across to others positively through word of mouth by the class experience students. The influence of word-of-mouth spread is very big because word of mouth through satisfaction makes it relatively easy to deliver class information, and it is delivered to the objects in large numbers simultaneously with delivery¹⁵. It might be said that the positive transition through such reliability and satisfaction plays a great role in the retention of relations with a school. Therefore, to give a lot bigger reliability to class-participating college students, it might be necessary to arrange a plan that can increase college students' emotional characteristic and cognitive characteristic through the culture physical education class.

Based on our results, this study maintains that university faculty members as a leader play an important role in promoting physical education courses in universities and encouraging students to increase interest in physical education. Therefore, a university may need efforts to provide various physical education courses as well as high quality of education service.

CONCLUSION

The purpose of this study was to find relationships between trust-forming factors, leader trust, university trust, university satisfaction, and maintenance of relationship in university physical education courses.

To reveal the purpose of this study, university students in Seoul, Gyeonggi-do, and Chungcheong-do who participated in university physical education courses in 2016 were selected. Total 365 valid questionnaires for this study were analyzed using frequency analysis, exploratory factor analysis, reliability analysis, correlation analysis, and regression analysis via PASW (Ver. 18.0).

The result of this study was as follows. First, trust-forming factors affecting leader trust were faithfulness

and good will and trust-forming factors affecting university trust were faithfulness. Second, leader trust significantly affected university trust. Third, leader trust and university trust all significantly affected university satisfaction. Fourth, university satisfaction significantly affected maintenance of relationship.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Maintenance of Relationship in University Physical Education Courses

REFERENCES

1. Kim B C, A Study on College Students' Participation in General Physical Education Courses and the Development of Their Physical Education Value. [Unpublished Master Dissertation], Gyeonggi: Graduate School of Education, Kyonggi University, 2004. (URL: <http://www.riss.kr/link?id=T9809116>)
2. McAllister D J, Affect- and Cognition-Based Trust as Foundations for Interpersonal Cooperation in Organizations. *Academy of Management Journal*, 1995, 38 (1), pp. 24-59.
3. Kesner J E, Teacher Characteristics and Quality of Child-teacher Relationships. *Journal of School Psychology*, 2000, 28 (2), pp. 133-149.
4. Lee G, Schallert D L, Meeting in the Margins: Effects of the Teacher-Student Relationship on Revision Processes of EFL College Students Taking a Composition Course. *Journal of Second Language Writing*, 2008, 17, pp. 165-182.
5. Lee K S, Kim S Y, Factors of Trust Building for College Students Who Participated in College Physical Education Classes, and Structural Relationships among Trust in Physical Director, Confidence in School, Attitude in Class and Attitude in School. *The Korea Journal of Sports Science*, 2010, 19 (4), pp. 989-999. (URL: <http://www.riss.kr/link?id=A82455135>)
6. Ahn J S, Jeong G K, The Influential Factors of Trust of Customer in Hotel and Business Industry. *Journal of Tourism Management Research*, 2005, 24, pp. 141-423. (URL: <http://www.riss.kr/link?id=A82620487>)

7. Ganesan S, Determinants of Long-term Orientation in Buyer-Seller Relationships. *Journal of Marketing*, 1994, 58, pp. 1-19.
8. Sirdeshmukh D, Singh J, Sabol B, Consumer Trust, Value, and Loyalty in Relational Exchanges. *Journal of Marketing*, 2002, 66 (1), pp. 15-37.
9. Oliver A, Cognitive Affective and Attributes Base of the Satisfaction Response. *Journal of Consumer Research*, 1993, 20 (3), pp. 418-430.
10. Dick A S, Basu K, Customer Loyalty: Toward an Integrated Conceptual Framework. *Journal of the Academy of Marketing Science*, 1994, 22 (2), pp. 99-113.
11. Nunnally J C, *Psychometric Theory* (2nd ed.). New York: McGraw-Hill, 1978.
12. Anderson J C, Gerbing D W, *Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach*. *Psychological Bulletin*, 1988, 103 (3), pp. 411-423.
13. Anderson E W, Sullivan M W, The Antecedents and Consequences of Customer Satisfaction for Firms. *Marketing Science*, 1993, 12 (2), pp. 125-143.
14. Cheon D H, Lee H J, A Study of Effect on Trust, Acceptance and Spread of Word-of-Mouth and Purchase Intention by Characteristics of Electronic Word-of-Mouth on Travel Industry. *Academy of Customer Satisfaction Management*, 2012, 14 (1), pp. 83-100.
15. Lee K S, Choi S B, Han T Y, Influence of Commercial Sports Center Service Characteristic on Formation of Relationship with Customers, Attributes of Reliability & Retention of Relationship. *The Korea Journal of Sports Science*, 2012, 21 (6), pp. 875-888. (URL: <http://www.riss.kr/link?id=A99557330>)

Factors Influencing on Dry Eye Symptoms of University Students Using Smartphone

Jung-hyun Choi¹, Kyung-sook Kim¹, Hee-jeong Kim¹, Se-jin Joo¹, Hye-gyeong Cha¹

¹Department of Nursing, Namseoul University, Cheonan, South Korea

ABSTRACT

This study is a descriptive study to investigate relevance of dry eye symptoms and physical symptoms of university students using smartphones and to identify the factors affecting dry eye symptoms. We collected data from university students in C province of Korea on March 3-29, 2016. They responded questionnaires of general characteristics, physical symptoms, and eye dry symptoms. 315 questionnaires were collected and 310 questionnaires were analyzed except for the incomplete one. Data were analyzed using t-test, one-way ANOVA, Scheffe test, Descriptive analysis, Pearson's correlation coefficients, and multiple regression analysis. The participants' dry eye symptoms according to general characteristics showed statistically significant differences in gender ($t=-3.306$, $p=.001$), whether to wear contact lenses ($t=-3.386$, $p=.001$), smartphone use time ($F=5.133$, $p=.002$), and computer use time ($F=5.137$, $p=.002$). We were found that 68 (21.9%) were normal, 80 (25.8%) were mild, 58 (18.7%) were moderate and 104 (33.5%) were severe, and that 78.1% of 310 students had dry eye. And OSDI (Ocular Surface Disease Index) showed a significant correlation with turtle neck syndrome ($r=.343$, $p<.001$), wrist tunnel syndrome ($r=.252$, $p<.001$), and eye fatigue ($r=.681$, $p<.001$), and OSDI was significantly affected by eye fatigue ($\beta=.668$, $t=16.042$, $p<.001$), and computer use time ($\beta=.111$, $t=2.656$, $p=.008$), these variables explained 47.2% of OSDI among university students. It is necessary a program that will reduce the unnecessary computer use time and make the students interested in the importance of proper use of smartphone to reduce eye fatigue.

Keywords: Dry eye symptoms, OSDI, Turtle neck symptoms, Wrist tunnel symptoms, eye fatigue

INTRODUCTION

In 2007, Dry Eye Workshop defined Dry Eye as a multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surface¹. According to the Health Insurance Review and Assessment Service statistics², the number of patients treated with dry eye symptoms has steadily increased from 1.4 million to 2.4 million for the last 10 years (2005~2015). Dry eye symptom is one of the most common ophthalmic diseases in clinical practice, and its

symptoms are reported to include a foreign body feeling like sand in the eye, stiffness, blurred object, easily tired eye, burning, heavy eyelid, irregular eye congestion, and sticky eye mucus, etc.³. In addition, although left untreated despite severe symptoms, it is reported that it causes corneal damage and severely impairs visual acuity⁴, and is associated with attention deficit hyperactivity disorder, sleep disorder, and depression⁵.

The causes of dry eye symptoms are indoor environmental pollution⁶, air pollution⁷, contact lens wear and myopia correction, long smartphone use, TV, computer and reading⁸, specific agents (antihistamines, antidepressants, antiarrhythmics, hormones, anti-Parkinson's drugs, etc.) or using artificial tears⁹.

With the increasing use of computers and mobile-phones and the Internet, as young adults have become more active in using documents, lectures, games, and Internet searches, previously, dry eye symptoms, which are common in older adults, are increasingly occurring in young adults¹⁰.

Corresponding Author:

Hye-gyeong Cha

Assistant Professor,

Dept. of Nursing, Namseoul University, Korea

Email: hgcha@nsu.ac.kr

As a result of studying domestic and foreign previous researches, there were many studies on cases of occurrence of dry eye symptoms, but studies to analyze the influence factors to prevent dry eye symptoms were rare. In particular, the use of smartphones and computers, which have recently become widely available, can lead to various physical symptoms¹⁰⁻¹¹ as well as dry eye symptoms.

This study attempted to investigate the relationship between dry eye symptoms and physical symptoms, and factors affecting dry eye symptoms in young university students, and to use it as basic data to prevent the dry eye symptoms and physical symptoms of university students.

METHOD

Research Design: This study is a descriptive study to investigate relevance of dry eye symptoms and physical symptoms that are rapidly increasing in university students using smartphones and to identify the factors affecting dry eye symptoms.

Data Collection: The participants for this paper were university students in C Province of Korea, and the survey was conducted in 2016. 315 university students participated in the survey after informed consent. The required sample size was estimated by G*power 3.1.2 Program. The minimum required sample size was 138 with significance level (α) 0.05, power of test ($1-\beta$) 0.95, effect size (p) 0.3, and the number of predictors 5. In considering the dropout rate, out of a total of 315 questionnaires collected, and except for the 5 questionnaire that had missing values and were responded improperly, a total of 310 questionnaires were used for the data analysis of this study.

Measurements: The questionnaire consisted of research participants' general characteristics, risk factors, physical symptoms, and dry eye symptoms. The general characteristics included gender, age, grade, smoking, drinking, and caffeine intake, the risk factors included contact lens wear, sleep time, smartphone use time, computer use time, reading time, and the physical symptoms included turtle neck, carpal tunnel, and eye fatigue self-test. The turtle neck subjective symptom had a total of 14 items, ranging from 0 to 31 points, at a scale of 1 to 4 points. And 0 point is a healthy condition without problems, 1-5 points is attention, 6-9 points is

warning, and 10 or more points is the risk of turtle neck syndrome. The subjective symptoms of the carpal tunnel were total 5 items, with 1 point in yes and 0 point in no, and if the total score was 4 points or more, it was measured as the carpal tunnel syndrome risk group. Eye fatigue subjective symptoms were measured on a total of 10 items, ranging from 1 point to 3 points, with 10-15 points being normal, 16-20 points being warning, and 21-30 points being ophthalmic.

Dry eye symptoms were measured using the Ocular Surface Disease Index (OSDI) developed by¹². The OSDI scores were calculated as follows with the 4 point scale of 12 items related to the perceived symptoms of the subjects on the eyeball surface, from 0 point for 'not at all' to 4 points for 'always.'

OSDI score = (total score of items answered * 25 / number of items answered)

The OSDI score ranged from 0 to 100, with higher scores indicating severer dry eye symptoms. According to the OSDI score, 0-12 points were classified as normal, 13-22 as mild dry eye, 23-32 as moderate dry eye, and 33-100 as severe dry eye. Reliability was Cronbach's $\alpha=.92$ at the study of¹⁴, and reliability in this study was Cronbach's $\alpha=.89$.

Data Analysis: This study used SPSS Win 22.0 for statistical analysis of the data, and conducted descriptive statistics for the general characteristics, physical symptoms, OSDI. For difference analysis of variables, we used t-test, one-way ANOVA, and analyzed the relation between variables with Pearson correlation coefficients. We used a stepwise multiple regressions for finding affecting factors of dry eye syndrome.

Ethical Consideration: Prior to data collection, this study considered the ethical aspects by providing participants with the purpose and method of research, utilization of research results, survey data to be used only for the study purpose, anonymity and confidentiality of research participants, and a description of stopping during the creation of the questionnaire, and by receiving the consent from participants. It took 10 to 15 minutes to complete the survey questionnaire items, and after the questionnaire items were fulfilled, a predetermined gift was provided for participants.

Limitations: This study was constricted by convenience sampling, which limited generalization to a broad population.

RESULTS AND DISCUSSION

Dry Eye Syndrome according to general Characteristics: The Dry Eye Symptoms according to general characteristics of the participants are shown Table 1.

Table 1: OSDI ACCORDING TO GENERAL CHARACTERISTICS (N = 310)

Variables*	Categories	N (%) M ± SD	OSDI	
			M ± SD	t(p)/F(p)/ scheffe
Gender	Male ^a	83(26.8)	21.44 ± 18.31	-3.306(.001)* a<b
	Female ^b	227(73.2)	29.37 ± 18.85	
Age	Average	20.82 ± 5.66	25.91 ± 19.26	0.993(.396)
	18-19	131(42.3)	29.71 ± 18.44	
	20-21	110(35.5)	25.44 ± 19.19	
	22-23	52(16.8)	27.08 ± 20.06	
	≥24	17(5.5)		
Grade	1 st	111(35.8)	25.34 ± 19.42	0.832(.477)
	2 nd	69(22.3)	26.93 ± 19.90	
	3 rd	72(23.2)	29.72 ± 18.66	
	4 th	58(18.7)	28.20 ± 17.55	
Contact lenses	Not used ^a	185(59.7)	24.29 ± 18.85	-3.386(.001)* a<b
	Wear ^b	125(40.3)	31.62 ± 18.45	
Sleeptime	<5hrs	32(10.3)	25.85 ± 22.00	0.148(.931)
	5-6hrs	121(39.0)	27.63 ± 16.55	
	6-7hrs	122(39.4)	26.84 ± 18.81	
	≥7hrs	35(11.3)	28.57 ± 24.70	
Smartphone use time	1-2hrs ^a	29(9.4)	22.34 ± 16.12	5.133(.002)* a,b<c,d
	2-3hrs ^b	109(35.2)	22.69 ± 17.09	
	3-5hrs ^c	111(35.8)	30.76 ± 19.80	
	≥5hrs ^d	61(19.7)	31.32 ± 20.13	
Computer use time	<1hrs ^a	151(48.7)	25.04 ± 16.23	5.137(.002)* a,b,c<d
	1-2hrs ^b	76(24.5)	25.90 ± 17.53	
	2-3hrs ^c	50(16.1)	28.29 ± 21.81	
	≥3hrs ^d	33(10.6)	38.83 ± 25.24	
Reading time	<1hrs	146(47.1)	25.94 ± 18.01	0.985(.400)
	1-2hrs	80(25.8)	26.54 ± 19.15	
	2-3hrs	52(16.8)	30.81 ± 22.56	
	≥3hrs	32(10.3)	29.17 ± 16.63	

*p<.01

Of the participants, 83 students (26.8%) were male and 227 students (73.2%) were female, and there was a significant difference between the two groups ($t=0.993$, $p=.001$). That is, the mean score of dry eye symptoms was higher in women than in men, which is consistent

with the results of previous studies^{10, 11}. This suggests that women prefer to use contact lenses rather than eyeglasses and that they are affected by frequent eye makeup and hormones. The average age of them was 20.82 years, 111 students (35.8%) were freshmen, 69

(22.3%) were sophomores, 72 (23.2%) were juniors, and 58 (18.7%) were seniors. There was no significant difference in dry eye symptoms between the ages and the grades, and there was no significant difference in smoking, drinking and caffeine use. However, there was a significant difference in wearing contact lenses. The average wearing time was 31.62 ± 18.45 in 125 patients (40.3%), and 185 patients (59.7%) in non-wearing contact lenses were found to be mean 24.29 ± 18.85 . This was consistent with the results of previous studies^{10, 14, 15} in which dry eye symptoms are more severe and more frequent when wearing contact lenses. This may be due to the increase in the number of people wearing color contact lenses for cosmetic purposes as well as the recent correction of eyesight, resulting in a higher rate of dry eye symptoms in the younger age group.

Sleep time and reading time did not differ among groups, but smartphone use time and computer use time differed by group. In other words, the dry eye symptom score in the group using more than 3 hours was higher than the group using less than 3 hours in the smartphone use time ($t=5.133, p=.002$), and the group using the computer for more than 3 hours had a higher dry eye symptom score than the group using less than 3 hours ($t=5.137, p=.002$). Excessive use of video devices such as computers and smartphones can cause visual display terminal (VDT) syndrome. That is, while using these, the number of flicker is reduced, and the evaporation of the tears occurs well, which can lead to symptoms such as conjunctival hyperemia, foreign body sensation, tearing, headache, dry eye, etc.¹⁶. In a study of 3549 white-collar office workers in Japan¹⁷, long-term use of VDT for more than 4 hours was reported to increase the risk of dry eye symptoms, but in this study, dry eye symptoms were significantly different in the group using computer and smartphone for more than 3 hours. Therefore, the education program for the prevention of VDT syndrome of university students should include recommendations to decrease the use of video equipment such as computer and smartphone to less than 3 hours.

The distribution of Ocular Surface Disease Index (OSDI) score: In a study¹⁰ to investigate the prevalence of dry eye for a total of 263 university students, it is reported that dry eye was seen in 133 students (50.5%) as shown in figure 1. However, in this study, it was found that 68 (21.9%) were normal, 80 (25.8%) were mild, 58 (18.7%) were moderate and 104 (33.5%) were severe, and that 78.1% of 310 students had dry eye,

which is higher than the previous studies. This is a result reflecting the tendency that the dry eye is increasing in the younger age group, though there is a difference between the subjects and the time of the investigation, and follow-up research is required.

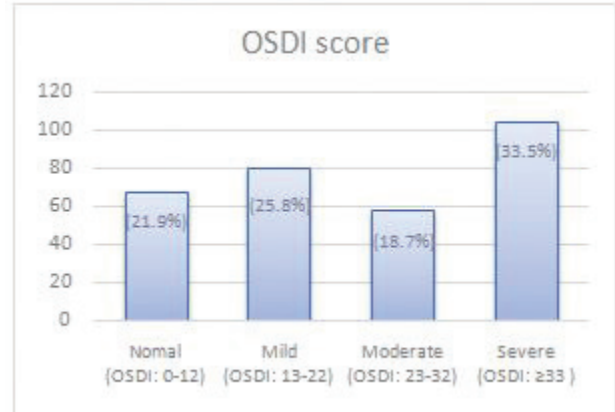


Figure 1: The distribution of Ocular Surface Disease Index (OSDI) score

OSDI According to Physical symptoms of Participants: Table 2 shows the correlations between dry eye symptoms and physical symptoms appearing in the participants. That is, There were a positive correlation in OSDI and turtle neck symptoms ($r=.343, p<.001$), carpal tunnel syndrome ($r=.252, p<.001$), and eye fatigue ($r=.681, p<.001$). Visual Display Terminal (VDT) syndrome is a typical problem that can arise when the use of smartphone by university students increases due to popularization of smartphone. The most common symptoms of VDT syndrome are eye diseases and musculoskeletal disorders. In a study on university students' smartphone addiction and health problems¹⁸, university students who used smartphones for a long time reported that the eye fatigue was 31%, the wrist and finger pain was 15%, and neck and shoulder stiffness were 15%. When staring at the same screen such as smartphone for a long time, it reduces the blink of the eye, and due to bad posture, as well as dry eye symptoms, eye fatigue, turtle neck, and carpal tunnel symptoms can appear. Also, since university students are at the highest level of physical health during the life cycle, it would be easy to overlook the awareness or risk of their physical symptoms. Therefore, to reduce the dry eye symptoms of university students, it is necessary to incessantly remind them about the correct posture and usage of the smartphone. Dry eye symptoms were significantly correlated with eye fatigue, carpal tunnel symptoms, and turtle neck symptoms. Therefore, it is necessary to introduce education program to manage these physical symptoms as well as dry eye symptoms.

TABLE 2: CORRELATION AMONG MAIN VARIABLES (N = 310)

Description	OSDI	Turtle neck syndrome	Wrist tunnel syndrome	Eye fatigue
OSDI	1			
Turtle neck syndrome	.343*	1		
Wrist tunnel syndrome	.252*	.359*	1	
Eye fatigue	.681*	.422	.298*	1

* $p < .001$

Factors Influencing on Organ Donation Attitude of University Students: Table 3 shows the participants' dry eye symptoms was affected significantly by eye fatigue ($\beta = .668$, $t = 16.042$, $p < .001$), and computer use time ($\beta = .111$, $t = 2.656$, $p = .008$), and these variables explained 47.2% ($F = 139.210$, $p < .001$).

TABLE 3: FACTORS INFLUENCING (N = 310)

Variable	B	S.E.	β	t	p	Adj. R ²
Constant	-21.117	3.075		-6.867	<.001	
Eye Fatigue	2.876	.179	.668	16.042	<.001	.462
Computer use time	2.036	.767	.111	2.656	.008	.472

F = 139.210, $p < .001$

Prolonged use of the smartphone as well as the computer has been shown to be the most important factor affecting eye fatigue and affecting dry eye symptoms. Therefore, to prevent dry eye symptoms that may occur when using a smartphone, university students need to improve their posture and computer habits to reduce eye fatigue. In other words, it is necessary to keep the distance between the smartphone and the eyes at about 40cm and avoid using it continuously for more than 30 minutes to prevent eye fatigue. It is also necessary to reduce unnecessary computer use time and to have a break time frequently when using the computer.

CONCLUSION

This study was conducted to propose a method to prevent the dry eye symptoms of university students by

analyzing factors affecting rapidly increasing dry eye symptoms among college students using smartphones. The results of this study showed that dry eye symptoms were significantly higher for women, contact lens users, and those who used computer for more than 3 hours, and It was also found that they could be accompanied by dry eye symptoms as well as turtle neck symptoms, carpal tunnel symptoms, and eye fatigue. In addition, eye fatigue and computer use time were the most influential factors for dry eye symptoms. Therefore, to prevent the dry eye symptoms of university students using smartphones, it is necessary to have a program that will reduce the unnecessary computer use time and make the students interested in the importance of proper use of smartphone to reduce eye fatigue. There is a limit to generalization of this study because this study is a convenience sampling study on university students in one area of Korea. Therefore, it is necessary to elucidate the prevalence and influencing factors of dry eye symptoms which are rapidly increasing in young ages through repeated research in future. These studies will enable university students to be more interested in and active in managing their health care in using smartphones and computers, and this study can be used as a basic data for the development of preventive programs that minimize the negative effects of long time use of smartphones and computers.

Ethical Clearance: Not required

Source of Funding: Funding for this paper was provided by Namseoul University.

Conflict of Interest: Nil

REFERENCES

1. Foulks GN, Lemp M, Jester J, Sutphin J, Murube J, Novack G. Introduction to report of the international dry eye workshop (DEWS). *Ocul Surf* 2007; 5(2): 65-204; doi:10.1016/S1542-0124(12)70078-2.
2. Health Policy Insurance Service. Disease Statistics (2005-2015). <http://stat.kosis.kr/nsieu/view/tree.do>; 2017.
3. Stern ME, Pflugfelder SC. Inflammation in dry eye. *Ocul Surf* 2004; 2(2): 124-30.
4. Her S, Kim KH. Dry eye syndrome and ocular fatigue according to the status of contact lens wearing and management among female university

- students. *Korean J Academic Community Health Nurs* 2014; 25(4): 259-69.
5. Cho KJ, Kim HK, Lim MH, Baek HS, Yang YA, Kang BH, et al. Depression, ADHD, job stress and sleep problems with dry eye disease in Korea. *J Psychiatry* 2015; 18(6): 1-5.
 6. Kim WJ, Kim SD, Kim HJ, Kim HH, Lee CM, Kim YS. Impact of indoor air quality on the eye conditions of occupants in newly-built university buildings. *Korean J Ophthalmic Optics Society* 2011, 16(2): 201-7.
 7. Hwang SH, Choi HJ, Wee WR, Kim MK, Kim DH. Potential importance of ozone in the association between outdoor air pollution and dry eye disease in south Korea. *JAMA Ophthalmol* 2016; 134(5): 503-10.
 8. Park JS, Choi MJ, Ma JE, Moon JH, Moon HJ. Influence of cellular phone videos and games on dry eye syndrome in university students. *Academic Community Health Nursing* 2014; 25(1): 12-23.
 9. Chia EM, Mitchell P, Rochtchina E, Lee AJ, Maroun, R. Prevalence and associations of dry eye syndrome in an older population: The blue mountains eye study. *Clin Exp Ophthalmol* 2003; 31:229-32.
 10. Yun CM, Kang SY, Kim HM, Song JS. Prevalence of dry eye disease among university students. *Korean J Ophthalmol* 2012; 53(4): 505-9.
 11. Lee AJ, Lee J, Saw SM, Gazzard G, Koh D, Widiaia, D, et al. Prevalence and risk factors associated with dry eye symptoms: a population based study in Indonesia. *Br J Ophthalmol* 2002, 86(12): 1347-51.
 12. Lee B, Kim SW, Kim YJ, Bae JY, Woo SK, Woo HN, et al. The relationship between smartphone usage time and physical and mental health of university students. *Korean J Society School Health* 2013, 26(1): 45-53.
 13. Schiffman RM, Christiansosn MD, Jacobsen G, Hirsch JD, Reis BL. Reliability and validity of the ocular surface disease index. *Arch Ophthalmol* 2000; 118(5): 615-24.
 14. Begley CG, Chalmers RL, Mitchell GL, Nichols KK, Caffery B, Simpson T, et al. Characterization of ocular surface symptoms from optometric practices in north America. *Cornea* 2001; 20(6): 610-8.
 15. Guillon M, Maissa C. Dry eye symptomatology of soft contact lens wearers and nonwearers. *Optom Vis Sci* 2005; 82(9): 829-34.
 16. Cho YA, Won JS, An GJ. The effect on the dryness of eye during VDT work. *Korean J Ophthalmol* 1996; 37(12): 1991-5.
 17. Uchino M, Schaumberg DA, Doqru M, Uchino Y, Fukaqawa K, Shimmura S, et al. Prevalence of dry eye disease among Japanese visual display terminal users. *Ophthalmol* 2008; 115(11): 1982-8.
 18. Yun J, Moon J, Kim M, Kim Y, Kim H, Huh B, et al. Smartphone addiction and health problem in university student. *KACEM* 2011; 3(2): 92-104.

Communication, Emotional Labor and Organizational Commitment among Nurses

, Sung-Yun Ahn²

¹Assistant Professor, Dept. of Nursing, Daejeon University, Korea; ²Assistant Professor, Dept. of Nursing, Pai Chai University, Korea

ABSTRACT

Nursing is professional care based on interactive relationships, and performed primarily through communication. This study investigated the nurse's communication type. The present study is a cross-sectional correlation study that aimed to investigate nurses' communication type and identify the differences in emotional labor and organizational commitment according to nurses' communication type. The subjects were 170 nurses working in university hospitals. Data were collected from August 1, 2016 to August 15, 2015. Data were analyzed using IBM SPSS program version 23.0. The communication competence of the participants was clustered using K-means cluster analysis. Two groups of group 1 (verbal and nonverbal communication positive) and group 2 (verbal and nonverbal communication negative) were finally determined. Comparison of emotional labor and organizational commitment according to communication type of nurse, Emotional labor was higher in group 2, but not statistically significant, and organizational commitment was significantly higher in group 1 ($p = .040$). There were significant relationships between verbal communication and nonverbal communication ($r = .58, p < .001$), and between nonverbal communication and emotional labor ($r = -.20, p = .041$) in group 1; whereas there was a significant relationship between verbal communication and nonverbal communication ($r = .31, p = .008$) in group 2. Therefore, emotional labor and organizational commitment programs based on nurse communication styles are needed.

Keywords: *Communication type, Emotional labor, Organizational commitment, Nurse, Group.*

INTRODUCTION

The Necessity for this Study: Nursing is professional care based on interactive relationships, and performed primarily through communication. In other words, communication is used when interacting with patients and providing direct nursing care. In addition, communication also plays an important role in drawing cooperation and mediating conflict when providing indirect nursing through cooperation with other medical professionals. In view of the fact that communication is the process by which people effectively deal with partners in the interaction process¹; communication becomes

an essential component of medical practice, beyond increasing patient satisfaction with medical service, when effective communication between employees in hospitals is achieved.

Meanwhile, nurses may be pressured to display only the emotions socially acceptable and required by hospitals in the process of interacting with communication partners such as patients, senior nurses, doctors, administrators etc. When there is a gap between the feelings experienced by employees and emotional display rules allowed by an organization, individual employees' efforts to control their emotional expressions in compliance with the rules is referred to as emotional labor². If nurses are forced to express their feelings in a stereotyped manner, they are likely to experience negative symptoms leading to depression and stress³. However, as the competition between medical institutions becomes intense, the demand for emotional labor is emphasized to improve customer satisfaction⁴.

Corresponding Author:

Sung-Yun Ahn

Assistant Professor, Dept. of Nursing,
Pai Chai University, Korea

Email: syahn@pcu.ac.kr

Emotional dissonance caused by emotional labor decreases job satisfaction and increases depression among employees⁵. It also decreases organizational commitment and employee morale, which decreases employees' willingness to devote their efforts and loyalty to the organization⁶. Previous studies have revealed that emotional labor was negatively related to organizational commitment⁷⁻⁸. Therefore, organizational commitment⁶, in which an employee voluntarily strives to achieve organizational goals by internalizing organizational goals, is very important in order to improve organizational performance and productivity. Thus, it is necessary to explore ways to reduce the negative effects of emotional labor in nurses.

According to previous studies, communication competence was found to be negatively related to emotional labor⁹⁻¹⁰, and was found to be a useful resource to reduce emotional labor in nurses by establishing a relationship of mutual trust through communication competence¹¹. In another study, communication competence was found to be related to organizational commitment³, and communication satisfaction was found to be highly correlated with organizational commitment¹².

Communication competence is not merely language delivery, but is a combination of diverse abilities such as message output ability, message interpretation ability, and the ability to understand relationships. The expression of microscopic aspects of communication competence, including verbal and nonverbal skills, is also important¹³. Therefore, when nurses communicate with patients, it is important to use nonverbal expressions such as eye contact or gestures in addition to verbal expressions.

Studies regarding nurses' communication classified into verbal and nonverbal communication are scarce. The results of the present study, which intended to classify nurses' communication type into verbal and nonverbal communication and to investigate the characteristics of communication type, can be used as baseline data for the development of desirable communication-intervention programs, considering the characteristics of communication types in nurses. The present study intended to classify nurses' communication type using a cluster analysis, investigate the characteristics of communication type, and the relationship between emotional labor and organizational commitment.

Purpose of this Study: The present study aimed to investigate the differences in emotional labor and organizational commitment according to nurses' communication competence. The detailed objectives are as follows.

1. To identify the differences in communication competence between the two groups according to the general characteristics of nurses.
2. To classify nurses' communication type.
3. To investigate the differences in communication competence according to communication type.
4. To investigate the differences in emotional labor and organizational commitment according to communication type.
5. To investigate the relationship between communication competence, emotional labor, and organizational commitment according to nurses' communication type.

STUDY METHODS

Study Design: The present study is a cross-sectional correlation study that aimed to investigate nurses' communication type and identify the differences in emotional labor and organizational commitment according to nurses' communication type.

Instruments

Communication competence: Communication competence was measured using a communication competence measurement tool developed by Kim and Yu¹⁴, and modified by Kim¹⁵. It was developed to measure verbal and nonverbal communication in doctors. This tool consists of 13 items with 4 items on verbal communication and 9 items on nonverbal communication. Each item is scored on a 5-point Likert scale, and the total score ranges from 13 to 65 points. A high score indicates high communication competence. In a study by Kim¹⁵, the reliability of this tool showed Cronbach's alpha = .93, and in this study Cronbach's alpha = .90.

Emotional labor: Emotional labor was measured using a tool developed by Morris and Feldman¹⁶, and translated into Korean by Kim¹⁷. This tool consists of 9 items measured on a 5-point Likert scale with 3 items on the frequency of emotional display, 3 items on

attentiveness to required emotional-display rules, and 3 items on emotional dissonance. A high score indicates a high degree of emotional labor. Cronbach’s $\alpha=.81$ at the time of tool development, .86 in a study by Kim¹⁷, and .89 in the present study.

Organizational commitment: Organizational commitment was measured using a tool developed by Mowday and Poeter¹⁸ and a factor analysis was performed by Lee¹⁹. This tool consists of 15 items measured on a 5-point Likert scale. A high score indicates high organizational commitment. Cronbach’s $\alpha=.86$ in a study by Lee¹⁹, and Cronbach’s $\alpha=.91$ in the present study.

Participants and Data Collection: The present study was conducted with 170 nurses working at a university hospital. Data were collected from August 1, 2016 to August 15, 2015. Before data collection, the participants were explained the purpose, methods, expected outcomes, possible risks of the present study, contents of study participation, and were guaranteed anonymity. The participants were also informed that the collected data would be not used for any purpose other than the present study, and that they could stop participating in the present study at any time during the survey. The participants provided a written consent if they volunteered to participate in the present study.

Data Analysis: Collected data were analyzed using the statistical software program IBM SPSS version 23.0.

The demographic characteristics of the participants, and the mean values and standard deviation of

variables were analyzed using descriptive statistics. Differences in communication competence according to the demographic characteristics of the participants were analyzed using a t-test and an ANOVA, and post-hoc was tested using Scheffe’s test.

- The communication competence of the participants was clustered using K-means cluster analysis.
- Differences in communication competence according to communication type were analyzed using a t-test.
- Differences in emotional labor and organizational commitment were analyzed using a t-test.
- The relationship between communication competence, emotional labor, and organizational commitment according to communication type was analyzed using Pearson’s correlation coefficients.

RESULTS

Differences in Communication according to the General Characteristics of the Participants: There were significant differences in verbal communication according to age ($t = -3.05, p = .003$), gender ($t = -5.0, p < .001$), experience of working ($F = 4.23, p = .016$), and job satisfaction ($F = 6.54, p = .002$); while there were significant differences in nonverbal communication according to age ($t = -3.05, p = .003$), gender ($t = -4.33, p < .001$), experience of working ($F = 6.48, p = .002$), and job satisfaction ($F = 4.67, p = .011$) [Table 1].

Table I: General Characteristics of Subjects

Variables	Categories	N(%)	Verbal communication		Nonverbal communication	
			M(SD)	t or F(p)/Scheffe	M(SD)	t or F(p)/Scheffe
Age(year)	<30	110(64.7)	14.26(1.85)	-3.05(.003)	32.85(3.81)	-3.05(.003)
	30≤	60(35.3)	15.21(2.09)		34.73(3.84)	
Marriage	Married	34(20.0)	16.02(1.58)	-5.0(<.001)	36.0(3.67)	-4.33(<.001)
	Single	136(80.0)	14.24(1.92)		32.89(3.74)	
Education level	College	29(17.1)	14.72(1.88)	0.26(.771)	33.93(4.68)	0.84(.433)
	University	129(75.9)	14.54(1.98)		33.31(3.71)	
	Over master	12(7.1)	14.91(2.35)		34.66(4.14)	
Number of nurses/unit	<20	112(65.9)	14.63(1.99)	0.30(.758)	33.51(3.90)	0.01(.999)
	20≤	58(34.1)	14.53(1.98)		33.51(3.97)	
Experience of working(year)	<5 ^a	94(55.3)	14.45(1.79)	4.23(.016) a,b<c	33.48(3.40)	6.48(.002) a,b<c
	5-10 ^b	48(28.2)	14.31(2.32)		32.35(4.61)	
	11≤ ^c	28(16.5)	15.57(1.75)		35.60(3.51)	
Job satisfaction	Satisfied ^a	40(23.5)	15.55(2.27)	6.54(.002) a,b<c	35.05(4.25)	4.67(.011) a<c
	Moderate ^b	94(55.3)	14.37(1.82)		33.25(3.53)	
	Dissatisfied ^c	36(21.2)	14.13(1.75)		32.50(4.12)	

Classification of Nurses' Communication: In order to classify nurses' communication type, K-means cluster analysis, a non-hierarchical cluster analysis, was performed for verbal and nonverbal communication, which are the sub-areas of communication. The K-means cluster analysis has the advantage of calculating errors that occur at the end of each step of clustering, and continue clustering in the direction that does not cause further errors²¹.

When the authors of the present study tried to extract various results within the number of possible clusters, the results showed that 2 clusters were finally determined [Table 2].

Looking at the extracted factor loading values by communication type, group 1 consisted of 100 participants (58.8%) and was positive for verbal and nonverbal communication (+), whereas group 2 consisted of 70 participants (41.2%) and was negative for verbal and nonverbal communication (-). There were statistically significant differences in both verbal and nonverbal communication as the standardized variables according to each cluster ($p < .001$).

Table II: Factor Loading and Group Distribution

Factor loading	Group 1	Group 2	F(p)
Verbal communication	.64	-.91	246.75 (<.001)
Nonverbal communication	.62	-.88	207.80 (<.001)
N(%)	100(58.8)	70(41.2)	

Differences in Communication Type: The mean values for verbal communication and nonverbal communication were compared to determine whether there was a significant difference between the two groups classified through the cluster analysis. As a result, there were significant differences in both verbal and nonverbal communications ($p < .001$) between the groups, and group 1 showed higher verbal and nonverbal communication than group 2 [Table 3].

Table III: Mean of communication by the group

Factor loading	Group 1 M (SD)	Group 2 M (SD)	t (p)
Verbal communication	15.88 (1.23)	12.77 (1.32)	15.70 (<.001)
Nonverbal communication	35.95 (2.72)	30.04 (2.48)	14.41 (<.001)

Based on the above results, group 1 was classified as having good communication, while group 2 was classified as having poor communication.

Differences in Emotional Labor and Organizational Commitment according to Communication Type: A t-test was performed to compare the degree of emotional labor and organizational commitment by communication type. As a result, the degree of emotional labor was higher in group 2, but it was not statistically significant. The degree of organizational commitment was significantly higher in group 1 ($p = .040$) [Table 4].

Table IV: Comparisons of Variables by group of communication

Variables	Group 1 M (SD)	Group 2 M (SD)	t(p)
Emotional labor	32.72(6.09)	33.14(5.30)	-0.46(.640)
Organizational commitment	58.36(7.0)	56.37(4.66)	2.07(.040)

Relationship between Verbal and Nonverbal Communication, Emotional Labor, and Organizational Commitment: There were significant relationships between verbal communication and nonverbal communication ($r = .58, p < .001$), and between nonverbal communication and emotional labor ($r = -.20, p = .041$) in group 1; whereas there was a significant relationship between verbal communication and nonverbal communication ($r = .31, p = .008$) in group 2 [Table 5].

Table V: Correlation among the Variables

Group	Variables	Verbal communication r(p)	Nonverbal communication r(p)	Emotional labor r(p)
1	Verbal communication	1		
	Nonverbal communication	.58(<.001)	1	
	Emotional labor	-.16(.102)	-.20(.041)	1
	Organizational commitment	.06(.515)	.02(.839)	.11(.263)

Conted...

2	Verbal communication	1		
	Nonverbal communication	.31(.008)	1	
	Emotional labor	.14(.223)	.18(.118)	1
	Organizational commitment	.02(.833)	-.04(.710)	.01(.980)

DISCUSSION

The present study aimed to analyze nurses' communication type, investigate the differences in emotional labor and organizational commitment according to nurses' communication type, and the relationship between communication type, emotional labor, and organizational commitment.

Communication can be divided into verbal and nonverbal communication, and nonverbal communication or paralinguistics is as important as verbal communication²⁰. Paralinguistics plays an important role in interacting with others, and can affect the persuasive effect that influences the persuasive power, authority, credibility, and attraction of a persuader in a communication situation²¹. In other words, communication is a process in which verbal and nonverbal communication are combined and perceived, and when one of these two factors is insufficient, it is seen as ineffective communication. This is in accordance with the present study that revealed that group 1 showed positive (+) values for both verbal and nonverbal communication, whereas group 2 showed negative (-) values for both verbal and nonverbal communication. However, future studies on verbal and nonverbal communication are needed to investigate the differences in the values.

The results of the present study found that organizational commitment differed according to nurses' communication competence. These results are similar to the results of a study by Lee and Kim²² that showed a significant relationship between communication competence and organizational commitment. It is thought that good communication within an organization increased employees' feelings of being respected and provides a sense of belongingness to the organization when their opinions were accepted, and this might positively influence their organizational commitment. As communication competence increases, employees have less friction with other employees and have a more satisfying relationship with others²³. Therefore,

it is necessary to increase organizational commitment by improving verbal and nonverbal communication competence in nurses.

The results of the present study showed a negative relationship between nonverbal communication and emotional labor. This finding is consistent with the results of a study by Park et al.¹⁰ that showed a negative relationship between communication competence and emotional labor. However, this study is in conflict with the results of another study by Park and Jung²⁴ that showed a positive relationship between communication competence and emotional labor. Nurses' nature of work is such that they should continuously interact with patients and maintain their relationship with patients while restraining their emotions. Considering that emotional labor is defined as the management of feelings to display externally observable facial expressions or gestures², emotional labor that cannot be expressed verbally might be expressed nonverbally without one's awareness. Communication competence is a significant factor influencing nursing performance and resilience that is negatively related to emotional labor²⁴. Therefore, emotional labor decreases if communication competence increases.

The results of the present study showed a significant relationship between verbal and nonverbal communication, and showed a difference in and a significant relationship between emotional labor and organizational commitment according to communication type. Therefore, communication type should be considered when developing and applying intervention programs designed to reduce emotional labor and increase organizational commitment in nurses. In addition, support programs should be provided to improve communication competence in nurses.

CONCLUSION

Nursing is based on interpersonal relationships, in which communication skills are most frequently used. Verbal and nonverbal communication is an influential factor for communication among nurses themselves, and is an important tool for evaluating the quality and satisfaction of nursing care for patients.

The results of the present study found that verbal and nonverbal communication competence in nurses differed according to age, marital status, experience of working, and job satisfaction. These results suggest that the personal characteristics of nurses influence their communication competence. These results should be applied to developing communication-intervention programs for nurses, and customized communication-interventions should be provided, accordingly.

In addition, the results of the present study showed no differences in emotional labor according to the nurses' communication type, but showed a difference in organizational commitment. This suggests that nurses' communication does not have a great influence on emotional labor, but it is an influential factor in organizational commitment. Further studies should be conducted, and efforts to improve nurses' communication competence are needed to reduce the high turnover rate among nurses and to ensure that they are well absorbed into organizations.

The results of the present study will be helpful in improving the quality and efficiency of nursing care in clinical nursing.

Ethical Clearance: Not required

Source of Funding: This work was supported by the research grant of Pai Chai University in 2017.

Conflict of Interest: Nil

REFERENCES

- Rubin, RB., Graham, EE., & Mignerey, JT., "A longitudinal study of college students' communication competence". *Commun Educ.* 1990; 39 (1): 1-14.
- Hochschild, AR., "The Managed Heart: Commercialization of Human Feeling". Berkeley and Los Angeles, CA. University of California Press, 1983.
- Lee. HS. & Kim, JK., "Relationship among communication competence, communication types, and organizational commitment in hospital nurses". *Journal of Korean Academy of Nursing Administration.* 2010; 16(4): 488-496.
- Park, SE., "The effects of emotional dissonance on the employee's job attitudes and the moderation role of job autonomy and social supports". *Korean Management Review.* 2009; 38(2): 379-405.
- Lee, SY. & Yang, HS., "The relations of emotional labor to emotional exhaustion and turnover intention in call center workers". *The Korea Contents Association.* 2008; 8(4): 197-210.
- Kanter, RM., "Commitment and social organization: a study of commitment mechanisms in utopian communities". *American Sociological Review.* 1968; 33(4): 499-517.
- Yang, JH. & Jeoung, KH., "Effects of emotional labor, job satisfaction and organizational commitment on turnover intention in nurses". *Journal of the Korea Academia-Industrial Cooperation Society.* 2014; 15(12): 7170-7178.
- Hong, SS. & Kwon, MS., "Affecting factors of hospital nurses' emotional labor and social support on organizational commitment". *Korean Journal of Occupational Health Nursing.* 2015; 24(4): 259-269.
- Kim, SH. & Lee, MA., "Effects of emotional labor and communication competence on turnover intention in nurses". *Journal of Korean Academy of Nursing Administration.* 2014; 20(3): 332-341.
- Park, NK., Lee, HK., Lee, TW., & Park, JS., "Correlations among emotional labor, servant leadership, and communication competence in hospital nurses". *Korean Journal of Occupational Health Nursing.* 2015; 24(2): 57-66. <http://dx.doi.org/10.5807/kjohn.2015.24.2.57>
- Mastracci, SH., Guy, ME., & Newman, MA., "Emotional Labor and Crisis Response: Working on the Razor's Edge". Armonk, NY : M.E. Sharpe, 2008.
- Kang, KH., Han, YH. & Kang, SJ., "Relationship between organizational communication satisfaction and organizational commitment among hospital nurses". *Journal of Korean Academy of Nursing Administration.* 2012; 18(1):13-22.
- Dilbeck, KE. & McCroskey, JC., "Socio-communicative orientation, communication competence, and rhetorical sensitivity". *Human Communication.* 2009; 12(3): 255-266.

14. Kim, YK. & Yu, JP., "A study on verbal and non-verbal communication of medical service provider". *Journal of the Korea Service Management Society*. 2008; 9(1): 225-258.
15. Kim, SH., "Nurses' Communication, Trust in Nurses, and Satisfaction of Nursing Service Perceived by Inpatients". Master's thesis, Seoul National University, Seoul, 2012. http://www.riss.kr/search/detail/DetailView.do?p_mat_type=be54d9b8bc7cdb09&control_no=8e264b2305817eb0ffe0bdc3ef48d419
16. Morris, JA. & Feldman, DC., "The dimension, antecedents and consequences of emotional labor". *Academy of Management Review*. 1996; 21(4): 986-1010.
17. Kim, MJ., "Effect of the hotel employee's emotional labor upon the job-related attitudes". *Korea Journal of Tourism and Hospitality Research*. 1998; 21(2): 129-141.
18. Mowday, RT., Poeter, LW., & Street, RM., "The management of organization commitment". *Journal of Vocational Behavior*. 1979; 14: 224-247.
19. Lee, MH., "Relationship between Organization Culture Types and Organizational Effectiveness in Hospitals". Doctoral Dissertation, Chungnam National University, 1998. http://www.riss.kr/search/detail/DetailView.do?p_mat_type=be54d9b8bc7cdb09&control_no=6c71591ce4491854#redirect
20. Seiter, JS. & Weger, HJ., "Audience perceptions of candidates' appropriateness as a function of nonverbal behaviors displayed during televised political debates". *Social Psychology*. 2005; 145: 225-235.
21. Jung, DH. & Lee, EJ., "Analysis of difference between college students' sex and perceived sex role toward news anchor on the verbal and non-verbal communication, para-social interaction and source credibility". *Speech & Communication*. 2011; 15: 89-120. <http://www.earticle.net/article.aspx?sn=147186>
22. Lee, HS. & Kim, JK., "Relationship among communication competence, communication types, and organizational commitment in hospital nurses". *Journal of Korean Academy of Nursing Administration*. 2010; 16(4): 488-496.
23. Han, JL. & Hur, GJ., "The influence of family member's communication competence, locus of control, impulsivity, and optimism on their family relationship satisfaction". *Korea Journal of Communication*. 2005; 28: 251-282.
24. Park, JH. & Jung, SK., "Influence of emotional labor, communication competence and resilience on nursing performance in university hospital nurses". *Journal of the Korea Academia-Industrial Cooperation Society*. 2016;17(10): 236-244.

Application of Problem Based Learning (PBL) for Nursing Students' Practicum in Handoff Communication

Eun-Kyung Lee¹, Sun Young Park²

¹College of Nursing, Catholic University of Daegu, Daegu, Republic of Korea; ²Department of Nursing, Division of Health Science, Baekseok University, Cheonan, Republic of Korea

ABSTRACT

This study's purpose is to verify its effectiveness upon developing and carrying out the field practicum in problem based learning (PBL) applied handoff communication. The study formed discussion learning groups consisting of senior nursing students in B university, and was developed and operated for the practical training class for hand off communication utilizing the suggested scenario. The evaluation for the overall PBL class was an average point of 4.46 ± 0.43 , the evaluation for students' self-capacity was an average point of 4.62 ± 0.49 , the evaluation for small group activities for PBL was an average point of 4.69 ± 0.50 , and the evaluation for an instructor's role in PBL class was an average of 4.77 ± 0.29 . Through the study, upon graduation, senior nursing students transitioning into new nurses ahead of actual duty, are considered more benefited from carrying out practical training in handoff communication in the aspect of adaptation of nursing duty and its handoff communication.

Keywords: *Problem based learning, nursing, handoff, communication*

INTRODUCTION

It has been reported that handoff communication in practice among nurses is a task of great difficulty and importance^{1,2}. Mutual handoff communication enables nurses not only to share information about nursing courses and acquire important guidance in nursing the sick, but it also shares personal information, including doctors' medical treatments, treatment protocols, patients' physical mental nursing contents, patients' economic conditions, family and social relationships, and awareness of health problems^{3,4,5}.

Recently, rapid changes in health care have led to set a high value on the acquisition of knowledge about diverse and complex diseases and patient safety and rights, which in turn restricts nursing students' nursing care activities in clinical practice, and thus in particular

it has become difficult for them to experience practicum in handoff communication.

Meanwhile, PBL has recently been applied to nursing courses. PBL is a small group discussion learning which, by presenting practical questions, leads learners to explore and understand logically approaching procedures, problem solving information and basic clinical knowledge in dealing with problems for themselves with interest and motivation^{6,7,8}. Students, through nursing courses with PBL application, are not only able to systemize necessary knowledge, skills and attitude in dealing with nursing problems, but are also able to build critical thinking ability, problem solving skills and communication skills.

The study concludes to provide nursing students and new nurses with the baseline data for the organization of the training program of the standardized nursing practicum in handoff communication by developing and implementing the nursing practicum program in handoff communication and verifying its effectiveness. The subjects of the program are senior nursing students, PBL is applied to it, and the program follows the given patients' scenario^{9,10}.

Corresponding Author:

Sun Young Park

Associate Professor, Dept of Nursing,

Division of Health Science, Baekseok University, Cheonan

Email: sypark@bu.ac.kr

MATERIALS AND METHOD

Subject of study: The study subjects were recruited through verbal explanation; study contents were explained to them through the explanatory note. Those who agreed to participate in the study consisted of 100 senior nursing students in B university who completed adult nursing classes including those dealing with emergency, dyspepsia, circulatory, respiratory, and neurologic patient nursing focuses.

The sample size was analyzed by using G power program 3.1.9. 82 subjects were required to maintain 0.05 of the significant level in the independent t-test, 0.30 of the effect size, and 0.80 in the test power. A total of 100 study subjects were selected, with 20% considered for the elimination rate.

Research Tool: The study's purpose is to develop the practicum module in PBL applied handoff communication and evaluate its effectiveness. After running a total of eight hours (four hours a week for two weeks) of nursing practicum in PBL applied handoff communication, a five-point scale questionnaire was used to verify its effectiveness. The questionnaire consisted of 27 questions, nine questions to evaluate the PBL module, four questions to evaluate students' self-capacity, five questions to evaluate small group activities, and nine questions to evaluate an instructor's role.

Data Collection and Statistical Analysis: Data collection was done through the self-administered questionnaire

which the subjects filled out in person. The researcher explained the research goal and contents, and how to fill out the questionnaire, and the subjects signed on the written agreement for the study. The analysis of operation effect was carried by using mean and standard deviation.

RESULTS AND DISCUSSION

Most authors will be able to prepare images in one of the allowed formats listed above. This section provides optional, additional information on preparing PS, EPS, and TIFF files. No matter how you convert your images, it is a good idea to print the files to make sure nothing was lost in the process.

Development and Operation of the Practicum Module in Handoff Communication with PBL Application

Setting of learning objectives: Learning objectives included developing the scenario of nursing care situations of the subjects for circulatory system, respiratory system, and digestive system by collecting information in the field of clinical practice, and effectively solving the health problems of the nursing subjects by adjusting the duties of the health care team under the condition of the suggested scenario and by carrying out handoff communication through the cooperation of professional teams.

Operation of practicum module: Practicum module in PBL applied handoff communication was managed as seen in Table 1.

Table I: OPERATION PLAN FOR PRACTICUM MODULE

Week	Content of Learning Activity	Form of class
Week 1 (2 hours)	<ul style="list-style-type: none"> ● Orientation ● Selection of a role such as a group leader and a secretary, ● Set of ground rules ● Confirmation of suggested scenario 	OT, group activity
Week 2 (2 hours)	<ul style="list-style-type: none"> ● Discussion and confirmation of additional data in accordance with problem-solving approach ● Discussion on assignment of self-study ● Emergency nursing simulation practice 	Group activity, discussion, simulation practice
Week 3 (2 hours)	<ul style="list-style-type: none"> ● Presentation of assignment of self-study ● Reanalysis and confirmation of problems ● Performance of emergency nursing and simulation in handoff communication 	Group activity, discussion, simulation practice
Week 4 (2 hours)	<ul style="list-style-type: none"> ● Presentation of group assignments and submission of report ● Evaluation 	Group presentation

Evaluation of Practicum Module in PBL Applied Handoff Communication: The evaluation of the operation of the practicum module in PBL applied handoff communication were implemented by dividing the evaluation of the overall PBL class, the evaluation of self-capacity, the evaluation of small group activities, and the evaluation of an instructor’s role. The evaluation of the operation of the practicum module in PBL applied handoff communication were implemented by dividing the evaluation of the overall PBL class, the evaluation of self-capacity, the evaluation of small group activities, and the evaluation of an instructor’s role. The evaluation for the overall PBL class was an average point of 4.46 ± 0.43 , the evaluation for students’ self-capacity was an average point of 4.62 ± 0.49 , the evaluation for small group activities for PBL was an average point of 4.69 ± 0.50 , and the evaluation for an instructor’s role in PBL class was an average of 4.77 ± 0.29 as seen in Table 2. The category with the lowest grade was the evaluation for the overall PBL class, and the category with the highest grade was the evaluation for an instructor’s role in PBL class.

Table II: EVALUATION OF FOR PRACTICUM MODULE

Number	Category	Mean ± SD
1	Evaluation for PBL class	4.46 ± 0.43
2	Evaluation for students’ self-capacity	4.62 ± 0.49
3	Evaluation for small group activities	4.69 ± 0.50
4	Evaluation for an instructor’s role	4.77 ± 0.29

Evaluation for the overall PBL class: The evaluation for the overall PBL class was an average point of 4.46 ± 0.43 as seen in Table 3. The items with the highest grade were “PBL is an effective method of learning” and “PBL was more interesting than previous learning styles,” and the item with the lowest grade was “Acquired various information searching methods through PBL.”

Table III: EVALUATION OF PBL CLASS

Number	Item	Mean ± SD	Overall Mean
1	Clinical practice knowledge insufficient in PBL was complemented.	4.56 ± 0.52	4.46 ± 0.43
2	PBL is an effective method of learning.	4.71 ± 0.48	
3	PBL was more interesting than previous learning styles.	4.71 ± 0.58	
4	Led own learning under intellectual stimulus.	4.30 ± 0.72	
5	Printed materials and learning materials were helpful.	4.44 ± 0.67	
6	Acquired various information searching methods through PBL.	4.25 ± 0.83	
7	Learned how to discuss sequentially respecting colleagues’ opinions and howto reach a conclusion systematically.	4.59 ± 0.58	
8	Materials and space for discussion were sufficient.	4.35 ± 0.79	
9	Time for discussion was sufficient.	4.27 ± 0.82	

Evaluation for self-capacity: The evaluation for students’ self-capacity was an average point of 4.62 ± 0.49 as seen in Table 4. The item with the highest grade was “Participated in discussions passionately and positively,” and the items with the lowest grade were “Can lead own study with a positive attitude and an inquisitive mind” and “Can analyze nursing problems and nursing processes.”

Table IV: EVALUATION FOR SELF-CAPACITY

Number	Item	Mean ± SD	Overall Mean
1	Can lead own study with a positive attitude and an inquisitive mind.	4.55 ± 0.61	4.62 ± 0.49
2	Can express own opinion in front of others.	4.66 ± 0.54	
3	Can analyze nursing problems and nursing processes.	4.55 ± 0.58	
4	Participated in discussions passionately and positively.	4.70 ± 0.55	

Evaluation for small group activities: The evaluation for small group activities for PBL was an average point of 4.69 ± 0.50 as seen in Table 5. The item with the highest grade was “Observed the rules of small groups,” and the item with the lowest grade was “Made an effort to improve by monitoring the activities from time to time.”

Table V: EVALUATION FOR SMALL GROUP ACTIVITIES

Number	Item	Mean \pm SD	Overall Mean
1	Every group member participated in discussions.	4.67 ± 0.65	4.69 ± 0.50
2	Observed the rules of small groups.	4.81 ± 0.44	
3	Every group member participated in cooperative learning for problem-solving.	4.70 ± 0.65	
4	Every group member participated in discussions for problem-solving.	4.68 ± 0.64	
5	Made an effort to improve by monitoring the activities from time to time.	4.61 ± 0.70	

Evaluation for an instructor’s role: The evaluation for an instructor’s role in PBL class was an average of 4.77 ± 0.29 as seen in Table 6. The item with the highest grade was “The instructor explained and answered questions kindly,” and the item with lowest grade was “The instructor interfered with discussions.”

Table VI: EVALUATION FOR AN INSTRUCTOR’S ROLE

Number	Item	Mean \pm SD	Overall Mean
1	The instructor showed intimacy-smile, warm gestures, and so on.	4.86 ± 0.35	4.77 ± 0.29
2	The instructor explained and answered questions kindly.	4.90 ± 0.33	
3	The instructor provided the class with quick feedback.	4.88 ± 0.37	
4	The instructor provided the class with adequate information materials for self-learning.	4.75 ± 0.45	
5	The instructor interfered with discussions.*	4.41 ± 0.85	
6	The instructor encouraged the class by asking individual tasks or questions.	4.71 ± 0.51	
7	The feedback from the instructor was helpful to clarifying problems.	4.81 ± 0.42	
8	The instructor encouraged the class to summarize and organize themselves.	4.82 ± 0.41	
9	The instructor guided students’ discussions to go smoothly.	4.88 ± 0.32	

* Reverse conversion process

CONCLUSION

The study’s purpose is to verify its effectiveness upon developing and carrying out the field practicum in PBL applied handoff communication.

The study formed discussion learning groups consisting of senior nursing students in B university, and was developed and operated for the practical training class for handoff communication utilizing the suggested scenario of the subjects with disorders in the circulatory system, respiratory system, and digestive system.

The evaluation for the overall PBL class was an average point of 4.46 ± 0.43 , the evaluation for students’ self-capacity was an average point of 4.62 ± 0.49 , the evaluation for small group activities for PBL was an average point of 4.69 ± 0.50 , and the evaluation for an instructor’s role in PBL class was an average of 4.77 ± 0.29 .

Through the study, upon graduation, senior nursing students transitioning into new nurses ahead of actual duty are considered more benefited from carrying out practical training in handoff communication in the

aspect of adaptation of nursing duty and its handoff communication.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Application of Problem Based Learning (PBL)

REFERENCES

1. Kim, EM, Ko, JW, and Kim, S. "Korean nurses' perspectives regarding handoffs." *Contemp Nurse*, 2016, 52(4): 421-429.
2. Ferrara, P, Terzoni, S, Davì, S, Bisesti, A, and Destrebecq, A. "A tool for assessing the quality of nursing handovers: a validation study." *Br J Nurs*, 2017, 26(15): 882-888.
3. Abraham, J, Kannampallil, T, Brenner, C, Lopez, KD, Almoosa, KF, Patel, B, and Patel, VL, "Characterizing the structure and content of nurse handoffs: A Sequential Conversational Analysis approach." *J Biomed Inform*, 2016, 59: 76-88.
4. Lee, J, Mast, M, Humbert, J, Bagnardi, M, and Richards, S, "Teaching Handoff Communication to Nursing Students: A Teaching Intervention and Lessons Learned." *Nurse Educ*, 2016, 41(4): 189-193.
5. Lim, F, and Pajarillo, EJ, "Standardized handoff report form in clinical nursing education: An educational tool for patient safety and quality of care." *Nurse Educ Today*, 2016, 37: 3-7.
6. Haith-Cooper, M, "An exploration of tutors' experiences of facilitating problem-based learning. Part 1--an educational research methodology combining innovation and philosophical tradition." *Nurse Educ Today*, 2003, 23(1): 58-64.
7. Mete, S, and Yildirim, Sari H, "Nursing students' expectations from tutors in PBL and effects of tutors' behavior on nursing students." *Nurse Educ Today*, 2008, 28(4): 434-442.
8. Yu, M, and Kang, KJ, "Effectiveness of a role-play simulation program involving the sbar technique: A quasi-experimental study." *Nurse Educ Today*, 2017, 53: 41-47.
9. Kesten, KS, "Role-play using SBAR technique to improve observed communication skills in senior nursing students." *J Nurs Educ*, 2011, 50(2): 79-87.
10. Stow, J, Morphet, J, Griffiths, D, Huggins, C, Morgan, P, Stow, J, Morphet, J, Griffiths, D, Huggins, C, and Morgan, P, "Lessons learned developing and piloting interprofessional handover simulations for paramedic, nursing, and physiotherapy students." *J Interprof Care*, 2017, 31(1): 132-135.

Health Perception and Wellness Behaviors of College Students Participating in Physical Education

Yeong-Gwon Jo¹, Chun-Ho Yang²

¹Dept. of Physical Education Gwangju University; ²Dept. of Marine Sports Hanseo University

ABSTRACT

Background/Objectives: The purpose of the study is to identify the effects of health perception of college students who participated in physical education.

Method/Statistical analysis: Toward this end, the survey was conducted targeting 293 four-year college students and the following results were obtained.

Findings: First, a statistically significant positive correlation was observed between sub-factors of health perception and behavioral wellness of students who participated in physical education.

Second, physical health perception had a positive effect on well-being in terms of product purchase, environment-friendly behaviors, dietary well-being and lifestyle measures, and exercise orientation.

Third, the sub-variable of physical and mental health perception showed statistically significant effects on hobby orientation.

Improvements/Applications: The university students who participated in optional sports classes manifested a positive effect not only on the purchase of wellness products and services, but also on their life styles, including exercise, meditation, wellness diets and leisure or hobby activities.

Keywords: *physical education, physical health perception, mental health perception, well-being oriented behaviors*

INTRODUCTION

Compared with other curricula, physical education encompasses a functional curriculum with physical activities as a tool, and cognitive, emotional and social activities as well as simple physical activities ¹. It maintains and promotes the individual student's health through voluntary participation in sports activities and enables students to cultivate their social and moral spirits, leading to a prosperous school life ².

Since the physical education in college is targeted at university students who will enter the society soon,

it is an important driving force for college students to participate in physical education activities continuously after graduation. Conclusively, physical education in college can be expected to provide ways to live a healthy and pleasant life even after graduation as well as to participate in various sports for satisfactory college life³.

Physical education in college should promote a desirable perception of health in everyday life as a qualitative concept to maintain and promote individual health. In other words, the students should pursue physical and mental health by participating in physical education. Among college students, health is an expression of self-realization. In addition, health is not related to any specific disease or problems and is a behavior aiming at promotion of individual well-being.

This health perception carries a personal dimension that dominates human health behaviors and may be regarded as self-assessment of individual physical and mental well-being ⁴. The optimal health condition pursued

Corresponding Author:

Chun-Ho Yang
Professor, Dept. of Marine Sports, Hanseo University,
Seosan, 31962, Korea
Email: healthyang@hanseo.ac.kr

by college students represents the basis of individual happiness and well-being and eventually, enhances their mental quality of life⁵. Health perception that dominates human behaviors, from the individual perspectives, is self-evaluation of individual physical and emotional well-being⁶. Health perception, which is one of the motivational factors affecting individual well-being-oriented behaviors, strongly predicts life satisfaction⁷.

Participation in physical education at college is a pursuit of well-being through physical and mental health as well as satisfying college life. Well-being is defined by happiness and stability and also seeking search for the value of physical and mental health⁸. With the expansion of well-being to include physical and mental harmony, activities targeting environment-friendly behaviors have expanded widely in recent years in relation to health throughout the society, and social perception about healthy life quality has spread rapidly⁹.

Wellness behaviors have evolved to an industry level in developing wellness products catering to consumer culture. Commercialization of behaviors involving wellness products and services has become a cultural phenomenon.

Consumption based on wellness behaviors is a decision based on economic efficiency. However, it may be regarded as representative of differentiated emotional and symbolic consumer culture where the thoughts or values of college students manifest through the consumption of time as well as consumption of goods and services¹⁰.

In other words, health perception affects both material and psychological aspects of our lives¹¹, and is also closely related to wellness behaviors. Emotions underlying wellness behaviors triggered by health perception and expectations related to wellness culture may be bigger than other factors¹². Recent trends suggest wellness as an emerging social issue related to improvement in college life satisfaction and quality of life. It differs progressively from the simple wellness life style and also affects the way of life of college students. Therefore, the purpose of this study is to identify the effects of health perception on wellness behaviors of college students participating in physical education.

STUDY METHOD

Study subjects: The study population included college students who attended liberal arts physical education

classes among the four-year college students in Gwangju metropolitan city in 2017. Based on a convenience sampling method, the survey targeted 300 college students who participated in physical education classes. A total of 293 valid samples were selected for the analysis, excluding seven samples which were deemed to have low confidence level. The general characteristics of the survey subjects are as follows. Male students were 155 (52.9%) and female students were 138 (47.1%). The number of 1st grade students was 90 (30.7%), 2nd grade students 85 (29.0%), 3rd grade students 67 and 4th grade students 51 (17.4%). Based on study subjects, 93 students majored in humanities and social sciences (31.8%), 75 students in health sciences (25.6%), 88 students in business schools (30.0%) and 37 students in convergence science (12.6%).

Study tools: Health Perception Questionnaire (HPQ) developed before¹³ to measure health perception and questionnaires revised in¹⁴ and¹⁵ were used. Next, in order to measure wellness behaviors, reconstructed questionnaires as described in¹⁶ based on¹⁷ and¹⁸ studies were used. These questionnaires were measured using a 5-point Likert scale of 'Very likely, 5 points', 'Likely, 4 points', 'Normal, 3 points', 'Not likely, 2 points' and 'Not very likely, 1 point'.

Exploratory factor analysis and reliability: Exploratory factor analysis was used to test the validity of the questionnaire. Bartlett's unit matrix check was used to identify the independence of individual variables, and the goodness-of-fit of factor analysis was assessed via the sample goodness-of-fit of KMO. In addition, an eigenvalue higher than 1.0 was set for the reference and only the questionnaires with values higher than 0.4 were selected for factor loading. Additionally, Cronbach's alpha coefficient was used to analyze the reliability. Only the questionnaires with an eigenvalue higher than 0.6, were used. The Bartlett unit matrix of health perception was 4716.269, the significance of probability was 0.001 and KMO index was 0.931, suggesting appropriate selection of variables. Based on this analysis, the two factors were extracted following the factor analysis using 8 questionnaires, which showed an approximately 71.5% of explanation of the total variance.

The loading values of physical motion perception ranged from 0.806 to 0.875 and those of psychopathological motions varied from 0.713 to 0.882. In addition, the reliability values varied from 0.690 to

0.698, suggesting relative reliability. The Bartlett unit matrix of wellness oriented behaviors was $\chi^2=1172.084$, with a significance probability is 0.001 and a KMO index of 0.825, which suggests reliable selection of variables. Factor analysis of 24 questionnaires based on these results showed 5 extracted factors, with approximately 70.6% explanation of the total variance. The loading values of wellness products purchased ranged from 0.665 to 0.815 and those of environment-friendly behaviors varied from 0.631 to 0.823. Loading values of dietary wellness ranged from 0.548 to 0.818 and exercise-oriented loading values varied from 0.500 to 0.828. Hobby-oriented loading values ranged from 0.875 to 0.901 and the reliability values varied from 0.615 to 0.814, suggesting reliability.

Data processing: Completed questionnaires were immediately collected at the site. Double-double-entry and non-entry data were excluded from the data analysis and only valid samples were coded according to the coding guidelines. Coded data were processed using the statistical program, SPSS 21.0 ver., for the analysis of frequency, exploratory factors, reliability, correlation

and multiple regression. The significance level of all data was set at $p < .05$ level.

RESULTS

Correlation analysis: As shown in Table 1, Pearson’s correlation coefficient was calculated to identify the correlation between health perception and wellness behaviors of college students who participated in physical education. A statistically significant positive correlation was observed between sub-factors of health perception and wellness behaviors. Specifically, physical health perception showed a significantly positive correlation with wellness product purchase ($r = .779$), exercise orientation ($r = .735$), environment-friendly behaviors ($r = .684$), dietary wellness ($r = .442$) and hobbies ($r = .286$). Mental health perception showed significantly positive correlation with hobbies ($r = .573$), wellness product purchase ($r = .241$), exercise orientation ($r = .194$), dietary wellness ($r = .154$) and environment-friendly behaviors ($r = .135$). These results satisfy the validity of the variables.

Table 1: Correlation analysis

Sub-factors	A	B	C	D	E	F	G
Physical health perception	-						
Mental health perception	.299***	-					
Wellness product purchase	.779***	.241**	-				
Environment-friendly behaviors	.684***	.135*	.724***	-			
Dietary wellness	.442***	.154**	.424***	.369***	-		
Exercise orientation	.735***	.194***	.643***	.637***	.344***	-	
Hobby orientation	.286***	.573***	.269***	.237***	.178**	.127*	-

*** $p < .001$, ** $p < .01$, * $p < .05$

Effects of health perception on wellness behaviors: Multiple regression analysis was conducted to identify the effects of health perception on wellness behaviors. In the SPSS program, tolerance and variance magnification index (VIF) were used to identify multi-collinearity. The tolerance in this study was 0.910 and VIF was 1.098.

Effects of health perception on wellness product purchase: The results of a regression analysis as shown in Table 2 suggest that health perception had a significant effect on wellness product purchase. The significance of the total regression equation was $F = 220.898$ ($p < .001$), and the explanatory power was approximately 60.7% ($R^2 = .607$) of the total variance. Beta value, a relative effect of health perception on wellness product purchase, showed significant effects of physical health perception ($\beta = .776$).

Table 2: Effects of health perception on wellness product purchase

	B	SE	β	t	F	R2
Constant	1.547	.185		8.366***	220.898***	.607
Physical health perception	.667	.033	.776	19.986***		
Mental health perception	.009	.038	.009	.227		

*** $p < .001$

Effects of health perception on environment-friendly behaviors: As shown in Table 3, health perception had a significant effect on environment-friendly behaviors. The significance of the total regression equation was $F = 128.111$ ($p < .001$), and the explanatory power was approximately 47.3% ($R^2 = .473$). Beta value, a relative influence of health perception on environment-friendly behaviors, indicates significant effects on physical health perception ($\beta = .706$).

Table 3: Effects of health perception on environment-friendly behaviors

	B	SE	β	t	F	R2
Constant	1.066	.284		3.753***	128.111***	.473
Physical health perception	.804	.051	.706	15.695***		
Mental health perception	-.099	.058	-.076	-1.697		

*** $p < .001$

Effects of health perception on dietary well-being: As shown in Table 4, health perception had a significant effect on dietary well-being. The significance of the total regression equation was $F = 34.805$ ($p < .001$), and the explanatory power was approximately 19.6% ($R^2 = .196$) of the total variance. Beta value, a relative influence of health perception on dietary well-being, shows significant effects of physical health perception ($\beta = .435$).

Table 4: Effects of health perception on dietary well-being

	B	SE	β	T	F	R2
Constant	4.405	.343		12.848***	34.805***	.196
Physical health perception	.484	.062	.435	7.823***		
Mental health perception	-.030	.071	-.024	-.426		

* $p < .05$, *** $p < .001$

Effects of health perception on exercise orientation: As shown in Table 5, health perception had a significant effect on exercise orientation. The significance of the total regression equation was $F = 168.312$ ($p < .001$), and the explanatory power was approximately 54.1% ($R^2 = .541$) of the total variance. Beta value, a relative influence of health perception on exercise orientation, shows significant effects of physical health perception ($\beta = .743$).

Table 5: Effects of health perception on exercise orientation

	B	SE	β	t	F	R2
Constant	.733	.257		2.845**	168.312***	.541
Physical health perception	.822	.046	.743	17.696***		
Mental health perception	-.036	.053	-.028	-.675		

* $p < .05$, *** $p < .001$

Effects of health perception on hobby orientation: As shown in Table 6, health perception had a significant effect on hobby orientation. The significance of the total regression equation was $F = 74.417$ ($p < .001$), and the explanatory power was approximately 34.2% ($R^2 = .342$) of the total variance. Beta value, a relative influence of health perception on hobby orientation, shows significant effects of physical health perception ($\beta = .126$).

Table 6: Effects of health perception on hobby orientation

	B	SE	β	t	F	R2
Constant	-.212	.347		-.612	74.417***	.342
Physical health perception	.157	.062	.126	2.509*		
Mental health perception	.759	.071	.535	10.641***		

* $p < .05$, *** $p < .001$

DISCUSSION

In recent years, interest and studies investigating health perception and effects of health on quality of life have increased. Such developments have occurred in the context of significantly increased life expectancy due to technological and medical advances, and a decrease in patients with acute illness and an increase in patients with chronic illness. The management of most chronic illnesses is not focused on healing but minimizing the exacerbation of current symptoms while improving the patients' abilities. In recent years, the emphasis in health management has been on health perception, because actions are based on perceptions and feelings¹⁹. Perception controls a person's behavior and is also a subjective phenomenon of the environment. It is a concept based on behaviorism and also humanitarian psychology, which links individual attitude and behavior with the individual adaptation to the environment. It is determined by the characteristics of the perceptual field of each individual.

Meanwhile, university students are only allowed genuine leisure time after admission to university, while during their high school years they are asked to suppress the desire for leisure time or activities²⁰. In a human life cycle, standards for value judgment are established in university years based on an ego-consciousness followed by various adjustments to the psychological and social environment while experiencing positive human relations, which help to establish a concept of self. Voluntary leisure or sports activities during this period not only help in promoting the individual health during their transformation to adults, but can also help establish life-long hobby and leisure activities²¹.

Physical education enriches the university curriculum by assisting students in the formation of a wider range of peer relationships, promotes stress release, and brings vibrancy to university life. Therefore, this study reviewed the effects of health perception of university students who participated in optional sports classes on their wellness behavior. The study found a significant positive correlation between individual health perception and behavioral wellness. A comprehensive review showed that perception of physical health resulted in a positive effect on the purchase of wellness products, environment-friendly behavior, wellness diets, fondness for exercise and hobbies. Perception of mental health had a positive effect on fondness for hobbies. This finding

shows that the health perception of university students following participation in optional physical education classes in university had a positive effect on their wellness behavior. According to Younghan Kim and Heejung Im²² wellness can change an individual's life style, and wellness products and markets will grow worldwide as the consumption culture is altered. Our study findings support this forecast, as university students participating in optional physical education classes exhibited a positive effect on their purchase of wellness products, as well as on their environment-friendly behavior and wellness diets. Other studies also noted that wellness behavior affects health consumption behavior and health management²³. Therefore, this finding indirectly suggests that the health perception of university students who participate in optional sports classes affects their behavioral wellness. Moreover, consumers involved in natural healing and health product markets show health-oriented behaviors consistent with their value system²⁴, and therefore, suggest an association between health perception and wellness behavior reported in this study.

As university students are the future talent of society who assume the lead in establishing life-long sports patterns, it is important to offer them a positive sports experience during their university years. This study showed that the health perception of university students who participated in optional sports classes exhibited a higher sentiment and expectation for wellness behavior, compared with other factors.

CONCLUSION

The purpose of this study was to identify the effects of health perception on wellness behaviors among college students who participated in physical education. Toward this end, a survey was conducted targeting 293 four-year college students and the following results were obtained.

First, the college students who participated in physical education showed a statistically significant positive correlation between sub-factors of health perception and sub-factors of well-being-oriented behaviors.

Second, physical health perception among the sub-variables of health perception had a positive effect on wellness product purchase, environment-friendly behaviors, dietary well-being and exercise orientation.

Third, physical and mental health perception among the sub-variables of health perception showed a statistically significant effect on hobby orientation. Thus, university students who participated in optional sports classes manifested a positive effect not only on the purchase of wellness products and services, but also on their life styles, including exercise, meditation, wellness diets, leisure or hobby activities.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Health perception and wellness in physical education

REFERENCES

1. Sim, Sang-Sin. A Study on the Leisure Attitude and School Life Satisfaction in Satisfaction with Participation Fitness Class of College Students. *Korean journal of physical education*. 2004, 43(1), pp 309-314.
2. Heo, Hyeon-Mi., & Kim, Sug-Ja. A Study on Female College Students' Satisfaction and Recognition at Physical Education. *Journal of Korean Physical Education Association for Girls and Women*. 2003, 17(2), pp 163-176.
3. Kim, Jeong-Muk. A Study on the Relationship between Fun Factor and Physical Education Learning Attitude, Classes Satisfaction of Physical Education in University. *Journal of Korean Society for the Study of Physical Education*. 2010, 15(1), pp 319-330.
4. Kim, Sun-Jung., & Jung, Eun-Young. A Relevance on Health Perception, Health Knowledge and Health Promotion Behavior of the University students. *Journal of the Korea Academia-Industrial Cooperation Society*. 2015, 16(8), pp 5394-5403.
5. Lee, Mee-Sook. Looking at 'Well-Being' in Terms of Lifestyle: Healthy or Trendy? *Korean Journal of Human Ecology*. 2004, 13(3), pp 477-484.
6. Nicholas, P. K. Hardiness. Self-care practices and perceived health status in older adults. *Journal of advanced Nursing*. 1993, 18(7), 1085-1094.
7. Pender, N, J. *Health Promotion in Nursing Practice*. Norwalk, CT: Appleton & Lange. 1987.
8. Kim, Byoung-Sook., & Kim, Min-Jeong. Wellbeing Consumption Value and the Typology of Well-being Consumers. *Consumer policy and education review*. 2011, 7(2), pp 103-124.
9. Lee, Dong-Jin., & Yu, Grace-B. Testing a Model of Perceived Quality of Life Impact (PQOLI) for a Well Being Product: The Case of Health-Related Consumer Products in Korea. *Korea Marketing Review*. 2008, 23(3), pp 37-56.
10. Jeon, Hyang-Ran., & Jae, Mie-Kyung. A Comparison of Well-being oriented consumer behaviors in Dietary life between College students and Housewives. *Korean Society of Consumer Policy and Education*. 2009, 5(3), pp 1-16.
11. Jang, Ho-Jung., & Kim, Jeong-Muk. The Relationship between of Health Perception of Sports Participation, Health Promoting Behavior and Quality of Life, *Korea Sport Society*. 2003, 12(2), pp 285-296
12. Choi, Mi-Ran., & Lee, Joung-Young. The Emotional Experiences of Leisure fencing Activity and Social Structural Factors. *Korean journal of physical education*. 2002, 41(3), pp 73-81.
13. Were. J. E. *Health perception questionnaire Instruments for measuring nursing practice and other care variables*. Hyattsville. Maryland: DHEW Publication; 1979. pp 158-161.
14. Lee, Ji-Hye. The Relationship between Health Perception and Health Promoting Behavior of Finance Clerks. Unpublished master's Dissertation. Seoul: Sookmyung Women's University. 2006.
15. Jung, Ha-Na. The Influence of Well-Being Cultural Activity through Health Perception of Well-Being Sports Participator. Unpublished doctor Dissertation. Seoul: Kookmin University. 2010.
16. Kim, Byoung-Sook. Related Factors of Well-being Oriented Behavior and Typology of Well-being Consumers. Unpublished doctor Dissertation. Deagu: Keimyung University. 2006.
17. Kim, Min-Jeong., & Kim, Byoung-Sook. The Development of the Scale of 'Well-being' and the Determinants of the Well-being Oriented Behavior. *Korean Consumption Culture Association*. 2005, 8(2), pp 149-164.

18. Yoo, Hyun-Jung. Consumer Consciousness Toward Well-being Trend and Well-being Behaviors. *Korean Journal of Human Ecology*. 2006, 15(2), pp 261-274.
19. Lee, Kyeong-Sook. A Study on Health Perception and Health Promoting Behavior of the Elderly. Unpublished master's Dissertation, Chonbuk National University. 1997.
20. Lim, Burn-Jang., & Kim, Hong-Soul. The Relationship Between Types of Leisure Activity and Leisure Satisfaction Among College Students. *Korean journal of physical education*. 1996, 35(4), 4480-4491.
21. Han, Hae-Won. The Relationship among Partivipation of Leisure Sport, Physical Self-Concept and Psychological Well-Being for University Students, *Journal of Korean Physical Education Association for Girls and Women*. 2009, 23(2), 129-139.
22. Kim, Young-Han., & Lim, Hee-Jung. Well-being marketing. Publisher: Dasan books; 2004.
23. Baek, Eun-Young., & Jeong, Woon-Young. Determinants of Health Oriented Consumption. *Korean Consumption Culture Association*. 2006, 9(2), 25-48.
24. Thompson, C. J., & Troester, M. Consumer Value Systems in the Age of Postmoden Fragmentation: The Cases of the Natural Health Microculture. *Journal of Consumer Research*. 2002, 28, 550-571.

Factors Affecting the Quality of Life of Male Workers According to the Type of Job

Myoung-Jin Kwon¹, Sung-Yun Ahn²

¹Assistant Professor, Dept. of Nursing, Daejeon University, Korea; ²Assistant Professor, Dept. of Nursing, Pai Chai University, Korea

ABSTRACT

Background/Objectives: The present study was conducted to investigate the factors affecting the quality of life of male workers according to the type of job.

Method/Statistical analysis: The present study used raw data from the 6th National Health and Nutrition Examination Survey (2015). The subjects were 1,037 male office workers; service and sales workers; experts in agriculture, forestry, and fishing; technical workers; device-machine operators; and assembly workers. A composite sample analysis plan file was created using the IBM SPSS 23.0 program, then weighted and analyzed. The significance level was set at .05.

Findings: The factors affecting quality of life among the office workers included stress and subjective health, and their explanatory power was 34.5% ($F = 2.03, p = .003$). The factors affecting quality of life among service and sales workers included age, number of family members, subjective health, and continuous depression for more than two weeks, and their explanatory power was 36.3% ($F = 2.10, p = .002$). The factors affecting quality of life among experts in agriculture, forestry, and fishery included economic status, number of family members, hours of sleep, presence or absence of diabetes mellitus, time spent sitting per day, and subjective health; their explaining power was 41.7% ($F = 61.46, p < .001$). The factors affecting quality of life among technical workers, device-machine operators, and assembly workers included economic status, education level, rate of aerobic physical activity practice, time spent sitting per day, and subjective health status; their explanatory power was 26.3% ($F = 2.87, p < .001$).

Improvements/Applications: Therefore, in order to improve the quality of life, interventions that take into account different influencing factors depending on occupation are required.

Keywords: *Quality of Life (QOL), Male Workers, Type of Job, NHANES, Subjective Health Status*

INTRODUCTION

The quality of life of workers in the workplace is very important. This is because quality of life encompasses the subjective and objective aspects that explain the well-being of a human in an integrated way and reflects the needs of those seeking internal and external balance¹. It has been evaluated that workers in South Korea not only have the second longest working

hours in the OECD countries, they also have a high level of stress due to performance-oriented assessment and high job insecurity², threatening their quality of life. In particular, changes in the type of employment, such as non-regular workers, resulting from changes in the industrial structure, and labor flexibility are regarded as new threats related to job stress³, which are evaluated to threaten the quality of life⁴. Work life⁵, which not only takes a long time in one's life, but occupies a large portion in terms of importance, has a direct impact on individuals' lives, and thus is considered to be closely related to quality of life.

If the quality of life among workers deteriorates, it may not only adversely affect work performance, but also cause a lot of social costs. In particular, because male

Corresponding Author:

Sung-Yun Ahn

Assistant Professor, Dept. of Nursing,
Pai Chai University, Korea

Email: syahn@pcu.ac.kr

workers account for a large proportion of the total number of workers, and also have acted traditionally and culturally as patriarchs within their family, it can be assumed that the quality of life in male workers is highly related to the quality of life of their family. Meanwhile, the quality of life of all workers cannot be assessed collectively, since the situation in the workplace is unique to each worker, depending on the type of job. Consequently, the working environment of individual workers can affect their quality of life⁶, the type of job affects the situation, and their quality of life has subjectivity that may be perceived differently according to the type of job. Therefore, quality of life, rather than other factors, is more likely to be affected by the type of job.

Although among studies conducted so far, there are many studies on quality of life that limit the subjects by type of job^{4,7-9}, but studies on quality of life using the type of job as a variable are scarce. Therefore, the present study aims to investigate the factors affecting the quality of life of male workers according to the type of job, which can be used as baseline data for the development of effective intervention programs to enhance the quality of life in male workers.

The specific objectives of the present study are as follows. First, the present study aims to identify differences in general, physical, and psychological characteristics according to the type of job. Second, the present study aims to investigate the factors affecting quality of life according to the type of job.

MATERIALS AND METHOD

Study design: The present study is a descriptive research designed to investigate the factors affecting the quality of life of male workers according to the type of job using a secondary analysis of the data from the 2015 National Health and Nutrition Examination Survey.

Participants: The present study used raw data from the 6thNational Health and Nutrition Examination Survey (2015). The 6thNational Health and Nutrition Examination Survey (2015), conducted by the Ministry of Health and Welfare Affairs and the Centers for Disease Control and Prevention in South Korea, involved a total of 7,380 people, including 1,037 male office workers; service and sales workers; experts in agriculture, forestry, and fishing; technical workers; device-machine operators; and assembly workers.

Research variables

General characteristics: The variables for the general characteristics of the participants included age, economic status, education level, number of family members, marital status, hours of sleep, health examination status, and quality of life.

- **Age:** divided into those aged 40 years or younger, those in their 40s, those in their 50s, and those aged 60 years or older.
- **Economic Status:** divided into “high,” “medium-high,” “medium-low,” and “low” economic status based on individual income.
- **Education level:** divided into “elementary school graduates or below,” “middle school graduates,” “high school graduates,” and “college graduates or above.”
- **Number of family members:** divided into “1,” “2-3,” and “more than 4.”
- **Marital status:** divided into “married” and “single.”
- **Hours of sleep:** divided into “less than 3 hours,” “7-8 hours,” and “more than 9 hours.”
- **Health examination status:** “yes” or “no.”
- **Quality of life:** measured using the EQ-5D (EuroQol-5Dimension).

Physical-psychological characteristics: The physical-psychological characteristics included presence or absence of hypertension, presence or absence of diabetes mellitus, presence or absence of dyslipidemia, weight control for one year, monthly drinking rate, current smoking rate, work-moderate-intensity physical activity, aerobic physical activity, time spent sitting per day, body mass index (BMI), subjective body shape perception, stress, subjective health status, and continuous depression for more than two weeks.

- **Presence or absence of hypertension:** this refers to responding with “No” or “Yes” to the question about doctor-diagnosed hypertension.
- **Presence or absence of diabetes mellitus:** this refers to responding with “No” or “Yes” to the question about doctor-diagnosed diabetes mellitus.
- **Presence or absence of dyslipidemia:** this refers to responding with “No” or “Yes” to the question about doctor-diagnosed dyslipidemia.

- **Intended weight control for one year:** divided into “efforts to reduce weight,” “efforts to maintain weight,” and “no effort to control weight.”
- **Monthly drinking rate:** this refers to responding with either “non-drinking for a lifetime or less than one drink per month for the past year” or “drinking one or more drinks per month for the past year.”
- **Current smoking rate:** this refers to responding with either “former smoker or non-smoking”, or “current smoker.”
- **Work-moderate-intensity physical activity:** this refers to responding to the question, “Does your job involve a medium-strength physical activity that lasts for at least 10 minutes, with a little bit increased respiration or heart rate?”
- **Aerobic physical activity:** this refers to responding with either “not practicing moderate-intensity physical activity for more than 2.5 hours per week, not practicing high-intensity physical activity for 1.25 hours, or not practicing a mix of moderate- and high-intensity physical activities for an equivalent time per week” or “practicing moderate-intensity physical activity for 2.5 hours per week, high-intensity physical activity for 1.25 hours, or a mix of moderate-intensity and high-intensity physical activities for an equivalent time per week.”
- **Time spent sitting per day:** divided into “less than 5 hours,” “5-9 hours,” and “more than 10 hours.”
- **Body Mass Index (BMI):** calculated as body weight/height (m²), and categorized into “<25kg/m²” and “≥ 25kg/m².”
- **Subjective body shape perception:** Being “very thin” or “thin” was classified as “thin,” being “normal” as “normal,” and being “very fat” as “very fat.”
- **Stress:** “Feeling almost no stress” or “feeling a bit of stress” was classified as “a low level of stress,” and “feeling a lot of stress” or “feeling very much stress” were classified as “a high level of stress.”
- **Subjective health status:** “Very good” or “good” was classified as “good,” being “normal” was classified as “normal,” and “poor” or “very poor” were classified as “poor.”
- **Continuous depression for more than two weeks:** this refers to responding with “Yes” or “No” to the relevant question.

Data analysis method: In this study, we extracted data on male office workers; service and sales workers; experts in agriculture, forestry, and fishery; technical workers; device-machine operators; and assembly workers from the 6th National Health and Nutrition Examination Survey raw data, which was collected by a stratified cluster systematic sampling method, and investigated the factors affecting the quality of life among the participants. A composite sample analysis plan file was created using the IBM SPSS 23.0 program, then weighted and analyzed. The significance level was set at .05.

The general, physical, and psychological characteristics of the workers were analyzed using frequency and percentage. Frequency was calculated using actual values, but the percentage was calculated by considering weight. The factors affecting the quality of life of male workers were analyzed using composite sample logistic analysis.

RESULTS AND DISCUSSION

Comparison of general characteristics: As shown in Table 1, significant differences were found in age, economic status, education level, and marital status, according to the type of job ($p < .001$), and significant differences were also found in the number of family members and health examination status, according to the type of job ($p = .001$).

Those aged <40 years old were most commonly (51.0%) office workers, whereas those aged ≥60 were most commonly (57.1%) among the experts in agriculture, forestry, and fishery. In terms of economic status and education level, “high” economic status and “college graduates or above” were the most common among the office workers. Conversely, those with “low” economic status and “elementary graduates or below” were the most common among the experts in agriculture, forestry, and fishery. Those who live alone or are unmarried were the most common among technical workers, device-machine operators, and assembly workers. In terms of hours of sleep, the office workers had the fewest hours of sleep. The workers who were least likely to undergo health examination were technical workers, device-machine operators, and assembly workers.

Table 1: Comparison of General Characteristics

Characteristics		Office worker(251) n(weight %)	Service and sales people(227) n(weight %)	Experts in agriculture and forestry fishing(161) n(weight %)	Function source, device · machine operation and assembly worker(398) n(weight %)	$\chi^2(p)$
Age	<40	104(51.0)	83(46.9)	2(2.9)	92(31.6)	203.58 ($<.001$)
	40-49	70(26.3)	46(23.4)	89(12.7)	97(29.7)	
	50-59	62(19.9)	53(19.1)	35(27.3)	118(26.1)	
	≥ 60	15(2.8)	45(10.7)	116(57.1)	91(12.6)	
Economic status	Low	31(11.8)	50(23.6)	41(33.2)	99(26.6)	82.49 ($<.001$)
	Medium-low	49(19.9)	59(23.6)	56(30.6)	126(33.1)	
	Medium-high	67(28.6)	72(33.9)	33(19.1)	89(21.2)	
	High	104(39.8)	46(18.9)	31(17.2)	84(19.1)	
Educational status	\leq Elementary school	3(0.5)	25(6.3)	74(40.2)	62(13.5)	332.77 ($<.001$)
	Middle school	5(1.3)	17(6.3)	36(20.6)	71(13.6)	
	High school	60(23.5)	91(42.5)	37(28.3)	197(51.6)	
	\geq College	183(74.7)	94(44.8)	13(10.9)	68(21.3)	
Number of family member	1	15(6.0)	13(6.5)	12(5.7)	35(7.4)	29.52 (.001)
	2-3	124(45.7)	115(49.1)	125(73.4)	210(50.0)	
	≥ 4	112(48.3)	99(44.4)	24(20.8)	153(42.6)	
Marital status	Married	198(73.8)	165(66.5)	157(95.2)	340(81.5)	44.83 ($<.001$)
	Single	53(26.2)	62(33.5)	4(4.8)	58(18.5)	
Hour of sleeping	≤ 6	139(53.2)	87(37.9)	61(36.5)	178(43.7)	40.87 ($<.001$)
	7-8	109(45.6)	120(52.3)	71(48.5)	202(51.8)	
	≥ 9	3(1.3)	20(9.7)	29(15.0)	18(4.5)	
Health examination status	Yes	200(77.6)	137(60.2)	111(67.4)	255(61.2)	25.48 (.001)
	No	51(22.4)	83(39.8)	50(32.6)	142(38.8)	

Comparison of physical-psychological characteristics: As shown in Table 2, significant differences were found in the presence or absence of hypertension, presence or absence of diabetes mellitus, presence or absence of dyslipidemia, one-year weight control, monthly drinking rate, aerobic physical activity, time spent sitting, subjective body shape perception, stress, and subjective health status, according to the type of job ($p < .005$).

Hypertension and diabetes were the most common among the experts in agriculture, forestry, and fishery, whereas dyslipidemia was the most common among technical workers, device-machine operators, and assembly workers. Office workers made the most effort to lose weight and had the highest monthly drinking rate. The service and sales workers were the most engaged in practicing aerobic activities, and had the longest time spent sitting. Office workers had the highest rate of perceiving themselves to be obese, while the service and sales workers perceived themselves to be the healthiest, and office workers had the highest level of stress.

Table 2: Comparison of Physical-psychological Characteristics

Characteristics		Office worker(251) n(weight %)	Service and sales people(227) n(weight %)	Experts in agriculture and forestry fishing(161) n(weight %)	Function source, device · machine operation and assembly worker(398) n(weight %)	$\chi^2(p)$
Hypertension	Yes	222(91.0)	180(85.6)	96(64.4)	308(79.5)	58.57 ($<.001$)
	No	29(9.0)	40(11.5)	65(35.6)	89(16.7)	
Diabetes Mellitus	Yes	227(91.3)	197(88.9)	140(88.4)	346(89.8)	17.71 (.040)
	No	24(8.7)	23(8.2)	21(11.6)	51(9.4)	
Dyslipidemia	Yes	238(95.6)	212(96.3)	132(94.8)	368(94.3)	17.93 (.001)
	No	13(4.4)	15(3.7)	29(5.2)	30(5.7)	
Intention of weight control	Loss	99(41.3)	75(32.7)	35(19.4)	118(30.8)	45.39 (.001)
	Maintenance	66(24.5)	56(25.7)	31(21.0)	75(16.3)	
	Gain	14(5.1)	19(8.5)	14(9.5)	40(10.3)	
	None	71(28.4)	77(33.1)	79(49.1)	160(40.9)	
Monthly drinking rate	Yes	213(85.1)	172(78.1)	104(67.0)	299(77.1)	15.12 (.003)
	No	37(14.9)	55(21.9)	55(33.0)	94(22.9)	
Current smoking rate	Yes	88(34.6)	87(44.5)	50(39.7)	166(45.8)	9.60 (.074)
	No	162(65.4)	133(55.5)	108(60.3)	226(54.2)	
Work-medium strength physical activity	Yes	17(7.2)	37(16.5)	23(13.6)	55(17.2)	20.55 (.062)
	No	233(92.2)	190(83.5)	138(86.4)	343(82.8)	
Practice aerobic physical activity	Yes	139(57.8)	135(62.0)	60(35.8)	175(47.0)	28.04 ($<.001$)
	No	111(42.2)	92(38.0)	100(64.2)	223(53.0)	
Time spent sitting/day	<5	20(7.4)	55(26.2)	63(40.0)	116(31.8)	157.28 ($<.001$)
	5-9	82(31.4)	113(49.2)	78(49.8)	160(40.1)	
	≥ 10	149(61.1)	59(24.5)	20(10.1)	122(28.1)	
Body Mass Index(BMI)	<25	142(57.5)	135(63.5)	93(58.3)	237(58.8)	2.12 (.586)
	≥ 25	103(42.5)	87(36.5)	66(41.7)	150(41.2)	
Subjective body shape perception	Under weight	37(16.1)	54(22.5)	39(24.7)	72(18.7)	18.15 (.031)
	Normal	104(39.2)	98(43.8)	78(49.9)	163(38.3)	
	Over weight	109(44.7)	75(33.8)	42(25.4)	158(43.0)	
Stress	High	98(44.0)	59(28.2)	33(26.3)	105(28.4)	22.95 (.001)
	Low	152(56.0)	168(71.8)	124(73.7)	288(71.6)	
Subjective health status	Good	92(35.0)	90(40.9)	43(25.6)	119(30.4)	16.74 (.036)
	Moderate	129(51.6)	110(48.9)	81(50.7)	217(53.6)	
	Bad	30(13.4)	27(10.2)	36(23.7)	62(16.0)	
Continuous depression for more than 2 weeks	Yes	16(6.4)	20(8.5)	18(11.8)	39(9.4)	6.03 (.194)
	No	234(93.6)	207(91.5)	140(88.2)	354(90.6)	

Factors affecting quality of life: The factors affecting the quality of life by occupation are shown in Table 3.

The factors affecting quality of life among the office workers included stress and subjective health, and their explanatory power was 34.5% (F = 2.03, p = .003). As stress was lowered and subjective health was perceived as healthier, the quality of life was higher.

The factors affecting quality of life among service and sales workers included age, number of family members, subjective health, and continuous depression for more than two weeks, and their explanatory power was 36.3% (F = 2.10, p = .002). Quality of life among service and sales workers was higher for those in their 40's than those in the 60's or older; those with 2-3 family members than those with 4 or more family members; those whose subjective health status was good; and those with no continuous depression for more than two weeks.

The factors affecting quality of life among experts in agriculture, forestry, and fishery included economic status, number of family members, hours of sleep, presence or absence of diabetes mellitus, time spent sitting per day, and subjective health; their explaining power was 41.7% (F = 61.46, p < .001).The quality of

life among the experts in agriculture, forestry, and fishery was lower than all the other groups when compared to those with “high” economic status. Quality of life was also higher in those with 2-3 family members than those with more than 4 family members; those with 7-8 hours of sleep than those with more than 9 hours of sleep; those without diabetes than those with diabetes; those with less than 5 hours spent sitting per day than those with more than 10 hours spent sitting per day; and those whose subjective health was “good” or “moderate” than those whose subjective health was “bad.”

The factors affecting quality of life among technical workers, device-machine operators, and assembly workers included economic status, education level, rate of aerobic physical activity practice, time spent sitting per day, and subjective health status; their explanatory power was 26.3% (F = 2.87, p < .001).Quality of life was lower in the other groups than in those with “high” economic status, and quality of life was higher for “high school graduates” than “college graduates or above,” those who practiced aerobic physical activity than those who did not practice aerobic physical activity, those with less than 5 hours spent sitting per day than those more than 10 hours spent sitting per day, and those with good subjective health status.

Table 3: Factors Associated with Quality of Life

Characteristics		Office worker(251)				Service and sales people(227)				Experts in agriculture and forestry fishing(161)				Function source, device machine operation and assembly worker(398)			
		β	t	p	R ² /F/p	β	t	p	R ² /F/p	β	t	p	R ² /F/p	β	t	p	R ² /F/p
Age	<40	.022	1.17	.241	34.5%, 2.03, .003	.028	1.39	.164	36.3%, 2.10, .002	.013	0.19	.849	41.7%, 61.46, <.001	.015	0.96	.334	26.3%, 2.87, <.001
	40-49	.033	1.81	.072		.041	2.41	.017		.010	0.40	.689		.008	0.51	.605	
	50-59	.016	0.90	.368		.018	1.01	.311		.029	1.83	.068		.008	0.66	.509	
	≥60	1.0				1.0				1.0				1.0			
Economic status	Low	-.005	-0.68	.494		.001	0.10	.915		-.034	-2.13	.035		-.034	-3.10	.002	
	Medium-low	-.012	-1.36	.175		-.010	-0.92	.359		-.051	-2.89	.004		-.021	-2.16	.032	
	Medium-high	.001	0.18	.857		.002	0.22	.824		-.054	-2.72	.007		-.012	-1.50	.135	
	High	1.0				1.0				1.0				1.0			
Educational status	≤Elementary school	-.005	-0.16	.871		-.032	-1.78	.076		-.015	-0.86	.390		.007	0.48	.625	
	Middle school	.012	0.40	.685		-.024	1.81	.071		-.013	-0.69	.488		.011	0.66	.507	
	High school	-.007	-0.85	.392		-.006	-0.80	.423		-.017	-1.04	.298		.029	2.70	.008	
	≥College	1.0				1.0				1.0				1.0			
Number of family member	1	.007	0.59	.556		.013	0.79	.427		.033	1.38	.168		-.013	-1.14	.253	
	2-3	.010	1.72	.087		.018	2.35	.020		.038	2.26	.025		-.010	-1.40	.162	
	≥4	1.0				1.0				1.0				1.0			
Hour of sleeping	≤6	.090	1.70	.090		-.010	-0.82	.409		.055	3.40	.001		.021	0.56	.573	
	7-8	.090	1.71	.089	-.002	-0.13	.895	.060	3.24	.001	.039	1.02	.306				
	≥9	1.0			1.0			1.0			1.0						
Diabetes Mellitus	Yes	1.0			1.0			1.0			1.0						
	No	-.002	-0.13	.893	.032	1.28	.201	.038	3.67	<.001	-.004	-0.21	.828				
Practice aerobic physical activity	Yes	1.0			1.0			1.0			1.0						
	No	-.004	-0.60	.546	-.010	-1.20	.230	-.005	-0.33	.741	.020	2.73	.007				

Conted...

Time spent sitting/day	<5	.008	1.09	.277		-.008	-0.65	.511		.045	2.10	.037		.022	1.96	.050
	5-9	-.003	-0.60	.545		.001	0.08	.930		.005	0.29	.767		.008	0.69	.491
	≥10	1.0				1.0				1.0				1.0		
Stress	High	1.0			1.0			1.0			1.0					
	Low	.012	2.22	.028	.009	0.94	.347	.025	1.15	.252	.008	0.97	.332			
Subjective health status	Good	.057	3.30	.001	.072	3.40	.001	.068	5.28	<.001	.059	3.88	<.001			
	Moderate	.056	3.31	.001	.068	2.88	.004	.073	4.67	<.001	.046	2.92	.004			
	Bad	1.0			1.0			1.0			1.0					
Continuous depression for more than 2 weeks	Yes	1.0			1.0			1.0			1.0					
	No	.005	0.24	.810	.062	2.10	.037	.014	0.73	.461	.015	0.70	.485			

DISCUSSION

In the results of the present study involving male workers, the common characteristic affecting quality of life was found to be subjective health status. This result is similar to the results of previous studies^{7, 10} of office workers indicating that quality of life was higher in those whose perceived health status was good than those whose perceived health was not good. In addition, the results of the present study are consistent with the results of several previous studies involving workers with industrial injuries^{11, 12}, showing that better subjective health status was associated with a higher quality of life. The results of the present study are in line with the results of a previous study¹³, in which the quality of life of workers was directly influenced by health status. Therefore, these results suggest that subjective health status is a very important variable for male workers.

In addition to the common characteristics affecting the quality of life, the factors differently affecting the quality of life according to the type of job type are as follows. The results of this study showed that, in particular, stress affected the quality of life of office workers. This result is consistent with a previous study⁷ reporting that job stress was inversely correlated with the quality of life, and evidence can be found in a study of Ghanaian professional women showing that managerial women had higher job-related tension and lower energy activity than blue-collar workers, and were thus more exposed to stress¹⁴. Therefore, stress management is essential for the quality of life of office workers.

The present study showed that in the case of service and sales workers, depression affected their quality of life. This result is in line with the results of a previous study¹⁵ revealing that emotional dissonance arises from workers' expressing distorted emotions, rather than their actual emotions, which might increase the level

of depressive symptoms because service workers are required to perform standardized emotional expression in the process of emotional labor. Therefore, it can be seen that the management of depressive symptoms potentially caused by emotional labor is important for the quality of life of service and sales workers.

In the case of experts in agriculture, forestry, and fishery, quality of life was higher in those with "high" economic status than those with "medium" or "low" economic status; those with 2-3 family members than more than 4 family members; those with 7-8 hours of sleep than those with more than 9 hours of sleep; and those with less than 5 hours spent sitting per day than those with more than 10 hours spent sitting per day. This result is considered to be related to the occupational characteristics of agriculture, forestry, and fishery where working hours are not fixed and income cannot be guaranteed, compared to other occupations. It is assumed that less sleep, less time spent sitting, and a smaller number of family members are likely to be associated with a better economic status. This result is consistent with a previous study¹⁶ showing that the quality of life of the elderly in rural areas, unlike the elderly in urban areas, is affected by economic status. Therefore, in order to improve the quality of life of experts in agriculture, forestry, and fishery, efforts should be made to improve their economic status.

In the case of technical workers, device-machine operators, and assembly workers, quality of life was higher in "high school graduates" than "college graduates or above". This result is considered to be related to the occupational characteristics of this occupation that require mainly an educational level of graduation from a vocational high school, and is regarded as downward employment for college graduates¹⁷. Therefore, in order to improve the quality of life of those in this occupation,

it is important to activate a career development path by policy that enables vocational high school graduates to begin their profession immediately after their graduation so as to increase their competency.

CONCLUSION

The present study is significant in that it investigated the factors affecting the quality of life of male workers according to the type of job, and provided baseline data to improve the quality of life of male workers that may differ according to the type of job. It is suggested that the results of the present study be utilized for the development of programs to enhance quality of life among male workers.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

- Rios KA, Barbosa DA, Belasco AGS. Evaluation of quality of life and depression in nursing technicians and nursing assistants. *Revista Latino-Americana de Enfermagem* [Internet]. 2010 May/June [cited 2018 Aug 13]; 18(3):413-420. Available from: <http://dx.doi.org/10.1590/S0104-11692010000300017>
- Chang SJ, Koh SB, Kang MG, Cha BS, Park JK, Hyun SJ, et al. Epidemiology of psychosocial distress in Korean employees. *J Prev Med Public Health* [Internet]. 2005 Feb [cited 2018 Aug 13]; 38(1):25-37. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/16312907>
- Levi L, Guidance work related stress: Spice of life or kiss of death? Luxembourg: Office for Official Publications of the European Communities [Internet]; 2000[cited 2018 Aug 13]. Available from: <https://www.stress.org/wp-content/uploads/2011/11/Guidance2520on2520work-related2520stress.pdf>
- Jeon ES, Lee KS, Lee SY, Yu JH, Hong AR. The relationship between job stress and quality of life for hospital workers by type of employment. *Korean J Occup Environ Med* [Internet]. 2009 March [cited 2018 Aug 13]; 21(1): 28-37. Available from: http://www.riss.kr/search/detail/DetailView.do?p_mat_type=1a0202e37d52c72d&control_no=7449451c3ff46551ffe0bdc3ef48d419
- Tak JK, Comparisons of job stressors and job stress among the white collar workers the blue collar workers and the professional research workers. *The Korean Journal of Health Psychology* [Internet]. 2002 April[cited 2018 Aug 13];7(1):125-41. Available from: <http://kiss.kstudy.com/thesis/thesis-view.asp?key=1930171>
- Rusli BN, Edimansyah BA, Naing L. Working conditions, self-perceived stress, anxiety, depression and quality of life: A structural equation modelling approach. *BMC Public Health*, 2008 Feb; 8: 48. DOI: 10.1186/1471-2458-8-48.
- Eom HJ, Lee HJ. Predictors of quality of life among workers in public health corporations. *Journal of the Korean Academy of Fundamentals of Nursing* [Internet].2009[cited 2018 Aug 13]; 16(2): 153-161. Available from: <http://www.ndsl.kr/ndsl/search/detail/article/articleSearchResultDetail.do?cn=JAKO200920149326294&SITE=CLICK>
- Hwang WJ, Park YH. Factors affecting health-related quality of life on Korean blue-collar workers. *Korean Journal of Occupational Health Nursing*. 2015; 24(2): 94-102. DOI: 10.5807/kjohn.2015.24.2.94.
- Park YH, Chae DH, Kim SH. The effects of overtime work on health-related quality of life of Korean blue-collar workers. *Journal of the Korea Convergence Society*. 2017; 8(12):199-208. DOI:10.15207/JKCS.2017.8.12.199.
- Joung NY, Chung YK. A study on the quality of life: males in 40s. *Chung-Ang Journal of Nursing* [Internet]. 2004 Dec [cited 2018 Aug 13]; 8(2): 49-59. Available from: http://nursing.cau.ac.kr/research/lab/lab_thesis_view.php?page=1&s_key=s_word=&idx=34
- Kim SM, Kim EH. Factors affecting the quality of life among injured workers: focusing on the psychosocial factors. *Journal of Institute for Social Sciences*. 2015; 26(4):389-411. DOI:10.16881/jss.2015.10.26.4.389.
- Park AS. A study on influence factors on the quality of life of a re-employed worker with industrial injuries. *The Journal of Korea Society for wellness* [Internet]. 2018[cited 2018 Aug 13];13(1):349-362. Available from: <http://dx.doi.org/10.21097/ksw.2018.02.13.1.349>

13. Lee BI, Jung HS. A predictive model of workers' quality of life. *Korean Journal of Occupational Health Nursing* [Internet]. 2011 May [cited 2018 Aug 13]; 20(1):35-45. Available from: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1002.7795&rep=rep1&type=pdf>
14. Sackey J, Sanda MA. Influence of occupational stress on the mental health of Ghanaian professional women. *International Journal of Industrial Ergonomics* [Internet]. 2009 Sep [cited 2018 Aug 13]; 39(5):876-887. Available from: <https://doi.org/10.1016/j.ergon.2009.04.003>
15. Kim SY, Chang SJ, Kim HR, Roh JH. A study on the relationship between emotional labor and depressive symptom among Korean industrial service employees. *Korean J Occup Environ Med* [Internet]. 2002 Sep [cited 2018 Aug 13]; 14(3):227-235. Available from: <http://www.dbpia.co.kr/Article/NODE01156168>
16. Sohn SY. A comparative study on the quality of life of the elderly and its' affecting factors between rural and urban areas. *Journal of the Korea Gerontological Society* [Internet]. 2006 [cited 2018 Aug 13]; 26(3):601-615. Available from: <http://www.papersearch.net/thesis/article.asp?key=2560163>
17. Park DY, Lee KM. Career pathway types and developmental process of technical worker graduated from vocational high school. *Journal of Agricultural Education and Human Resource Development* [Internet]. 2012 June [cited 2018 Aug 13]; 44(2):25-48. Available from: <http://www.dbpia.co.kr/Article/NODE01905818>

The Relationship Between Eccentric Strength and Various Dynamic Balance Exercises in Male and Female

Su-Hyeon Cha¹, Yong-Min Ji¹, Dong-Yeop Lee², Ji-Heon Hong², Jin-Seop Kim², Jae-Ho Yu²

¹Student, ²Professor Department of physical therapy, Sunmoon University, Asan-SI, Chungnam, Korea

ABSTRACT

Background/Objectives: The purpose of this study was to investigate the gender difference and correlation in eccentric strength and dynamic balance exercises.

Method/Statistical analysis: Thirty-four healthy adults (17 males and 17 females) with a mean age of 21 participated in this study. The angular velocity of isokinetic equipment was set to 90 degrees with the eccentric peak torque values of knee flexion and extension, ankle dorsiflexion and plantar flexion recorded while giving verbal comments. Electromyography(EMG) which was used to measure muscle activation during exercise was attached to rectus femoris, biceps femoris, tibialis anterior and gastrocnemius muscles respectively. A total of 5 movements including side step, calf raise, step down, lunge, and chair sit/one-leg squat was performed.

Findings: According to muscle values, there was a significant difference in eccentric peak torque between sexes($p < .05$). However, there was no significant difference in muscle activity between sexes in dynamic balance exercise($p > .05$). Both eccentric peak torque and dynamic balance exercises displayed a positive correlation($p < .001$).

Improvements/Applications: A better understanding of the correlation between eccentric strength and dynamic balance may be helpful in creating effective balance training interventions for athletes and those in need of balance stabilization.

Keywords: Eccentric strength, Dynamic balance exercise, Muscle activity, Low muscle

INTRODUCTION

Balance refers to the ability to maintain the center of gravity within a given base of support. It is composed of a series of complex processes which are influenced by diverse factors^[1]. That is, less effort is required to maintain balance with a normal ability. This is as a result of the complexity of occurrences that arise in order to maintain the center of gravity within the base of support. The ability to maintain balance depends on the effective conveyance of sensory information from the body to the muscle and joints. This may appear to be very complex

but it happens unconsciously. When we walk, we do not consider what muscle should be contracted or what sequence the muscles should be contracted in. It occurs naturally if not instinctively. If we happen to analyze all movements of the body including appropriate muscle functions, walking would be the most challenging matter in the world.

Balance is mainly classified into static and dynamic balances. Static balance occurs when the center of gravity of an object is located within the axis of rotation. In other words, it is the ability of the object to maintain a stationary state on the horizontal axis without applying a brake force. On the other hand, dynamic balance can be defined as an ability to maintain the center of gravity within the base of body support while performing an intended motion^[2]. The important element required to maintain balance is stability of the rectus femoris(RF), biceps femoris(BF), tibialis anterior(TA), and gastrocnemius(GCM) muscles, knee and ankle joints as

Corresponding Author:

Jae-Ho Yu

Professor, Professor Department of Physical Therapy
Sunmoon University, Korea

Email: naresa@sunmoon.ac.kr

well as core muscles such as abdominals and obliques. For dynamic balance training, one-leg squat, calf raise, side step, lunge, step down, etc. were performed.

To maintain balance, although concentric contraction might be considered important, eccentric contraction plays a relatively substantial role in the same sense. Eccentric contraction occurs when a muscle contracts while being stretched. This reflects the rule that states that the direction of a moving object is opposite to the direction of the force applied. In a kinematic sense, although a muscle contracts when stretched, it is accompanied by deceleration. In addition, eccentric contraction is important for daily movements carried out by human beings which include mobility, stability and muscular strength. The high and low energy cost of eccentric contraction is particularly appropriate for athletic training and rehabilitation. This empirical evidence of exercise intolerance in various sports injuries proves the reliability of intervention relating to the eccentric exercises. This may prove that performing eccentric training is suitable to enhance motor control than concentric training^[3].

Recent researches have included progressive exercise training over 3 phases in dynamic balance control and exercises which emphasizes on the eccentric lower limb muscle strength and core stability during dynamic balance training. The first phase of dynamic balance exercise is composed of sitting rotation, chair sit/squat, calf raise, side stepping and stepping pattern. The second phase includes standing rotation, step down, toe walking, lateral step-up and stepping pattern while the final phase consists of stepping rotation, lunge, mini-hop, skate stepping and cone walking. This research is aimed at proving that eccentric strength exercises can lead to the improvement of dynamic balance as well as the correlation between the eccentric strength and the dynamic balance. This portrays the moderate relation between the eccentric strength and dynamic balance. In addition, Susan et al.(2003) has suggested that ankle plantarflexion, knee flexion, and extension, and hip extension may result in significant changes in the balance ability with no significant reduction in strength^[4]. Interestingly, except for the hip extension, the force of the same muscle group was intimately related to balance.

Contradictory to existing researches however, Norris and Trudelle-Jackson(2011) observed the star excursion balance test, which measures muscle activation level as a dynamic balance test. The high activation level of vastus medialis was observed in a low level dynamic

balance test, which displayed that low eccentric strength can play a more significant role in dynamic balance. This may be as a result of eccentric contraction which absorbs, decelerates and stabilizes the force applied to the center of the body^[5].

Existing researches have drawn various results concerning the correlation of diverse intervention methods together with eccentric strength to produce balance. However, researches on the connection between dynamic balance and force are centered on the concentric elements that generate force^[6]. There have been no research to reveal the precise correlation between eccentric strength and dynamic balance. In addition, most of the researches have been limited to using knee flexion and extension in measuring the eccentric strength. Research performed by including ankle plantar and dorsiflexion are insufficient and there is still no research conducted while comparing by gender.

This study was therefore, performed to investigate the correlation between concentric force according to genders while performing diverse dynamic balance exercise including ankle plantar and dorsiflexion besides knee flexion and extension to measure the eccentric strength.

MATERIALS AND METHOD

Subject: This study was conducted with the healthy adult male and females attending S University located in Asan, Chungnam. Sufficient explanation on the purpose and method of research was given to all the subjects before participating in the research and those who agreed voluntarily participated in the research. The subjects of this study were the persons who did not receive any surgical operation related to the musculoskeletal diseases of knee joint and ankle joint within recent 6 months and did not exercise regularly and presented their statement to participate in the study. 40 participants were selected by using the output program(G*power 3.1.9.2) in the size of sample and the physical characteristics of the participants are as shown in Table 1. Out of 40 participants recruited initially, 6 participants who received the surgical operation related to the knee in the past or have edema or pain by the knee and ankle diseases or have diabetes, cardiac diseases or any other medical problem were excluded and 34 participants of 20s having any particular problem were taken as subject. In addition, this study was conducted under the approval of IRB(Institutional Review Board)'s institutional bioethics (SM-201705-020-2).

Table 1: General characteristics (N = 34)

Characteristic		Value
Gender	Male	n = 17
	Female	n = 17
Age (year)		21.37 ± 2.00
Height (cm)		167.33 ± 9.10
Weight (kg)		62.95 ± 15.05

All values are mean ± standard deviation(SD)

Procedure: This study was conducted with single group without control group. The subjects were verified if they do correct move by practicing the dynamic balance exercise before the experiment and to be performed the experiment with exact position, the ankle dorsi and plantar flexion were performed in the knee flexion, extension and supine positions. The subjects performed the warm-up with comfortable walk for 5 minutes and then sit on the isokinetic measuring equipment and fixed the trunk and abdominal area using belt. The intervention of other parts except the knee joint was minimized using the belt during the measurement of knee joint. To minimize the intervention of other leg, the subjects were instructed to grab the handle at the both sides after fixing the other leg with belt. Ankle dorsi and plantarflexion were performed by adjusting the shin pad so that it is located at 2cm above the ankle joint from knee joint to be measured and fixing it with the string^[7], and when measuring the ankle joint, the ankle dorsi and plantarflexion fixing the dorsum of foot with string at the supine position. The education on the movement was given by practicing 3 times, when measuring, the verbal encouragement was given in order to make effort as much as possible and the value of peak torque when the knee and the ankle were contracted eccentrically was recorded out of 5 times of exercise using isokinetic equipment after rest for 90 seconds. And when performing the dynamic balance exercise, to measure the muscle activation, the side step, calf raise, step down, lunge and chair sit/one-leg squat were performed. Total 5 motions were exercised and the postures between the motions are shown in Figure 1.

In addition, to consider the muscle fatigue between each posture, the measurement for 3 motions were made two days after the measuring two motions and following motion was measured after 5 minutes of rest from previous motion. Out of the experiment subjects, the persons who dropped out were 6 persons; 2 persons having past knee-related surgery, 3 persons having knee and ankle edema or pain and 1 person having medical illness.

Eccentric strength testing: o find out the eccentric strength, the eccentric peak torque of the knee flexion and extension and the ankle dorsiflexion and plantarflexion was measured by fixing the angular velocity of isokinetic measuring equipment(CSMI, Humax Co, USA, 2010) to 90 degree. The isokinetic evaluation procedure of the knee and ankle joint was followed the procedure proposed by Perrin(1994)^[8]. The education on the movement was given by practicing 3 times, when measuring, the verbal encouragement was given in order to make effort as much as possible and the value of peak torque when the knee and the ankle were contracted eccentrically was recorded out of 5 times of exercise using isokinetic equipment after rest for 90 seconds. The eccentric peak torque of the ankle joint was measured with same method.

Electromyographic Measurements: This experiment was performed using Electromyography (Zero WIRE EMG, EMG OQUS100, Italy, 2009) to find out the muscle activation in the rectus femoris, biceps femoris, tibialis anterior, gastrocnemius during the chair sit/single leg squat, calf raise, side stepping, step down, lunge, which are the dynamic balance exercise. For EMG value, the average value of muscle activation during intermediate 3seconds was recorded and Maximum Voluntary Isometric Contraction(MVIC) was measured with existing manual muscle test(MMT). The subjects were asked to apply maximum force when measuring MVIC and MVIC was measured 3 times during 5 seconds. Before the experiment, the subjects were asked to shave and wear the shorts to reduce the skin resistance in the area where the electromyogram was attached. The analog signal of electromyogram collected in 4 channel was sent to MP150 system to convert into digital signal and was analyzed and processed using sEMG software myoresearch 1.06.44 software in the computer. The sampling rate of signal was set to 1000 Hz and the noise was minimized using band pass filter of 20-500 Hz. The sampled signal was applied to RMS(root mean square). RMS values were computed for each collection period.

Data analysis: All the measured values were processed statistically using SPSS 22.0 version. To draw the physical characteristics of the subjects and to calculate the mean and standard deviation of all variables, the descriptive statistic was used. The correlation between the muscle activation and the eccentric peak torque during the dynamic balance exercise was evaluated using pearson's correlational analysis. For the post hoc test of muscle activity value between the gender by muscle, the independent t-test was used. All the statistical significant level was set to p<.05.


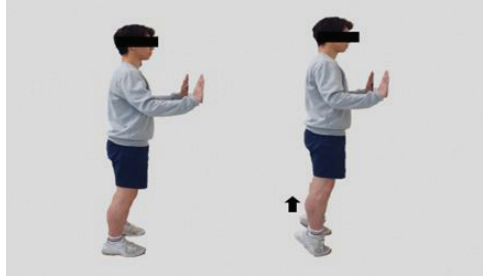



Dynamic balance exercises	Posture
 <p>[A] Side step</p>	<ul style="list-style-type: none"> ● Slightly bending both knees with arms crossed over your chest. After that spreads the dominant leg widely and then brings the non dominant leg.
 <p>[B] Calf raise</p>	<ul style="list-style-type: none"> ● Place both hands on the wall. Slowly rise up on to your toes, lifting your heels off the floor.
 <p>[C] Lunge</p>	<ul style="list-style-type: none"> ● Cross your hands over the chest, and put legs apart at the shoulder width. Step forward with the dominant leg and slowly lower the body until your front knee is bent at least 90 degrees. Pause, then push yourself to the starting position.
 <p>[D] Step down</p>	<ul style="list-style-type: none"> ● Stand sideways on top of a step with arms crossed over your chest. Slowly lower your non-dominant leg down to the floor while keeping your other foot up on the step throughout.
 <p>[E] Chair sit/One-leg squat</p>	<ul style="list-style-type: none"> ● Cross the arms over the chest then standing on dominant leg. Push your hips back, bend your knee, and keep your torso straight as you slowly lower your butt to the chair.

Figure 1: Dynamic balance exercises

RESULTS

Comparison of eccentric peak torque between male and female according to muscle: Compared if there was any difference in the eccentric peak value by the gender according to the muscle[Table 2]. In the results, EP at RF was $t=2.764(p<.01)$, EP at TA was $t=6.316(p<.001)$, BF

was $t=2.253$ and GCM was $t=3.144(p<.05)$. EP of male was relatively higher than EP of female. Therefore, the male has higher EP than the female and it was observed that there is significant difference in eccentric peak torque by muscle according to the gender.

Table 2: Comparison of eccentric peak torque and muscle activity between male and female according to muscle

	Between Group											
	BF			RF			TA			GCM		
	M	F	t	M	F	t	M	F	t	M	F	t
EP	3.68 ±1.02	2.90 ±0.99	2.253*	2.28 ±0.78	1.66 ±0.49	2.764**	0.83 ±0.16	0.54 ±0.10	6.316***	2.51 ±0.51	1.90 ±0.61	3.144*
SS	22.05 ±2.58	25.49 ±3.93	-3.010	21.54 ±1.67	21.05 ±1.20	0.972	39.31 ±2.39	37.99 ±3.90	1.193	24.60 ±3.58	20.20 ±5.25	2.853
CR	14.04 ±1.57	13.39 ±1.42	1.252	34.17 ±1.62	35.04 ±1.96	-1.419	32.89 ±3.04	36.07 ±6.27	-1.879	50.44 ±2.63	48.85 ±2.39	1.839
SD	31.63 ±1.80	31.59 ±1.39	0.074	28.84 ±1.84	28.64 ±1.83	0.324	44.02 ±4.07	41.58 ±3.15	1.949	44.06 ±3.99	45.75 ±3.05	-1.379
Lunge	29.58 ±2.85	28.46 ±3.05	1.096	32.52 ±1.50	32.20 ±2.07	0.504	45.50 ±4.28	43.08 ±3.44	1.813	37.54 ±2.57	37.21 ±2.79	0.367
CS - OLS	49.38 ±2.20	49.61 ±1.76	-0.341	39.75 ±1.35	39.49 ±1.52	0.514	49.24 ±3.74	47.94 ±3.96	0.983	45.04 ±4.49	42.38 ±5.48	1.547

* $p<.05$, ** $p<.01$, *** $p<.001$, Mean ± standard deviation, M: Male, F: Female, BF: Biceps femoris, RF: Rectus femoris, TA: Tibialis anterior, GCM: Gastrocnemius, EP: Eccentric peak torque, SS: Side step, CR: Calf raise, SD: Step down, CS-OLS: Chair sit/one-leg squat

Comparison of Muscle activity between male and female according to dynamic exercise: Compared if there was any difference in the muscle activity between the gender according to the dynamic exercise[Table 2]. When comparing the activity by muscle during side step, BF was $t=-3.010$, RF was $t=0.972$, TA was $t=1.193$ and GCM was $t=2.853$. Therefore, when performing SS by gender, there was no significant difference in the activity by muscle($p>.05$).

When comparing the activity by each muscle during calf raise, BF was $t=1.252$, RF was $t=-1.419$, TA was $t=-1.879$ and GCM was $t=1.839$. Therefore, there is no significant difference in the activity by muscle according to gender when raising calf($p>.05$). When comparing the activity by muscle during lunge, BF was $t=1.096$, RF was $t=0.504$, TA was $t=1.813$ and GCM was $t=0.367$. Therefore, there was not significant difference in the activity by muscle according to the gender during lunge($p>.05$). When comparing the activity by each muscle during chair sit/one-leg squat, BF was $t=-0.341$, RF was $t=0.514$, TA was $t=0.983$ and GCM was $t=1.547$.

Therefore, it was observed that there is no significant difference in the activity by muscle during the CS-OLS by gender($p>.05$).

Correlation between eccentric strength and dynamic balance exercise: Pearson correlation was performed to find out what correlation between the eccentric peak torque and the dynamic balance exercise. In the results of analyzing the correlation by subfactor of adults male and female, the significant correlation was represented. The correlation between EPKF and CS-OLS was $r=0.871$, the highest positive correlation and the significant correlation was represented in order of lunge $r=0.845$, CR $r=0.837$, SD $r=0.831$, SS $r=0.660(p<.001)$. The correlation between EPKE and SS was $r=0.938$, the highest positive correlation and the significant positive correlation was represented in order of SD $r=0.892$, lunge $r=0.850$, CS-OLS $r=0.838$ and CR $r=0.833(p<.001)$. The correlation between EPDF and SS was $r=0.853$, the highest positive correlation and the significant positive correlation was represented in order of CR $r=0.839$, SD $r=0.824$, CS-OLS $r=0.800$ and lunge

$r=0.793(p<.001)$. The correlation between EPPF and CS-OLS was $r=0.887$, the highest positive correlation and the significant positive correlation was represented in order of CR $r=0.857$, lunge $r=0.836$, SD $r=0.772$ and CS-OLS $r=0.719(p<.001)$

DISCUSSION

This study was intended to find out the difference between the gender and the correlation. To achieve this purpose, the eccentric peak torque(EPT) was measured and the correlation of muscle activation in RF, BF, GCM and TA during the dynamic balance exercise was explained. As a result, the significant difference was found only in the eccentric strength by gender during EPT and dynamic balance exercise, in the dynamic balance exercise, no significant difference was found and the positive correlation was found in both cases.

There was no existing research that compares the male and female through the dynamic balance and eccentric strength. So, this study compared the male and female and in the results, there was no significant difference in the dynamic balance exercise and the significant difference was found only in EPT. The reason is deemed to be the difference in the amount of muscle and the weight by gender and the physiological factor. Also, in the research by Anthony(2009), to explain the difference in the power between the male and female, the isometric strength of the quadriceps, hamstring, external and internal rotator, gluteus maximus and medius was measured. In the results, he reported that the strength of the male was higher than the female and the reason is that there is the difference in the power due to the difference in the height, weight, BMI(Body Mass Index), amount of muscle, navicular drop and Q-angle^[9]. In addition, Cott(2002) conducted the research to explain the difference by gender during landing and in the results, the female has far less knee flexion and the rotation of lower leg during landing than the male and the female took far less time to reach to the maximal knee flexion. In contrast, since the male has less maximum angular displacement, reaching to the maximal knee flexion angle does not take much time and the shock was absorbed more than the female. In this research, it was observed that the physiological structure is different by gender, which has impact on the strength^[10]. As a result, that the strength of the male is higher compared to the female seems to be similar to the results of this study

although there is slightly different from the intervention of this study.

Lunge, one of the dynamic balance exercise not only enhances the hamstring strength and running ability but also is effective for the eccentric exercise^[11]. In addition, since the squat is used in the power phase of training program as the eccentric contracture is considerably important and effective to enhance the motor capability. CR is the exercise good for the power generation and balancing ability and since SS and SD use the muscles in the lower extremity, it is very important for eccentric contracture and used a lot as the balance training. However, no significant difference was found by gender in the dynamic balance exercise. However, if we would have increased the frequency or applied higher load during the dynamic exercise, it would not have different results. Therefore, the follow-up research would be necessary by complimenting the intensity and load.

In the preceding studies related to RF and BF, some authors used Y-balance, which is similar to lunge of dynamic balance exercise in this study with the 50 college football players of 20s and measured the EPT and CMJ(Counter-movement jump) of knee flexion and extension. In the results, there was no correlation between the standard score of Y-balance test and EPT of knee flexion but revealed that EPT of knee extension represents the better dynamic balance performance when the person having great power balances in the bridge. However, Muehlbauer et al.(2013) concluded in the results of measuring the dynamic balance and CMJ from the adults of 20s that the values were independent^[12]. Although in their research, the eccentric strength was expressed as CMJ, this study measured EPT following the procedure proposed by Perrin(1994) using the isokinetic measuring equipment. In addition, as written in the limitation of existing researches, the participants in the study were the persons whose weekly physical activity level was higher than the average of general public. Consequently, this study seems to be similar to the research by previous research and drew the conclusion that there exists the correlation between the knee flexion, ankle dorsi and plantarflexion and the eccentric strength beside the knee extension.

Gonzalez and Marques(2010) who studied the relation between the jumping ability and the eccentric strength beside the balancing focusing on GCM and TA asserted that to maximize the powerful contraction

of lower body muscle particularly, vertical height when jumping, the person having strong eccentric strength is effective^[13]. And as a similar research also claimed that a significant relationship was observed between strength and dynamic balance performance using the non-dominant leg for stance in both groups, which implies that there are many factors having impact on the dynamic balance such as proprioception and vestibular function. In addition, the need of strength training to improve the balancing out of the dynamic activity as the correlation between the eccentric strength and the dynamic balance can be emphasized. However, some authors reported that there was no relation between the knee flexion and the extension strength and the SEBT (star excursion balance test) reach, which are similar to SS in this study. Consequently, similarly with this study, the eccentric strength was measured with isokinetic dynamometer and the dynamic balance ability was measured with SEBT but the participant was limited as they were 23 persons. However, this study found the correlation between the knee and ankle strength and the dynamic balance ability by adding the ankle dorsi and plantarflexion. Therefore, this study showed the similar results with the research of Gonzalez and Marques^[13].

This study has several limitations. First, since the subjects were composed of male and female of 20s, it is hard to generalize the results of the study. Second, in measuring the eccentric peak torque, this study measured the open kinetic chain not the closed kinetic chain and not significant correlation might be observed. Third, in this study, the eccentric strength was limited to the knee and ankle but it is necessary to study by adding other joints beside the knee and ankle for more precise measurement. Therefore, the research that compliments such limitations is deemed to be necessary as a follow-up research.

CONCLUSION

The purpose of this study was to investigate the gender difference and correlation in eccentric strength and dynamic balance exercises. As a result, the correlation between the eccentric peak torque of knee flexion and extension, ankle dorsi and plantarflexion and various dynamic balance exercises showed a positive correlation and there was no significant difference between genders. Therefore, a major comprehension of the correlation between eccentric strength and dynamic balance could

be a guidance as a balance training intervention for athletes and those who lack of balance and stability and may possible to expect a great achievement.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Eccentric strength and various dynamic balance

REFERENCES

1. Tyson S, Watson A, Moss S, Troop H, Dean-Lofthouse G, Jorritsma S, Shannon M. Greater Manchester Outcome Measures P. Development of a framework for the evidence-based choice of outcome measures in neurological physiotherapy. *Disability and Rehabilitation*. 2008;30:142-9.
2. Butler RJ, Southers C, Gorman PP, Kiesel KB, Plisky PJ. Differences in soccer players' dynamic balance across levels of competition. *Journal of Athletic Training*, 2012;47,616–20.
3. Roig M, O'Brien K, Kirk G, Murray R, McKinnon P, Shadgan B. The effects of eccentric versus concentric resistance training on muscle strength and mass in healthy adults: a systematic review with meta-analysis. *Br. J. Sports Med*. 2009;43,556–68.
4. Susan MB, Elsie GC, Brenda B. Balance, Muscle Strength, and Fear of Falling in Older Adults, *Experimental Aging Research: An International Journal Devoted to the Scientific Study of the Aging Process*,2003;29(2),205-19.
5. Norris B, Trudelle JE. Hip-and thigh-muscle activation during the star excursion balance test. *Journal of Sport Rehabilitation*, 2011;20,428-41.
6. Paterno MV, Schmitt IC, Ford K, Hewett T. Contribution of lower extremity strength and postural stability to performance on the star excursion balance test. *Journal of Orthopaedic and Sports Physical Therapy*. 2009;39, A101.
7. Maffiuletti NA, Juneau M, Munzinger U, Bizzini M, Agosti F. differences in quadriceps muscle strength and fatigue between lean and obese subjects. *Eur J Appl Physiol*. 2007;101(1):51-9.
8. Perrin D. Open chain isokinetic assessment

- and exercise of the knee. *Journal of Sport Rehabilitation*. 1994;3,245-54.
9. Anthony IB, Sarah JM, Stephen WM, Darin AP, Barry PB. Muscle strength and qualitative jump-landing differences in male and female military cadets: The jump-ACL study *journal of Sports Science and Medicine* 2009; 8,663-71.
 10. Cott ML, Cheryl MF, Bryan LR, Joseph BM, Freddie HF. Gender Differences in Strength and Lower Extremity Kinematics During Landing. *Clinical orthopaedics and related research Number* 2002;401,162-9.
 11. Jonhagen, S, Ackermann, P, Saartok, T. Forward lunge: a training study of eccentric exercises of the lower limbs. *J Strength Cond Res* 2009;23(3):972-8.
 12. Muehlbauer T, Gollhofer A, Granacher U. Association of balance, strength, and power measures in young adults. *Journal of Strength and Conditioning Research*. 2013;27,582-9.
 13. Gonzalez BJ, Marques MC. Relationship between kinematic factors and countermovement jump height in trained track and field athletes. *Journal of Strength and Conditioning Research*, 2010; 24,3443-7.

A Study on the Aesthetic Cosmetic Surgery in Nursing Students: Q-Methodology

Hanyi Lee¹, Sunyoung Jang²

¹College of Nursing, Hanyang Univ., 222 Wangsimni-ro, Seongdong-gu, Seoul, Korea;

²Dept. Nursing, Hanseo Univ., 46 Hanseol Ro, Haemi-myun, Seosan-si, Chungcheongnam-do, Korea

ABSTRACT

Background/Objectives: The purpose of this study was to identify the subjectivity of aesthetic cosmetic surgery recognized by nursing students.

Method/Statistical analysis: This study was to describe the characteristics of each type, to identify the types of aesthetic cosmetic surgery, and Q methodology was applied. The 30 nursing students from 'A' University were asked to classify 47 statements about aesthetic cosmetic surgery.

Findings: The collected data were analyzed using QUANL PC program. In this study, nursing students classified the perception of aesthetic cosmetic surgery into 4 factors. Factor 1 was 30.80%, Factor 2 was 8.04%, Factor 3 was 5.85% and Factor 4 was 5.36%. Factor 1 has an explanatory power of 30.80%, which can be regarded as the most explaining factor for aesthetic cosmetic surgery. Of the total of 30 subjects, 8 were in Factor 1, 4 were in Factor 2, 9 were in Factor 3, and 9 were in Factor 4. Each factor corresponds to a group with similar responses to aesthetic cosmetic surgery. The subjectivity types for aesthetic cosmetic surgery were 'Deliberate type', 'Positive type', 'Supporting type' and 'Conservative stance type'.

Improvements/Applications: The study identified the perception of aesthetic cosmetic surgery in nurses in the clinical field and provided basic data on education.

Keywords: *Aesthetic cosmetic surgery, Nursing student, Subjectivity, Q methodology, Nurses*

INTRODUCTION

Until the early part of the 20th century, aesthetic cosmetic surgery was regarded as a violation of ethical standards even in the West and was carried out to restore damage caused by birth defects or physical accidents or to restore function of the body¹. In modern society, appearance management through aesthetic cosmetic surgery is not only for self-satisfaction, but also has many advantages in life such as employment, interviews, and marriage².

Appearance is the easiest information that can be obtained from other people as an external characteristic

that is first seen whenever there is an interaction with others³. Human beings consider the physical attractiveness of the person as an important factor when evaluating others⁴. Appearance is also an important factor in interpersonal relationships, and it also plays an important role in choosing a partner⁵.

As a result of this socio-cultural phenomenon, many people take the economic costs and physical risks to manage their appearance, and as a result, one of the recent steadily increasing methods is aesthetic cosmetic surgery. Aesthetic cosmetic surgery has a great influence on cosmetic and feminine beauty, and is one of the most powerful ways to change the body in terms of cosmetics in modern society⁶.

Nurses are not only the most important part of the healthcare field, but they are also key contacts with the most contacts, and need to provide safe and high quality nursing care within a limited time in a rapidly changing healthcare environment⁷. The subjectivity of perception

Corresponding Author:

Sunyoung Jang

Assistant Professor, Department of Nursing,
Hanseo University, South Korea

Email: sjang@hanseo.ac.kr

when treating subjects in the nursing field has a great effect on the nursing they perform. Therefore, it is important to understand the perception of nurses and prospective nurses.

Previous studies related to aesthetic cosmetic surgery have focused on perception of aesthetic cosmetic surgery, perception and attitude toward self-appearance, motivation and influence factors that determine surgery, and effects of surgery on mental health status.

In addition, the research on aesthetic cosmetic surgery for nursing students is insufficient. The Q methodology is a methodology that enables understanding of characteristics of each type according to the subjectivity structure of human beings⁸, and Because the perception of aesthetic cosmetic surgery in nursing college students is unique subjective experience of the subject, it is an appropriate research method to identify the type of perception of aesthetic cosmetic surgery in nursing college students through the Q methodology, which is a research method considering the subjects' subjectivity.

Therefore, the purpose of this study was to examine the subjectivity structure of aesthetic cosmetic surgery from the perspective of nursing students, and to provide the basic data necessary for the development of differentiated education programs based on the characteristics of each type of aesthetic cosmetic surgery in prospective nurses.

The purpose of this study was to identify the characteristics and types of subjective perception of aesthetic cosmetic surgery of nursing students applying the Q-methodology, to provide information about nursing students starting aesthetic cosmetic surgery and to provide basic data for presenting strategy in education of nursing students starting out in aesthetic cosmetic surgery. Specific objectives for this are as follows.

1. Typify nursing students' subjective perception of aesthetic cosmetic surgery.
2. Analyze and describe the type specific characteristics of perception of aesthetic cosmetic surgery of nursing students.

MATERIALS AND METHOD

Design: In order to achieve the purpose of the study, literature, media data and previous studies on aesthetic cosmetic surgery were reviewed, and subjectivity of

nursing students who experienced aesthetic cosmetic surgery was examined to identify the types of subjective perception of aesthetic cosmetic surgery.

Q population and Q sample selection: The Q population was derived from a review of domestic and international literature, an open questionnaire, and individual in-depth interviews to extract comprehensive statements about the effects of aesthetic cosmetic surgery on current nursing students. Through this process, three domains and 200 Q-populations are derived. In addition, a total of 100 Q-populations are extracted by collecting literature collected from domestic and foreign literature reviews. After reviewing and revising the extracted Q samples, the final 47 samples with high discrimination power were selected.

P sample selection method: The Q-methodology is a qualitative research that emphasizes individual inertia by emphasizing differences in meaning or importance among individuals, not individual differences, and it is based on small sample doctrine where when the P sample is large, several people are biased on one factor and their characteristics are not apparent⁹. The P-sample of this study were 30 students who were enrolled in a nursing course and fully agreed to volunteer their consent to participate in the study.

Q classification and data analysis method: The Q classification process is a process in which individuals who are selected as P samples classify the Q samples as statements of forced and normal distribution and make a spontaneous definition of aesthetic cosmetic surgery⁹. Data were collected using Q-card for 30 current OO University nursing students. The time required for one subject to complete the Q-classification was generally 30-45 minutes. The distribution of the Q sample was classified from the strong positive to the strong negative according to the importance according to the opinion of the subjects. Statements on aesthetic cosmetic surgery (Q1) were classified on a 12-point scale. Thereafter, the subjects and the subsequent interviews were conducted with respect to the statements classified at the extremes. Q factor analysis was performed using Principle Component Factor Analysis (Varimax) method. Type classification was based on Eigen value 1.0 or higher and the number of factors was selected and the results were compared with the total explanatory variables. The collected data were scored from 1 to 12 points, which were assigned to each of the cards forcibly distributed in the distribution chart of the Q sample. The assigned

conversion scores were coded in Q sample order and processed by the main factor analysis by QUANL PC program. Data were analyzed using QUANL pc program.

Ethical considerations for the subjects: After volunteer consent was obtained from the subjects before the study, it was explained to the subjects that they could stop at any time during the study. In order to respect the rights of the subjects and ensure the confidentiality of the subject’s privacy and personal information, all the information collected through this study is treated as an anonymous name in all data analysis, and encoding and Q sorting ensures confidentiality.

RESULTS

Subjectivity and type-specific characteristics of aesthetic cosmetic surgery

Q type structure: Q-factor analysis of the subjectivity of aesthetic cosmetic surgery by nursing students using the QUANL pc program resulted in 4 types.

Type-specific characteristics of aesthetic cosmetic surgery: In order to analyze the subjectivity of aesthetic cosmetic surgery by nursing students by type, the

characteristics of each type were described based on statements belonging to each type. The Q-response of the P sample (subject) was divided into upper and lower questions, and 4 factors were extracted. In the Q methodology, a person with a high factor weight among the individuals belonging to each type indicates a typical or ideal person representing the type.

To analyze the characteristics of each type of aesthetic cosmetic surgery, the meanings of the statements with the standard score (z-score) of ± 1.00 or more were given meaning and interpreted. In this study, for the number of people with a factor weight of 1.0 or higher, Type 1 had 8, Type 2 had 4, Type 3 had 9, and Type 4 had 9.

The subjectivity of aesthetic cosmetic surgery was analyzed using the PC QUANL program, which was followed by three factors, accounting for 50.05% of the total variance. Factor 1 was 30.80%, Factor 2 was 8.04%, Factor 3 was 5.85% and Factor 4 was 5.36%. Factor 1 has an explanatory power of 30.80%, which can be regarded as the most explaining factor for aesthetic cosmetic surgery [Table 1]. Of the total of 30 subjects, 8 were in Factor 1, 4 were in Factor 2, 9 were in Factor 3, and 9 were in Factor 4. Each factor corresponds to a group with similar responses to aesthetic cosmetic surgery.

Table 1: Eigen Value, Variance, and Cumulative Percentage

	Type I	Type II	Type III	Type IV
Eigen Value	9.2408	2.4111	1.7544	1.6089
Variance(%)	.3080	.0804	.0585	0536
Cumulative	.3080	.3884	.4469	.5005

Analysis by type: The subjectivity type for aesthetic cosmetic surgery calculated by the type analysis method is as follows.

a. Deliberate type: Type 1 was composed of 8 subjects. Statements showing a strong positive response for Type 1 subjects were, ‘Since the side effects of aesthetic cosmetic surgery can not be ruled out, it needs deliberation.(Z=2.13)’, ‘Aesthetic cosmetic surgery should be decided after a professional consultation.(Z=1.84)’, and ‘Aesthetic cosmetic surgery does not guarantee success rate.(Z=1.47)’ [Table 2]. In type 1, the subjects with the highest factor weight was No.8 (1.3904), and the most agreeable statements were 3, 13, and 17. Statements showing a strong negative response for Type 1 subjects were, ‘If you have never experienced aesthetic cosmetic surgery, you are already outdone.(Z=-2.79)’, ‘Aesthetic cosmetic surgery should be done only

for therapeutic purposes.(Z=-1.78)’, ‘The cost of dressing up after aesthetic cosmetic surgery increases.(Z=-1.29)[Table 2]. In Type 1, the subject with the lowest factor weight was No.14 (0.4458), and the most negative statements were 9, 23, and 30. Type 1 characteristics suggest that aesthetic cosmetic surgery should still be performed by a specialist because of the high incidence of side effects and high risk. They thought that aesthetic cosmetic surgery should be preceded by counseling of a medical person who has a professional knowledge as well as aesthetic cosmetic surgery, and that side effects should be checked carefully. They were receptive to aesthetic cosmetic surgery if a person lost confidence in their appearance due to birth defects or trauma, or if they could cause psychosocial secondary health problems. Therefore, Type 1 was named ‘Deliberate type’.

Table 2: Q-statements on aesthetic cosmetic surgery type of representative items and Z-scores (N = 25)

Representative items of type				
Factor	No.	Representative items	Mean(SD)	Z-score
Factor1 (N = 8)	3	Since the side effects of aesthetic cosmetic surgery can not be ruled out, it needs deliberation.	11.25(1.488)	2.13
	13	Aesthetic cosmetic surgery should be decided after a professional consultation.	10.63(1.768)	1.84
	17	Aesthetic cosmetic surgery does not guarantee success.	9.75(1.581)	1.47
	18	Aesthetic cosmetic surgery can not change the inner beauty.	8.75(3.576)	1.41
	7	Aesthetic cosmetic surgery is not a secret to hide.	9.25(1.832)	1.25
	9	If you have never experienced aesthetic cosmetic surgery, you are already outdone.	1.38(0.518)	-2.79
	23	Aesthetic cosmetic surgery should be done only for therapeutic purposes.	3.88(1.642)	-1.78
	30	The cost of dressing up increases after an aesthetic cosmetic surgery.	4.88(1.246)	-1.29
	43	Older generation can be rejuvenated by performing aesthetic cosmetic surgery.	4.75(1.982)	-1.17
	41	Once a person undergoes aesthetic cosmetic surgery, they can't stop.	5.13(2.416)	-1.10
Factor2 (N = 4)	38	The age at which aesthetic cosmetic surgery is performed is getting lower.	6.88(1.959)	1.82
	13	Aesthetic cosmetic surgery should be decided after professional counseling	10.63(1.768)	1.71
	31	Unlike other surgeries, the patient decision of aesthetic cosmetic surgery is the first priority.	7.63(2.615)	1.69
	7	Aesthetic cosmetic surgery is not a secret to hide.	9.25(1.832)	1.46
	28	Aesthetic cosmetic surgery can create health problems such as mental craving.	9.75(1.500)	1.09
	9	If you have never experienced aesthetic cosmetic surgery, you are already outdone.	1.00(0.000)	-2.23
	30	Aesthetic cosmetic surgery is an act that undermines the appearance handed down parents	3.25(1.893)	-1.63
	45	There is regret after aesthetic cosmetic surgery.	4.25(2.062)	-1.58
	10	Aesthetic cosmetic surgery is a good solution to resolve the appearance complex.	4.50(2.380)	-1.57
	8	Aesthetic cosmetic surgery is one of the self-management methods to increase competitiveness.	4.75(2.630)	-1.55
Factor3 (N = 9)	1	It is dangerous to plan aesthetic cosmetic surgery, led by fashion or curiosity.	11.78(2.635)	2.63
	31	Unlike other surgeries, the patient decision of aesthetic cosmetic surgery is the first priority.	10.00(1.732)	1.54
	34	Aesthetic cosmetic surgery can not be said to be only for women.	9.78(2.489)	1.46
	13	Aesthetic cosmetic surgery should be decided after a professional consultation.	9.22(1.481)	1.15
	38	The age at which aesthetic cosmetic surgery is performed is getting lower.	9.11(1.900)	1.14
	9	If you have never experienced aesthetic cosmetic surgery, you are already outdone.	2.11(1.616)	-2.38
	47	People want to hide their aesthetic cosmetic surgery.	4.00(2.449)	-1.82
	30	Aesthetic cosmetic surgery is an act that undermines the appearance handed down parents.	3.56(1.236)	-1.78
	45	There is regret after undergoing aesthetic cosmetic surgery.	4.33(1.581)	-1.46
	22	Aesthetic cosmetic surgery creates a society without personality.	4.00(1.000)	-1.42

Conted...

Factor4 (N = 9)	1	It is dangerous to plan aesthetic cosmetic surgery, led by fashion or curiosity.	10.56(1.590)	1.85
	43	Older generation can be rejuvenated by performing aesthetic cosmetic surgery.	10.33(1.871)	1.79
	10	Aesthetic cosmetic surgery is a good solution to resolve the appearance complex.	9.89(2.369)	1.65
	18	Aesthetic cosmetic surgery can not change the inner beauty.	9.44(2.189)	1.38
	42	The frequency of aesthetic cosmetic surgery in the elderly increases.	9.11(1.691)	1.25
	9	If you have never experienced aesthetic cosmetic surgery, you are already outdone.	2.00(1.500)	-2.54
	41	Once a person undergoes aesthetic cosmetic surgery, they can't stop.	3.78(2.279)	-1.72
	23	Aesthetic cosmetic surgery should be done only for therapeutic purposes.	4.44(2.242)	-1.58
	25	Aesthetic cosmetic surgery can help one meet a good spouse.	4.00(1.323)	-1.53
	14	One of the reasons for hesitating for aesthetic cosmetic surgery is the economic situation.	4.00(1.871)	-1.52

b. Positive type: Type 2 was composed of 4 subjects. Statements showing a strong positive response for Type 2 subjects were, 'The age at which aesthetic cosmetic surgery is performed is getting lower. (Z=1.82)', 'Aesthetic cosmetic surgery should be decided after a professional consultation. (Z=1.71)', 'Unlike other surgeries, the patient decision of aesthetic cosmetic surgery is the first priority.(Z=1.69)' [Table 2]. In type 2, the subjects with the highest factor weight was No.6 (6.3574), and the most agreeable statements were 38, 13, and 31. Statements showing a strong negative response for Type 2 subjects were, 'If you have never experienced aesthetic cosmetic surgery, you are already outdone.(Z=-2.23)', 'Aesthetic cosmetic surgery is an act that undermines the appearance handed down parents.(Z=-1.63)', 'There is regret after undergoing aesthetic cosmetic surgery.(Z=-1.58)'[Table 2]. In Type 2, the subject with the lowest factor weight was No.2 (0.4804), and the most negative statements were 9, 30, and 45. The characteristics of Type 2 were relatively open and positive for aesthetic cosmetic surgery. This type does not think that it is a secret to hide or hide the aesthetic cosmetic surgery, and thinks that it can improve not only simple changes in appearance but also overall life. They also found that the age of aesthetic cosmetic surgery was getting lower and that aesthetic cosmetic surgery was not a behavior that undermined the appearance of the parents. Rather, it was expressed as a choice of aesthetic cosmetic surgery as an alternative to make your

appearance more visible. However, even in this type, they agreed that aesthetic cosmetic surgery should be decided after professional counseling. Therefore, Type 2 was named 'Positive type'.

c. Supporting type: Type 3 was composed of 9 subjects. Statements showing a strong positive response for Type 3 subjects were, 'It is dangerous to plan aesthetic cosmetic surgery, led by fashion or curiosity.(Z=2.63)', 'Unlike other surgeries, the patient decision of aesthetic cosmetic surgery is the first priority.(Z=1.54)', 'Aesthetic cosmetic surgery can not be said to be only for women. (Z=1.46)' [Table 2]. In type 3, the subjects with the highest factor weight was No.21 (1.4629), and the most agreeable statements were 1, 31, and 34. Statements showing a strong negative response for Type 3 subjects were, 'If you have never experienced aesthetic cosmetic surgery, you are already outdone.(Z=-2.38)', 'People want to hide that they had aesthetic cosmetic surgery.(Z=-1.82)', 'Aesthetic cosmetic surgery is an act that undermines the appearance handed down parents. (Z=-1.78)'[Table 2]. In Type 3, the subject with the lowest factor weight was No.12 (0.2589), and the most negative statements were 9, 47, and 30. In Type 3, aesthetic cosmetic surgery can be selected regardless of age, regardless of whether the patient's decision has priority and whether it is female or male. They think that they will not hide or regret about the aesthetic cosmetic surgery, and they will maintain their individuality even if they do aesthetic cosmetic surgery. Overall, they

support the practice of aesthetic cosmetic surgery and support the practitioners. However, they are concerned about aesthetic cosmetic surgery performed for fashion or curiosity. Therefore, Type 3 was named 'Supporting type'.

d. Conservative stance type: Type 4 was composed of 9 subjects. Statements showing a strong positive response for Type 4 subjects were, 'It is dangerous to plan aesthetic cosmetic surgery, led by fashion or curiosity.(Z=1.85)', 'Older generation can be rejuvenated by performing aesthetic cosmetic surgery.(Z=1.79)', 'Aesthetic cosmetic surgery is a good solution to resolve the appearance complex. (Z=1.65)' [Table 2]. In type 4, the subjects with the highest factor weight was No.25 (1.3933), and the most agreeable statements were 1, 43, and 10. Statements showing a strong negative response for Type 4 subjects were, 'If you have never experienced aesthetic cosmetic surgery, you are already outdone.(Z=-2.54)', 'Once a person undergoes aesthetic cosmetic surgery, they can't stop.(Z=-1.72)', 'Aesthetic cosmetic surgery should be done only for therapeutic purposes. (Z=-1.58)' [Table 2]. In Type 4, the subject with the lowest factor weight was No.3 (0.4378), and the most negative statements were 9, 41, and 23. Type 4 believes that choosing aesthetic cosmetic surgery without caution is dangerous, and choosing aesthetic cosmetic surgery is a wrong choice. They think that aesthetic cosmetic surgery can not change the beauty of the inside, and think it will be possible to operate under one's own judgment at middle-aged and older. They did not think that aesthetic cosmetic surgery was performed only for therapeutic purposes, but did not think that someone was behind the trend because of never having experienced aesthetic cosmetic surgery, and did not think that one would meet a good spouse or change one's life through it Therefore, Type 4 was named 'Conservative stance type'.

DISCUSSION

According to the results of the study, the subjectivity types of aesthetic cosmetic surgery perceived by nursing students were Type 1 'Deliberate type', Type 2 'Positive type', Type 3 'Supporting type' and Type

4 'Conservative stance type', and the following will discuss the characteristics of each type.

Type 1 in this study was 'Deliberate type'. This type of subject felt the importance of consultation with a medical professional who had expertise in determining aesthetic cosmetic surgery. They also showed a careful attitude that they should carefully review the various possible problems, including the side effects caused by surgery, and decide on the operation. They thought that, because aesthetic cosmetic surgery is also an operation, a correct perception and critical perception of the risk of surgical procedure and success were needed.

As in the study results¹⁰ that state that in aesthetic cosmetic surgery, patients should be informed about preoperative consultation and surgery without any treatment when there is doubt about the operation, this type requires that one provide accurate information on surgical procedures and side effects and interactions. They thought that planning aesthetic cosmetic surgery could lead to another health problem, and it was thought that it was getting more difficult to make a right judgment because various media highlighted the positive aspect of aesthetic cosmetic surgery. In fact, the mass media has a negative effect on the appearance of the body through self-comparison with the unrealistic body image¹¹, and the thoughts were similar to that of the study¹² where the lower the subjective satisfaction level, the higher the acceptance of aesthetic cosmetic surgery. They looked at the aesthetic cosmetic surgery from a skeptical point of view and thought that if the stability of the operation is not ensured, the more strict management should be applied to cope with the side effects of aesthetic cosmetic surgery. In fact, medical procedures involving surgery, including aesthetic cosmetic surgery, are performed in an invasive manner for the patient, which can lead to various risks and side effects, but as aesthetic cosmetic surgery becomes popular, the social acceptability of cosmetic surgery is gradually increasing, and the risks and side effects are being overlooked.

Aesthetic cosmetic surgery should meet the obligation of the medical practitioner to meet the patient's right to know and have expertise in aesthetic cosmetic surgery. In addition, aesthetic cosmetic surgery should be provided with preventive measures against medical accidents, and a safe and proper choice of aesthetic cosmetic surgery should be provided by strengthening the real name system and patient safety standards of medical personnel.

Type 2 was 'Positive type'. This type of subjects looked at aesthetic cosmetic surgery as a way to fill their shortcomings, to make them feel confident, and not just to change their appearance, but to improve their lives. They considered aesthetic cosmetic surgery as a positive solution as a way of solving psychological problems together with inner beauty.

It could be seen in a similar context to study results showing that higher the acceptability of cosmetic surgery, the lower the self-esteem and appearance control beliefs, and results showing that a person with an inappropriate perception of his or her body considers aesthetic cosmetic surgery¹². However, for the motivation to actually choose aesthetic cosmetic surgery, it was considered in anticipation that physical changes will promote social or emotional changes, but even with the self-esteem, which was temporarily high immediately after surgery, gradually decreases with time, indicating that aesthetic cosmetic surgery can not be a way to increase self-confidence and self-satisfaction¹³. In addition, the evaluation of the satisfaction of the appearance between the patient and the control group before the operation was increased, but the self-esteem and the psychological problem did not change after the operation¹⁴.

Type 3 was 'Supporting type'. They do not encourage aesthetic cosmetic surgery. They also do not think that aesthetic cosmetic surgery has a great effect on people's lives. However, they support the choice of people who have undergone aesthetic cosmetic surgery and value their strengths.

With the improvement of the income level, the economic richness rapidly increased interest in beauty regardless of age or gender. With this socio-economic change, the desire for beauty is becoming an important part not only for women but also for men, and appearance management behavior itself is regarded as a natural phenomenon for the competitiveness of the individual, and the appearance management behavior for the individual beauty appears regardless of gender.

Type 4 was 'Conservative stance type'. This type of subject was a type that perceives the beauty of inner beauty in the sense that external changes can not change inner beauty through aesthetic cosmetic surgery. They believed individual personality does not come from the person's appearance, but from the various things that the person has, including the inside, and they thought

that aesthetic cosmetic surgery which does not have a clear standard and clear reason could not be acceptable.

They emphasized that if they were satisfied with their outward appearance, they would not have to do it, and most of the subjects had a negative view of aesthetic cosmetic surgery as part of their appearance management behaviors for their competitiveness. Similarly to the results of the study¹⁵ where the higher the satisfaction with their appearance, the more they can contribute to the sense of survival and self-esteem, subjects of this type are considered to be subjects with high self-esteem.

The subjects of the 'Conservative stance type' are positive to the subjective body image, and the type that thinks the inner beauty rather than the external beauty as their competitiveness. Therefore, it is necessary to provide information about the therapeutic effect and positive effect that can be obtained through aesthetic cosmetic surgery, and to intervene to differentiate it from others by raising the inner beauty.

This study investigated the subjective perception of aesthetic cosmetic surgery by nursing students and divided them into 4 types. This subjectivity study can be used as a basic data for the education of aesthetic cosmetic surgery subjects who have become recently interested. In addition, it is expected to be utilized as a basic data for the development of differentiated education programs by presenting the subjective structure and type characteristics of aesthetic cosmetic surgery perception of nursing students, who are prospective healthcare providers.

However, the study was based on a single university, and there is a limit to the generalization of the results of aesthetic cosmetic surgery because the subjects were not selected considering the factors affecting perception, and subsequent studies will require further verification of the type by constructing Q samples with diverse backgrounds.

CONCLUSION

The purpose of this study was to apply the Q methodology to provide the basic data necessary to explore the ways of activating aesthetic cosmetic surgery based on the subjective data that was explored and analyzed for subjective perception of aesthetic cosmetic surgery of nursing students. The results of this study showed 4 different factors. The types of aesthetic

cosmetic surgery perception were 'Deliberate type', 'Positive type', 'Supporting type' and 'Conservative stance type'.

This study typified the subjectivity of aesthetic cosmetic surgery of nursing students and provided the basic data necessary for introducing or applying a policy to activate aesthetic cosmetic surgery in the future. In the study, the types of aesthetic cosmetic surgery perception of nursing students were analyzed and their characteristics were confirmed, so it is expected that there will be development of an educational program considering the characteristics of each type. Also additional research on the type analysis by selecting a sample considering various factors, and qualitative research to identify various factors affecting nursing aesthetic cosmetic surgery subjects are suggested.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Haiken, E. *Venus Envy: History of Cosmetic Surgery*. Baltimore: Johns Hopkins University Press; 1997. p. 16.
2. Mulford M, Orbell J, Shatto C, Stockard J. Physical attractiveness, opportunity, and success in everyday exchange. *American Journal of Sociology*. 1998;13(6):1565-1592.
3. Hassion R, Trope Y. Facing faces: Studies on the cognitive aspects of physiognomy. *Journal of Personality and Social Psychology*. 2002;78(5):837-889.
4. Eagly AH, Wood W. The origins of sex differences in human behaviors: Evolved dispositions versus social roles. *American Psychologist*. 1999;54(6):408-423.
5. Sarwer DB, Grossbart TA, Didie ER. Beauty and Society. In: Kaminer MS, Doer JS, Arndt A. Eds. *Atlas of Cosmetic Surgery*. Saunders, Philadelphia;2003. P. 48-59.
6. Karupiah p. Modifications of the body: a comparative analysis of view of youths in Penang, Malaysia and Seoul. South Korea. *Journal of Youth Studies*.2013;16(1):1-16.
7. Dyess S, Parker C. Transition support for the newly licensed nurse: a programme that made a difference. *Journal of Nursing Management*. 2012;20:615-623.
8. Stephenson W. Q-methodology, interbehavioral psychology and quantum theory. *Psychol Record*.1982;32:235-248.
9. Whang SM, You SW, Kim JW, Kim RG, Consumer Types and Cultural Consumption Characteristics of Korean Society: Who Spends for What Reasons? *Journal of Human Subjectivity*, 2006, 13, 25-39. URL: http://www.riss.kr/search/detail/DetailView.do?p_mat_type=1a0202e37d52c72d&control_no=f6ca29c361371a0effe0bdc3ef48d419
10. Harth W, Hermes B. Psychosomatic disturbances and cosmetic surgery. *Journal der deutsch endermatologis change sellschaft*.2007;5(9):736-743.
11. Markey CN, Markey PM. Carrelates of young women's interest in obtaining cosmetics surgery. *Sex Roles*. 2009;61(3-4):158-166.
12. Bazner J. Attitudes about cosmetics surgery: gender and body experience. *McNair Scholars Journal*. 2002;6(1):10-16.
13. Josh A. Modification of the body: a comparative analysis of view of youths in Penang, Malaysia and Seoul, South Korea. *Journal of Youth Studies*.2010;16(1):1-16.
14. Von Soest T, Kvaalem I. L, Roald HE, Skolleborg KC. The effects of cosmetics surgery on body image, self-esteem, and psychological problems. *Journal of Plastic Reconstructive & Aesthetic Surgery*.2009;62:1238-1244.
15. Goldberg JL, McCoy SK, Pyszczynski T, Greenburg J. The body as a source of self-esteem: the effect of morality salience on identification with one's body, interest in sex, and appearance monitoring. *Journal of Personality and Social Psychology*.2002;79(1):118-130.

A Study on the Subjectivity Study of Single Mothers in Nursing Students : Q-Methodology

Sunyoung Jang

Dept. Nursing, Hanseo Univ., 46 Hanseo1 Ro, Haemi-myun, Seosan-si, Chungcheongnam-do, Korea

ABSTRACT

Background/Objectives: The purpose of this study was to identify the subjectivity of single mothers recognized by nursing students, to describe the characteristics of each type, to identify the types of single mothers

Method/Statistical analysis: This study applied Q methodology was applied. 26 nursing students from 'A' University were asked to classify 45 statements about single mothers. The collected data were analyzed using QUANL PC program.

Findings: The subjectivity of single mothers was analyzed using the PC QUANL program, which was followed by three factors, accounting for 48.56% of the total variance. Factor 1 was 35.33%, Factor 2 was 7.11%, and Factor 3 was 6.11%. Factor 1 has an explanatory power of 35.33%, which can be regarded as the most explaining factor for single mothers. According to the research result, the recognition of nursing students was classified into 3 types. In this study, nursing students classified the perception of single mothers into 3 factors. The subjectivity types for single mothers were 'overcoming type', 'pessimistic type', and 'empathetic type'.

Improvements/Applications: The study identified the perception of single mothers in nurses in the clinical field and provided basic data on education.

Keywords: *Single mothers, Nursing students, Subjectivity, Q methodology, Nurses*

INTRODUCTION

The dictionary definition of single mothers is "a mother who does not have a husband or partner"¹. The causes of single mothers vary greatly from country to country, but single mothers were considered social problems after the 19th century industrial revolution, and the occurrence of single mothers is concerned with accidental occurrences depending on individual, cultural, environmental factors and individual living environment factors².

During pregnancy, single mothers may feel their pain projected on the baby and hate the baby, but on the other hand, they feel sorry and pity for the baby and have ambivalence. During pregnancy, single mothers gradually become more and more attached with the baby, suffering from childbirth and increasing attachment to new life. However, single mothers experience a loss of maternal love as most adoption decisions are made due to economic difficulties. The sense of loss experienced by

single mothers is more difficult to overcome than the loss caused by bereavement³. In addition, single mothers are more likely to have a dysfunctional structure, including health risks, school dropouts, loss of job opportunities, experience of abortion wounds, risk of child abuse, and increased likelihood of divorce due to lack of physical, cognitive, and emotional maturity⁴.

Most single mothers who decide to raise their children require full-time nursing intervention for their abortion, childbirth, adoption and child-rearing conflicts after physical check-ups because they suffer from many physical, psychological, social and economic aspects. In the case of teen single mothers, there is larger influence, and Claman and Bell (1991) claimed that teenage pregnant women need nutrition not only for the growth of the fetus but also for their growth, and therefore, inadequate nutritional deficiencies may lead to fetal or neonatal deaths, such as intrauterine fetal growth retardation, premature labor, placental abruption, and amniocentesis⁵. Many studies have

shown an increase in various prenatal, delivery and postpartum complications, including complications such as anemia and prematurity⁶, and the prevalence of hypertensive diseases⁷, low birth weight and surgical labor were high in pregnancy⁸. Therefore, first of all, it is necessary to understand the process of single mothers' decision making of child rearing and to identify factors influencing the decision process.

Nurses are not only the most important part of the healthcare field, but they are also key contacts with the most contacts, and need to provide safe and high quality nursing care within a limited time in a rapidly changing healthcare environment⁹. The subjectivity of perception when treating subjects in the nursing field has a great effect on the nursing they perform. Therefore, it is important to understand the perception of nurses and prospective nurses.

Research on perception of single mothers in nursing students is insufficient. The Q methodology is a methodology that enables understanding of characteristics of each type according to the subjectivity structure of human beings¹⁰, and Because the perception of single mothers in nursing college students is unique subjective experience of the subject, it is an appropriate research method to identify the type of perception of single mothers in nursing college students through the Q methodology, which is a research method considering the subjects' subjectivity.

Therefore, the purpose of this study was to examine the subjectivity structure of single mothers from the perspective of nursing students, and to provide the basic data necessary for the development of differentiated education programs for nursing students based on the characteristics of each type of single mothers in prospective nurses.

The purpose of this study was to identify the characteristics and types of subjective perception of single mothers of nursing students applying the Q-methodology, to provide information about nursing students starting to work with single mothers and to provide basic data for presenting strategy in education of nursing students. Specific objectives for this are as follows.

1. Typify nursing students' subjective perception of single mothers.
2. Analyze and describe the type specific characteristics of perception of single mothers of nursing students.

MATERIALS AND METHOD

Design: In order to achieve the purpose of the study, literature, media data and previous studies on single mothers were reviewed, and subjectivity of nursing students who experienced working with single mothers was examined to identify the types of subjective perception of single mothers.

Q population and Q sample selection: The Q population was derived from a review of domestic and international literature, an open questionnaire, and individual in-depth interviews to extract comprehensive statements about the effects of single mothers on current nursing students. Through this process, three domains and 200 Q-populations are derived. In addition, a total of 100 Q-populations are extracted by collecting literature collected from domestic and foreign literature reviews. After reviewing and revising the extracted Q samples, the final 45 samples with high discrimination power were selected.

P sample selection method: The Q-methodology is a qualitative research that emphasizes individual inertia by emphasizing differences in meaning or importance among individuals, not individual differences, and it is based on small sample doctrine where when the P sample is large, several people are biased on one factor and their characteristics are not apparent^[18]. The P-sample of this study was 26 students who were enrolled in a nursing course and fully agreed to volunteer their consent to participate in the study.

Q classification and data analysis method: The Q classification process is a process in which individuals who are selected as P samples classify the Q samples as statements of forced and normal distribution and make a spontaneous definition of single mothers^[19]. Data were collected using Q-card for 26 current OO University nursing students. The time required for one subject to complete the Q-classification was generally 30-45 minutes. The distribution of the Q sample was classified from the strong positive to the strong negative according to the importance according to the opinion of the subjects. Statements on single mothers (Q1) were classified on a 12-point scale. Thereafter, the subjects and the subsequent interviews were conducted with respect to the statements classified at the extremes. Q factor analysis was performed using Principle Component Factor Analysis (Varimax) method. Type classification

was based on Eigen value 1.0 or higher and the number of factors was selected and the results were compared with the total explanatory variables. The collected data were scored from 1 to 12 points, which were assigned to each of the cards forcibly distributed in the distribution chart of the Q sample. The assigned conversion scores were coded in Q sample order and processed by the main factor analysis by QUANL PC program. Data were analyzed using QUANL pc program.

Ethical considerations for the subjects: After volunteer consent was obtained from the subjects before the study, it was explained to the subjects that they could stop at any time during the study. In order to respect the rights of the subjects and ensure the confidentiality of the subject’s privacy and personal information, all the information collected through this study is treated as an anonymous name in all data analysis, and encoding and Q sorting ensures confidentiality.

RESULTS

Subjectivity and type-specific characteristics of single mothers

Q type structure: Q-factor analysis of the subjectivity of single mothers by nursing students using the QUANL pc program resulted in 3 types.

Type-specific characteristics of single mothers: In order to analyze the subjectivity of single mothers by nursing students by type, the characteristics of each type were described based on statements belonging to each type. The Q-response of the P sample (subject) was divided into upper and lower questions, and 3 factors were extracted. In the Q methodology, a person with a high factor weight among the individuals belonging to each type indicates a typical or ideal person representing the type.

To analyze the characteristics of each type of single mothers, the meanings of the statements with the standard score (z-score) of ± 1.00 or more were given meaning and interpreted. In this study, for the number of people with a factor weight of 1.0 or higher, Type 1 had 10, Type 2 had 8, and Type 3 had 8.

The subjectivity of single mothers was analyzed using the PC QUANL program, which was followed by three factors, accounting for 48.56% of the total variance. Factor 1 was 35.33%, Factor 2 was 7.11%, and Factor 3 was 6.11%. Factor 1 has an explanatory power of 35.33%, which can be regarded as the most explaining factor for single mothers[Table 1]. Of the total of 26 subjects, 10 were in Factor 1, 8 were in Factor 2, and 8 were in Factor 3. Each factor corresponds to a group with similar responses to single mothers.

Table 1: Eigen Value, Variance, and Cumulative Percentage

	Type I	Type II	Type III
Eigen Value	9.1870	1.8489	1.5898
Variance(%)	0.3533	0.0711	0.0611
Cumulative	0.3533	0.4245	0.4856

Analysis by type: The subjectivity type for single mothers calculated by the type analysis method is as follows.

a. Overcoming type : Type 1 was composed of 10 subjects. Statements showing a strong positive response for Type 1 subjects were, ‘There will be difficulties with residence.(Z=2.17)’, ‘Because of the happiness of the child, worries and anxieties will disappear.(Z=1.65)’, ‘They will want to enter the single mother facility.(Z=1.64)’ [Table 2]. In type 1, the subjects with the highest factor weight was No.15 (0.9241), and the most agreeable statements were 24 and 37. Statements showing a strong negative response for Type 1 subjects were, ‘She is afraid of the child being

hurt when they learn about the father after she grows up.(Z=-3.53)’, ‘It’s not possible to ask about the father.(Z=-1.54)’, ‘She will be afraid of the negative gaze around her. (Z=-1.47)’[Table 2]. In Type 1, the subject with the lowest factor weight was No.23 (0.2150), and the most negative statements were 21 and 27. The characteristics of Type 1 are that single mothers can be hard and difficult due to child-rearing and economic situation, but they think that the child will be happy and gain strength as they grow. They did not think that it was difficult for the child to have a social life and thought that single mothers should be more proud. They said that they can raise a child alone, and that if they grow up with a lot

of mother’s love they can grow up to be happier than any other child. They hoped for national and social support for these single mothers, and they actively supported the life of single mothers. They think that a single mothers family is one of the

family types and that it is not simply a disorder of sexual ethics, that it is one of the choices of the individual and the individual should be responsible for it. Therefore, Type 1 was named ‘overcoming type’.

Table 2: Q-statements on unmarried mothers type of representative items and Z-scores (N = 26)

Representative items of type				
Factor	No.	Representative items	Mean (SD)	Z-score
Factor1 (N = 10)	24	There will be difficulties with residence.	6.10(2.331)	2.17
	37	Anxiety and worry will disappear due to the happiness of the child	6.70(2.263)	1.65
	6	They will want to enter the single mother facility.	4.50(2.915)	1.64
	30	It will not be possible to raise a child in happiness.	3.60(2.319)	1.46
	42	She will remember the love she received from the unmarried father, and the psychological arrangement would be difficult.	4.60(2.459)	1.26
	44	She is afraid the child will get hurt when the child hears about the father after they grows up.	7.60(2.675)	-3.53
	35	It’s not possible to ask about the father.	4.90(1.912)	-1.54
	21	She will be afraid of the negative gaze around her.	8.20(2.394)	-1.47
	27	It will be tough because of the social perspective on single mothers.	8.50(1.509)	-1.36
	20	She will have difficulty in relationships with people around her.	5.10(2.807)	-1.19
Factor2 (N = 8)	24	There will be difficulties with residence.	7.00(2.928)	1.69
	29	It is hoped the social outlook will change.	9.00(3.162)	1.65
	5	She will have economic burden.	9.25(1.488)	1.47
	9	The risk of depression will increase.	7.25(2.375)	1.37
	1	She will worry about sending her child to adoption.	5.63(3.583)	1.29
	44	She is afraid of the child being hurt when they learn about her father after they grows up.	5.25(2.712)	-2.68
	21	She will be afraid of the negative gaze around her.	7.75(2.053)	-1.59
	22	She will have difficulty in getting a job.	6.50(1.512)	-1.48
	34	Fear of becoming a single mother leads to decision of abortion.	5.63(1.923)	-1.47
	31	She will worry that her child will be bullied.	4.75(1.389)	-1.29
Factor3 (N = 8)	43	She will find true love after being a single mother.	5.25(1.982)	2.42
	42	She will remember the love she received from the unmarried father, and the psychological arrangement would be difficult.	5.13(3.482)	2.12
	10	There should be more support for single mothers.	6.13(3.044)	1.60
	12	I realized the importance of contraception.	7.13(2.800)	1.12
	11	She will gain courage seeing her growing child.	8.00(3.207)	1.10
	44	She is afraid of the child being hurt when they learn about her father after they grows up.	7.38(2.387)	-2.99
	39	She will be a parent of a child and will be delighted to receive her change.	6.25(3.196)	-1.78
	33	She will have difficulties with marriage.	6.25(2.435)	-1.32
	35	It’s not possible to ask about the father.	5.88(1.959)	-1.24
	22	She will have difficulty in getting a job.	7.63(2.722)	-1.17

b. Pessimistic type: Type 2 was composed of 8 subjects. Statements showing a strong positive response for Type 2 subjects were, 'There will be difficulties with residence.(Z=1.69)', 'It is hoped the social outlook will change.(Z=1.65)', 'She will have economic burden.(Z=1.47)' [Table 2]. In Type 2, the subjects with the highest factor weight was No.18 (1.2428), and the most agreeable statements were 5 and 29. Statements showing a strong negative response for Type 2 subjects were, 'She is afraid of the child being hurt when they learn about her father after they grows up.(Z=-2.68)', 'She will be afraid of the negative gaze around her.(Z=-1.59)', 'She will have difficulty in getting a job.(Z=-1.48)' [Table 2]. In Type 2, the subject with the lowest factor weight was No.21 (0.2159), and the most negative statements were 31 and 34. The characteristics of Type 2 are that they still think that single mothers in the society will have a heavy economic burden and suffer difficulties in their residence. They said that it would increase the risk of depression and eventually the anxiety about sending a child to adoption. Korea had a prejudice against single parent children, and it has been thought that it is very difficult to raise a single child especially for women. The families of those who decided to become single mothers on their own voluntary basis were opposed or even excluded from their families. Therefore, Type 2, with this older perspective, was named 'pessimistic type'.

c. Empathetic type: Type 3 was composed of 8 subjects. Statements showing a strong positive response for Type 3 subjects were, 'She will find true love after being a single mother.(Z=2.42)', 'She will remember the love she received from the unmarried father, and the psychological arrangement would be difficult.(Z=2.12)', 'There should be more support for single mothers.(Z=1.60)' [Table 2]. In Type 3, the subjects with the highest factor weight was No.11 (1.0824), and the most agreeable statements were 10 and 12. Statements showing a strong negative response for Type 3 subjects were, 'She is afraid of the child being hurt when they learn about her father after they grows up.(Z=-2.99)', 'She will be a parent of a child and will be delighted to receive her change.(Z=-1.78)', 'She will have difficulties

with marriage.(Z=-1.32)' [Table 2]. In Type 3, the subject with the lowest factor weight was No.14 (0.2121), and the most negative statements were 35 and 33. Type 3 thought looking at the case of single mothers, about looking back on one's life and finding true love, especially the importance of contraception. They thought that they would be psychologically difficult because of the memories of the unmarried father, but they saw that they would empower themselves by watching the growing children. They also hoped for increase in social support for single mothers. They looked at the single mothers and found a way to go back to their lives and move in a more happy direction. Therefore, Type 3 was named 'empathetic type'.

DISCUSSION

According to the results, the subjectivity of single mothers recognized by nursing students was Type 1 'overcoming type', Type 2 'pessimistic type', and Type 3 'empathetic type', and the following will discuss the characteristics of each type.

Type 1 in this study was 'overcoming type'. They think that in the case of single mothers who raise their children, it is necessary to strive for independence of single mothers as a living subject and to grow independently with their children in order to be more positive as a mother of a child beyond prejudice. In order to do this, they feel that social perception need to be changed for single mothers so that single mothers can live a normal life away from social prejudice, and that economic, psychological and social support for the burden of child care is needed.

They said that the family of single mothers and the father of the baby had little effect on single mothers' decision to raise children. They said that there was no difference in their support or approval, and that the mother-child family has a strong desire to become independent rather than rely on government assistance¹¹.

The single most important factor for single mothers to stand alone is their attachment to the child. Attachment is the social relationship of infants and mothers that is formed in the early stages of life and is an affectionate and emotional bond that ensures infant survival and stability and continues to adulthood¹². The pattern of early parental interrelationship is highly

dependent on maternal sensitivity, maternal sensitivity is closely related to infant attachment, and maternal sensitivity to interaction with infant signals is essential for effective care behavior. It is an important factor in stable attachment development¹³.

The single mothers identify the situation of the baby at the same time and feel the burden of being a single parent when raising a child. With worries about the child growing up without the father, the biggest complaint was economic difficulties, and this is consistent with the results of research that suggests that social support is needed, such as psychological, social, medical benefits, counseling programs¹⁴.

The single mothers were planning the future by accepting the baby into their lives through the process of identifying their situation and the baby's condition. Because it is her child, her willingness to raise a child is strongly expressed because of her blood, which is expressed in attachment, compassion, and maternal love. However, the maternal image, which is considered to be a good mother to be entirely responsible for the growth of the child prevents the mother and the child from growing independently, and that is why women point out that as a mother of her own life, the mother is independent of the child and must be the mother who grows up with her child¹⁵.

Type 2 was 'pessimistic type'. They feel pessimistic about the situation that single mothers will experience because of prejudices in our existing society. They found that single mothers themselves had a high social and economic burden of care, and that they would be subject to social prejudice and constraints.

The mother-child family centered on single mothers who are raising children in our society is accepted as a defective family, not a normal family in social common sense, which is a reflection of our society's prejudices about single mothers. Prejudice means 'an attitude of emotion to a subject with certain attributes'. Aronson (1980) also argues that prejudice is a generalization of defective or incomplete information that has hostile or negative attitudes toward a particular group. This is a kind of 'prepared attitude' by acting positively or negatively on the subject without investigating whether it is justifiable or not for someone's behavior¹⁶. Single mothers were concerned about social constraints as concerns about social prejudice, and single mothers

were found to have abortion attempts by their family's unconditional recommendation of abortion and by the provision and betrayal of unmarried people as social prejudices against prenatal pregnancy¹⁷.

In addition, they stopped work and school to maintain their pregnancy, and in order to avoid their surroundings, they were placed in a single mothers care facility to give birth. These social prejudices, due to the fear of social gaze from pregnancy to childbirth, lowers self-esteem, causing negative self-perception and loss of self-confidence, making social functioning difficult.

Type 3 was an 'empathetic type'. By projecting their life directly and indirectly to the lives of single mothers, they set the direction of their lives. Also, they draw on the positive and pursuing life that they think. They also hope that support for single mothers will increase.

Single mothers had basic survival needs for economic subsidy, employment, food, shelter, and health, but single mothers did not know the information about the programs or help provided. For single mothers who decided to raise their children, economic support (43.8%) was most needed, and there was family understanding (24.7%), free child care (13.7%), and among family's wishes, 'family understanding' was the highest at 48.6%. Single mothers in the low-income group show complications from pregnancy occurring frequently in babies and mothers, which is due to failure in antenatal care¹⁸. Thus, for single mothers who are raising their children, together with a practical and integrated single mothers support program to support single mothers' employment, including living expenses, child support, education, child care facilities and medical support, it seems that single mothers need psychological and social support to be able to raise their children positively and correctly away from social prejudice.

This study examined the subjective perception of single mothers by nursing students by dividing into 3 types. In this study, most nursing students think that the single mothers family is a new family type, and they felt that they needed a lot of support for the adoptive family. By type, there was 'overcoming type', where one would overcome the situation of being single mothers and actively organize life independently in nurturing, 'pessimistic type', which recognizes the difficulties that single mothers have to undergo by traditional values, and 'empathic type' that directly or indirectly senses

the life of single mothers and reflects their lives in their own lives and realizes their desire to live a desirable life. This subjectivity study could be used as a basic data for the single mothers support program which is of interest recently. In addition, it is expected to be used as a basic data for the development of differentiated education programs by presenting the subjective structure and characteristics of nursing students' perspective on single mothers.

However, the study was based on a single university, and there is a limit to the generalization of the results of single mothers because the subjects were not selected considering the factors affecting perception, and subsequent studies will require further verification of the type by constructing Q samples with diverse backgrounds.

CONCLUSION

The purpose of this study was to apply the Q methodology to provide the basic data necessary to explore the ways of activating support for single mothers based on the subjective data that was explored and analyzed for subjective perception of single mothers in nursing students. The results of this study showed 3 different factors. The types of single mothers perception were 'overcoming type', 'pessimistic type', and 'empathetic type'.

This study typified the subjectivity of single mothers of nursing students and provided the basic data necessary for introducing or applying a policy to activate support for single mothers in the future. In the study, the types of perception of single mothers in nursing students were analyzed and their characteristics were confirmed, so it is expected that there will be development of an educational program considering the characteristics of each type. Also additional research on the type analysis by selecting a sample considering various factors, and qualitative research to identify various factors affecting nursing single mothers subjects are suggested.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Merriam-Webster. [cited 2018Sep1]. Available from: [https://www.merriam-webster.com/dictionary/single%20mother\(website\)](https://www.merriam-webster.com/dictionary/single%20mother(website))

2. Amini SB. CatalanoPM. Mann LI. Birth to unmarried mothers: trendsandobstetricoutcomes. *Women'sHealthIssues*. 1996;6(5):264-272.
3. Elster AB. The effect of maternal age, parity and prenatal care on perinatal outcome in adolescentmother's. *American Journal of Obstetric and Gynecology*. 1993;174(8):845-847.
4. DottAB. Medical and social factors affecting early teenage pregnancy. *American Journal of Obstetric and Gynecology*. 1995;180(4):532-536.
5. Claman AD. Bell HM.Pregnancy in the very young teen-ager. *American Journal of Obstetric and Gynecology*. 1991; 167(3):350-354.
6. Semmens JP. Implications of teen-age pregnancy. *American Journal of Obstetric and Gynecology*. 1984; 148(3):77-85.
7. Dwyer JF.Teen-age pregnancy.*American Journal of Obstetric and Gynecology*. 1984;148(3):373-376.
8. Sarrel PM. Klerman LV. The young unwed mother : Obstetric results of a program of comprehensive care. *American Journal of Obstetric and Gynecology*. 1969;105(4):575-578.
9. Dyess S. Parker C. Transition support for the newly licensed nurse: a programme that made a difference. *Journal of Nursing Management*. 2012;20:615-623.
10. Stephenson W. Q-methodology, interbehavioral psychology and quantum theory. *Psychol Record*.1982;32:235-248.
11. Oehler JM.HannanT. Catlett A. Maternal views of preterm infants' responsiveness to social interaction. *Neonatal Network-Journal of Neonatal Nursing*.1993;12(6):67-74.
12. Ainsworth MDS. Attachment beyond infancy. *American Psychology*.1989;44(4):709-716.
13. De Wolff M. Van I. Jendoorn,M.H.(1997). Sensitivity and attachment:A meta-analysis on parental antecedents of infantattachment. *ChildDevelopment*, 68(4),571-591.
14. Lee BS. Chun YJ. A Study on Life History of Unwed Mothers.*Journal of women's studies*, 2005;16:1-32.Available from: [http://scholar.dkyobobook.co.kr/searchDetail.laf?barcode=4010020388824\(website\)](http://scholar.dkyobobook.co.kr/searchDetail.laf?barcode=4010020388824(website))

15. Han YR. Yang SO. The Study on the Pregnancy Experiences of Unmarried Mothers. *Journal of Korean Public Health Nursing*. 1997;11:194-208. Available from: <http://www.dbpia.co.kr/Journal/ArticleDetail/NODE02228763>(website)
16. Jo EY. (A) Study on the Stigmatization Process toward the People with Mental Illness [dissertation] University of Yonsei; 2002.
17. Choe YJ. Kim GB. Experiences of Unwed Mothers. *Korean J Women Health Nurs*. 2004;10(4):331-341. Available from: <http://www.papersearch.net/thesis/article.asp?key=2414760&code=CP00000006>(website)
18. Sarrel PM. Klerman LV. The young unwed mother: Obstetric results of a program of comprehensive care. *American Journal of Obstetric and Gynecology*. 1969;105(4):575-578.

Integrative Review of Studies of Service-Learning in Health-Related Disciplines

Youngshin Song¹, Miyoung Lee², Ancho Lim¹, Geumbo Ko¹

¹College of Nursing Chungnam National University, 266 Munwha-ro, Jung-gu, Republic of Korea;

²College of Nursing, Eulji University, 77 Gyeryong-ro, 771 Beon-gil, Jung-gu, Republic of Korea

ABSTRACT

Background/Objectives: Bachelor programs have been expanded to help the community learn about social issues and the accompany in responsibilities. The purpose of this paper is to integrate the studies that conducted service-learning (SL programs) in undergraduate curricula.

Method/Statistical analysis: To identify the relevant studies, an integrative review was conducted. Eight electronic databases were searched for studies published from 2010-2018 in English and Korean. Studies included in this review analysis were all conducted using an experimental study design and focused on a SL program for undergraduate students who were in health care-related disciplines. Study characteristics including the authors, years of publication, study aims, sample size, disciplines, credit status, SL name usage, study design, and main outcomes were coded independently by two coders.

Findings: The initial search revealed 4753 studies, but only 53 of these met the inclusion criteria and were analyzed. The total sample size consisted of 7534 undergraduate students. The most frequently studied disciplines were nursing and medicine; 7 studies amalgamated the various health care disciplines. Among all the studies, 19 studies described SL programs that were applied during the freshman year, while 17 described SL programs that were conducted during the third and fourth years. All SL programs were applied within community settings such as rural areas, schools, low income countries, nursing homes, and long-term care service centers. In 32 studies, the SL program was conducted using an experimental design, and a one-group pre-post test design was used in 15 studies. The main outcome of all the studies was psycho-social-cultural competence. The number of studies published between 2010 and 2014 was 32 (60.4%), whereas 21 studies were published from 2015-2018. The term SL program was used in 12 studies, but specific program names were used in 41 studies. The SL program was offered as an elective course for credit in only 14 studies (26.4%).

Improvements/Applications: SL programs may improve students' community awareness in terms of cultural competence, skills, knowledge, and leadership. The content of the SL programs was well designed. However, in future studies, a reflection process should be applied.

Keywords: Service, Learning, Review, Health, Curriculum

INTRODUCTION

Service-learning (SL) is an educational method focused on community engagement with specific learning objectives and structured reflection ^[1]. To emphasize the relationship between service and learning, a hyphen “-” is used to connect them ^[2]. The key components of service-learning are reciprocity and reflection. Reciprocity assures that experiences are mutually beneficial in terms of outreach through assisting both community and service providers in such a way that all

Corresponding Author:

Miyoung Lee

Associate Professor, College of Nursing

Eulji University, South Korea

E-mail: mylee3730@eulji.ac.kr

participants learn from each other in a collaborative, non-hierarchical manner [3]. The goal of bachelors programs in healthcare disciplines such as medicine, nursing, pharmacology, etc. should involve education in not only the major subjects but also social responsibility. Lots of bachelor's program have tried to provide opportunities for undergraduate students to engage in SL projects, in a broad sense of the term. However, the operating system, content, and main outcomes of the SL programs varied according to each program's goal.

Among SL programs, the effects of the SL method have been proven in various bachelor's curricula including nursing, medical, and pharmacy to improve socio-cultural competence, skill, and knowledge. For example, Chen et al. [4] have researched the positive effects of service-learning projects within a community in terms of cultural knowledge and cultural competence. In a study by Fowler [5], 3hrs of a SL program at a non-profit organization were effective in improving nursing professional development for a baccalaureate program. In pharmacy curricula, providing SL opportunities to students may positively influence their teaching skills and patients' health, but time is a barrier to participating in SL programs [6].

In recent years, several studies have been published that synthesized the effects of SL programs using systematic review and meta-analysis. For example, Warren (2012) reported that the SL program had positive effects on empathy, cultural awareness, personal and interpersonal development, social issues, motivation to study, self-efficacy, life skills, and civic engagement/responsibility through 11 included studies [7]. In 40 studies of business education, SL programs were effective in improving understanding of social issues, personal insight, and cognitive development [8].

As such, the positive impact of SL programs on various students' competences have been reported in studies; however, synthesized information was not found among the healthcare disciplines due to a lack of systematic review. Therefore, this review aims to systematically analyze studies focused on SL projects for healthcare students.

MATERIALS AND METHOD

Data sources and review strategy: Data were extracted independently by two coauthors using electronic

databases such as PubMed, EMBASE, the Cochrane Library, CINAHL, KISS, RISS, NDSL, and DBPia by two coauthors independently. Mesh terms and key words such as "service-learning," "students," "leadership," "social justice," "education" were searched from 2010 to 2018 in English and Korean.

When Mesh terms and key words were entered in the database, a total of 4753 articles were identified. After eliminating the duplicated articles, 1117 articles remained. Among them, 496 articles that case study and qualitative study were excluded. The full text of the remaining 621 studies were reviewed, but 568 studies did not meet the inclusion criteria. In final, a total of 53 studies were analyzed.

Inclusion and exclusion criteria: The inclusion criteria were as follows: a) experimental and observational studies of SL programs applied within curricula; b) participants who were undergraduate students; c) health-related curricula from medical and paramedical disciplines such as nursing, dentistry, and pharmacology; and d) studies that were published from 2010-2018.

Studies that were designed using only qualitative methods were excluded, as were systematic reviews and methodological studies.

Data extraction: Extracted data were coded independently by two coauthors. Two coders recorded the study characteristics such as authors, years of publication, study aims, sample size, disciplines, credit status, SL name usage, study design, and main outcomes. After completing the coding, the coders compared their results. If differences were found between the coders' sheets, the principal investigator (PI) settled the discrepancy after reviewing the articles.

Analysis: Included studies (N = 53) were categorized in terms of study design, types of disciplines, students' grades, years of publication, credit status, SL name usage, and types of main outcome variables.

The frequencies and percentages were calculated.

RESULTS AND DISCUSSION

A total of 7534 undergraduate students were enrolled in 53 studies that assessed the application of an SL program. The average sample size was 142, with a range from 7 to 908. SL programs in all the

included studies were for undergraduate students, but the disciplines varied. Regarding year of study, 19 SL programs were applied in freshman courses and 17 studies assessed SL programs conducted in the third and fourth years. Nursing (34%) and medicine (34%) were the major disciplines in which the SL programs were used; 7 studies amalgamated the various health care disciplines. The next most frequent disciplines were pharmacology and dental science. Twelve studies used the generic term “SL program,” but the remaining 41 studies used specific names such as “community health.” SL programs were offered as an elective for course credit in only 14 studies (26.4%). The course design for the SL program was developed by either a community non-profit organization or the university.

SL programs were performed using an experimental design in 32 studies, whereas 21 studies were conducted using mixed methods. Among the experimental studies, 15 used a one-group pre-post test design. Those studies mentioned that it was impossible to establish a control group due to ethical issues. Moreover, there are limitations to the quantitative analysis of the effectiveness of the SL program. The effect of the SL program was evaluated using qualitative data in terms of interviews regarding the satisfaction of the program. When the studies were divided in terms of years of publication, 32 (60.4%) were published between 2010 and 2014, and 21 studies were published from 2015-2018. Therefore, the number of relevant studies has been decreasing in recent years. In all studies, SL programs were applied in community settings such as rural areas, schools, low-income countries, nursing homes, and long-term care service centers. The main outcome of all the studies was psychosocial-cultural competence, and cultural competence in particular was frequently assessed. Because SL programs have been applied in various foreign countries to enhance skills and knowledge, those SL programs were focused on cultural sensitivity and transcultural diversity. Most cultural competence objectives were positively achieved in those studies. Specific skills were also enhanced through SL programs. For example, the skills necessary for cardiovascular risk screening such as blood glucose, blood pressure, waist circumference, and measurement of body mass index were significantly increased in a study by Packard et al. [9].

The SL programs were developed according to the educational years of the students. In lower-level SL programs, psychomotor skills and knowledge were most

often addressed, but in the higher levels, leadership skills and social responsibility were the main outcome variables in several studies. For example, the SL program in a course for leadership and management was effective in increasing leadership practices such as ‘modeling the way’, ‘inspiring a shared vision’, ‘challenging the process’, ‘enabling others to act’, and ‘encouraging the heart’ in a study by Foli et al [10]. In one study, health literacy attitudes and knowledge were assessed as outcomes. The SL programs in a study by Milford et al. [11] were composed of educational program to improve healthy eating and physical activity for children and families in the community. Medical students’ (1st and 2nd years) health literacy attitudes, knowledge, and skill confidence increased after the completion of the SL program.

The content of the SL program consists of a theoretical phase, a phase for participating in a service session, and a reflection phase. Several studies did not apply the reflection phase. Undertaking a reflection process regarding the learning objectives may improve the understanding of the real world, which would in turn improve social responsibility. However, most of the included studies did not report on the reflection process.

Table 1 summarizes the study design.

The findings from this current integrative review showed that there are increasing numbers of studies assessing the application of SL programs in undergraduate curricula within health-related disciplines. The aims of the SL programs were varied, and the outcomes were also well assessed according to the SL program content. However, SL programs were still mainly focused on the nursing, medical, and pharmacy disciplines. SL programs should be extended to various health care disciplines. Moreover, the randomized clinical trial numbers were relatively small compared to the one group pre-post test studies. If the effectiveness of SL program were proved in experimental studies, this would increase the evidence for the power of the SL programs.

The limitations of this study can be considered in light of the interpretation of the results. We did not perform a meta-analysis, and the effect size of the SL program could not be calculated. In future studies, the necessary effect size of the SL program should be calculated by synthesizing the individual studies. Moreover, we did not appraise the methodological quality of the included studies. Despite these limitations, this current integrative review of recent studies can provide an indicator of the scope of SL programs and their main effects.

Table 1: Classifications of SL program (N = 53)

Characteristics	Classification	n (%)
Types of disciplines (*Duplicated)	Nursing	18 (34.0%)
	Medicine	18 (34.0%)
	Pharmacy	14 (26.4%)
	Dental hygiene	3 (5.7%)
	Dentistry	3 (5.7%)
	Para-medicine	4 (7.5%)
	Dietetics	1 (1.9%)
	Biomedical science	1 (1.9%)
	Health administration	1 (1.9%)
Students' grade, Year (*Duplicated)	First Year	19 (35.8%)
	Second Year	12 (22.6%)
	Third Year	17 (32.1%)
	Fourth Year	17 (32.1%)
	Non reported	17 (32.1%)
Credit status (*Duplicated)	Credit	14 (26.4%)
	Non credit	13 (24.5%)
	Non reported	47 (88.7%)
SL name usages	Yes	12 (22.6%)
	No	41 (77.4%)
Year of publication	2010-2014	32 (60.4%)
	2015-2018	21 (39.6%)
Study design	Experiment design	32 (60.4%)
	Mixed methods (qualitative + quantitative)	21 (39.6%)
Outcome variables (*Duplicated)	Cognitive competence	33 (62.3%)
	Psycho-social-cultural competence	53 (100.0%)
	Psycho-motor skills	24 (45.3%)

CONCLUSION

The findings from this integrative review suggest that SL programs were applied in undergraduate health-related disciplines, and their benefits were evaluated. SL programs in bachelor's curricula, irrespective of whether credit was obtained, are effective for improving health care providers' social awareness, various competencies, and senses of responsibility. However, future reviews should investigate and report on studies evaluating the self-reflection process. Moreover, based on this integrative review, a meta-analysis should be conducted in the future to synthesize and calculate the necessary effect size for SL intervention.

Ethical Clearance: Not required

Source of Funding: This work was supported by research fund of Chungnam National University (2018-0563)

Conflict of Interest: Service-learning in health-related disciplines

REFERENCES

- Reising DL, Shea RA, Allen PN, Laux MM, Hensel D, Watts PA. Using service-learning to develop health promotion and research skills in nursing students. *International Journal of Nursing Education Scholarship*. 2008 Jul 22;5(1):1-5.
- Amerson R. The impact of service-learning on cultural competence. *Nursing education perspectives*. 2010 Jan 1;31(1):18-22.
- Yoder KM. A framework for service-learning in dental education. *Journal of Dental Education*. 2006 Feb 1;70(2):115-23.
- Chen HC, McAdams-Jones D, Tay DL, Packer JM. The impact of service-learning on students' cultural competence. *Teaching and Learning in Nursing*. 2012 Apr 1;7(2):67-73.
- Fowler DL. Service-learning and nursing professional values development: An experimental research study. *Nursing education perspectives*. 2013 Jan 1;34(1):50-1. <http://cochranelibrary-wiley.com/o/cochrane/clcentral/articles/691/CN-00905691/frame.html>.
- Hedges A, Miller S, Scott M, Persky AM. Current environment of service learning within the school of pharmacy. *Currents in Pharmacy Teaching and Learning*. 2014 Nov 1;6(6):884-90.
- Warren JL. Does service-learning increase student learning? A meta-analysis. *Michigan Journal of Community Service Learning*. 2012;18(2):56-61.
- Yorio PL, Ye F. A meta-analysis on the effects of service-learning on the social, personal, and cognitive outcomes of learning. *Academy of Management Learning & Education*. 2012 Mar;11(1):9-27.
- Packard K, Sexson E, Spangler M, Walters R. A novel cardiovascular risk screening and health promotion service learning course. *Currents in Pharmacy Teaching and Learning*. 2010;2(4):228-37.
- Foli KJ, Braswell M, Kirkpatrick J, Lim E. Development of leadership behaviors in undergraduate nursing students: a service-learning approach. *Nursing education perspectives*. 2014;35(2):76-82.
- Milford E, Morrison K, Teutsch C, Nelson BB, Herman A, King M, et al. Out of the classroom and into the community: medical students consolidate learning about health literacy through collaboration with Head Start. *BMC medical education*. 2016;16:121.

Differences in Nursing Students' Adaptation to College Life and Recognition of Death According to Their Degree of Adaptation to Field Practice

Nam Joo Je¹, Meera Park¹

¹Depart of Nursing, Changshin University, 262, Paryong-ro, Masanhoewon-gu, Changwon-si, Gyeongsangnam-do, Korea

ABSTRACT

Background/Objectives: This study identifies nursing students' adaptation to college life and recognition of death according to their degree of adaptation to field practice, and provides data for programs.

Method/Statistical analysis: Data were collected from 252 nursing students in June 2018 and were analyzed using IBM SPSS 21. Frequencies, means, and standard deviations were obtained for the groups' characteristics according to degree of adaptation to field practice. The groups' homogeneity was tested using t-test, Chi-Square test, and Fisher's exact probability test. Differences between the groups in adaptation to college life and death recognition were analyzed using t-test

Findings: The degree of adaptation to college life was higher for the group that showed high degree of adaptation to field practice than the group that showed low degree of adaptation ($t=7.47, p<.001$). The level of adaptation to all other subareas was higher for the group with level of adaptation to field practice that was higher than the lower group ($p<.001$). No statistically significant difference was found between the two groups in death recognition ($t=-1.44, p=.150$), and in the subareas of the level of acceptance of death, the level of denial of death, and death anxiety ($p>.05$). The level of interest in death, however, was higher for the group with level of adaptation to field practice that was lower than the group with higher level of adaptation to field practice ($p<.05$), while respect for life was higher for the group whose level of adaptation to field practice was higher ($p<.05$).

Improvements/Applications: The creation of a support system for individuals in conflict situations to providewith training is necessary, as is the development of education to improve death recognition.

Keywords: *Adaptation, College life adaptation, Death Recognition, Field practice, Nursingstudent.*

INTRODUCTION

Nursing students nurture their aptitudes and plan their future work lives as nurses through nursing classes and field practice^[1]. Many students express difficulty in adapting to their chosen major after they have been admitted to nursing departments. This may be a result of students applying to college or a specific department based on their college entrance scholastic aptitude test scores^[2], or having chosen nursing because of its high

employment rate compared with that of other majors without obtaining any information about the college and regardless of their aptitude for the profession. Furthermore, nursing students are required to commit more time to their studies than students of other majors, and may fear the mistakes that can occur during field practice with actual patients due to the inherent characteristics of nursing^[3]. If a nursing student has difficulty adapting to field practice, adapting to the nursing major, of which practice takes up a large part, will be hard. This will then make the student's future performance as a nurse difficult, which may make it difficult for them to form the beliefs and attitude necessary for efficient nursing, hindering the formation of the nurse's positive professionalism or self-concept^[4].

Corresponding Author:

Meera Park

Depart of nursing, Changshin University, Korea

E-mail: minerva32@cs.ac.kr

Difficulty adapting to field practice can also negatively affect nursing students' professional performance after their graduation [5].

Nursing students experience death in field practice more than students in other majors, and they state that they feel a burden or fear and anxiety when they nurse dying patients if their death recognition is unclear [6]. If nursing students' recognition of death can be established by helping them to understand death and think about the meaning of life before they enter field practice, their fear of field practice will be reduced and they will be more adequately prepared to adapt to it [3]. In addition, providing students with proper education for their situation by determining their adaptation to college life and differences in death recognition according to their level of adaptation to field practice will help them more smoothly adapt to college life and be more effective in forming a positive attitude toward death, effectively promoting a change in perception. Since nurses' death recognition and attitudes can significantly influence patient care, it is necessary for nursing students to systematically learn about patients' death, which they will face as nurses in the future [7].

Previous studies have examined the relationship between self-esteem and death anxiety [8], the relationship between life satisfaction and attitude toward death [9], the relationship between spiritual well-being and attitude toward death, and the relationship among religious life, life satisfaction, and attitude toward death [9] in nursing students. Even though there have been a few qualitative studies [10-12] on nursing students' field practice, studies on adaptation to field practice, adaptation to college, and death recognition together have rarely been conducted.

Accordingly, the present study was conducted to provide basic data for organizing program contents for adaptation to college life and the establishment of positive death recognition by determining differences in adaptation to college life and death recognition of nursing students according to their degree of adaptation to field practice.

MATERIALS AND METHOD

Research design: The present study employs a descriptive survey to determine nursing students' adaptation to college life and death recognition according to their degree of adaptation to field practice.

Subjects: Data were collected from junior and senior nursing students in a four-year university in K province from June 1 to June 30, 2018. The sample size was calculated for the t-test with effect size 0.5 (medium), significance level (α) .05, and a power ($1-\beta$) of 95% using G*power 3.10 program [13]. The minimum number of subjects was calculated to be 210, though data were collected from 252 subjects, considering a dropout rate of 20%.

Research instruments: Approval for the use of instruments used to measure adaptation to field practice, adaptation to college life, and death recognition was obtained from those who developed, revised, and supplemented the instruments before they were used in this study.

The instrument for adaptation to field practice was developed by Park [14] and consisted of nine items on a five-point Likert scale. Cronbach's α at the time of instrument development was .73, and Cronbach's α in the present study was .79. A mean score of adaptation to field practice was obtained, and subjects were divided into the high field practice adaptation score group (HFPAS group) if the score was equal to or higher than the mean score and the low field practice adaptation score group (LFPAS group) if the score was lower than the mean score.

For adaptation to college life, an instrument developed by Park [14] was used. The instrument consisted of 34 items on a five-point Likert scale with six subareas of satisfaction with major, excellence in major, academic fidelity, interpersonal relationships, coping competence, and employment preparation. The higher the score, the higher the degree of adaptation. Cronbach's α at the time of instrument development was .92, and Cronbach's alphas of the subscales were .86 for satisfaction with major, .78 for excellence in major, .69 for academic fidelity, .81 for interpersonal relationships, .78 for coping competence, and .68 for employment preparation. Cronbach's α in the present study was .91, and Cronbach's alphas of the subscales were .84 for satisfaction with major, .71 for excellence in major, .61 for academic fidelity, .75 for interpersonal relationships, .68 for coping competence, and .72 for employment preparation.

The instrument for death recognition was developed by Cha [15] and consisted of 36 items on a five-point Likert scale with five subareas of level of acceptance of

death, level of denial of death, death anxiety, level of interest in death, and respect for life. In the case of the level of acceptance of death, level of interest in death, and respect for life, the higher the score, the higher the degree of each subscale, while for the level of denial of death and death anxiety, the lower the score, the higher the degree of each subscale. Cronbach's alphas of the subscales at the time of instrument development was .79 for the level of acceptance of death, .71 for the level of denial of death, .86 for death anxiety, .85 for the level of interest in death, and .75 for respect for life. Cronbach's alphas in the present study were .79 for the level of acceptance of death, .74 for the level of denial of death, .79 for death anxiety, .81 for the level of interest in death, and .63 for respect for life.

DATA ANALYSIS

The collected data were analyzed using IBM SPSS WIN/21.0.

1. Frequencies, means, and standard deviations were obtained for the general characteristics of the subjects according to their degree of adaptation to field practice. The homogeneity of the two groups was tested using a t-test, Chi-Square test, and Fisher's exact probability test.
2. Differences between the two groups in adaptation to college life and death recognition according to their degree of adaptation to field practice were analyzed using a t-test.

Limitations of the study: Generalization of the results of the present study is limited because the present study used nursing students from only one university located in K province.

RESULTS AND DISCUSSION

The general characteristics of the subjects are shown in Table 1.

The ratio of males in the LFPAS group was higher, with 12 males (9.4%) and 116 females (90.6%), than that of the HFPAS group, in which 9 (7.3%) students were males while 115 (92.7%) were females, but the difference was statistically nonsignificant. The mean age of the LFPAS group was higher with 21.69 years than that of the HFPAS group with 21.26 years, but the difference was statistically nonsignificant. In terms

of education level, the LFPAS group had more senior students with 52 (40.6%) juniors and 76 (59.4%) seniors than the HFPAS group in which 63 (50.8%) students were juniors and 61 (49.2%) were seniors, but the difference was not statistically significant. Differences between the two groups in leave of absence from school, religion, living environment, parents' economic power, and grades in the previous semester were statistically nonsignificant. No statistically significant difference was found between the two groups in experience of hospice education, experience of dying well education, experience of death in one's family, and experience of death in clinical practice. In terms of personality, mixed personality types were the most prevalent (74 subjects, 59.7%), followed by extroverted (31 subjects, 25.0%), and introverted (19 subjects, 15.3%) in the HFPAS group, while the highest prevalence was seen for mixed type (93 subjects, 72.6%), followed by introverted (23 subjects, 18.0%) and extroverted (12 subjects, 9.4%) in the LFPAS group, and the difference between the two groups was statistically significant ($X^2=10.87, p=.004$). The HFPAS group had a higher number of meetings with professors, with 2.58 times per semester, than the LFPAS group, which had 2.00 meetings per semester, and the difference was statistically significant ($t=1.99, p=.047$). In terms of the experience of interpersonal conflict, HFPAS group replied "sometimes" (71 subjects, 57.3%), followed by "never" (50 subjects, 40.3%) and "often" (3 subjects, 2.4%), while LFPAS group replied "sometimes" (89 subjects, 69.5%), followed by "never" (30 subjects, 23.4%) and "often" (9 subjects, 7.0%), and the difference between the two groups was statistically significant ($X^2=29.96, p=.007$). Clinical practice satisfaction was higher for the HFPAS group, with 7.37 points, than the LFPAS group with 5.71 points, and the between-group difference was statistically significant ($t=8.30, p<.001$). The HFPAS group showed higher satisfaction with the nursing major, with 6.92 points, than the LFPAS group with 5.60 points, and the difference between the two groups was statistically significant ($t=6.07, p<.001$) [Table 1].

The degree of adaptation to college life according to the subjects' degree of adaptation to field practice is shown in Table 2.

The degree of adaptation to college life was higher for the HFPAS group, with 3.58 points, than the LFPAS group, with 3.21 points ($t=7.47, p<.001$). Satisfaction with major among the subareas was higher for the HFPAS

group, which scored 3.62 points, than the LFPAS group, which scored 3.14 points ($t=6.50, p<.001$). The score of the HFPAS group in excellence in major was 3.13 points, which was higher than that of the LFPAS group, which scored 2.84 points ($t=3.77, p<.001$). The score of the HFPAS group in academic fidelity was significantly higher, with 3.94 points, than that of the LFPAS group, which scored 3.64 points ($t=4.35, p<.001$). The interpersonal relationships score of the HFPAS group was significantly higher, with 3.76 points, than that of the LFPAS group with 3.39 points ($t=6.75, p<.001$). The HFPAS group's coping competence score was higher, with 3.71 points, than that of the LFPAS group with 3.43 points ($t=4.63, p<.001$). The HFPAS group scored 3.12 points on employment preparation, which was significantly higher than that of the LFPAS group, which scored 2.74 points ($t=4.37, p<.001$) [Table 2]. The results of the present study show that the degree of adaptation to college life was higher when adaptation to field practice was high. It is important to help students in adapting to field practice so that they can adapt well to college life. It is difficult to directly compare the adaptation of nursing students to field practice due to the lack of qualitative studies on the subject. In the light of a qualitative study [16] that reported the difficulty of adaptation to field practice in situations in which students experience rejection from patients and read the countenance of the head nurse and other nurses, adaptation to college life can be made smoother when situations of interpersonal conflict are reduced, when a support system that can support students in conflict situations is prepared, and

when training that enables them to cope with conflict situations is provided.

The degree of death recognition of the subjects according to the subjects' degree of adaptation to field practice is shown in Table 3.

No statistically significant difference between the two groups was found ($t=-1.44, p=.150$) for death recognition, for which the HFPAS group scored 3.12 points while the LFPAS group scored 3.18 points. For the level of acceptance of death among the subareas, the HFPAS group scored 3.27 points while the LFPAS group scored 3.29 points, and the difference between the two groups was statistically nonsignificant ($t=-0.33, p=.737$). For the level of denial of death, the HFPAS group scored 3.37 points while the LFPAS group scored 3.45 points, and the difference between the two groups was statistically nonsignificant ($t=-1.13, p=.256$). The score of the HFPAS group in death anxiety was 2.84 points while that of the LFPAS group was 3.03 points, and the difference between the two groups was statistically nonsignificant ($t=-1.85, p=.065$). A statistically significant difference ($t=-2.71, p=.007$) between the two groups was found for the level of interest in death, for which the HFPAS group scored higher with 2.38 points than the LFPAS group, which scored 2.66 points. Respect for life of the HFPAS group was higher ($t=2.36, p=.019$) with 3.32 points than that of the LFPAS group with 3.13 points.

Table 1: General characteristics between field practice adjustment of high group and low group. (N = 252)

Variables	Categories	Field practice adjustment		t or X ²	p
		High Group (n = 124) Mean ± SD or n(%)	Low Group (n = 128) Mean ± SD or n(%)		
Gender	Male	9(7.3%)	12(9.4%)	0.37	.543
	Female	115(92.7%)	116(90.6%)		
Age		21.26 ± 1.47	21.69 ± 2.48	-1.66	.095
Grade	Junior	63(50.8%)	52(40.6%)	2.63	.105
	Senior	61(49.2%)	76(59.4%)		
Leave of school	Yes	8(6.5%)	10(7.8%)	0.17	.675
	No	116(93.5%)	118(92.2%)		
Circles activity	Yes	36(29.0%)	25(19.5%)	3.09	.078
	No	88(71.0%)	103(80.5%)		
Religion	Christianity	20(16.1%)	22(17.2%)	1.68*	.671
	Catholic	5(4.0%)	2(1.6%)		
	Buddhist	16(12.9%)	14(10.9%)		
	None	83(66.9%)	90(70.3%)		

Conted...

Residence type	With parents	65(52.4%)	64(50.0%)	0.34	.840
	Dormitory	47(37.9%)	53(41.4%)		
	Alone	12(9.7%)	11(8.6%)		
Economic ability	Top	8(6.5%)	7(5.5%)	0.49	.781
	Medium	108(87.1%)	110(85.9%)		
	Down	8(6.5%)	11(8.6%)		
Last semester grade	< 3.5	63(50.8%)	65(50.8%)	0.00	.997
	≥ 3.5	61(49.2%)	63(49.2%)		
personality	Extrovert	31(25.0%)	12(9.4%)	10.87	.004
	Introspective	19(15.3%)	23(18.0%)		
	Mixed	74(59.7%)	93(72.6%)		
Number of consultations (Semester)		2.58 ± 2.98	2.00 ± 1.42	1.99	.047
Human relationship conflict experience	Not at all	50(40.3%)	30(23.4%)	9.96	.007
	Sometimes.	71(57.3%)	89(69.5%)		
	Frequently	3(2.4%)	9(7.0%)		
Satisfaction of clinical practice	1-10	7.37 ± 1.44	5.71 ± 1.71	8.30	<.001
Nursing major satisfaction	1-10	6.92 ± 1.64	5.60 ± 1.79	6.07	<.001
Hospice education experience	Yes	18(14.5%)	21(16.4%)	0.17	.678
	No	106(85.5%)	107(83.6%)		
Well-Dying education experience	Yes	15(12.1%)	14(10.9%)	0.08	.773
	No	109(87.9%)	114(89.1%)		
Family or acquaintance death experience	Yes	78(62.9%)	86(67.2%)	0.50	.476
	No	46(37.1%)	42(32.8%)		
death experience of clinical practice	Yes	55(44.4%)	58(45.3%)	0.02	.879
	No	69(55.6%)	70(54.7%)		

*Fisher exact test

Table 2: Comparison of Degree of College Life Adjustment between Field Practice Adjustment of High Group and Low Group (N = 252)

Item	Field practice adjustment		t(p)
	High Group (n=124) Mean ± SD	Low Group (n=128) Mean ± SD	
College life adjustment	3.58 ± 0.40	3.21 ± 0.37	7.47(<.001)
Major satisfaction	3.62 ± 0.56	3.14 ± 0.60	6.50(<.001)
Major excellence	3.13 ± 0.62	2.84 ± 0.56	3.77(<.001)
Academic fidelity	3.94 ± 0.53	3.64 ± 0.55	4.35(<.001)
Interpersonal relationship	3.76 ± 0.44	3.39 ± 0.41	6.75(<.001)
Active coping	3.71 ± 0.46	3.43 ± 0.50	4.63(<.001)
Job preparation	3.12 ± 0.72	2.74 ± 0.65	4.37(<.001)

Table 3: Comparison of Degree of recognition of Death between Field Practice Adjustment of High Group and Low Group (N = 252)

Item	Field practice adjustment		t(p)
	High Group (n = 124) Mean ± SD	Low Group (n = 128) Mean ± SD	
Recognition of death	3.12 ± 0.34	3.18 ± 0.32	-1.44(.150)
Affirmation of death	3.27 ± 0.60	3.29 ± 0.54	-0.33(.737)
Denial of death	3.37 ± 0.59	3.45 ± 0.51	-1.13(.256)
Anxiety about death	2.84 ± 0.83	3.03 ± 0.80	-1.85(.065)
Concern of death	2.38 ± 0.80	2.66 ± 0.80	-2.71(.007)
Respect for life	3.32 ± 0.70	3.13 ± 0.59	2.36(.019)

The results of the present study showed no statistically significant difference between the two groups in death recognition according to adaptation to field practice. In the case of juniors and seniors, no statistically significant difference between the two groups is expected since education about death and hospice nursing is given mostly through courses in the major. In the case of interest in death and respect for life, however, significant differences between the two groups were found. These differences appear to reflect the intentions of student nurses to avoid the death of patients and nurse them well in the case of a high degree of adaptation to field practice, and the differences in some areas appear to be due to unclearly established death consciousness. Therefore, relevant education is necessary for the establishment of proper death recognition for nursing students.

CONCLUSION

The present study was conducted to identify nursing students' adaptation to college life and differences in death recognition according to their degree of adaptation to field practice. The degree of adaptation to college life and all subareas were higher for the HFPAS group than the LFPAS group. No statistically significant difference between the HFPAS group and the LFPAS group was found for death recognition. There were also no statistically significant differences in the subareas of the level of acceptance of death, the level of denial of death, and death anxiety, but the level of interest in death were higher for the LFPAS group than the HFPAS group, and respect for life were higher for the HFPAS group than the LFPAS group.

The findings of the present study are expected to be used as basic data for organizing the contents of programs for the improvement in the adaptation of

nursing students to major and field practice. A study is suggested in which a program that improves adaptation to major and positive death recognition is designed and implemented based on the present study and in which the effect of the program is investigated.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: adaptation to college life and recognition of death

REFERENCES

1. Park HJ., OH JW. The relationships of the clinical practice stress and the major satisfaction with the nursing professionalism of nursing college students, *Journal of Digital Convergence*, 2014;12(12):417-426. <https://doi.org/10.14400/JDC.2014.12.12.417>
2. Kim SH., Moon HK. Status and consciousness of freshman year 2004. *The Journal of Creativity Development Research*. 2005;8:1-48.
3. Kim SN., Kim HJ., Choi SO. Effects of a hospice and palliative care education program including meaning in life on attitudes toward end-of-life care and meaning in life among nursing college students, *The Journal of Korean Academic Society of Nursing Education*, 2011;17(3),454-463. <https://doi.org/10.5977/JKASNE.2011.17.3.454>
4. Barron D., West E., Reeves R. Tied to the job: Affective and relational components of nurse retention, *Journal of Health Service Research Policy*, 2007 Apr;12:46-51. <https://doi.org/10.1258/135581907780318419>

5. Park HS., Jeong KS. Influence of self-directed learning ability and creativity on college adjustment in nursing students, *The Korean Academic Society of Nursing Education*, 2013 Nov;19(4):549-557. <https://doi.org/10.5977/jkasne.2013.19.4.549>
6. An MS., Lee KJ. Awareness of good death and attitudes toward terminal care among geriatric hospital nurses, *Korean Journal of Hospice and Palliative Care*, 2014 Sep;17(3):122-133. <https://doi.org/10.14475/kjhpc.2014.17.3.122>
7. Kim HR. Attitude towards death, stress and attitude on the terminal care among medical ward nurses with terminal experience [master's thesis], [Pusan] Catholic university. 2014. 15-25p.
8. Yu EY., Yang YJ., Jung EY. Attitudes toward death awareness among department of health university students, *Journal of Digital Convergence*, 2017 May;5(5):241-251. DOI: <https://doi.org/10.14400/JDC.2017.15.5.241>
9. Kim KH., Kim KD., Byun HS., Chung BY. Spiritual well-being, self-esteem, and attitude to death among nursing students, *Journal of Korean Oncology Nursing*, 2010 Feb;10(1):1-9.
10. Koh M. S. The observational experience of labor and delivery by student nurses in the clinical setting. *Journal of Korean Academic Nursing*, 1997 27(4):892-900.
11. Suh MS. The study on the experience of psychiatric nursing practice among nursing students using Q-methodological approach. *Journal Korean Academic Psychiatric Mental Health Nursing*, 2001 Dec;10(4):686-698.
12. Choi YJ. Therapeutic effects of ojungyousik meditation on mental health state of nursing students. *Journal Korean Academic Psychiatric Mental Health Nursing*, 2006 12(2);127-135.
13. Faul F., Erdfelder E., Buchner A., Lang AG. Statistical power analyses using G*power 3.1: Tests for correlation and regression analyses, *Behavior Research Methods*. 2009 41(4):1149-1160. DOI: <http://doi.org/10.3758/BRM.41.4.1149>
14. Park SY. Development and validation of the college life adjustment instrument for nursing students [dissertation]. [Gyeonggi] DanKook University. 2017. 50-121p.
15. Cha YR. A study on the nurses' attitude to death in Korea - centering on university hospital in Jeollabuckdo province - [master's thesis]. [Jeollabuckdo] WonKwang University. 2005. 17-34p.
16. Kim SM. Factors affecting nursing students' activeness in clinical education. *Perspectives in Nursing Science*. 2017 14(1):32-36.

The Effects of Computer-Based Cognitive Rehabilitation Program (CoTras) on the Verbal Fluency of Korean Patients with Mild Dementia

Haewon Byeon

Department of Speech Language Pathology, Honam University, Gwangju, South Korea

ABSTRACT

Background/Objectives: The objectives of this study were to identify the effects of computer-assisted cognitive rehabilitation (CACR) program on the verbal fluency among the executive functions of the prefrontal lobe and provide the baseline data for the cognitive-linguistic rehabilitation of dementia patients.

Method/Statistical analysis: This study selected 25 patients who were diagnosed with mild dementia by a psychiatrist among the dementia patients. The subjects were randomly assigned to the treatment group (n=13), which conducted a CACR intervention program, and the control group (n=12), which carried out a traditional cognitive rehabilitation intervention program (e.g., pencil and paper, and table-top activity). CoTras was used for the CACR program. The controlled oral word association test (COWAT) was conducted to measure the cognitive level by using the computerized neurocognitive function test (CNT).

Findings: The results of ANCOVA showed that the changes in the semantic fluency (total score) and MMSE-K (total score) were significantly ($p<0.05$) different between the treatment group and the control group. The results of parameter estimation revealed that the semantic fluency of the treatment group was 1.8 higher than that of the control group on average and the difference was significant. Moreover, the MMSE-K of the treatment group was 1.1 higher than that of the control group on average and the difference was significant. On the other hand, the phonemic fluency was significantly increased after 4 weeks of treatment compared to baseline in both treatment and control groups. However, it was not significantly different between the treatment group and the control group.

Improvements/Applications: The results of this study suggest that the CACR program is more effective in improving the semantic fluency than the traditional cognitive rehabilitation program. Randomized controlled trials are needed to verify the effects of long-term CACR programs.

Keywords: *computer-assisted cognitive rehabilitation, language cognitive rehabilitation, dementia, verbal fluency, speech language pathology, CoTras*

INTRODUCTION

The elderly population of South Korea has grown rapidly due to aging. As of 2017, the elderly population is over 14% of the total population and it has entered the aged society¹. If the current trend continues, the elderly population will be 19.3% in 2030, becoming a super-aged society¹. Moreover, it is expected that the proportion of the elderly population will be over 40% in 2060¹.

As the elderly population increases, the number of patients with dementia also increases. As of 2012, the prevalence of dementia is estimated to be 9.18% of the elderly over 65 years and the number of patients

is estimated to be 541,000 people (male: 156,000 and female: 385,000)². If the trend persists, the prevalence of dementia of the elderly over 65 years will continue to increase and exceed 15%². The abrupt increase in the mental disorders of the elderly is becoming big individual and social problems.

Dementia is a disease group that is accompanied with at least three mental dysfunctions among various mental activities (e.g., language ability, memory ability, spatiotemporal ability, personality, and cognitive ability) and these intellectual malfunctions are continuously exacerbated. The Diagnostic and Statistical Manual of Mental Disorders³ of the American Psychiatric Association

defines dementia as the status showing complex cognitive disorders interfering with social life and occupational life along with various memory impairments. It accompanies with three or more among cognitive impairments such as agnosia, aphasia, frontal execution dysfunction, and decreased visuospatial function.

If the language and cognition problems persist, they will deteriorate the quality of life by limiting the ability to perform the daily life and will cause difficulties in maintaining social activities⁴. Among various symptoms, the dysfunctions of verbal memory and frontal execution are the main symptoms of dementia⁵⁻⁸. Particularly, the deterioration of executive function and selective attention, among the decline of various neurocognitive functions, are considered as the most sensitive items for predicting the onset of dementia in the mild cognitive dysfunction stage, which is the pre-dementia stage⁹⁻¹¹.

Elliott (2003)¹² defined the executive function as a high-level cognitive processing process that requires a coordination of various subordinate cognitive functions to achieve a specific goal. It is also called the frontal lobe function because it mainly depends on the function of the frontal cortex^{13, 14}. The executive function is a concept that transcends the cognitive function of a single dimension. There are various methods to evaluate it. These methods evaluate the ability to form abstract concepts, the ability to organize information in the working memory, the ability to selectively inhibit inappropriate responses, and the ability to regulate behaviors in a socially relevant manner. Various tests (e.g., stoop, switching, trail making test, and verbal fluency) are used to evaluate these domains¹³. Among them, verbal fluency can not only highly predict the occurrence of dementia with high reliability but also be used easily in the clinical situations without using a special tool⁹.

An executive function is an ability to control and regulate behavior for oneself and it is an essential element in learning or utilizing knowledge. The dysfunction of the executive function makes a patient experience strong frustration and stress and is highly likely to cause fatal damage to daily life^{15, 16}. Therefore, the cognitive-linguistic rehabilitation for maintaining the executive function of the frontal lobe is an important topic for the patient in the early stage of dementia.

Over the past decade, various studies have proved the effectiveness of the traditional cognitive-linguistic

rehabilitation (e.g., occupational therapy, art therapy, and music therapy) on the elderly with dementia^{17, 18}. However, although the traditional cognitive-linguistic rehabilitation is widely used in clinical practices, it is not fully structured and there is not enough information regarding the consistency of treatments and the results of training. These limitations restrict the application of this rehabilitation.

Recently studies have consistently reported that the computer-assisted cognitive rehabilitation (CACR) can improve the cognitive functions (e.g., executive function) and daily life¹⁹⁻²¹. The utilization of CACR is increasing because it is possible to conduct an individualized treatment by stimulating the damaged area, reduce the spatial and temporal costs, and adjust the difficulty of the training according to the individual's cognitive level¹⁹. Nevertheless, the experimental studies conducted in South Korea have evaluated the effectiveness of CACR on the patients with the neurologic disorder (e.g., stroke and traumatic brain injury)^{20, 22}. There are still not enough studies for examining the effectiveness of CACR on the cognitive-linguistic rehabilitation for patients in the early stage of dementia.

The objectives of this study were to identify the effects of CACR program on the verbal fluency among the executive functions of the prefrontal lobe and provide the baseline data for the cognitive-linguistic rehabilitation of dementia patients.

MATERIALS AND METHOD

Subjects: This study selected 25 patients who were diagnosed with mild dementia by a psychiatrist among the dementia patients who visited medical institutes located in Seoul, Incheon, and Gwangju from Oct 2016 to Feb 2017. Among these 25 patients, 13 patients were assigned to a treatment group and 12 patients were assigned to a control group. Before conducting the experiment, the objectives and intentions of the study were explained to patients and patients' guardians in terms of the research ethics and the written and verbal consents of participants were received.

The selection criteria of the subjects are as follows: (1) who did not have issues in vision, hearing, and visual perception in order to conduct a task; (2) who could communicate; (3) whose Korean version of expanded clinical dementia rating (CDR) results fell between

0.5 and 1; (4) who did not have mental retardation; (5) who had been taking psychiatric medication for more than one year after being diagnosed as dementia and were taking the same amount of medication during the treatment period; and (6) who did not participate in a CACR treatment program before. The subjects were randomly assigned to the treatment group (n=13), which conducted a CACR intervention program, and the control group (n=12), which carried out a traditional cognitive rehabilitation intervention program (e.g., pencil and paper, and table-top activity) [Figure 1].

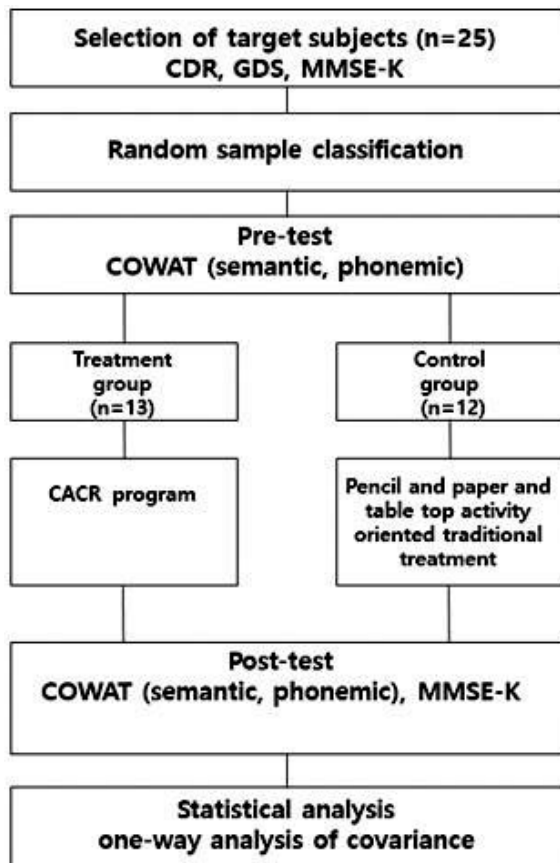


Figure 1: Design of research

Measurement

Procedure of the Program: This study was conducted from Oct 10, 2017, to Jan 9, 2018, for twelve weeks. One session was 30minutes and there were four sessions per week (total 48 sessions). One session was composed of 5 minutes of preparation time, 20 minutes for conducting a program for each activity area, and 5 minutes for sharing thoughts and wrapping up.

CACR: CoTras²² was used for the CACR program. CoTras is composed of five domains: visual perception training, attention training, memory training, orientation

training, and other training (e.g., categorization and ordering)[Figure 2], [Figure 3]. The treatment group received a sequential language recall memory training (finding a figure by a name: 1-5 steps), an association recall memory training (pairing: 1-5 steps), a language categorization memory training (grouping: 1-5 steps), and an integrated language memory training (story memorization: 1-4 steps). The subjects did not receive any cognitive treatment during the experimental period of conducting the CoTras.

Traditional Cognitive Treatment: The control group received the traditional cognitive treatment centered on pencil and paper and table top activity with excluding computer-based treatments. The program was composed of a recall memory training, an association recall memory training, a language categorization memory training, and an integrated language memory training.



Figure 2: Computer-based cognitive rehabilitation program for Koreans: CoTras



Figure 3: Examples of memory training in CoTras

COWAT: The controlled oral word association test (COWAT)²⁴ was conducted to measure the cognitive level by using the computerized neurocognitive function test (CNT). The COWAT is composed of semantic fluency and phonemic fluency. The semantic fluency

was evaluated by speaking words in the ‘animal’ category (e.g., dog and cat) as many words possible within one minute and recording correct responses. The phonemic fluency was carried out by asking a subject to say words starting with ‘/k/’ as many as possible within one minute. The evaluation method is the same as the semantic fluency test. An evaluator records all responses of the subject during the one minute and adds one point for each correct response. In this study, the COWAT was measured by summing the semantic COWAT and the phonemic COWAT.

CDR: The Korean version of expanded clinical dementia rating (CDR) ²³ is a measure of the cognitive and social functions of the elderly with dementia. It is based on the evaluation of six domains such as memory, orientation, judgment, social activities, family life and hobbies, problem-solving, and personal management. It uses a 7-point scale for judging the level of clinical dementia. A higher point indicates a severer degree of dementia.

GDS: The Korea version of global deterioration scale (GDS) ²⁵ is a tool to evaluate the progress of dementia. It is used at the beginning of dementia and can confirm the progress of dementia. The GDS consists of seven steps and each step has one 7-point scale item. A higher point indicates a severer cognitive impairment.

MMSE-K: The Korean mini-mental state examination (K-MMSE) ²⁶ is a common tool to screen dementia and can evaluate the level of the cognitive function quantitatively. It has been widely used because the reliability and the validity of the test are proven. The test consisted of 30 items encompassing orientation, memory, attention, and calculation ability, memory recall, and language and visuospatial ability. It uses a 2-point Likert scale. A higher point indicates a healthier mental status. The reliability of this study was .921.

Longest Occupation: The longest occupation was evaluated based on the response to “What is the longest occupation in your lifetime?” The surveyed occupations can be compared internationally. Based on the 6th Korean Standard Classification of Occupations ²⁷, the responses were reclassified into physical labor (e.g., technician, farmer, fishery, and forester), non-physical labor (e.g., clerk), and not economically active population (e.g., homemaker and unemployed). The not economically active population was added to the conventional classification for this study.

STATISTICAL ANALYSES

We originally aimed to conduct repeated measures ANOVA in order to identify the effects of the intervention on the two groups after the CACR program intervention. However, because the study had a small sample size and the pre-test score and the post-test score were autocorrelated, ANCOVA was used to analyze the changes in verbal fluency and cognitive function after receiving the treatment with using the semantic fluency and phonemic fluency of the pre-test as covariates. All statistical analyses were conducted using IBM SPSS version 24.0 (IBM Inc., Chicago, Illinois).

RESULTS

General Characteristics of Subjects: The general characteristics of the subjects are shown in Table 1. Chi-square test and independent sample t-test were conducted to determine the difference between the groups at the baseline status. There was no significant difference between the groups in age, gender, education level, and longest occupation.

Table 1: The general characteristics of the subjects

Variables	Control group (n = 12)	Treatment group (n = 13)	p
Age (year±SD)	76.53 ± 5.82	74.85 ± 6.31	0.350
Gender			0.870
Male	3	3	
Female	9	10	
Education level (year)	5.65 ± 4.80	5.93 ± 5.12	0.510
Longest occupation, n(%)			0.453
Physical labor	2 (16.7)	2 (15.4)	
Non-physical labor	2 (16.7)	2 (15.4)	
Not economically active population	8 (66.6)	9 (69.2)	

Control group=pencil and paper and table top activity oriented traditional treatment; Treatment group=CACR program

Changes in Semantic Fluency, Phonemic Fluency, and Overall Cognition Level by Intervention Program: A pre-test and a post-test were conducted to evaluate the changes in verbal fluency and overall cognition level of the treatment group (CACR program) and the control group (pencil and paper and table top activity oriented traditional treatment) by intervention method [Table 2].

The interaction between the pre-test and treatment was analyzed in order to test if the data satisfied the basic assumptions of ANCOVA. The results showed that the interaction was not significant so it was confirmed that the pre-test and the slope of the regression analysis were identical between the two groups. Moreover, the Levene test revealed that their variances were homogeneous.

Table 2: Changes in Semantic Fluency, Phonemic Fluency, and Overall Cognition Level by Intervention Program

Variables	Control group		Treatment group		P
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	
COWAT					
Semantic	8.38 ± 5.25	10.39 ± 4.33	8.15 ± 6.13	12.03 ± 5.15	<0.001
Phonemic	1.05 ± 2.30	1.42 ± 2.85	1.08 ± 2.60	1.58 ± 2.88	0.567
MMSE-K	16.41 ± 4.10	18.58 ± 3.88	16.15 ± 4.51	19.35 ± 4.27	0.015

Control group = pencil and paper and table top activity oriented traditional treatment; Treatment group =CACR program

DISCUSSION

This study applied the CACR program to patients with mild dementia for four weeks and found that it significantly improved the verbal fluency and overall cognition level. Although it is impossible to directly compare with the results of other studies due to differences in software programs, previous studies have also proved that various CACR programs improved the cognitive function. Lee, Kim, & Han (2012)²⁸ reported that the 4-week RehaCom program improved the problem-solving ability of brain damage patients. Moreover, Jeong et al. (2010) showed that the 5-week COMCOG program significantly increased the daily activity execution ability, cognitive functions (e.g., cognition level determination test, and job performance satisfaction²⁹). Similar results were reported in another study using RehaCom, which is one of the CACR programs. It not only significantly improved the concentration and memory but also significantly enhanced the overall cognitive level and functional independence measure³⁰. Additionally, Galante et al. (2007) applied the CACR program for twelve times to patients with Alzheimer’s dementia and found that the cognitive function of dementia patients did not change over time, while that of those who did not receive the CACR program significantly decreased. The results suggested that the CACR was effective in delaying the progress of cognitive decline in dementia patients and agreed with the results of this study³¹.

The previous studies that reported the cognitive rehabilitation effect of CACR explained that the CACR program was more interesting and increased the active participation and motivation because the CACR was more realistic and 3-dimensional compared to the paper and pencil task³². Moreover, the cognitive rehabilitation is believed to be effective because the training tasks of it can be adjusted easily to various difficulty levels compared to the traditional cognitive rehabilitation and it is also possible to conduct an individualized training suitable for the level of a patient³³. The results of this study suggested that the CACR is effective for enhancing specific cognitive functions such as verbal fluency as well as the overall cognitive function.

Another major finding of this study was that the CACR program improved the semantic fluency of the Korean elderly with mild dementia more than the traditional cognitive program but two programs were not different in the phonemic fluency. This result can be explained by two assumptions.

First, it is suspected that it is difficult to grasp the fine improvement of the phonemic fluency of Korean by only measuring the number of correct responses in the verbal fluency test⁹. The cross-sectional study of Byeon (2014)⁹ evaluated the predictive power of the naming test as a dementia screening test for 594 elderly Koreans and found that phonemic fluency was not a significant predictor for determining the mild dementia

of the elderly after adjusting all confounding variables including Apolipoprotein E epsilon 4 gene (APOE-e4), a dementia gene. The clustering and the switching, that moves word to a lower category, are important in the cognitive process of verbal frequency so it is difficult to evaluate the verbal frequency only using the number of correct responses³⁴.

Another speculation is that the task given in this study may be less related to the phonemic fluency for testing the phonetic language fluency and more related to the semantic fluency. Future studies evaluating the effectiveness of the CACR program by measuring the phonemic fluency are required to conduct qualitative analyses (e.g., semantic clustering, phonemic clustering, and switching) as well as quantitative analyses.

CONCLUSION

The results of this study suggest that the CACR program is more effective in improving the semantic fluency than the traditional cognitive rehabilitation program. Randomized controlled trials are needed to verify the effects of long-term CACR programs.

Ethical Clearance: The study protocol was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Source of Funding: This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2018R1D1A1B07041091).

Conflict of Interest: None of the authors have any conflicts of interest or financial ties to disclose.

REFERENCES

1. Cho MJ. The Prevalence and risk factors of dementia in the Korean elderly. *Health and Welfare Forum*. 2009;156:43-8.
2. Clinical Research Center for Dementia of South Korea. Clinical practice guideline for dementia, Part I: diagnosis & evaluation. Seoul: Clinical Research Center for Dementia of South Korea; 2011.
3. Castillo RJ, Carlat DJ, Millon T, Millon CM, Meagher S, Grossman S, et al. Diagnostic and statistical manual of mental disorders. Washington, DC: American Psychiatric Association Press; 2007.
4. Li H, Li J, Li N, Li B, Wang P, Zhou T. Cognitive intervention for persons with mild cognitive impairment: a meta-analysis. *Ageing Res Rev*. 2011 Apr;10(2):285-96. DOI.org/10.1016/j.arr.2010.11.003.
5. Byeon H, Lee Y, Lee SY, Lee KS, Moon SY, Kim H, et al. (2015). Association of alcohol drinking with verbal and visuospatial memory impairment in older adults: Clinical Research Center for Dementia of South Korea (CREDOS) study. *Int Psychogeriatr*. 2015 Mar;27(3):455-61. DOI.org/10.1017/S104161021400146X.
6. Henry JD, Crawford JR, Phillips LH. (2004). Verbal fluency performance in dementia of the Alzheimer's type: a meta-analysis. *Neuropsychologia*. 2004;42(9), 1212-22. DOI.org/10.1016/j.neuropsychologia.2004.02.001.
7. Byeon HW, Jin H, Cho S. Development of Parkinson's disease dementia prediction model based on verbal memory, visuospatial memory, and executive function. *J Med Imaging Health Inform*. 2017 Nov;7(7):1517-21. DOI.org/10.1166/jmih.2017.2196.
8. Byeon H. Verbal and visuospatial memory deficits in mild cognitive impairment: a cross-sectional study. *Information Tokyo*. 2014;17(12 (A)):6319-24. Available from: <https://search.proquest.com/openview/77c765813e98eed4d5bffc69d3c071f1/1?pq-origsite=gscholar&cbl=936334>
9. Byeon H. Could naming test really differentiate among mild cognitive impairment, mild dementia and normal elderly?. *Information Tokyo*. 2014;17(12 (A)), 6267-72. Available from: <https://search.proquest.com/openview/77c765813e98eed409edd382fd769aab/1?pqorigsite=gscholar&cbl=936334>
10. Mariani E, Monastero R, Mecocci P. Mild cognitive impairment: a systematic review. *J Alzheimers Dis*. 2007 Aug;12(1):23-35. DOI: 10.3233/JAD-2007-12104.
11. Byeon H. A prediction model for mild cognitive impairment using random forests. *Int J Adv Comput Sci Appl*. 2015;6(12):8-12.
12. Elliott R. Executive functions and their disorders: Imaging in clinical neuroscience. *Br Med Bull*. 2003 Mar;65(1):49-59. DOI.org/10.1093/bmb/65.1.49.

13. Alvarez JA, Emory E. Executive function and the frontal lobes: a meta-analytic review. *Neuropsychol Rev.* 2006 Mar;16(1):17-42.
14. Stuss DT, Knight RT. Principles of frontal lobe function. London: Oxford University Press; 2002.
15. Johnson J.K, Lui LY, Yaffe K. Executive function, more than global cognition, predicts functional decline and mortality in elderly women. *J Gerontol A Biol Sci Med Sci.* 2007 Oct;62(10):1134-41. DOI.org/10.1093/gerona/62.10.1134.
16. Martyr A, Clare L. Executive function and activities of daily living in Alzheimer's disease: a correlational meta-analysis. *Dement Geriatr Cogn Disord.* 2012;33(2-3):189-203. DOI.org/10.1159/000338233.
17. Raglio A, Bellelli G, Mazzola P, Bellandi D, Giovagnol AR, Farina E, et al. Music, music therapy and dementia: a review of literature and the recommendations of the Italian Psychogeriatric Association. *Maturitas.* 2012 Aug; 72(4):305-10. DOI.org/10.1016/j.maturitas.2012.05.016.
18. Chancellor B, Duncan A, Hatterjee A. Art therapy for Alzheimer's disease and other dementias. *J Alzheimers Dis.* 2014 Aug;39(1):1-11. DOI:10.3233/JAD-131295.
19. Hwang JH, Kim SJ. The effect of computer-assisted cognitive rehabilitation program on memory in the dementia: Case report. *Journal of the Korean Society of Assistive Technology.* 2011;3(1):53-63.
20. Shin SH, Kim JS, Kim YK. The effects of a computer-assisted cognition training program (RehaCom®) in stroke patients. *Brain & Neurorehabilitation.* 2008 Sep;1(2):181-9. DOI.org/10.12786/bn.2008.1.2.181.
21. Cicerone KD, Langenbahn DM, Braden C, Malec JF, Kalmar K, Fraas M, et al. Evidence-based cognitive rehabilitation: updated review of the literature from 2003 through 2008. *Arch Phys Med Rehabil.* 2011 Apr;92(4):519-30. http://DOI.org/10.1016/j.apmr.2010.11.015.
22. Kim YG. The effects of Korean computer-based cognitive rehabilitation program (CoTras) for the cognition and ADL in stroke. *J Korean Soc Occup Ther.* 2011;19(3):75-88.
23. Choi SH, Na DL, Lee BH, Hahm DS, Jeong JH, Yoon SJ, et al. Estimating the validity of the Korean version of expanded clinical dementia rating (CDR) scale. *J Korean Neurol Assoc.* 2001 Nov;19(6): 585-91.
24. Wild K, Howieson D, Webbe F, Seelye A, Kaye J. Status of computerized cognitive testing in aging: a systematic review. *Alzheimers Dement.* 2008 Nov;4(6):428-37. http://DOI.org/10.1016/j.jalz.2008.07.003.
25. Choi SH, Na DL, Lee BH, Hahm DS, Jeong JH, Jeong Y, et al. The validity of the Korean version of Global Deterioration Scale. *J Korean Neurol Assoc.* 2002 Nov;20(6):612-17.
26. Kang Y, Na DL, Hahn S. (1997). A validity study on the Korean Mini-Mental State Examination (K-MMSE) in dementia patients. *J Korean Neurol Assoc.* 1997 Apr;15(2):300-8.
27. Korea National Statistical Office. The Korean standard classification of occupations. Dejeon: Ministry of Employment and Labor; 2007.
28. Lee HR, Kim JY, Han DS. A survey on the cognitive rehabilitation of occupational therapy in Korea. *J Korean Soc Occup Ther.* 2012 May;20(2):73-84.
29. Jeong WM, Hwang YJ, Youn JC. Effects of a computer-based cognitive rehabilitation therapy on mild dementia patients in a community. *J Korean Geriatr Soc.*2010;30(1):127-40.
30. Oh BH, Kim YK, Kim JH, Shin YS. (2003). The effects of cognitive rehabilitation training on cognitive function of elderly dementia patients. *J Korean Neuropsychiatr Assoc.* 2003 Jul;42(4):514-9.
31. Galante E, Venturini G, Fiaccadori C. (2007). Computer-based cognitive intervention for dementia: preliminary results of a randomized clinical trial. *G Ital Med Lav Ergon.* 2007 Jul;29(3 Suppl B):B26-32. Available from: <https://www.researchgate.net/publication/5279667>
32. Lee HJ, Kim KD, Kim BR. The systematic discussion of a study on the application of computerized cognitive rehabilitation on patient with dementia in Korea. *Journal of The Korean Society of Integrative Medicine.* 2017;5(4), 83-89. DOI:10.15268/ksim.2017.5.4.083.

33. Cipriani G, Bianchetti A, Trabucchi M. Outcomes of a computer-based cognitive rehabilitation program on Alzheimer's disease patients compared with those on patients affected by mild cognitive impairment. *Arch Gerontol Geriatr.* 2006 Dec;43:327-35. DOI.org/10.1016/j.archger.2005.12.003.
34. Troyer AK, Moscovitch M, Winocur G. Clustering and switching as two components of verbal fluency: evidence from younger and older healthy adults. *Neuropsychology.* 1997 Jan;11(1):138-46.

Is the Combined Application of Tongue Pressure Training and Tongue Base Exercise More Effective in Improving the Strength of Tongue and Lips in Korean Patients with Flaccid Dysarthria

Haewon Byeon

Department of Speech Language Pathology, Honam University, Gwangju, South Korea

ABSTRACT

Background/Objectives: The objective of this study was to identify the effects of the tongue-pressure exercise protocol and the traditional orofacial exercise on the articulation muscle and percentage of correct consonants of the patients with dysarthria.

Method/Statistical analysis: This study was performed on 21 patients who were diagnosed with flaccid dysarthria due to stroke. The subjects were randomly divided into a control group (tongue-pressure protocol only; n=11) and a treatment group (tongue-pressure protocol and tongue base exercise; n=10). The maximal tongue strength (kPa) and the maximum lip strength (kPa) were estimated by measuring those three times and choosing the highest number.

Findings: The results of ANCOVA showed that the maximal tongue strength, maximal lip strength, and articulation accuracy were significantly different between the two groups ($p < 0.05$). The results of parameter estimation revealed that the treatment group had 3.5kPa higher maximal tongue strength and 1.0 kPa higher maximal lip strength than the control group. On the other hand, the correct articulation (%) was higher in the post-test than the pre-test in both groups, but there was no significant difference between groups.

Improvements/Applications: The results of this study showed that the combined rehabilitation program consisting of the tongue-pressure protocol and tongue base exercise improved the maximal tongue strength and maximal lip strength significantly more than the single rehabilitation program consisting only of the tongue-pressure protocol.

Keywords: *tongue pressure training protocol, tongue base exercise, dysarthria, speech language pathology, maximum tongue strength, the maximal lips strength*

INTRODUCTION

Dysarthria includes speech disorders due to the muscle control disorder of the speech mechanism (e.g., the paralysis, weakness, and incoordination of articulation muscle) owing to the damage of the central or peripheral nervous system¹. The dysarthria is not composed of a group showing the same symptom and the etiology of the disease is very complex. The dysarthria can be classified into spastic dysarthria, flaccid dysarthria, ataxic dysarthria, hypokinetic dysarthria, hyperkinetic dysarthria, unilateral upper motor neuron dysarthria, and mixed dysarthria according to the lesion and speech characteristics². Although it varies by the type, patients with dysarthria generally show the paralysis, weakness, and incoordination of muscles. Therefore, the intensity,

speed, the range of motion, and accuracy of speech is deteriorated and they experience difficulties in oral communication³⁻⁸.

The ultimate goal of the speech intervention strategy of dysarthria speakers is to improve the clarity of articulation^{2,9}. Therefore, it focuses on treating abnormal sounds or changing the major variables of articulation characteristics^{2,9}. Previous clinical studies have focused on controlling the changes in rhythm¹⁰, the articulation speed¹¹, and the training for increasing the vocal intensity¹² of speakers with dysarthria. Particularly, patients with flaccid dysarthria among patients with dysarthria experience difficulties in speech due to various clinical characteristics (e.g., weakness, hypomytonia, and shrinkage of the oral articulation organ)¹³. The oral articulation organ includes the tongue,

lips, and velum and the motor functions of the tongue and lips are important in a speech ².

Many studies have confirmed that the patients with dysarthria had significantly lower oral motor functions than healthy adults ^[1]. However, the relationship between the oral motor function and speech production and the non-speech oral motor treatment based on it are still controversial. Some studies showed that orofacial exercise enhanced the speech production of children and adults with dysarthria ¹⁴. However, other studies reported that they are not related because non-speech oral motor and speech production have different brain activation ¹⁵. Several studies, which reviewed evidence-based previous studies, also indicated that there is not enough evidence that oral motor treatment improved the speech production ^{16,17}.

Although previous studies have shown contradictory results, many speech-language therapists are still using the orofacial exercise to promote the speech production of patients with dysarthria. Especially, since several studies have confirmed that the swallowing function and the speech production are related ¹⁸, the effectiveness of orofacial exercise for enhancing the speech production of patients with dysarthria has been reconsidered.

On the other hand, the tongue-pressure training protocol is used as a non-speech exercise therapy for the purpose of improving the strength and accuracy of the tongue. Yeates et al. (2008) ¹⁹ developed the tongue-pressure training protocol based on the previous studies ^{20, 21} that tongue-exercise helped the increase of the tongue size and strength and reported that the protocol improved the strength and accuracy of the tongue.

Particularly, the tongue-pressure exercise is known to promote the recovery of tongue size and strength²¹. More recent studies reported that the combined application of the tongue-pressure exercise protocol and the traditional orofacial exercise significantly enhanced the recovery of the oral functions of the stroke patients with dysphagia²². However, the effects of the combined therapy of the tongue-pressure exercise protocol and the traditional orofacial exercise on the patients with dysarthria have not been confirmed yet. Therefore, it is urgent to prove the effects.

The objective of this study was to identify the effects of the 4-week long the tongue-pressure exercise protocol and the traditional orofacial exercise on the articulation muscle and percentage of correct consonants of the patients with dysarthria due to the stroke. The results of this study will provide baseline data for establishing the

basis of the non-oral motor therapy for the patients with flaccid dysarthria.

MATERIALS AND METHOD

Subjects: This study was performed on 21 patients who were diagnosed with flaccid dysarthria due to stroke in Seoul and Incheon rehabilitation hospitals from October 01, 2017, to January 31, 2018. All subjects participated in the study with the written consent of the subjects or guardians. The selection criteria of the subjects are as follows: (1) who did not have a problem in hearing and auditory comprehension for performing the given task; (2) who could communicate; (3) who were not classified as severe cognitive impairment with MMSE-K ²³ score equal to or larger than 17; (4) who could take the Iowa Oral Performance Instrument (IOPI) to measure the maximum pressure score of the oral-facial muscle strength; and (5) who did not receive a tongue-pressure training protocol. The subjects were randomly divided into a control group (tongue-pressure protocol only; n=11) and a treatment group (tongue-pressure protocol and tongue base exercise; n=10) [Figure 1].

Measurement

Tongue-Pressure Training Protocol: The conducted tongue-pressure training protocol consisted of isometric tongue strength exercise and isometric tongue accuracy exercise by using Iowa Oral Performance Instrument 8-2201 (IOPI, Carnation WA; IOPI medical, USA). IOPI is an instrument to exercise by pressing the air filled bulb, located on the palate, with the tongue ^{19, 24, 25}. This rubber bulb is located at the front or back of the mouth and shows the pressure (KPa; kilopascals) on the connected LCD [Figure 2]. The location of the IOPI application is shown in Figure 3.

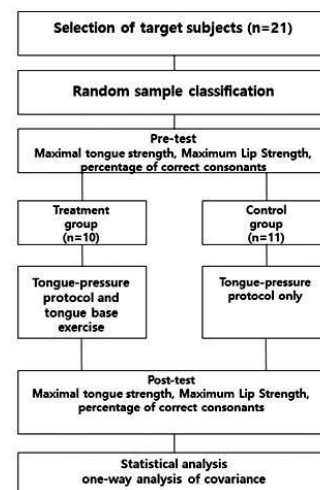


Figure 1: Design of research



Figure 2: Iowa Oral Performance Instrument (IOPI)

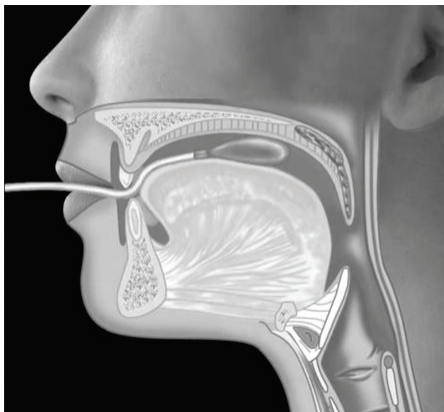


Figure 3: Location of IOPI

The tongue-pressure training protocol consisted of two exercise programs based on Yeates et al. (2008) ¹⁹. The first is an isometric tongue strength exercise. The exercise was performed by pressing the air filled rubber bulb placed at the behind of the upper front teeth with the tongue (=one time). One set was five times and a subject conducted it four sets. Moreover, the air filled rubber bulb was placed at the center of the hard palate. Pressing it with the middle of the tongue was considered one time and one set was composed of five times. A subject conducted it four sets. The second is an isometric tongue accuracy exercise. The accuracy exercise was designed to train the accurate motion of the tongue by

pre-setting the 50%, 75%, and 100% of the maximum isometric tongue strength measured during the isometric tongue accuracy exercise without exceeding 10KPa from the pre-set value.

Orofacial Exercise: The tongue based exercise was used for the orofacial exercise. The tongue based exercise instructs a tongue movement to a patient and the patient performs the movement [Figure 4], [Table 1]. The control conducted the tongue-press training protocol 30minutes per day and five times per week for four weeks. The treatment group performed the tongue base exercise additional to the tongue-pressure training program under the same condition.

Percentage of Correct Consonants: The correct consonants (%) was calculated by dividing the number of correctly pronounced target phonemes out of 37 test words (assessment of phonology and articulation for children (APAC) ²⁶) by seven (the total target phonemes) and multiplying it by 100.

Maximal tongue strength & Maximum Lip Strength: The maximal tongue strength (kPa) and the maximum lip strength (kPa) were estimated by measuring those three times using IOPI and choosing the highest number.



Figure 4: Example of tongue base exercise

Table 1: The procedure of the tongue base exercise

Name	Type	Description
Raising the tip of the tongue	Active Exercise	With closing the lips, raise the tip of the tongue as much as possible and maintain it for 5 seconds. Conduct it with opening the lips.
Raising the tip of the tongue with overcoming the resistance	Resistance Exercise	With opening the lips, raise the tip of the tongue as much as possible with resisting the pressure of a tongue depressor and maintain it for 5 seconds.

Conted...

Moving the tongue left and right	Active Exercise	With closing the lips, move the tongue left and right and maintain each pose for 5 seconds. Conduct it with opening the lips.
Moving the tongue left and right with overcoming the resistance	Resistance Exercise	With closing the lips, move the tongue left and right with resisting the pressure of a tongue depressor. Maintain each pose for 5 seconds.
Pushing the tongue out	Active Exercise	With closing the lips, push the tongue as straight as possible and as far as possible and hold the pose for five seconds. Conduct it with opening the lips.
Pushing the tongue out with overcoming the resistance	Resistance Exercise	With opening the lips, push the tongue as straight as possible and as far as possible resisting the pressure of a tongue depressor. Hold the pose for five seconds.

Statistical Analysis: We originally intended to conduct repeated measures of ANOVA in order to evaluate the effects of programs on the maximal tongue strength, maximum lip strength, and articulation accuracy after the intervention. However, we conducted one-way analysis of covariance (ANCOVA) instead of repeated measures of ANOVA because the same size was too small and the pre-test score could affect the post-test score. ANCOVA used the maximal tongue strength, maximum lip strength, and consonant accuracy, which were pre-scores, as covariates to analyze the changes in the outcome variables after treatments. All statistical analyses were conducted using IBM SPSS version 24.0 (IBM Inc., Chicago, IL, USA).

RESULTS

General Characteristics of Subjects: The general characteristics of the subjects are shown in Table 2. Chi-squared test and independent sample t-test were conducted to determine the difference between the groups at the baseline stage. The results showed that there was no significant difference between the groups in terms of age, gender, and education level.

Changes in maximal tongue strength, maximal lips strength, and articulation accuracy according to intervention method: Pre-test and post-test were conducted to the treatment group (tongue-pressure protocol & tongue base exercise) and the control group (tongue-pressure protocol) in order to identify the changes in maximal tongue strength, maximal lip strength, and articulation accuracy by the intervention method (Table 3). The interaction between the pre-test and treatment was analyzed in order to test if the data satisfied the basic assumptions of ANCOVA. The

results showed that the interaction was not significant so it was confirmed that the pre-test and the slope of the regression analysis were identical between the two groups. Moreover, the Levene test revealed that their variances were homogeneous.

The results of ANCOVA showed that the maximal tongue strength, maximal lip strength, and articulation accuracy were significantly different between the two groups (p<0.05). The results of parameter estimation revealed that the treatment group had 3.5kPa higher maximal tongue strength and 1.0 kPa higher maximal lip strength than the control group. On the other hand, the correct articulation (%) was higher in the post-test than the pre-test in both groups, but there was no significant difference between groups.

Table 2: The general characteristics of the subjects

Variables	Control group (n = 11)	Treatment group (n = 10)	p
Age (year ± SD)	67.03 ± 7.60	65.85 ± 9.23	0.433
Sex			0.420
Male	10	11	
Female	5	6	
Level of education (year)	9.65 ± 2.13	9.47 ± 2.86	0.860
Time since stroke (month), n(%)			<0.001
≤12	8	5	
>13	3	5	

Control group=Tongue-pressure protocol only; Treatment group=Tongue-pressure protocol and tongue base exercise

Table 3: Changes in maximal tongue strength, maximal lips strength, and articulation accuracy according to intervention method

Variables	Control group		Treatment group		p
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	
MTS, kPa	11.38 ± 8.14	17.92 ± 15.12	10.76 ± 9.77	20.80 ± 16.88	0.043
MLS, kPa	6.10 ± 3.52	9.30 ± 4.35	5.86 ± 3.81	10.13 ± 5.43	<0.001
CA, %	76.48 ± 13.31	79.13 ± 15.50	73.15 ± 15.85	77.47 ± 17.18	0.670

MTS = maximal tongue strength; MLS = maximal lip strength; CA = correct articulation

DISCUSSION

The maximal tongue strength and maximal lips strength significantly improved more when tongue-pressure training protocol and tongue base exercise were performed together than when only tongue-pressure training protocol was applied alone. However, the two groups did not show a significant difference in the correct articulation. The results revealed that tongue-pressure training protocol and tongue base exercise were effective in increasing the maximal tongue strength and maximal lips strength, while they were not effective in enhancing the correct articulation.

The results can be interpreted in two ways. First, it is possible the strength of the oral muscles did not affect the correct articulation. Researchers who denied the importance of oral muscle strength in the speech production emphasize that the speech production only needs 10-20% of the maximal muscle strength^{15,27}. These results support the results of this study.

Second, it is possible that the correct articulation was already improved sufficiently by performing only the tongue-pressure protocol. The results of this study showed that the correct articulation increased approximately 3% in the post-test compared to the pre-test in both treatment and control groups. The results implied that the combined training of the tongue-pressure protocol and the tongue base exercise was more effective than the tongue-pressure protocol only training in increasing the oral muscle strength but the combined training did not significantly improve the correct articulation compared to the tongue-pressure protocol only. The fact that the maximal strength of that tongue and lips that are directly related to articulation affects the correct articulation is the evidence of this possibility³. However, since this study measured the variables only twice (before and after the treatment), this study

could not fully interpret the changes of effects according to the time of treatment. A longitudinal study using repeated measures of ANOVA is needed to verify the treatment effects over time. Furthermore, future studies are needed to evaluate the effects of the tongue-pressure protocol and orofacial exercise on diverse orofacial motor functions (e.g., the range and directions of tongue motion, fatigue, endurance, masticatory function, and masticatory intensity) as well as the maximal strengths of the tongue and lips.

CONCLUSION

The results of this study showed that the combined rehabilitation program consisting of the tongue-pressure protocol and tongue base exercise improved the maximal tongue strength and maximal lip strength significantly more than the single rehabilitation program consisting only of the tongue-pressure protocol. However, there was no difference in the correct articulation between the two groups. Although the correct articulation is related to the strength of the tongue and lips, it reflects various elements required for speech production such as respiration, resonance, and vocalization in addition to articulation muscles. Future studies are needed to analyze additional variables such as respiration and resonance in addition to correct articulation in order to examine the combined effects of the tongue-pressure protocol and tongue base exercise on the speech production of the patients with dysarthria.

Ethical Clearance: The study protocol was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Source of Funding: This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2018S1A5A8028249).

Conflict of Interest: None of the authors have any conflicts of interest or financial ties to disclose.

REFERENCES

1. Crary MA. Developmental motor speech disorders (Neurogenic communication disorders). San Diego: CA: Singular Publishing Group; 1993
2. Kent RD, Duffy JR, Slama A, Kent JF, Clift A. Clinicoanatomic studies in dysarthria: review, critique, and directions for research. *J Speech Lang Hear Res.* 2001 May;44(3), 535-551. DOI:10.1044/1092-4388(2001/042).
3. Freed DB. Motor speech disorders: diagnosis and treatment. San Diego: Thomson Learning; 2000.
4. Byeon H. The acoustic characteristics of Korean diphthongs in speakers with flaccid and hypokinetic dysarthria. *Information Tokyo.* 2014 Oct;17(10B): 5297-5302. Available from: <https://search.proquest.com/openview/9830573b4b5ba7e42e27f164147dd8ca/1?pq-origsite=gscholar&cbl=936334>
5. Byeon H. Comparing the acoustic character of diphthong production between flaccid dysarthria and spastic dysarthria. *Commun Sci Disord.* 2010;15(1):66-78.
6. Cho SH, Jin HK, Byeon H. Analysis on vowel formant variation of amyotrophic lateral sclerosis by using Spectrogram: a longitudinal case study. *Information Tokyo.* 2016 Nov;19(11B), 5497-5502. Available from: <https://search.proquest.com/openview/00c49611fe2113e294765ba12198206c/1?pq-origsite=gscholar&cbl=936334>
7. Byeon H, Yu S, Cho S. (2016). Characteristics of Amyotrophic Lateral Sclerosis speakers drawn out through Spectral and Cepstral analysis. *Information Tokyo.* 2016 Nov;19(11B):5491-5496. Available from: <https://search.proquest.com/openview/4ee4554dc41f5fcb82b3ae7827817d90/1?pq-origsite=gscholar&cbl=936334>
8. Byeon H, Jin H, Cho S. Characteristics of hypokinetic dysarthria patients' speech based on sustained vowel phonation and connected speech. *International Journal of u-and e-Service, Science and Technology.* 2016 Oct;9(10):417-422.
9. Palmer R, Enderby P. Methods of speech therapy treatment for stable dysarthria: A review. *Advances in Speech Language Pathology.* 2007 Jul;9(2):140-53. DOI.org/10.1080/14417040600970606.
10. Schulz GM, Grant MK. Effects of speech therapy and pharmacologic and surgical treatments on voice and speech in Parkinson's disease: a review of the literature. *Clin Commun Disord.* 2000 Jan;33(1):59-88. [http://DOI.org/10.1016/S0021-9924\(99\)00025-8](http://DOI.org/10.1016/S0021-9924(99)00025-8).
11. Hong S, Byeon H. Speech Rate and Pause Characteristics in Speaker with Flaccid Dysarthria. *J Korea Acad Industr Coop Soc.* 2014;15(5):2930-6. DOI:10.5762/KAIS.2014.15.5.2930.
12. Fox CM, Boliek CA. (2012). Intensive voice treatment (LSVT LOUD) for children with spastic cerebral palsy and dysarthria. *J Speech Lang Hear Res.* 2012 Jun;55(3):930-45. DOI:10.1044/1092-4388(2011/10-0235).
13. Jordan LC, Hillis AE. Disorders of speech and language: aphasia, apraxia and dysarthria. *Curr Opin Neurol.* 2006 Dec;19(6):580-5. DOI: 10.1097/WCO.0b013e3280109260.
14. Bigenzahn W, Fischman L, Mayrhofer-Krammel U. (1992). Myofunctional therapy in patients with orofacial dysfunctions affecting speech. *Folia Phoniatr Logop.* 1992;44(5):238-44. <http://DOI.org/10.1159/000266155>.
15. Bunton K, Weismer G. (1994). Evaluation of a reiteration force-impulse task in the tongue. *J Speech Lang Hear Res.* 1994 Oct;37(5):1020-31.
16. Lass NJ, Pannbacker M. (2008). The application of evidence-based practice to nonspeech oral motor treatment. *Language, Speech, and Hearing Service in Schools.* 2008 Mar;39(3):408-21. DOI:10.1044/0161-1461(2008/038).
17. McCauley RJ, Strand E, Lof GL, Schooling T, Frymark T. Evidence-based systematic review: effects of nonspeech oral motor exercises on speech. *Am J Speech Lang Pathol.* 2009 Nov;18(4):343-60. DOI:10.1044/1058-0360(2009/09-0006).
18. Chang SJ, Sim HS, Kwon M. Relationship between chewing skills and speech intelligibility

- in Korean children with spastic cerebral palsy. *The Japan Journal of Logopedics and Phoniatics*. 2012;53(1):20-6. <http://DOI.org/10.5112/jjlp.53.20>.
19. Yeates EM, Molfenter SM, Steele CM. (2008). Improvements in tongue strength and pressure-generation precision following a tongue-pressure training protocol in older individuals with dysphagia: three case reports. *Clin Interv Aging*. 2008 Dec;3(4):735-47.
20. Robbins J, Gangnon RE, Theis SM, Kays SA, Hewitt AL, Hind JA. The effects of lingual exercise on swallowing in older adults. *J Am Geriatr Soc*. 2005 Sep;53(9):1483–9. DOI: 10.1111/j.1532-5415.2005.53467.x.
21. Robbins J, Kays SA, Gangnon RE, Hind JA, Hewitt AL, Gentry LR, et al. The effects of lingual exercise in stroke patients with dysphagia. *Arch Phys Med Rehabil*. 2007 Mar;88(2):150–158. DOI.org/10.1016/j.apmr.2006.11.002.
22. Won YS. The effects of oropharyngeal exercise combined with tongue pressure training protocol on swallowing function in stroke patients with dysphagia. *Journal of Special Education & Rehabilitation Science*. 2012;51(2):57-71.
23. Park JH. Standardization of Korean version of the Mini-Mental State Examination (MMSE-K) for use in the elderly. Part II. Diagnostic validity. *J Korean Neuropsychiatr Assoc*. 1989;28:508-513.
24. Clark HM, Solomon NP. Age and sex differences in orofacial strength. *Dysphagia*. 2012 Mar;27(1):2-9. DOI:10.1007/s00455-011-9328-2.
25. Hardy E, Robinson NM. Swallowing disorders treatment manual. 2nd ed. Texas: TX:Pro-Ed; 2004.
26. Kim MJ, Pae S, Park C. Assessment of phonology and articulation for children. Seoul: Human Brain Research & Consulting; 2007.
27. Bunton K, Weismer G. Evaluation of a reiterant force-impulse task in the tongue. *J Speech Lang Hear Res*. 1994 Apr;37:1020-31. DOI:10.1044/jshr.3705.1020.

A Study on General Hospital Nurses' Acceptance of New Medical Technology

Eunju Heo

Lecture, Dept. of Business Administration & Ph. D., Candidate, Dept. College of Nursing, Gyeongsang National University, 501, Jinju-daero, Jinju, KOREA

ABSTRACT

Background/Objectives: This study was designed to examine factors affecting general hospital nurses' behavioral intention to use new medical technology, if introduced, by using the Technology Acceptance Model. So this study is to understand the acceptance of new technology of nurses with self- efficacy and innovativeness of external variables of TAM.

Method/Statistical analysis: The subjects were 140 general hospital nurses who agreed to participate in this study. With a questionnaire form, the study surveyed the participants. Of the collected sheets of the form, 8 ,unfaithfully filled in, was excluded and the remaining 132 were analyzed here using the descriptive statistics, t-test, Mann-Whitney U test, Kruskal-Wallis test, correlation analysis and the multi-regression analysis in accordance with SPSS WIN 20.0.

Findings: General hospital nurses surveyed in this study showed significant differences in perceived usefulness and behavioral intention to use depending on marital status. Those nurses' innovativeness, perceived usefulness and behavioral intention to use varied significantly depending on age. Their level of education was a factor of significant difference in innovativeness and self-efficacy. The surveyed nurses' position brought their innovativeness, self-efficacy, perceived usefulness and behavioral intention to use to be significantly different. For the nurses, positive correlations were found among innovativeness, self-efficacy, perceived ease of use and perceived usefulness. Most affecting perceived ease of use was found perceived usefulness, followed by innovativeness. Both of the factors explained 62.0% of perceived ease of use. General hospital nurses' behavioral intention to use new medical technology was significantly affected by their perceived usefulness, but not by their perceived ease of use.

Improvements/Applications: Information or educational programs for an effective acceptance of new medical technology should be supported by strategies that lead nurses to recognize and innovatively accept the usefulness of such technology.

Keywords: TAM, Health care, Nurses, Perceived usefulness, Perceived ease of use

INTRODUCTION

Keeping pace with dramatic changes in the field of health and medicine, recently, some university hospitals in Korea have brought in an artificial intelligence-based medical diagnosis system called Watson. In a similar vein, the government of the country has begun to increase investment in the 4th industry-based medical technology. These moves including the use of new medical technology are expected to help better decision-makings by medical professionals, especially nurses who spend most of time in caring patients, ultimately contributing to the more specialization of nurses. By the way, terms regarding

technology in the era of the 4th industry, which were presented in Davos Forum, include robot engineering, artificial intelligence, clouding, big data, Internet of Things, linked data, 3D printing, bio technology and body-technology convergence^[1].

For the last decade, there has been a significant improvement in medical services thanks to the introduction of big data, cloud computing and Internet of Things(IoT)^[2]. E-Health Service allows risk prevention and advance treatment by facilitating nursing care and providing patient data^[3]. M-Health allows nurses to do the health management of patients and families, including

chronic disease management, without geographical, temporal or organizational barriers and burden of service costs^[4]. New technology like these, already attracting global attention, has yet to be practically attempted or theoretically considered in Korea, suggesting the need to research in relation to local introduction of such technology based on the 4th industry.

Such types of new medical technology as foresaid are currently attracting global attention, but have been little dealt with in this country. Examples of new medical technology that have been actively researched abroad include compact sensors that detect patients' blood pressure to be utilized as information^[5], wireless sensors that are worn by patients and transmit their skin temperature to medical professionals^[6], hand-washing monitoring sensors that allow medical professionals to monitor the hygienic state of their hands on a real-time basis^[7] and interactive gaming devices that provide child patients with the opportunity of learning while being in hospital^[8]. Thus, E-Health Service allows nurses to practice nursing more easily. It also provide patient data efficiently, preventing health-related risks of patients and making it possible to do advance treatment. In a similar vein, M-Health contributes to solving the health problems of patients and families by providing all of them with health management services that are free of geographical, temporal or organizational barriers and high costs to use^[9]. The ultimate goal of new medical technology such as ICT, M-Health, E-health and big data is to effective raise the quality of patient health which is the indicator of medical business performance. Whether the performance can be really successful with new medical technology depends on how much nurses intend to accept such technology, that is, their behavioral intention to use the technology. In other words, the very first step towards a successful introduction of new medical technology to the field of nursing from the beginning is determining whether and examining how much nurses have the behavioral intention to use such technology.

Previous research have mainly used Technology Acceptance Model(TAM) to explain the intention to accept new technology. TAM is an appropriate model for understanding the individual's intention to accept technology. According to TAM theory, perceived ease of use(PEOU) and perceived usefulness(PU) are two key factors influencing technology adoption. TAM is a theory to explain or predict personal intention of acceptance,

according to which the behavioral intention to use new technology is influenced by perceived usefulness and perceived ease of use^[10]. These belief-related or outside factors were identified by early TAM research^[11]. TAM was studied by adding new variables^[12].

Along with medical market development, now, TAM research has also been attempted on medical services, proving that the model considerably predicts or explains medical professionals' behavioral intention to use ICT technology^[13] and finding that nurses' optimism has a significant effect on their perceived ease of use and perceived usefulness both of which in turn significantly influences the nurses' intention of technology acceptance^[14]. In spite of its advantages, new technology is not easy to be settled in the medical institution. The behavioral intention by medical professionals including nurses to use new medical technology is influenced by both their perceived usefulness of that technology and their perceived ease of using it. To determine the degree to which medical professionals perceive new medical technology as useful or easy to use require understanding their cultures, emotions, habits, personalities and competence to use such technology^[15]. Another obstacles to the acceptance of new medical technology may include the complications of technology itself, political conflicts among groups of technology users and resistance or rejection by nurses or physicians. These obstacles need to be eliminated^[16].

Anyway, leading medical professionals to positively change their behaviors towards accepting new medical technology requires understanding their personal mechanism for the acceptance^[17]. Nurse's personal capacity is especially important for the acceptance of new technology. For medical institutions, understanding factors that affect their personnel's behavioral intention to use new medical technology is necessary for making efficient investments in such technology. Investing equipment in a medical institution is an economic burden. In particular, the cost of technology-based equipment is very high. So this study was designed as an attempt to examine factors influencing general hospital nurses' behavioral intention to use new medical technology. This study is to understand the acceptance of new technology of nurses with self-efficacy and innovativeness of external variables of TAM. Innovativeness is a personal trait that an individual is willing to try out new information technology^[18]. Self-efficacy is a judgment of the ability

to use technology to achieve a specific task^[19]. TAM was used. The objectives of the study are as follows.

Objective 1: Examining how general hospital nurses are different in innovativeness, self-efficacy, perceived ease of use, perceived usefulness and behavioral intention to use depending on their demographic characteristics

Objective 2: Examining relationships among general hospital nurses’ innovativeness, self-efficacy, perceived ease of use, perceived usefulness and behavioral intention to use

Objective 3: Identifying factors that influence general hospital nurses’ intention to accept new medical technology

MATERIALS AND METHOD

Participants: Data was collected by conducting a survey. Participants of this study were nurses from 4 general hospitals who agreed to receive the questionnaire survey given the objectives of the study under their nursing manager’s approval. The survey period was January 1~30, 2018. Nurses who worked in the survey for less than 6 months were excluded. The number of the participants was determined using G*Power program(3.0.1), through which the number of samples required for this study was found 132. In the meantime, the test power of .95, significance level of .05, effect size of .10 and 4 independent variables were designated as conditions for the multi-regression analysis. Considering dropout rates, this study distributed the form of questionnaire to

140 nurses. Of the collected sheets of the form, then, 132 were analyzed here except 8 that were deemed as unfaithfully filled in.

Data analysis and Measures: The questionnaire, which was based on previous research^[11,20], contained items measuring innovativeness(IT), self-efficacy(SE), perceived ease of use(PEoU) and perceived usefulness(PU), behavioral intention to use(BI) on the 5-point Likert scale(5 for strongly agree ~ 1 for strongly disagree). Data from survey with the questionnaire in this study were processed using the descriptive statistics, t-test, non-parametric tests, correlation analysis and the multi-regression analysis. Before the survey, the study got an e-mail consent from the copyright holder of the questionnaire, and then somewhat modified and supplemented it for this research. Items contained in the questionnaire comprised 4 questions for each of the above mentioned variables and questions asking about the participants’ demographic characteristics. To know the validity and reliability of the data, meanwhile, the exploratory factor analysis(EFA) and the reliability analysis with Cronbach’s alpha were made. The analysis found over .80 of data reliability. EFA using the Bartlett test identified a statistically significant level of data validity with KMO=.926, approximate Chi-square=2531.550, df=190 and p=.000. Also, eigen-value was over 1.0 and factor loading value over .593, both accounting for 82.21% of total variance. Table 1 shows the measurement items of the questionnaire, and the test results of data reliability and validity.

Table 1: Survey Scales and Items, Their Source, Internal Consistencies and Item Loadings

Construct	Measurement Item	Factor loading value	Cronbach’s alpha	Source
IT	I’m positive towards the use of new information technology.	.593	.889	[11]
	I tend to purchase or use new, innovative goods earlier than others.	.802		
	I tend to use new technology earlier than my colleagues.	.880		
	I’m in most cases innovative.	.804		
SE	I can collect information with new medical technology.	.759	.928	
	I can do problem-solving with new medical technology.	.754		
	I’m confident in mastering new medical technology.	.739		
	I’m confident in understanding how to use new medical technology.	.682		

Conted...

PEoU	It would be easy to learn how to use new medical technology.	.756	.898	[20]
	It would be easy to get accustomed to using new medical technology.	.755		
	It would be easy to use new medical technology.	.844		
	There would be no trouble in using new medical technology.	.748		
PU	New medical technology would help achieve my goals.	.806	.932	
	New medical technology would help perform my job efficiently.	.851		
	The use of new medical technology would help perform my job conveniently.	.799		
	New medical technology would often be useful.	.755		
BI	I intend to use new medical technology.	.811	.950	
	When new medical technology is introduced, they will be actively used.	.797		
	I will often use new medical technology.	.763		
	I am generally favorable about new medical technology.	.716		

RESULTS AND DISCUSSION

Nurses’ Demographic Characteristics and Difference by Variable: Of the subjects whose responses were analyzed in this study, 3(2.3%) were male and 129(97.7%) female. 83(62.9%) were unmarried and 49(37.1%) married. 63(47.7%) were 20 to 29 in age. 95(72.0%) were staff in position. The normality test to determine inter-variable differences found that all of the variables, except marital status, fail to satisfy normality. This is why this study made non-parametric tests, whose results are shown in Table 2. How general hospital nurses surveyed in this study were significantly different from each other in innovativeness(IT), self-efficacy(SE), perceived ease of use(PEoU), perceived usefulness(PU) or behavioral intention to use(BI) depending on their demographic characteristics can be described as follows. Marital status brought significant differences in perceived usefulness($t=2.729$, $p=.007$) and behavioral intention to use($t=2.444$, $p=.016$). Innovativeness($\chi^2=14.56$, $p=.002$), perceived usefulness($\chi^2=16.55$, $p=.001$) and behavioral intention to use ($\chi^2=14.82$, $p=.002$) all varied significantly depending on age. The level of education made innovativeness($\chi^2=12.40$, $p=.006$) and self-efficacy($\chi^2=8.46$, $p=.037$) significantly different. And position brought significant differences in innovativeness($\chi^2=11.08$, $p=.011$), self-efficacy($\chi^2=11.86$, $p=.008$), perceived usefulness($\chi^2=12.37$, $p=.006$) and behavioral intention to use($\chi^2=15.90$, $p=.001$).

Table 2: Nurses’ Demographic Characteristics and Difference by Variable <N = 132>

Variables	Category	N(%)	IT		SE		PEoU		PU		BI				
			M ± SD	z/t/ χ^2 (p)	M ± SD	z/t/ χ^2 (p)	M ± SD	z/t/ χ^2 (p)	M ± SD	z/t/ χ^2 (p)	M ± SD	z/t/ χ^2 (p)			
Gender	Male	3(2.3)	2.67 ± 0.72	-1.146	3.25 ± 0.25	-567	3.17 ± 1.26	-272	3.58 ± 0.80	-331	4.17 ± 1.10	-863			
	Female	129(97.7)	3.19 ± 0.72	(.257)	3.46 ± 0.69	(.571)	3.30 ± 1.26	(.786)	3.70 ± 0.65	(.741)	3.77 ± 0.71	(.388)			
Marital status	no	83(62.9)	3.26 ± 0.73	1.732	3.52 ± 0.70	1.513	3.34 ± 0.62	1.694	3.81 ± 0.61	2.729	3.90 ± 0.78	2.444			
	yes	49(37.1)	3.04 ± 0.69	(.086)	3.34 ± 0.62	(.133)	3.14 ± 0.65	(.093)	3.51 ± 0.55	(.007)	3.60 ± 0.56	(.016)			
Age (yr)	20-29	63(47.7)	2.96 ± 0.71	14.56	3.27 ± 0.62	5.50	3.10 ± 0.63	5.67	3.48 ± 0.57	16.55	3.61 ± 0.56	14.82			
	30-39	30(22.7)	3.08 ± 0.63		3.45 ± 0.59		(.139)		3.25 ± 0.56		5.67		3.63 ± 0.60	(.001)	3.69 ± 0.65
	40-49	31(23.5)	3.53 ± 0.84		3.60 ± 0.89		3.43 ± 0.78		3.91 ± 0.73		4.00 ± 0.94				
	50-59	8(6.1)	3.40 ± 0.35		3.45 ± 0.60		3.41 ± 0.83		4.25 ± 0.44		4.28 ± 0.41				
Level of education	college	42(31.8)	3.10 ± 0.63	12.40	3.42 ± 0.59	8.46	3.10 ± 0.55	6.25	3.68 ± 0.66	7.29	3.82 ± 0.64	3.60			
	Bachelor	45(34.1)	2.98 ± 0.73		3.27 ± 0.73		(.037)		3.11 ± 0.59		6.25		3.55 ± 0.53	(.063)	3.63 ± 0.68
	Master	36(27.3)	3.42 ± 0.68		3.69 ± 0.68		3.30 ± 0.78		3.84 ± 0.72		3.84 ± 0.80				
	Doctorate	9(6.8)	3.56 ± 0.83		3.61 ± 0.54		3.027 ± 0.77		4.00 ± 0.67		4.14 ± 0.80				

Conted...

Position	Director	5(3.7)	3.85 ± 0.70	11.08 (.011)	3.75 ± 0.35	11.86 (.008)	3.55 ± 0.96	5.70 (.127)	4.00 ± 0.61	12.37 (.006)	4.30 ± 0.54	15.90 (.001)
	Head	8(6.1)	3.72 ± 0.54		4.12 ± 0.50		3.75 ± 0.57		4.40 ± 0.46		4.63 ± 0.46	
	middle	24(18.2)	3.14 ± 0.73		3.28 ± 0.72		3.23 ± 0.60		3.60 ± 0.53		3.59 ± 0.57	
	staff	95(72.0)	3.10 ± 0.70		3.42 ± 0.66		3.22 ± 0.64		3.65 ± 0.66		3.74 ± 0.73	

Gender : Mann-Whitney U test/Age, Education , Work : Kruskal-Wallis test

Correlation analysis: Correlations between the variables were analyzed here to know the following. Innovativeness($r=.563, p<.001$), self-efficacy($r=.660, p<.001$), perceived ease of use($r=.573, p<.001$), and perceived usefulness($r=.738, p<.001$) were all found having positive correlations with behavioral intention to use. More details are shown in Table 3.

Table 3: Correlation Analysis

Variables	IT	SE	PEoU	PU	BI
IT	1				
SE	.667***	1			
PEoU	.561***	.675***	1		
PU	.452***	.625***	.536***	1	
BI	.563***	.660***	.573***	.738***	1
*** $p<.001$					

Factors Affecting Behavioral Intention to Use: Table 4 shows the results of multi-regression analysis that this study made to examine the influences of innovativeness(IT), self-efficacy(SE), perceived ease of use(PEoU)and perceive usefulness(PU) on behavioral intention to use(BI). Hypotheses for that analysis was supported by the multi-linearity test that identified the variance inflation factor(VIF) of below 10, tolerance of over 1.0 and the Durbin-Watson statistics of 1.783. The above mentioned factors, as the significance test showed, significantly accounted for 62.0% of behavioral intention to use($F= 54.84, P<.001$). The factor having the biggest influence on behavioral intention to use was perceived usefulness($\beta=.507, p=.000$), followed by innovativeness($\beta=.171, p=.022$).

Compared to this study, previous research^[14] showed that behavioral intention to use new medical technology is not significantly influenced by self-efficacy, but significantly affected by innovativeness. Also, it was previously found^[21] that the behavioral intention by medical professionals including nurses to use new medical technology is significantly influenced by their perceived usefulness of such technology. Furthermore, previous research^[22] showed that nurses’ self-efficacy and innovativeness significantly affect their perceived usefulness of new medical technology that in turn has a significant effect on their behavioral intention to use such technology. Thus, this study confirmed that nurses’ behavioral intention to use new medical technology is most influenced by their perceived usefulness of such technology, followed by their innovativeness, while previous research showed that variables are different in the power of influence on the behavioral intention to use.

Table 4: Regression Coefficients of Predictors on Behavioral Intention to Use

Variables	B	SE	β	t	p	Tolerance	VIF
IT	.171	.073	.171	2.325**	.022	.533	1.877
SE	.176	.094	.166	1.871	.064	.265	2.741
PEoU	.102	.084	.092	1.220	.225	.503	1.987
PU	.563	.078	.507	7.219***	.000	.585	1.709
$R^2=.63, \text{Adjusted } R^2=.62, F=54.84, p < .001; **p<.005 \text{ ***}p<.001$							

CONCLUSION

This study tried to examine factors that influence general hospital nurses' behavioral intention to use new medical technology by using Technology Acceptance Model(TAM). For the examination, the study made a questionnaire survey of some general hospital nurses. Of the sheets of the questionnaire form which were collected after being filled in by those nurses, 132 were analyzed here using SPSS WIN 20.0. The analysis showed that general hospital nurses' behavioral intention to use new medical technology was most influenced by their perceived usefulness of such technology, followed by their innovativeness, both of the influential factors explaining 62.0% of the behavioral intention. Also, it was shown that general hospital nurses were different in the foresaid perceived usefulness and innovativeness depending on their demographic characteristics such as marital status, age, level of education and position. In more details, general hospital nurses' innovativeness was significantly different from each other depending on their age, level of education or position. Also, those nurses were significantly different from each other in self-efficacy depending on their level of education or position. In addition, general hospital nurses' marital status, age and position were all found bringing significant difference in their perceived usefulness of new medical technology. Furthermore, the nurses' behavioral intention to use new medical technology was found significantly varying depending on their marital status, age or position. However, any demographic characteristic of general hospital nurses didn't involve their significant difference in perceived ease of use.

Based on its findings, this study makes the following suggestions. First, medical establishments that want to provide their nurses with information or education programs concerning new medical technology should take supportive strategies should take supportive strategies to make the usefulness of such technology better recognized and innovatively accepted by the nurses as they keep in mind that nurses' behavioral intention to use new medical technology is significantly affected by their perceived usefulness of such technology and innovativeness. In this study, general hospital nurses' innovativeness refers to their attitude in which they are willing to use new information technology or willing to use new or innovative products than any other does. This attitude is, as found in the study, an important factor that influences general hospitals' behavioral intention to

use. In this research, general hospital nurses' perceived usefulness means that they perceive new medical technology would be effective and convenient if used in nursing. The research showed that general hospital nurses' behavioral intention to use new medical technology was significantly affected by their perceived usefulness, but not by their perceived ease of use. Here, that there's no significant effect of general hospital nurses' perceived ease of use on their behavioral intention may suggest that newly introduced medical technology are less likely to be perceived by the nursing professionals as what to be easily learned or mastered because they tend to think that any new technology related to nursing or medical service require a lot of efforts to learn and master.

In the smooth introduction and settlement of new medical technology that practically costs high, it may be quite helpful for medical institutions to take and implement supportive strategies that include providing nurses with information about new medical technology and providing educational programs that lead nurses to perceive such technology as useful and innovative. By the way, it should be noted here that findings of this study need to be more carefully interpreted. This is partly because there's few other similar research locally made to be comparable with this study and partly because 132 general hospital patients as participants are not enough to generalize the study. In the future, it's needed to sample more nurses of different positions and hospitals of different types and check out outside variables related to TAM before researching nurses' behavioral intention to use new medical technology.

Second, internal marketing strategies that improve general hospital nurses' behavioral intention to use new medical technology should be built up provided the fact that perceive usefulness and innovativeness, both of which influence behavioral intention to use, vary depending on demographic characteristics is reflected. For example, this study showed that general hospital nurses who were 50 to 59 in age and managerial in position were higher in perceived usefulness, innovativeness and behavioral intention to use. In the field of nursing, it's almost unexceptional that nurses who are higher in age and position are those who are more experienced in nursing. More experiences in nursing lead to more awareness and expectations of new medical technology and, accordingly, higher behavioral intention to use such technology as found in this study. In other words, more experienced nurses could be innovators who take

the lead in making new medical technology introduced and accepted to the field of nursing. In this country, the teaching and learning of nursing practices are usually made in the mentor-mentee relationship. Here, mentors are in most cases nurses who have more experiences in nursing practice while, mentees nurses who are younger and lower-positioned. By the way, the mentors directly or indirectly influence the mentees' decision-makings while teaching them nursing practices. This suggests that more experienced nurses who are older and higher-positioned could naturally contribute to raising their disciplined younger nurses' behavioral intention to use new medical technology because the former nurses have a direct or indirect effect on the latter ones, which needs to be seriously considered by medical institutions.

Thus, future research needs to focus on programs for the improvement of behavioral intention to use, which are customized in accordance with nurses' demographic characteristics, and examine the effects of the programs. Regarding its limitations, by the way, this study is difficult to be generalized because it used the convenience sampling of general hospital nurses and because it used a self-reported questionnaire which might have not guaranteed the objectiveness of responses from nurses.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Badri A, Boudreau-Trudel B, Souissi AS. Occupational health and safety in the industry 4.0 era: A cause for major concern?. *Safety Science*. 2018 Nov;109:403-11. DOI:10.1016/j.ssci.2018.06.012.
2. Elhoseny M, Abdelaziz A, Salama AS, Riad AM, Muhammad K, Sangaiah AK. A hybrid model of internet of things and cloud computing to manage big data in health services applications. *Future Generation Computer Systems*. 2018 Sep;86:1383-94. DOI:10.1016/j.future.2018.03.005.
3. Bauer G. Delivering value-based care with E-health services. *Journal of Healthcare Management*. 2018 Jul;63(4):251-60. DOI:10.1097/JHM-D-18-00077.
4. Silva BM, Rodrigues JJ, de la Torre Díez I, López-Coronado M, Saleem K. Mobile-health: A review of current state in 2015. *Journal of Biomedical Informatics*. 2015 Aug;56:265-72. DOI:10.1016/j.jbi.2015.06.003.
5. Crosby GV, Ghosh T, Murimi R, Chin CA. Wireless body area networks for healthcare: A survey. *International Journal of Ad Hoc, Sensor & Ubiquitous Computing*. 2012 Jun;3(3): 1-26.
6. Rotariu C, Costin H, Pasarica A, Cristea C, Dionisie B. Wireless Skin Temperature measurement system for circadian rhythm monitoring. *Proc. of the IEEE 4th International Conference E-Health and Bioengineering*. 2013 Nov:21-3. DOI:10.1109/EHB.2013.6707345.1.
7. Baslyman M, Rezaee R, Amyot D, Mouttham A, Chreyh, R, Geiger, et al. Real-time and location-based hand hygiene monitoring and notification: proof-of-concept system and experimentation. *Personal and Ubiquitous Computing*. 2015 Jul;19(3-4):667-88. DOI:10.20381/ruor-67111.
8. Vicini S, Bellini S, Rosi A, Sanna A. An internet of things enabled interactive totem for children in a living lab setting. In *Engineering, Technology and Innovation (ICE), 2012 18th International ICE Conference on, IEEE*. 2012 June:1-10. DOI:10.1109/ICE.2012.6297713.
9. Silva BM, Rodrigues JJ, de la Torre Díez I, López-Coronado M, Saleem K. Mobile-health: A review of current state in 2015. *Journal of Biomedical Informatics*. 2015 Aug;56:265-72. DOI:10.1016/j.jbi.2015.06.003.
10. Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*. 1989 Sep;13(3):319-40. DOI:10.2307/249008.
11. Venkatesh V, Davis FD. A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*. 2000 Feb;46(2):186-204. DOI:10.1287/mnsc.46.2.186.11926.
12. Davis FD, BagozziRP, Warshaw PR. User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, 1989 Aug;35(8), 982-1003. DOI:10.1287/mnsc.35.8.982.

13. Melas CD, Zampetakis LA, Dimopoulou A, Moustakis V. Modeling the acceptance of clinical information systems among hospital medical staff: an extended TAM model. *Journal of Biomedical Informatics*. 2011 Aug;44(4):553-64. DOI:10.1016/j.jbi.2011.01.009.
14. Kuo KM, Liu CF, Ma CC. An investigation of the effect of nurses' technology readiness on the acceptance of mobile electronic medical record systems. *BMC Medical Informatics and Decision Making*. 2013 Aug;13(88):1-14. DOI:10.1186/1472-6947-13-88.
15. Lee Y, Kozar KA, Larsen KR. The technology acceptance model: Past, present, and future. *Communications of The Association for Information Systems*, 2003 Dec;12(1):752-80.
16. Lapointe L, Rivard S. Getting physicians to accept new information technology: insights from case studies. *Canadian Medical Association Journal*. 2006 May;174(11):1573-78. DOI:10.1503/cmaj.050281.
17. Godin G, Bélanger-Gravel A, Eccles M, Grimshaw J. Healthcare professionals' intentions and behaviours: A systematic review of studies based on social cognitive theories. *Implementation Science*, 2008 Jul;3(1):1-12. DOI:10.1186/1748-5908-3-36.
18. Ngafeeson MN, Sun J. The effects of technology innovativeness and system exposure on student acceptance of e-textbooks. *Journal of Information Technology Education: Research*, 2015 Win;14: 55-71.
19. Alenezi AR, Karim A. (2010). An empirical investigation into the role of enjoyment, computer anxiety, computer self-efficacy and internet experience in influencing the students' intention to use e-learning: A case study from Saudi Arabian governmental universities. *Turkish Online Journal of Educational Technology-TOJET*, 2010 Oct;9(4), 22-34.
20. Hwang J, Yu HS. A study of factors affecting the intention to use a mobile easy payment service: An integrated extension of TAM with perceived risk. *The Journal of Information Technology and Architecture*. 2016 Jun;13(2):291-306. http://210.101.116.36/journalSearch/ISS_Detail.asp?key=3455604&tname=kiss2002&code.
21. Aggelidis V P, Chatzoglou PD. Using a modified technology acceptance model in hospitals. *International Journal of Medical Informatics*. 2009Feb;78(2):115-26. DOI:10.1016/j.ijmedinf.2008.06.006.
22. Hsiao JL, Wu WC, Chen RF. Factors of accepting pain management decision support systems by nurse anesthetists. *BMC Medical Informatics and Decision Making*, 2013 Jan;13(1):1-13. DOI:10.1186/1472-6947-13-16.

Effect of Rest Interval on Total Work, Systolic Blood Pressure and Numerical Rating Scale during 65% 1RM Bench Press Exercise

Chul Yoon¹, Sung-SikKo², Chun-Ho Yang³, Ki-Hong Kim⁴

¹Dept.ofPhysical Education, Dankook University; ²Dept. of Sports and Health Care, Korea National University of Transportation; ³Dept. of Marine Sports, Hanseo University; ⁴Dept. of Recreation and Leisure Studies, Dankook University

ABSTRACT

Background/Objectives: We investigated the total work, systolic blood pressure, and numerical rating scale at 65% bench press according to the differences in rest time between sets in 8 males aged in their 20s.

Method/Statistical analysis: The subjects of this study included 8 healthy males in their 20s, and living in C city. Following signed voluntary agreement, the bench presses of these subjects under three resting time conditions were cross-distributed. The data were verified with repeated measures' two-way ANOVA and Contrast's repeated method was applied for post-hoc comparison. The significance value was $\alpha < .05$.

Findings: First, the total work decreased significantly as the set progressed. Second, systolic blood pressure did not show any significant difference. Third, in the initial set, the short rest condition (1 min) tended to be higher than the long rest condition (3 to 5 min), but the tendency was reversed as the set progressed.

Improvements/Applications: As the rest interval between sets increases, the total momentum increases. As the rest interval between sets decreases, the NRS value increases. During the 65% bench press all-out exercise, systolic blood pressure was 181-186 mmHg under all conditions.

Keywords: Bench press, Total work, Rest interval, Systolic Blood Pressure, Numerical Rating Scale

INTRODUCTION

Studies have been conducted to achieve exercise goals most effectively by combining the main factors underlying resistance exercise prescription such as exercise intensity, number of sets, number of repetitions, rest interval between sets, exercise order, movement speed, and exercise frequency. Until now, research has been conducted to combine the main elements of resistance exercise prescription to achieve the most effective exercise¹. Modifying only one of these factors led to varying training outcomes. It is important to understand the interaction of these factors for safe and effective training². Exercise intensity and rest

interval between sets are the most important factors in resistance exercise program planning³. The rest interval between sets was an important factor affecting the one-time response to the resistance program and the long-term adaptation⁴. Also, the condition of the rest time not only affected the performance of the next set⁵, but also the metabolism⁶, hormones⁷, and cardiovascular responses⁸. Previous studies have suggested that rest interval between sets should range from 3 to 5 min, 1 to 3 min, and 1 min, respectively, in order to improve the maximum strength, hypertrophy and endurance⁹. On the other hand, it is necessary to define an appropriate rest interval considering the characteristics of the study subjects and the specificity of sports⁴. Resistance training for muscle endurance does not provide a clear rest interval between sets when compared with resistance training for hypertrophy¹⁰. A study of long-term strength training was more effective, and in the case of long rest intervals than in short rest intervals in improving muscle strength^{11, 12}. In case of maximum strength exercise using multi-joint, a rest interval of more than 3 ~ 5 min

Corresponding Author:

Ki-Hong Kim

Professor, Dept. of Recreation and Leisure Studies,
Dankook University, Cheonan, 31116, Korea

Email: bodykim@hanmail.net

is recommended ¹³. ¹² reported 5-week training results: the group with a 30-s rest time showed a 2% increase in muscle strength, while a group with a 3-min rest time showed a 7% increase in muscle strength. In addition, ^[11], showed that the group observing a rest time of 160s compared with the group with the 40-s rest time showed a 5~8% greater improvement in muscle strength. Training with 20-60 s of short rest interval between sets improved the repetition speed during repetitive sub-maximum exercise and increased the maximum torque during high-intensity exercise, which effectively improved muscle contraction and power, In order to improve muscle endurance, it is advantageous to use a short rest interval between sets ⁷. However, ^{14, 15} and ¹⁶, reported that the number of repetitions decreases under short rest intervals between sets. The effective rest interval for improving muscle endurance is still disputed. Changes in blood pressure during resistive training are dependent on cardiac output and peripheral blood vessel resistance, and resistance training during the cardiovascular response is directly affected by the amount of training and intensity of exercise ¹⁷. Systolic blood pressure increases directly in proportion to exercise intensity in endurance training ¹⁸. At rest, the systolic blood pressure of 120 mmHg surpasses 200 mmHg under maximum exercise. A normal, healthy, highly trained athlete has a maximum systolic blood pressure of 240-250mmHg, however, diastolic blood pressure is almost unchanged during endurance training of intensity ¹⁹. In addition, blood pressure is known to rise rapidly even during resistance exercise ²⁰. These changes are also reported to depend on exercise intensity ²¹. These changes in circulation during exercise represent the physiological

changes underlying the supply of necessary oxygen and nutrients to the tissues, such as increased muscle activity, and to prevent the accumulation of waste products. The physiological change is thought to be related to the decrease in the number of repetitions based on individual differences during the resistance exercise to improve muscle endurance(or hypertrophy) ^{22, 2}. In addition, individual differences in exercise performance need to be considered to determine a uniform rest time between sets or to provide guidelines. In terms of recovery, the possibility of error can be increased. As described above, resistance training for muscular endurance includes elements of aerobic exercise in terms of energy metabolism ¹⁸. The rest time between sets is not just a concept of recovery time between sets, The total work and physiological variables such as systolic blood pressure(SBP) and numerical rating scale(NRS) were measured, as well We attempted to present more objective rest time between sets for muscular endurance (or hypertrophy).

METHOD

Subject: The subjects of this study included eight males who were healthy, and aged in their 20s. They live in C city of Chungnam and signed voluntary agreements. The subjects were provided with sufficient preliminary explanations about the study goals and the experimental procedures in advance to enable their participation voluntarily. One week prior to the experiment, they were instructed to limit excessive activity and avoid smoking and drinking alcohol or taking medication. Subject characteristics is shown in Table 1.

Table 1: Subject characteristics

Subject (N)	Age (yr)	Weight (kg)	Height (cm)	body fat (%)
8	23.33 ± 2.52	767.47 ± 7.12	178.07 ± 2.75	14.01 ± 4.21

Study design: Bench press 1RM was measured after the subjects were selected. The subjects were randomly cross-categorized to vary the exercise order according to the three resting conditions (30s, 1min, 3min, and 5min). In addition, exercise performance, physiological variables and pain scale were measured at the resting time of each set for 7 sets of bench press exercise at 65% -1RM load intensity under 3 resting conditions. After the first experiment under each condition, the second experiment was performed similarly at intervals of one week. A total of three experiments were performed similarly.

RM measurements: 1RM measurements were made using a direct measurement method based on an indirect measurement²³, and the exercise load (RM) for 1RM in this study was determined ²⁴. Using the relationship between% RM and repetition maximum(RM)²⁵, 65% -1RM was more accurately measured in this study. The Indirect estimation formula is shown in Figure 1.

$$1 \text{ RM} = W0 + W1$$

$$W0 = 7.8 \text{ RM}$$

$$W1 = W0 \times 0.025 \times \text{Reception}$$

Figure 1: Indirect estimation formula

Total work: The total work was calculated by multiplying the weight by the number of repetitions in each set. The Total work calculation formula is shown in Figure 2.

Total Work = Load (kg) × Reception
Figure 2: Total work calculation formula.

Systolic blood pressure (SBP): SBP was measured using a sphygmomanometer (FT500R PLUS) immediately after each bench press exercise. A total of 7 measurements were taken at each resting condition (1 min, 3 min, and 5 min). The sphygmomanometer is shown in Figure 3.



Figure 3: Sphygmomanometer

Numerical rating scale (NRS): The subjects were measured using NRS, to evaluate the degree of pain according to the scores ranging from 0 (no pain) to 10 (severe pain). NRS range of 0-10 was displayed in a straight line on the table. The pain intensity was indicated as a number. The pain level of the subject was measured based on the immediate response after the bench press exercise set. Pain intensity measurements were made according to the NRS. The 10cm horizontal line is divided into 10 equal numbers, with 0 indicating 'no pain' and 10 denoting 'very painful' at both ends. The higher the score, the greater was the degree of pain. The Numerical rating scale is shown in Figure 4.



Figure 4: Numerical rating scale

Statistical analysis: The SPSS 22.0 statistical program was used for analysis. Data were verified with repeated measures' Two-way ANOVA and Contrast's repeated method was applied for post-hoc comparison. The significance value was $\alpha < .05$.

RESULTS

Change in Total work: Repeated measurements of change in total work were made according to rest time (1, 3, and 5min) and 7set. As a result, a statistically significant difference in the total work with rest time was found between sets ($p = .000$). The total work measured according to the set also showed a statistically significant difference ($p = .000$). Statistically significant differences were also found in the interaction between set and rest time ($p = .000$). Therefore, the change in total work with rest time was significantly reduced at 1- and 3-min intervals ($p = .003$). At 3 and 5 min rest ($p = .006$), the total work according to the set was 1-2 sets ($p = .000$), 2-3 sets ($p = .000$), and 3-4 sets ($p = .000$) with a statistically significant decrease, whereas, 6-7sets maintained a similar level.

Further, the rest time was 1 min to 3 min ($p = .001$) in the 3 min-5 min condition ($p = .004$). The total work of each group showed a significant difference between 1-2 sets. The amount of exercise at the beginning and the amount of movement between the sets were high under longer rest times. Two-way ANOVA test results for Total work are shown in Table 2.

Table 2: Two-way ANOVA test results for Total work according to Rest interval and Set (kg)

Rest time	1set	2set	3set	4set	5set	6set	7set		F	Contrast
1min	1189.38 ±140.06	576.25 ±149.78	392.50 ±116.56	314.38 ±111.53	261.25 ±81.32	252.50 ±92.81	244.38 ±80.06	Time(T)	27.225***	□<□<□
3min	1218.13 ±170.42	880.63 ±210.69	669.38 ±201.25	593.13 ±197.32	489.38 ±155.44	498.75 ±171.10	446.25 ±176.49	Set(S)	299.468***	□>□>□>□>□=□>□
5min	1239.38 ±201.08	1086.88 ±200.98	935.63 ±272.28	821.88 ±267.55	765.63 ±223.18	715.63 ±220.64	671.88 ±222.65	(T)x(S)	20.045***	

M±SD. * $p < .05$, ** $p < .01$, *** $p < .001$

Changes in Systolic blood pressure: Changes in SBP were repeatedly measured between sets just after exercise (1, 3, and 5min) and 7set. No statistically significant difference was found in SBP or in terms of interaction between rest time and set. Two-way ANOVA test results for SBP are shown in Table 3.

Table 3: Two-way ANOVA test results for Systolic blood pressure according to Rest interval and Set (mm/Hg)

Rest time	1set	2set	3set	4set	5set	6set	7set		F
1min	185.25 ±15.41	181.00 ±0.53	186.50 ±13.96	181.38 ±0.52	186.63 ±14.30	181.38 ±0.52	181.63 ±0.52	Time(T)	.448
3min	181.38 ±0.52	181.75 ±0.71	181.38 ±0.52	181.50 ±0.53	181.38 ±0.52	181.25 ±0.71	181.25 ±0.71	Set(S)	953
5min	185.75 ±14.25	181.00 ±0.53	181.38 ±0.74	181.38 ±0.52	181.75 ±0.46	186.75 ±13.84	181.75 ±0.46	(T)x(S)	1.024

M±SD

Changes in Numerical rating scale: Repeated measurement of changes in NRS according to rest time (1, 3, and 5 min) and set (7) showed statistically significant difference (p = .010) according to rest time condition. A significant difference (p = .000) between 1 and 3-min rest times, and 3-and 5-min resting conditions (p = .016) was observed. A statistically significant difference in NRS was found according to the set(p=.000): 1-2sets (P = .000), 2-3 sets (p = .000) and 5-6 sets (p = .020).A significant difference was also detected in the interaction effect between the rest time, set and the NRS (P = .000).

Based on the interaction between NRS, the rest time between sets at1 min and 3 min showed significant differences in 4-5 sets (p = .003) and 6-7 sets (p = .041). Two-way ANOVA test results for NRS are shown in Table 4.

Table 4: Two-way ANOVA test results for Numerical rating scale according to Rest interval and Set

Rest time	1set	2set	3set	4set	5set	6set	7set		F	Contrast
1min	5.63 ±0.74	6.50 ±1.20	7.63 ±1.41	7.50 ±0.93	7.38 ±1.06	7.63 ±1.19	7.38 ±1.41	Time(T)	6.573**	□ > □ = □
3min	4.13 ±0.83	5.00 ±0.93	5.75 ±0.89	6.25 ±0.89	6.88 ±1.25	7.25 ±1.04	7.88 ±1.64	Set(S)	19.727***	□ < □ < □ = □ = □ < □ = □
5min	5.00 ±1.07	5.63 ±0.74	6.00 ±0.76	6.75 ±0.71	7.13 ±0.83	7.25 ±0.89	7.63 ±1.06	(T)x(S)	3.788***	

M±SD. *p<.05, **p<.01, ***p<.001

DISCUSSION

The total work can be calculated for each set by multiplying the lifted weight(kg) by the number of repetitions, and the momentum can be calculated from the number of sets and the number of repetitions between sets². The determinants of exercise level include exercise load, the number of repetitions, and the number of sets. Among them, the exercise load is the biggest factor that determines the amount of exercise⁹. In addition, a longer rest period facilitated increased amount of exercise^{14, 15},

and sufficient rest between the sets improved the muscle strength^{11, 12}. In this study, the exercise load was 20RM on 65% of 1RM. Therefore, the total work of seven sets of bench press under a 20RM load was examined. We investigated the effect of rest interval between sets on the changes of total work. A statistically significant difference was detected between the total work under the rest interval and the total work according to the set, and the interaction between the resting time and the set was also statistically significant. The total work was significantly reduced at 1, 3, and 5minute resting

periods. The total work showed a statistically significant decrease in each set with rest interval (1, 3, and 5 min) after 2 sets. The total work under 1-min resting interval tended to decrease to 4 sets, and similarly from 5 to 7 sets. The total work under the 3-min rest interval decreased to 5 sets. However, it increased in 6 sets and decreased again in 7 sets. Further, the total work in three sets of resting interval showed a higher total work than in a single set of resting interval. The total work under 5-min rest tended to decrease significantly in all sets, although the amount of exercise and total work at the beginning of exercise were the highest when compared with 1-min and 3-min resting interval. In the study of ²⁶, the total work decreased following a short resting interval during resistance exercise. This study also showed that the total work decreased substantially under short rest periods of 1 min during resistance exercise, and the total work increased under longer resting intervals of set. These results indicate that under longer set time intervals, the total momentum decreased little suggesting that the 4- to 10-min rest period was required to remove the elevated levels of lactate during high-intensity exercise ²⁷, and to recover muscle ATP and PCr, which provide the energy needed for muscle contraction. It is also believed that short rest intervals resulted in rapid accumulation of high levels of lactic acid during high-intensity exercise, resulting in rapid fatigue, and a sudden reduction in total work ⁶. The findings suggest that the resting time was closely related to the three energy production systems (ATP-PC, glycolysis, and aerobic respiration) ². In the case of a relatively long resting time, energy was restored for muscle contraction. The time required for lactate metabolism and its elimination was longer than under short-term resting conditions. Similar results were obtained in the study under three exercise intensities (60%, 75%, and 90% 1RM) and relaxation times of 1, 3 and 5 min during the bench press exercise of ¹⁶. The results showed that a longer rest interval between sets led to a lower reduction in the total momentum. As a result, the exercise performance and physiological changes in exercise intensity were observed at the 65% 1RM bench press exercise, which showed the total work varied with the rest interval at the same exercise intensity. As shown in previous studies, increasing the amount of exercise under a relatively short rest period has a positive effect on improvement of muscle endurance. However, whether the total exercise amount under short resting times in this study was effective in improving muscle endurance needs to be investigated. Further, the effect of total exercise amount under relatively long

resting periods in improving muscle strength needs to be elucidated ². No statistically significant difference was detected between SBP and SBP immediately after exercise according to the rest time. The SBP was above 180 mmHg in all three conditions (1 min, 3 min, and 5 min) under 1RM 65% rest interval between sets using a bench press. No statistically significant difference was found between SBP and SBP according to rest time. Despite the difference in the total exercise volume per set, the SBP showed a similar tendency due to the fact that the exercise was performed with the greatest effort at each set during the bench press. In addition, it may represent a phenomenon in all-out exercise when using 65% 1RM of bench press as a maximal effort. Usually, muscle-derived pain begins in the skeletal muscle, the tendon, and the fascia. In this regard, protective muscle tension, localized muscle pain, and fascia pain occur acutely. If the problem is not resolved properly, it can develop into a chronic and unmanageable chronic musculoskeletal disorder, if normal and healthy muscles are affected by tissue damage or function due to constant stimulation. Protective muscle tension is induced and the muscles are protected against damage. At this time, if muscle function is restored, it may return to normal state. However, in the case of sustained protective muscle tension, pain-inducing substances such as intramuscular bradykinin, prostaglandin, and substance P are locally released. The resulting structural change and muscle pain induces muscular weakness and reduces the ability for muscle contraction by 33% to 50% ⁷. Pain is an essential element in manifesting the senses in the human body, and can warn against external threats and internal diseases. Pain is used as a major diagnostic indicator for physicians and medical personnel. The NRS is widely used in pain assessment along with VAS ²⁸. In the present study, repeated measurement of the changes in NRS according to rest time (1, 3, and 5 min) and set (7), showed statistically significant differences in the NRS according to resting conditions, especially between 1 min and 3 min, and 3 and 5 min. In the initial set, the short rest condition (1 min) tended to be higher than the long rest (5 min). However, as the set progressed, a significant increase in the rest time condition (5 min) was observed. The pain triggered by muscle fatigue due to exercise after incomplete recovery was attributed to the short rest time between sets during bench press resulting in dysfunction following exercise ¹⁶. Further, muscle dysfunction accelerated muscle fatigue and muscle pain ⁷, apparent from the high degree of pain in the first two sets. Conversely, under prolonged rest between sets (3

and 5 min), muscle function was restored partly due to sufficient rest time at the start of the set. The structural damage of muscles is caused by energy exhaustion and work^[6] due to the progress of the set. It is believed that the degree of pain increased in the latter half of the set due to the release of pain-inducing substances⁷.

CONCLUSION

A 1-min rest between sets led to a low total momentum due to incomplete rest. The NRS value was high from the beginning of the set. Conversely, a 5-min rest interval showed a large total momentum due to a sufficient rest interval between sets and a high NRS value in the posterior set. Therefore, as the rest interval between sets increases, the total momentum increases. As the rest interval between sets decreases, the NRS value increases. During the 65% bench press all-out exercise, SBP ranged from 181 to 186 mmHg in all conditions.

Ethical Clearance: Not required

Source of Funding: This study was conducted as part of the Asan City Hot Spring exercise program(2018)

Conflict of Interest: Systolic Blood Pressure and Numerical Rating Scale

REFERENCES

1. American College of Sports Medicine. Progression Models in Resistance Training for Healthy Adults. *Med. Sci. Sports Exerc.* 2009;687-708.
2. Kraemer WJ, Ratamess NA. Fundamentals of resistance training: progression and exercise prescription. *Med Sci Sports Exercise*, 2004; 36(4):674-88.
3. Hass CJ, Feigenbaum MS, & Franklin BA. Prescription of resistance training for healthy populations. *Sports medicine*, 2001;31(14):953-964.
4. De Salles BF, Simao R, Miranda F, da Silva Novaes J, Lemos A, Willardson JM. Rest interval between sets in strength training. *Sports medicine*, 2009;39(9):765-777.
5. Kraemer WJ. A series of studies—The physiological basis for strength training in American football: Fact over philosophy. *The Journal of Strength & Conditioning Research*, 1997;11(3): 131-142.
6. Kraemer WJ, Noble BJ, Clark MJ, Culver BW. Physiologic responses to heavy resistance exercise with very short rest periods. *Int. J. Sports Med*, 1987;8:247-252.
7. Kraemer WJ, Marchitelli L, Gordon SE, Harman E, Dziados JE, Mello R, Fleck SJ. Hormonal and growth factor responses to heavy resistance exercise protocols. *Journal of Applied Physiology*, 1990;69(4):1442-1450.
8. Fleck SJ. Cardiovascular responses to strength training. *Strength and Power in Sport*, Second Edition, 2008;406.
9. Bompa T. Theory and methodology of training, *Human Kinetics*, 4th, 1999; 413.
10. Phillip AB, Eric J, Krista W. Recovery from training: A Brief Review. *J Strength Cond Res*, 2008; 22(3): 1015-1024.
11. Pincivero DM, Lephart SM, Karunakara RG. Effects of rest Interval on isokinetic strength and functional performance after short term high intensity training. *Br J Sports Med*, 1997; 31:229-234.
12. Robinson JM, Stone MH, Johnson RL, et al (1995). Effects of different weight training exercise/rest intervals on strength, power, and high intensity exercise endurance. *J Strength Cond Res*. 9: 216-21.
13. Fry AC, Kraemer WJ. Resistance exercise overtraining and over reaching. *Sports Med*, 1997; 23:106-129.
14. Willardson JM, Burkett LN. A comparison of 3 different rest intervals on the exercise volume completed during a workout. *Journal of Strength and Conditioning Research*, 2005; 19(1): 23.
15. Willardson JM, Burdett LN. The effect of rest interval length on bench press performance with heavy vs. light loads. *J Strength Cond Res*, 2006; 20: 396-9.
16. Song SH, Lee YS, Han AL, Kim SY, Ko SS. Effects of Varied Resistance Training Intensities and Rest Intervals Between Sets on iEMG, Repetition Rate, and Total Work. *Korea journal of physical education*, 2012;51(5):639-647.
17. Kraemer WJ, Mazzetti SA, Nindl BC, Gotshalk LA, Volek JS, Bush JA., et al. Effect of resistance training on women's strength/power and

- occupational performances. *Medicine & Science in Sports & Exercise*, 2001; 33(6): 1011-1025.
18. Cho KW, Kim SH, Kim CH, Seul KH. Mechanical basis of ANP secretion in beating atria: atrial stroke volume and ECF translocation. *Am. J. Physiology-Regulatory, Integrative and Comparative Physiology*, 1995; 268(5):R1129-R1136.
 19. Costill DL, Branam G, Fink R, Nelson R. Exercise-induced sodium conservation: Changes in plasma renin and aldosterone. *Med. Sci. Sports*, 1976; 8: 209-213.
 20. DeVan AE, Anton MM, Cook JN, Neidre DB, Cortez-Cooper MY, Tanaka H. Acute effect of resistance exercise on arterial compliance. *J. Appl. Physiol.*, 2005; 98: 2287-2291.
 21. Lee MG, Hong KS, Song JK. Effects of Continuous Exercise, Accumulation of Short Duration Exercise, and Resistance Exercise on Blood Pressure, Vascular Elasticity, and Blood Variable after each Exercise. *Korean journal of Sport Science*, 2008; 19(2): 21-36.
 22. Kraemer WJ, Ratamess NA. Endocrine responses and adaptations to strength and power training. In: *Strength and Power in Sport*, 2nd Ed., P. V. Komi(Ed.). Malden, MA: Blackwell Science, 2003; 361-386.
 23. O'Shea P. *Scientific Principles and Methods of Strength Fitness*. Reading, MA: Addison-Wesley. 1976; 79.
 24. Baechle TR, Earle RW. *NSCA's essentials of personal training*. Human Kinetics.2004.
 25. Thomas PR, Murphy SM, Hardy L. Test of Performance Strategies: development and preliminary validation of a comprehensive measure of athletes' psychological skills. *Journal of Sports Sciences*, 1999; 17: 697-711.
 26. Bottaro M, Martins B, Gentil P, Wagner D. Effects of rest duration between sets of resistance training on acute hormonal responses in trained women. *Journal of Science and Medicine in Sports*, 2009; 12(1):73-78.
 27. Hultman E, Sjoholm H. Biochemical causes of fatigue. *Human muscle power*, 1986; 215-238.
 28. Millan MJ. The introduction pain: A nintegrative review. *Progress in Neurobiology*, 1999; 57: 1-164.

Factors Influencing Suicidal Ideation in Depressed Patients: Based on the 6th Korea National Health and Nutrition Examination Survey

Kyongeun Lee

Assistant Professor, Department of Nursing, Tongmyong University, Republic of Korea

ABSTRACT

Suicidal ideation in depressed patients is important related to their life. The purpose of this study was to identify factors influencing suicidal ideation in patients with depression in Korea. This study carried out secondary analysis using data from the 6th Korea National Health and Nutrition Examination Survey (KNHANES). This population-based survey was a nationwide, stratified, multistage, clustered probability design. The subject samples of this study were selected a total of 151 patients who had a major depression among the 7,380 population. Data were analyzed by using χ^2 -test, t-test, and logistic regression with the SPSS23.0 and STATA 13.0 program. The average age of a total of 151 depressed patients was 53 years (range 20 to 81). Education ($p=.045$), subjective health status ($p=.001$), body discomfort during the past 2 weeks ($p=.038$), perceived stress ($p<.001$), depressive mood more than 2 weeks ($p<.001$), health-related quality of life ($p<.001$), and hospital accessibility during the past 1 year ($p=.005$) were statistically significant. To determine the factors affecting suicidal ideation in patients with depression, logistic regression analysis were conducted with only statistically significant variable in the χ^2 -test and t-test results. As a results, body discomfort during the past 2 weeks (OR=2.53, 95% CI1.29 to 4.95; $p=.007$), depressive mood more than 2 weeks (OR=10.57, 95% CI3.64 to 30.63; $p<.001$), health-related quality of life (OR=0.50, 95% CI0.01 to 0.88; $p=.007$), hospital accessibility (OR=2.33, 95% CI1.06 to 5.13; $p=.001$) were significantly associated with suicidal ideation in patients with major depression. Depending on the results of this study, tailored interventions for patients with major depression are needed to manage each of the factors affecting suicidal ideation.

Keywords: *Suicidal ideation; Depression; National survey; KNHANES; Secondary analysis.*

INTRODUCTION

The suicide rate of Korea was second highest among OECD nations and first among Asian nations [1]. The number of suicides per 100,000 was 27.3 persons, and 13,836 persons committed suicide in 2014 alone [1]. Although the death rate of intentional self-harm (suicide) was reduced by 0.8% and 3.4% respectively in 2015 and 2016, but the suicide rate of Korea is still high [2,3]. The statistics on the causes of death in 2016 shows that suicide is one of 10 leading causes of death for Koreans [3]. Accordingly, the Korean government is making various efforts to reduce the suicide rate. In addition, the academic community is conducting active research on suicide ideation, which affects suicide attempt [4]. Especially, depression is the most dangerous single factor that leads to suicide [5,6]. There are more than 300 million depression patients in the world [7], but the number of depression patients in Korea is increasing at an alarming rate [8].

Studies on suicide ideation are mostly carried out for different life cycle groups. For the adolescent period in Korea, stress and depression caused by various reasons such as school life, academic performance, internet addiction and family background related to parents are the risk factors of suicide ideation [8-11]. Suicide ideation in the adolescent period is known to have a significant effect on suicide ideation in the adulthood, but the difference from suicide ideation in the adulthood and old age is impulsiveness [12,13]. Therefore, this study aims to examine suicide ideation that appears in the life cycle groups of adulthood or older.

In the adulthood, depression, anger, anxiety, stress and low self-respect caused by educational background, economic factors and absence of a spouse were found to affect suicide ideation [14-16]. Also, Korea has become an aging society where old age suicide is a social issue.

Compared to other life cycle groups, suicide attempts have increased in the old age. In the old age group, the dominant causes of suicide ideation are physical weakness, weakened social support, stress, anxiety and pressure from aging, and lowered self-respect^[17,18]. Other studies confirmed that suicide ideation in the old age is not only influenced by psychological and emotional impairment but also by physical factors such as pain, discomfort and limited daily activities^[19,20]. Identifying the factors influencing suicide ideation for different life cycle groups can provide important background data to come up with a method of reducing the suicide rate.

As shown by the results of the previous studies examined earlier, it is important to find the factors influencing suicide ideation for each life cycle group. However, since suicide ideation is a primary risk factor of suicide attempt especially in the group of depression patients^[6,7], it would be necessary to examine the factors influencing suicide ideation in depression patients. There are various studies related to suicidal ideation, however, studies on suicide ideation of depression patients in Korea are seldom found. An Australian study conducted using national data showed that suicide ideation is relatively more common in the subjects with a mental problem^[21]. A recent foreign study reported a decrease in suicide ideation according to improvement in the symptoms of depression^[22]. Another study explained that subjective symptoms are more closely associated with suicide ideation compared to neurovegetative symptoms in depression patients^[22]. In another study, negative emotions of depression patients were found to have a significant relationship with suicide ideation, suggesting that suicide ideation can be significantly reduced by improving negative emotions^[23]. Accordingly, the purpose of this study is to take a comprehensive approach to suicide ideation of all adult depression patients regardless of the life cycle group and to identify the characteristic factors influencing suicide ideation of Korean depression patients. The significance of this study is in finding characteristics of Korean depression patients.

This study intends to examine the characteristic factors that influence suicide ideation in all adult depression patients of Korea using the Korea National Health and Nutrition Examination Survey (KNHANES). The specific purpose of this study is to identify the differences of suicide ideation in depression patients

according to general characteristics and health-related characteristics and to analyze the factors influencing suicide ideation. The results of this study would provide useful data that can help take a factor-specific approach in preventing suicide attempts of depression patients.

METHOD

Study design: In this study, a secondary analysis was carried out using data from the 6th Korea National Health and Nutrition Examination Survey (KNHANES) conducted in 2015.

Sample: The sample population of this study was 7,380 participants of the 6th Korea National Health and Nutrition Examination Survey. Among them, 1,445 participants who did not respond or responded that they are not sure about the question on recent suicide ideation ('Have you felt like dying during the past 1 year?') were excluded. Among 5,935 participants who clearly answered 'Yes' or 'No', 151 depression patients were selected as the subjects of this study.

Ethical considerations: This study analyzed the dataset of the Korea National Health and Nutrition Examination Survey had been collected by the Korea Centers for Disease Control (KCDC). All identifying information was deleted by the KCDC before the dataset was downloaded. The confidentiality and privacy of all the participants were secured.

MEASURE

General characteristics and health-related characteristics: In this study, gender, age, education, occupation, living state, subjective health status, comorbidity, restriction of activity, body comfort, perceived stress, depressive mood, and health-related quality of life were analyzed as general characteristics and health-related characteristics.

Health-related behavioral characteristics: In this study, current smoking status, current alcohol drinking status, regular exercise, individual mental health counseling, and impossibility of visiting a clinic were analyzed as health-related behavioral characteristics.

Data analysis: The 6th Korea National Health and Nutrition Examination Survey can represent all Korean citizens because it calculates the estimator of variance considering a complex sample design by analyzing

the data with weighted values, stratification variables and clustering variables. The data for this study were analyzed using the SPSS 23.0 and STATA 13.0 programs as follows. The differences in suicidal ideation according to general characteristics, health-related characteristics and health-related behavioral characteristics of the 151 depression patients were analyzed by performing frequency analysis, percentage analysis, χ^2 -test and t-test. To identify the factors influencing suicidal ideation, logistic regression was carried out on significant variables found during χ^2 -test and t-test among general

characteristics, health-related characteristics and health-related behavioral characteristics.

RESULT AND DISCUSSION

Results: Out of the 151 depression patients, 61 subjects (40.4%) responded that they recently experienced suicidal ideation and 90 subjects (59.6%) responded that they did not recently have suicidal ideation. The results were considered to be statistically significant at a 5% significance level ($p < .05$).

Table 1: Differences in suicidal ideation according to general characteristics and health related characteristics of subjects (N = 151)

Characteristics	Categories	Suicidal ideation Yes n (%) or M ± SE	Suicidal ideation No n (%) or M ± SE	χ^2 or t (p)
Gender	Male	14(45.0)	20(55.0)	0.226(.742)
	Female	47(40.8)	70(59.2)	
Age	20~39	8(63.5)	4(36.5)	6.127(.278)
	40~59	18(34.9)	39(65.1)	
	60~79	34(43.9)	44(56.1)	
	≥80	1(25.4)	3(74.6)	
Education (complete school)	≤Elementary	27(44.3)	37(55.7)	9.518(.045)
	Middle	12(59.1)	11(40.9)	
	High	18(42.4)	25(57.6)	
	≥University	4(14.1)	16(85.9)	
Occupation	Yes	17(38.3)	37(61.7)	0.772(.429)
	No	44(45.4)	53(54.6)	
Living state	Not alone	33(38.2)	58(61.8)	0.387(.586)
	Alone	21(43.6)	27(56.4)	
Home ownership	Yes	27(33.1)	65(66.9)	6.011(.082)
	No	34(52.9)	25(47.1)	
Subjective health status	Good	4(35.4)	9(64.6)	19.310(.001)
	Moderate	12(22.7)	45(77.3)	
	Bad	45(59.6)	36(40.4)	
Comorbidity	Yes	29(41.7)	45(58.3)	0.009(.934)
	No	32(42.4)	45(57.6)	
Restriction of activity	Yes	28(44.5)	28(55.5)	0.213(.713)
	No	33(40.7)	62(59.3)	
Body discomfort (during the past 2 weeks)	Yes	37(53.8)	35(46.2)	7.041(.038)
	No	23(33.3)	52(66.7)	
Perceived stress	Very High	27(74.6)	12(25.4)	33.423(<.001)
	High	22(45.6)	24(54.4)	
	Moderate	11(18.4)	46(81.6)	
	Low	1(19.7)	8(80.3)	
Depressive mood (more than 2 weeks)	Yes	56(57.7)	38(42.3)	30.016(<.001)
	No	5(11.1)	52(88.9)	
Health-related quality of life		0.74 ± 0.03	0.86 ± 0.01	3.770(<.001)

Note: n(%), M±SE were except missing values.

The differences in suicidal ideation according to general characteristics and health-related characteristics of patients with major depression are as shown in Table 1. The suicide ideation rate according to educational background was 44.3% for elementary school graduate or below, 59.1% for middle school graduate or above, 42.4% for high school graduate or above and 14.1% for university graduate or above. This difference was statistically significant ($p=.045$). The suicide ideation rate according to subjective health status was 35.4% for good subjective health status, 22.7% for moderate health status and 59.6% for bad health status. The suicide ideation rate increased significantly with worsening subjective health status ($p=.001$). The suicide ideation rate according to body discomfort was 53.8% with discomfort and

33.3% without discomfort. The suicide ideation rate was significantly higher when the subjects experienced body discomfort ($p<.001$). The suicide ideation rate according to perceived stress was 19.7% for low degree of perceived stress, 18.4% for moderate degree, 45.6% for high degree and 74.6% for extremely high degree. The suicide ideation rate increased significantly with increasing level of perceived stress ($p<.001$). The suicide ideation rate according to a depressive mood that continued more than 2 weeks was 11.1% without a depressive mood and 57.7% with a depressive mood. This difference was statistically significant ($p<.001$). As for health-related quality of life, the score of 0.74 with suicide ideation was significantly lower than the score of 0.86 without suicide ideation ($p<.001$).

Table 2: Differences in suicidal ideation according to health related behavioral characteristics of subjects (N = 151)

Characteristics	Categories	Suicidal ideation Yes n(%)	Suicidal ideation No n(%)	χ^2 (p)
Current smoking status	Yes	11(52.4)	10(47.6)	1.552(.376)
	No	50(39.7)	80(60.3)	
Current alcohol drinking status	Yes	10(28.5)	16(71.5)	0.009(.933)
	No	14(29.6)	29(70.4)	
Regular exercise	Yes	21(43.7)	34(56.3)	0.101(.801)
	No	40(41.1)	54(58.9)	
Individual mental health counseling	Yes	32(44.1)	41(55.9)	0.253(.641)
	No	29(40.0)	49(60.0)	
Hospital accessibility (during the past 1 year)	Yes	28(63.5)	18(36.5)	10.836(.005)
	No	33(33.9)	72(66.1)	

Note: n(%), M±SE were except missing values.

The differences in suicidal ideation according to health-related behavioral characteristics of patients with major depression are as shown in Table 2. The suicide ideation rate was higher if the subjects wanted to visit hospitals and local clinics during the past 1 year but were unable to visit because of various reasons. Specifically, the suicide ideation rate was 63.5% if they failed to visit hospitals and local clinics and 33.9% if they could visit hospitals and local clinics. This difference was statistically significant ($p=.005$).

Table 3: Risk factors of suicidal ideation patients with major depression

Characteristics	Categories	Suicidal ideation		
		OR	95%CI	p
Education(ref: ≥University)	≤Elementary	2.88	0.82~10.07	.098
	Middle	4.36	1.11~17.13	
	High	2.92	0.88~9.72	
Subjective health status(ref: Good)	Moderate	0.60	0.16~2.29	.455
	Bad	2.81	0.80~9.88	

Conted...

Body discomfort(during the past 2 weeks)(ref: No)	Yes	2.53	1.29~4.95	.007
Perceived Stress(ref : Low)	Very High	0.72	0.65~7.95	.560
	High	2.02	0.18~22.10	
	Moderate	4.00	0.35~45.45	
Depressive mood(more than 2 weeks) (ref: No)	Yes	10.57	3.64~30.63	<.001
Health-related quality of life		0.50	0.01~0.88	.007
Hospital accessibility(during the past 1 year)(ref: Yes)	No	2.33	1.06~5.13	.001

Note: OR=odds ratio; CI=confidence interval.

Multiple logistic regression with only statistically significant variable in the χ^2 -test and t-test results was conducted to determine the factors influencing suicidal ideation as shown in Table 3. Suicide ideation was increased by 2.53 times (95% CI 1.29 to 4.95) when there was body discomfort in the past 2 weeks and 10.57 times (95% CI 3.64 to 30.63) when there was a depressive mood for 2 weeks or longer. In addition, suicide ideation was increased by 0.50 times (95% CI 0.01 to 0.88) as health-related quality of life decreased by a level. Suicide ideation was increased by 2.33 times (95% CI 1.06 to 5.13) if the subjects wanted to but were unable to visit hospitals and local clinics during the past 1 year.

DISCUSSION

World Health Organization (WHO) defines suicide as a continuous process in which one's attempts to take one's own life eventually lead to death, explaining that it is an act of intentional self-harm [24]. Many studies in Korea reported that suicide is influenced by the correlation between psychological and emotional aspects of individuals such as stress, anxiety and depression and various social and environmental aspects affected by family and community systems [14-19]. Such previous studies suggest that there are extremely complicated factors influencing suicide ideation in Koreans for different life cycle groups. This study intends to present a specific policy direction for adult patients with major depression by identifying the common factors influencing their suicide ideation. This study examined the differences in suicide ideation according to general characteristics, health-related characteristics and health-related behavioral characteristics of depression patients, as well as the factors influencing suicide ideation according to general characteristics, health-related characteristics and health-related behavioral characteristics.

As for the differences in suicide ideation according to general and health-related characteristics of depression patients, there were differences caused by educational background, subjective health status, body discomfort in the past 2 weeks, perceived stress, depressive mood longer than 2 weeks and health-related quality of life. Some of these results agreed with a previous study conducted in Korea on elders. However, the results of this study were somewhat different from the previous study, which also showed differences according to economic status, limited activities and number of chronic diseases [25]. An Australian study conducted using national data reported that suicide ideation is influenced by age, gender, marital status, economic status and mental problem, showing different results compared to this study. Such differences are probably caused by differences among nations. Nonetheless, the results of the Australian study suggesting the relevance between mental problem and suicide ideation support the idea of this study limited to patients with major depression [26].

As for the differences in suicide ideation according to health-related behavioral characteristics, the only difference was found shown by hospital accessibility during the past 1 year. Unfortunately, it was difficult to find any Korean or foreign studies that examined hospital accessibility and suicide ideation. Since previous studies presented limited activities, body discomfort and individual mental health counseling as the factors influencing suicide ideation [17-19], this study paid attention to hospital accessibility based on the idea that depression patients would be willing to visit hospitals and local clinics for psychological and physical reasons such as limited activities, body discomfort and individual mental health counseling. Hospital accessibility is assessed by responses to the question, 'Have you experienced an inability to visit a hospital for various reasons (economic difficulty, inconvenient

transportation, difficulty in appointment, etc.)? In this study, the inability to access hospitals and local clinics led to greater suicide ideation. This is probably because hospital accessibility of depression patients affects their negative mood.

The main findings of this study are that suicidal ideation in depressed patients are associated with body discomfort during the past 2 weeks, depressive mood longer than 2 weeks, health-related quality of life, and hospital accessibility during the past 1 year. In a previous study that classified Korean adults into the young adult group, middle-aged adult group and older adult group to find the factors influencing suicide ideation. The young adult group was influenced by education level, self-esteem, stress, depression and anger control problem. The middle-aged adult group was additionally influenced by existence of a spouse. Also, the older adult group was additionally influenced by anxiety [27]. The results of this study differed from the results of the previous study according to adults group. This implies that negative emotions caused by physical discomfort and situational frustration probably lead to suicide ideation in depression patients, instead of general characteristics such as education level and existence of a spouse in regular adults. These results also agreed with a foreign study that associated negative emotions of depression patients with suicide ideation [23]. Accordingly, a follow-up study is required to examine other situations that arouse frustration, despair, depressive mood and physical discomfort of patients with major depression in addition to the situations considered in this study. Evaluation of suicide ideation and interventions to reduce suicide ideation are also necessary. In Korea, a depression test is available for citizens to diagnose depression patients. Therefore, this study suggest to implement a future-oriented education system that can examine situations that lead to suicide ideation of depression patients and find specific plans to prevent suicide attempts on the national level.

The meaning of this study is in utilizing national data representing all citizens of Korea, but the limitation is that this is a cross-sectional study that confirmed factors influencing health-related quality of life at a time point. A cohort study would be required to explain the causal relationship of the factors influencing health-related quality of life in patients with major depression. It is also necessary to conduct a wide range of survey on the number of suicide attempts and suicide planning

which are suggested as primary factors in many suicide studies [28]. To develop a specific intervention for improved health-related quality of life in depression patients, the influential factors found in this study must be investigated further. Despite the limitations of this study, the results of this study using national data can provide valuable health policy suggestions for depression patients by examining the factors influencing health-related quality of life of all Korean adult patients with major depression.

CONCLUSION

The factors influencing suicide ideation in adult depression patients differed from the results of previous studies that examined the factors influencing suicide ideation for different life cycle groups. In this study, the subjects were mainly affected by psychological factors resulting from body discomfort in the past 2 weeks, depressive mood longer than 2 weeks and hospital accessibility during the past 1 year (inability to visit hospitals and local clinics for various reasons such as economic difficulty and inconvenient transportation). Accordingly, it would be necessary to develop personalized intervention programs that can manage negative emotions and reduce suicide ideation of depression patients and come up with a process to encourage active participation in such programs. The present study was meaningful in providing a nationally representative result using national survey data in Korea.

Ethical Clearance: Taken from the Institutional Review Board of the author's affiliated university (201709-HR-001)

Source of Funding: This research was supported by the Tongmyong University Research Grants 2017(2017A007).

Conflict of Interest: Nil

REFERENCES

1. Organization for economic cooperation and development [Internet]. Paris (FR): Suicide rates; [cited 2018 May 12]. Available from: <https://data.oecd.org/healthstat/suicide-rates.htm>.
2. Statistics Korea [Internet]. Seoul (KR): Causes of death statistics; [updated 2015 September 23; cited 2018 March 31]. Available from: <http://>

- kostat.go.kr/portal/korea/kor_nw/3/index.board?bmode=read&aSeq=348541. Korean.
3. Statistics Korea [Internet]. Seoul (KR): Causes of death statistics in 2016; [updated 2017 September 22; cited 2018 March 31]. Available from: <http://kostat.go.kr/portal/eng/pressReleases/1/index.board?bmode=read&aSeq=363695>.
 4. Jeon HJ, Lee JY, Lee YM, Hong JP, Won SH, Cho SJ, Kim JY, Chan SM, Lee DS, Lee H W, Cho MJ. Lifetime prevalence and correlates of suicidal ideation, plan, and single and multiple attempts in a Korean nationwide study. *The Journal of nervous and mental disease*. 2010 Sep;198(9):643-6. <https://doi.org/10.1097/NMD.0b013e3181ef3ecf>.
 5. Klerman G. Clinical Epidemiology of suicide. *Journal of Clinical Psychiatry*.1987;48:33-8.
 6. Flink N, Lehto SM, Koivumaa-Honkanen H, Viinamäki H, Ruusunen A, Valkonen-Korhonen M, Honkalampi K. Early maladaptive schemas and suicidal ideation in depressed patients. *The European Journal of Psychiatry*. 2017 Jul-Sep;31(3):87-92. <https://doi.org/10.1016/j.ejpsy.2017.07.001>.
 7. World Health Organization [Internet]. Geneva (CH): Depression; [updated 2018 March 22; cited 2018 May 13]. Available from: <http://www.who.int/news-room/fact-sheets/detail/depression>.
 8. Organization for economic cooperation and development [Internet]. Paris (FR): Korea's increase in suicides and psychiatric bed number is worrying, says OECD; [cited 2018 May 12]. Available from: <https://www.oecd.org/els/health-systems/MMHC-Country-Press-Note-Korea.pdf>.
 9. Kim YS, Koh YJ, Leventhal B. School bullying and suicidal risk in Korean middle school students. *Pediatrics*.2005 Feb;115(2), 357-63.
 10. Park E. The influencing factors on suicide attempt among adolescents in South Korea. *Journal of Korean Academy of Nursing*. 2008 Jun;38(3):465-73. <https://doi.org/10.4040/jkan.2008.38.3.465>.
 11. Lee D, Jung S, Park S, Hong HJ. The impact of psychological problems and adverse life events on suicidal ideation among adolescents using nationwide data of a school-based mental health screening test in Korea. *European child & adolescent psychiatry*. 2018 Feb;1-12. <https://doi.org/10.1007/s00787-018-1130-3>.
 12. Park S, Jang H. Correlations between suicide rates and the prevalence of suicide risk factors among Korean adolescents. *Psychiatry research*. 2018 Mar;261:143-7. <https://doi.org/10.1016/j.psychres.2017.12.055>.
 13. Reinherz HZ, Tanner JL, Berger SR, Beardslee WR, Fitzmaurice GM. Adolescent suicidal ideation as predictive of psychopathology, suicidal behavior, and compromised functioning at age 30. *American Journal Psychiatry*. 2006 Jul;163(7):1226–32. <https://doi.org/10.1176/appi.ajp.163.7.1226>.
 14. Lee DY, Jung GH, Seo HY. Suicidal ideation, social support and self-esteem in middle school students according to the degree of depression. *Journal of the Korean Society of School Health*. 2017 Aug;30(2):136-45. <https://doi.org/10.15434/kssh.2017.30.2.136>.
 15. Chin YR, Lee HY, So ES. Suicidal ideation and associated factors by sex in Korean adults: a population-based cross-sectional survey. *International journal of public health*. 2011 Aug;56(4), 429. <https://doi.org/10.1007/s00038-011-0245-9>.
 16. Park E, Choi SJ. Prevalence of suicidal ideation and related risk factors among Korean adults. *Journal of Korean Academy of Psychiatric and Mental Health Nursing*.2013 Jun;22(2): 88-96. <https://doi.org/10.12934/jkpmhn.2013.22.2.88>.
 17. Han KM, Chang J, Won E, Lee MS, Ham BJ. Precarious employment associated with depressive symptoms and suicidal ideation in adult wage workers. *Journal of affective disorders*. 2017 Aug;218:201-9. <https://doi.org/10.1016/j.jad.2017.04.049>.
 18. Choi Y, Kim M, Seo AR, Kim HO, Park KS. Effects of Depressive Symptom and Health Status on Several Factors that Affect Suicidal Ideation among the Elderly Living Alone in Rural Area: The Fully Mediating Effect of Depressive Symptom. *Korean Journal of Health Promotion*.2017 Sep;17(3):193-8. <https://doi.org/10.15384/kjhp.2017.17.3.193>.

19. Cha KS, Lee HS. The effects of ego-resilience, social support, and depression on suicidal ideation among the elderly in South Korea. *Journal of women & aging*, 2017 Apr;1-16. <https://doi.org/10.1080/08952841.2017.1313023>.
20. Chang S, Suh EE, Choi H. Risk Factors on Suicidal Ideation and Suicidal Attempt among Community dwelling Older Adults: Based on 2014 Community Health Survey. *The Korean Journal of Rehabilitation Nursing*.2017 Dec;20(2):111-21. <https://doi.org/10.7587/kjrehn.2017.111>.
21. Johnston AK, Pirkis JE, Burgess PM. Suicidal thoughts and behaviours among Australian adults: findings from the 2007 National Survey of Mental Health and Wellbeing. *Australian and New Zealand Journal of Psychiatry*. 2009 Jul;43(7): 635-43.
22. Keilp JG, Ellis SP, Gorlyn M, Burke AK, Oquendo MA, Mann JJ, Grunebaum MF. Suicidal ideation declines with improvement in the subjective symptoms of major depression. *Journal of affective disorders*. 2018 Feb;227: 65-70. <https://doi.org/10.1016/j.jad.2017.09.018>.
23. Kiosses DN, Gross JJ, Banerjee S, Duberstein PR, Putrino D, Alexopoulos GS. Negative emotions and suicidal ideation during psychosocial treatments in older adults with major depression and cognitive impairment. *The American Journal of Geriatric Psychiatry*. 2017 Jun;25(6): 620-9. <https://doi.org/10.1016/j.jagp.2017.01.011>.
24. World health organization [Internet]. Geneva (CH): Suicide; [cited 2018 June 1]. Available from: <http://www.who.int/news-room/fact-sheets/detail/suicide>.
25. Koo CY, Kim JS, Yu J. A study on factors influencing elders' suicidal ideation: Focused on comparison of gender differences. *Journal of Korean Academy of Community Health Nursing*. 2014 Mar;25(1):24-32. <https://doi.org/10.12799/jkachn.2014.25.1.24>.
26. Pirkis J, Burgess P, Dunt D. Suicidal ideation and suicide attempts among Australian adults. *Crisis: The Journal of Crisis Intervention and Suicide Prevention*. 2000;21(1):16-25.
27. Lee SE. Risk Factors for Suicidal Ideation across the Life Cycle among Korean Adults: Korean Psycho-social Anxiety Survey. *Korean Journal of Adult Nursing*.2017 Apr;29(2):109-18. <https://doi.org/10.7475/kjan.2017.29.2.109>.
28. Han B, Compton WM, Gfroerer J, McKeon R. Prevalence and correlates of past 12-month suicide attempt among adults with past-year suicidal ideation in the United States. *The Journal of clinical psychiatry*. 2015 Mar;76(3):295-302. <https://doi.org/10.4088/JCP.14m09287>.

A Study on Information System Introduced to Improve Daily Living-Based Physical Function After Ovariectomy

Seong-Ran Lee

Dept. of Medical information, Kongju National University, Gongju 32588, South Korea

ABSTRACT

The paper is to identify a new method for medical information systems to improve physical function after surgery for ovarian cancer. Experimental group investigated 61 people who were consisted of members by the application of mediating technology, while the normal members of 61 people were consisted of people without mediating technology. The chi-square test was used for the examination of the general variables between two groups. The t-test was performed the difference of life habits by the application of medical information systems. The results are as follows. Firstly, male with 47.5% in the experimental group showed a higher rate than male with 42.6% in the normal people. While female of 52.5% in the test group was observed less than female with 57.4% in the normal group. Secondly, for vitamin intake, the mean point(79.51±0.69) of the group which have eaten vitamin in the post-test by mediating technology system were statistically significantly higher than the mean point(51.84±2.93) of the group in the pre-test by the application of medical information systems ($t=-5.17$, $p=.000$). Thirdly, the data achieved a significantly higher rate in the group observed than the normal group, even the days passed 20 days by the application of medical information systems. Therefore, the paper conducted to evaluate the effectiveness of medical information systems. This impact of medical information system will have a technique on prevention of ovarian cancer.

Keywords: Method, Medical information systems, Physical function, Ovarian cancer, Surgery

INTRODUCTION

Cervical cancer is the most frequent occurrence of female genital organs. But ovarian cancer has the highest mortality rate among female cancer cases in Korea. Surgery for ovarian cancer is commonly performed by salpingo-oophorectomy. Salpingo-oophorectomy is the operative dissection of both ovaries and right or left ovary^{1,2,3}.

Ovarian cancer can not know early stage which appear their symptoms because their body responses are not felt. The first method of ovarian cancer is operation. Ovarian cancer is the sixth most common form of cancer in women. Early symptoms are often absent or associated with other problems; thus early diagnosis is uncommon. When the ovaries are dissected, a female is at a five times more disease of stroke or myocardial infarction^{4,5}.

Surgery for ovarian cancer is factor related to increased risk of osteoporosis and bone fractures. Therefore, the improvement of life quality through the development of clinical information system is

important information technology which can provide to oophorectomy patients. The strategic approach of medical technology system adoption to improve life quality after surgery for ovarian cancer needs to chronic disease patients^{6,7}.

The incidence of ovarian cancer can find when parts in one ovary or right and left ovaries are out of function. Although every ages of women are easy to appear the incidence of ovarian cancer, approximately 95% of female observed with the disease are over 40 years old, and almost illnesses appear in female over 50 years old, according to National Statistical Center. Additionally, the majority of ovarian cancer were in situ(25.6%) or local (49.6%) stage. As noted in above. The National Statistical Center reports that there are much more than 35,294 recent ovarian cancer and about 195,826 mortalities from female ovarian cancer in the U.K. in 2014. Additionally, according to this situation, it occurred from 2013 to 2014, 3.1% of female observed now will be presented illness with ovarian cancer at this environment during women lifecycle. The total six-year associated with proportion of life existence since 2006^{8,9,10}.

This research tries to implement a management control system to raise the performance of an experiment with the objective to achieve to the entire success toward a special strategy for ovarian cancer. Information was collected from the major problems in order to detect the key characteristics of life habits where a change of treatment is needed^{11,12,13}. The system was developed to understand the effect that has the control system in the management of the positive results observed in the analysis of results. In order to maintain the strategies, it was necessary to develop information system to check the system status 14,15.

Therefore, the supply of mediating technology of information system is only solution of the problem of ovarian cancer and the best way that can improve physical status to patients with ovarian cancer after salpingo-oophorectomy. The research is needed to explore the development of experimental technology to improve physical status after operation.

Thus, the paper is to identify a new method for medical information systems to improve physical function after surgery for ovarian cancer. The positive results will play an important role in the establishment of future medical system and data that provides invaluable insights in the effect of a medical information system.

MATERIALS AND METHOD

Predictive Modeling Technology: The design of medical technology system is as follows. 1) planning stage : construction of medical technology system 2) application stage: input, stratege, process, analysis, application 3) Effectiveness stage : physical function, measurement 4) final phase : verifying study, impact, usability of system in Figure 1.

Materials: The data were achieved through fill out the paper of form structured and interview from January 16 to March 30, 2017. It has time to fill out this survey. Experimental group investigated of 61 people who were consisted of members by the application of mediating technology, while the normal members of 61 people were consisted of people without mediating technology.

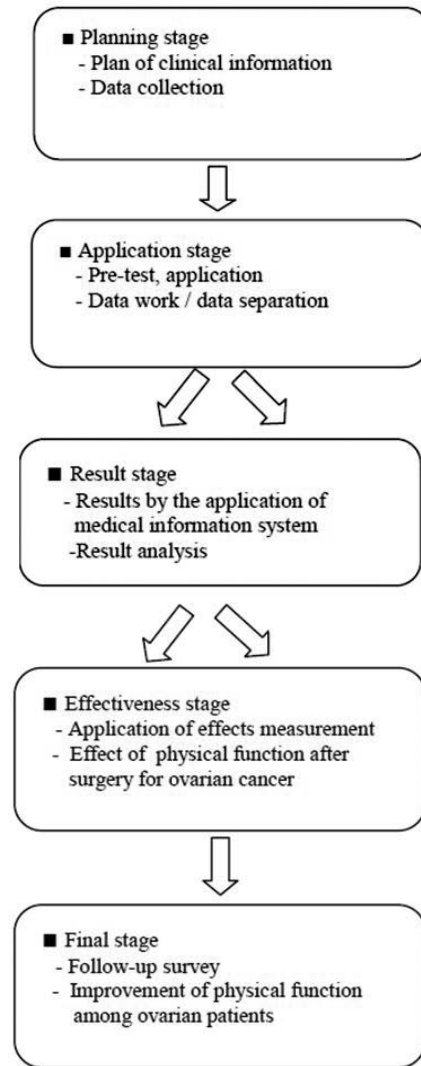


Fig. 1: Design of Advanced Information Systems

Methods: General variables of basic information were measured by percentage and number. The chi-square test was used for the e the general variables of basic information between two groups. In addition, the t-test was performed the difference of life habits by the application of medical information systems. On the other hand, the t-test was performed health change in physical and mental function by medical information systems. The data analyzed physical function after surgery in participants with ovarian cancer using SPSS 18.0.

RESULTS

General Variables of Basic Information: General variables of basic information are next contents(Table 1). The proportion of unmarried subjects(23.0%) in the experimental group were a lower rate than the proportion(26.2%) of normal group. The subject’s sex was analyzed. Male with 47.5% in the experimental group

showed a higher rate than male with 42.6% in the normal people. While female of 52.5% in the test group was observed less than female with 57.4% in the normal group.

Table 1: General Variables of Basic Information

Variables	Exp	Cont	X ²
	No. (%)	No. (%)	
Marital status			
Unmarried	14(23.0)	16(26.2)	4.2
Married	47(77.0)	45(73.8)	
Gender			
Man	29(47.5)	26(42.6)	9.5
Female	32(52.5)	35(57.4)	
Age			
-40	4(6.6)	9(14.8)	10.7
41-50	10(16.4)	22(36.1)	
51-60	22(36.1)	13(21.3)	
>60	25(41.0)	17(27.9)	
Monthly income			
99	15(24.6)	9(14.8)	6.1
100-200	9(14.8)	11(18.0)	
201-299	17(27.9)	23(37.7)	
300	20(32.8)	18(29.5)	
Education			
Under middle	16(26.3)	15(24.6)	4.8
High school	25(41.0)	21(34.4)	
University	20(32.8)	25(41.0)	
Total	61(100.0)	61(100.0)	

Difference of Life Habits by Medical Information Systems: Contents described below are the difference of life habits by medical information systems after surgery for ovarian cancer in table 2. For vitamin intake, the mean point(79.51±0.69) of the group which have eaten vitamin in the post-test by mediating technology system were statistically significantly higher than the mean point(51.84±2.93) of the group in the pre-test by the application of medical information systems (t= -5.17, p=.000).

Table 2 : Difference of Life Habits by Medical Information Systems

Variables	Pre-test	Post-test	t	p
	Mean ± S.D.	Mean ± S.D.		
Vitamin intake	51.84 ± 2.93	79.51 ± 0.69	-5.17	.000
Exercise	46.17 ± 0.52	82.41 ± 2.16	-2.84	.000
Stress	81.45 ± 2.92	64.18 ± 1.92	5.62	.001

Conted...

Hypertension	65.70 ± 1.58	48.25 ± 0.64	1.37	.002
Alcohol	70.35 ± 2.47	45.09 ± 1.62	6.18	.000
Vegetable	56.21 ± 1.52	76.15 ± 0/85	-1.63	.000
Cholesterol	78.54 ± 1.38	63.79 ± 2.17	2.60	.047
DM	53.72 ± 2.19	51.29 ± 1.28	-1.49	.726
Soybean	59.08 ± 2.05	72.28 ± 2.91	-4.27	.001
Carrot intake	42.30 ± 1.78	65.74 ± 1.93	-2.94	.000
Onion	56.17 ± 0.27	72.59 ± 2.36	-5.52	.000
Cancer Screening	53.24 ± 1.64	75.28 ± 1.47	1.33	.000
Acupressure	36.18 ± 1.49	51.16 ± 1.83	-2.48	.000
Tomato	52.72 ± 0.62	59.63 ± 3.37	-4.12	.000
Garlic	45.39 ± 2.52	56.38 ± 0.63	-1.56	.000
Meditation	29.14 ± 5.78	62.49 ± 1.37	-3.27	.000
Listening to music	34.61 ± 0.68	57.63 ± 2.15	-0.54	.000

Health Changes in Physical and Mental Function: As below, it indicates health changes in physical function by medical information systems in Figure 2. The data achieved a significantly higher rate in the group observed than the normal group, even the days passed 20 days by the application of medical information systems.

In particular, the variation was estimated to increase more rapidly with time elapsed of 30 days after the application of medical information systems.

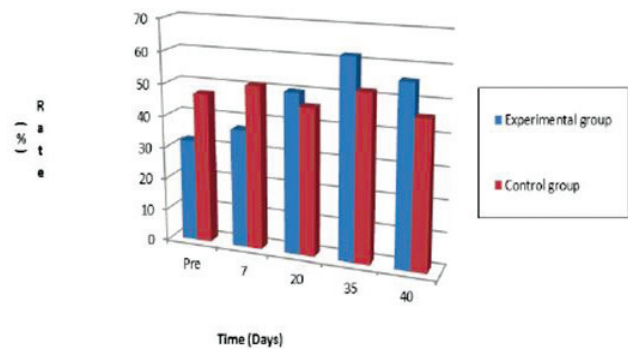


Fig. 2: Health change in physical function

Health Change in Mental Function: As below, it indicates the health change in mental function by the application of medical information systems in Figure 3. The data achieved a significantly higher rate in the group observed than the normal group, even the days passed 15 days by the application of medical information systems.

However, the effect was decreased rapidly with time elapsed of 35 days after application as compared to before application.

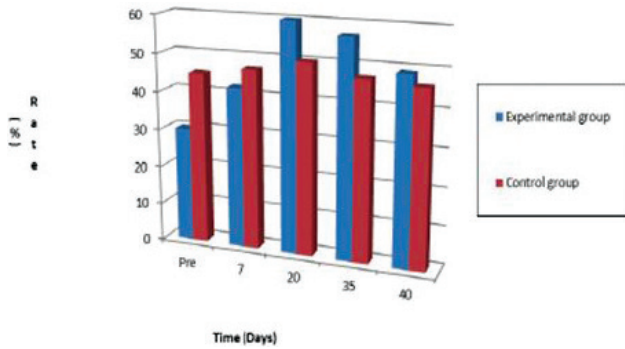


Fig. 3: Health change in mental function

DISCUSSION

The paper is to explore the usability of medical technology to enhance physical function after surgery for ovarian cancer. The conclusions of this research are as next contents. Physical function after surgery for ovarian cancer patients who has eaten vitamin diminished the symptoms of body illnesses. The achieved data was similar with the previous researches on the vaginal cancer^{16,17}.

This study indicated that participants with ovarian cancer should be focused on mediating technology to prevent the observed disease related to the ovarian cancer. From contents on the data obtained, it expects that this may be used an effective data for using and connecting medical information systems for enhancing physical function.

In addition, systematic studies should be established continually in order to prove results of this study. The present work appeared that life habit rate of mediating technology was increased from 61.5% to 71.4% by the mediating technology system, which is similar to data conducted from previous contents^{18,19,20}.

However, it indicated that the mediating technology is not persisted for 40 days of time. Accordingly, in order to persist the mediating technology, it is very important to perform regular training. The conclusion drawn will contribute to improve physical function after surgery for ovarian cancer.

CONCLUSION

The paper is to identify a new method for medical information systems to improve physical function after surgery for ovarian cancer. The results are as follows.

Firstly, for vitamin intake, the mean point(79.51 ± 0.69) of the group which have eaten vitamin in the post-test by medical information systems were statistically significantly higher than the mean point(51.84 ± 2.93) of the group in the pre-test by the application of medical information systems ($t = -5.17, p = .000$). Secondly, the data achieved a significantly higher rate in the group observed than the normal group, even the days passed 20 days by the application of medical information systems. Therefore, the paper conducted to evaluate the effectiveness of medical information systems. This impact of medical information system will have a technique on prevention of ovarian cancer.

ACKNOWLEDGMENT

I want to appreciate about the efforts of people who had experienced for research to enhance physical function after surgery for ovarian cancer. The medical information systems will be useful data for treatment among ovarian cancer patients.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Improve Daily Living-Based Physical Function

REFERENCES

1. A. L. Petri, A. H. Simonsen, F. Hagdall, A. T. Pedersen, D. Hartwell, E. T. Fung, "Biomarker panels in urine and serum for ovarian cancer diagnosis. *Protomic Clin, App.* 2012; 4(3): 304-314
2. A. F. Saad, W. Hu, A. Sood, "Ovarian cancer". *Horm Cancer.* 2010.
3. B. Yurkovetsky, K. Zoya, "Development of a multimarker assay for early Detection of Ovarian Cancer", *Journal of Clinical Oncology.* 2010; 28(13): 2159-2166
4. C. Hedlund, "Surgery of the reproductive and genital systems, In : *Small Animal Surgery*", 1st ed. St. Louis : Mosby-Year Book Inc, 2007: 517-574
5. E. Hardie, M. B. Hansen, G. S. Carroll, "Behavior after ovariectomy in the dog; What's normal?." *App Anim Behav Sci,* 2007; 51(1): 111-128

6. G. P. Chanoit. H. P. Lefebvre. K. Orcel. V. Laroute. P. L. Toutain. J. P. "Use of plasma creatine kinase pharmacokinetics to estimate the amount of exercise-induced muscle damage in beagles" *Am J Vet Res.* 2001; 62(1): 1375-1380.
7. L. Holton. P. Pawson. A. Nolan. J. Reid. E. Scott, "Development of a behavior-based scale to measure acute pain in dogs". *Vet. Rec.* 2001; 148(1): 225-226
8. J. K. Hee, "Smoking cessation and relapse among smoking cessation scholarship beneficiaries". *Indian Journal of Science and Technology.* 2015; 9(26):132-138.
9. J. L. Su, Y. J. Da, J. N. Hyun, J. K. Su, H. Y. Myeong, J. J. Young, S. B. Won, C. L. Keon, Y. L. Dong, "The effects of squat exercises on the space between the knees of persons with genu-varum". *Indian Journal of Science and Technology.* 2016; 9(26):110-120.
10. M. E. Carney, J. M. Lancaster, C. Ford, "A population-base of Care for Ovarian Cancer Who is Seen By A Gynecologic Oncologist and Who is not", *Gynecol Oncol.* 2002; 84(1): 36-41
11. M. S. Jakeways, V. Mitchell. I. A. Hashim. S. J. Chadwick. A. Shenkin, C. J. Green, F. Carli. Metabolic and inflammatory responses after open or laparoscopic cholecystectomy, *Br. J. Surg.* 2004; 81(1): 127-131
12. S. Mastrocinque. D. Fantoni, "A comparison of preoperative tramadol and morphine for the control of early postoperative pain in canine ovariohysterectomy". *Vet Anesth Analg.* 2003;30(1): 220-228.
13. S. R. Lee, "The effect of an integrated information system adoption for performance ability improvement in hypertensive patients", *IJSEIA.* 2014;18(1):435-442
14. S. R. Lee, "Short-Term impact analysis of a clinical information system adoption on relieving menstrual distress", *IJBSBT.* 2014; 6(2): 61-68
15. R. B. Fingland. "Ovariohysterectomy in current techniques in small animal surgery", 4th ed. Baltimore : Williams & Wilkins. 2008: 489-496.
16. S. R. Lee, "The model development and empirical application for the alleviation of low back pain", *The 5th International Conference Ubiquitous Computing and Multimedia Application, Indonesia.* 2014;6(1): 19-22.
17. R. B. Hancock, O. I. Lanz, D. R. Waldron, R. B. Duncan, R. V. Broadstone, P. K. Hendrix, "Comparison of postoperative pain after ovariohysterectomy by harmonic scalpel-assisted laparoscopy compared with median celiotomy and ligation in dogs", *Vet Surg.* 2005;34(1): 273-282
18. R. Marcovich, A. L. Williams A. L. Seifman B. D. Wolf, S. A "canine model to assess the biochemical stress response to laparoscopic and open surgery", *J Endourol.* 2001; 15(1): 1005-1008.
19. Z. Zhang, R. C. Bast, Y. Yu, "Three biomarkers identified from proteomic analysis for the detection of early stage", *Ovarian Cancer.* 2004; 64(1): 5882-5990
20. S. M. Omstein, D. R. Garr, R. G. Jenkins, P. F. Rust, A Amon, "Computer-generated physician and patient reminder tools to improve population adherence to selected preventive services", *J Fam Pract.* 2008; 32(2): 83-85.

Effects of Participation in Dancesports Program on Age Identity, Existential Identity, and Ego Integrity of the Elderly in South Korea

Yoon-Mi Jong¹, Moon-Suk Lee¹, Jong-Kil Lee²

¹Research Scholar, ²Professor, Department of Sport Science, College of Natural Science, Chungnam National University Daejeon, South Korea

ABSTRACT

For successful aging and welfare of the Korean elderly in the face of ‘super-aged society’, this study aimed to explore the effects of participation in dancesports program on age identity, existential identity, and ego Integrity of the elderly. This study used a pre-posttest non-equivalent control group design as a field study. Subjects of experimental group (n=93) and control group (n=103) were males and females over 65 years old who participated in senior dancesports program or not during three months. Pretest and posttest were administered by using elderly existential identity scale, age identity scale, and ego integrity scale. Statistical methods were an Analysis of Covariance and a multi-level model of structural equation modeling by using M-plus program. Followings are the results of this study. First, participation in dancesports positively affects the elderly’s sense of age identity. In other words, the sense of age identity improved after participation in dancesports. Second, participation in dancesports positively affects the existing identity of the elderly. Therefore, the existential identity feeling after participating in the dancesports is higher than before. Third, participation in dancesports positively affects ego integrity of elderly people. The ego integrity improved significantly after participation in dance sports. Fourth, dancesports participation has a positive influence on age identity, existential identity, and ego integrity both directly and indirectly. In addition, dancesports participation has a positive influence on ego integrity mediated by age identity and existential identity. The effects of participation in dancesports program can provide the empirical evidences for expanding the scope of social welfare for elderly. This study will also contribute to the understanding, specialization, and institutionalization of the potential value of the therapeutic programs for the elderly which has not yet established as a specialized field in South Korea.

Keywords: *dancesports, age identity, existential identity, ego integrity, the Korean elderly*

INTRODUCTION

According to a recent domestic survey^[1], 36.9% of the surveyed think that they are 6 to 10 years younger than their actual age. 26.2% said they were one to five years younger, and 16.6% said they were even 11 to 15 years younger than their actual age. Thus, according to some cultural standards, they are already ‘old people’, but many people have self-concept that does not feel that they are old enough to resist the internalization of stereotypes of age discrimination and to move away from the social stigma associated with ‘Protect self-image and uplift oneself^[2]. These results show that the sense of age identity, which is believed to be young in old age, seems to be a desirable coping strategy in

a culture that negatively affects the elderly because it increases the satisfaction of life for oneself.

The elderly participated in dance sports as a representative social activity of voluntary participation for the elderly. The elderly will be able to improve their subjective health status and life satisfaction as well as obtain compensation from a social role loss by confirming their identity through social activities and forming a social network. In addition, it can be linked to social support and subjective health status, and it may be related to the ego integrity which is the ultimate satisfaction of the elderly’s life. Therefore, specific and experimental researches on the effect of dancing sports participation in the elderly’s major social activities on the completion of ego

integration, which is the result of successful aging, should be continuously carried out^[3]. The purpose of this study is to explore the structural relationship among dancesports and ego integrity related variables by analyzing the changes of age identity and existential identity through participation in dancesports program.

MATERIALS AND METHOD

Research design of this study was a pretest and posttest non-equivalent control group of quasi-experimental design as a field study.

Subjectives: The subjects of this study were 196 seniors(93 participants and 103 non-participants) aged 65 and over selected from 3 to 5 distinctions among 5 elderly welfare centers.

Treatment/Program: The dancesports programs were provided as a treatment of quasi-experimental design for the participants each 50 minutes, twice a week for three months, which were composed of three of four quarters of ChaChaCha, Rumba and Jive, and the most popular Latin American dance events.

Measurement tools: The tools for measuring the variables were used for the self-administrated questionnaires including types of the elderly age identity^[4], existential identity^[5], and ego integrity^[6]

Statistical Methods: The statistical methods to test hypotheses were Analysis of Covariance(ANCOVA) and a multi-level model of structural equation modeling(SEM) by using M-plus program with SPSS and Amos ver.21.

RESULTS

Effect of participation in dancesports program on age identity

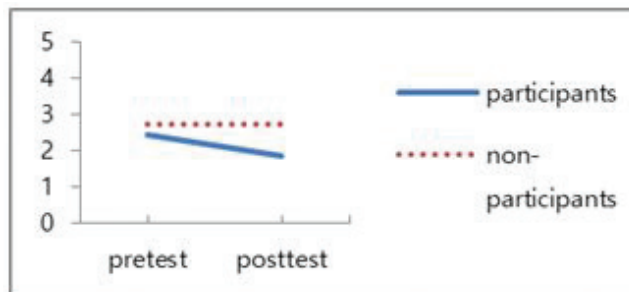


Fig. 1: Pretest and posttest of age identity of the groups

Figure 1 show the results of pretest and posttest of age identity of experimental group(participants) and control group(non-participants). Age identity of participants decreased much more after participation in program, while non-participants did not. Actually, there was a significant difference of changes(-.59 and -.01) between two groups. These results indicated that dancesport participants thought themselves much younger than their actual age after dancesports program compared to non-participants. ANCOVA to test main effect of participation validated a statistical significance($F=75.378, df=1, p<.000$).

Effect of participation in dancesports program on existential identity

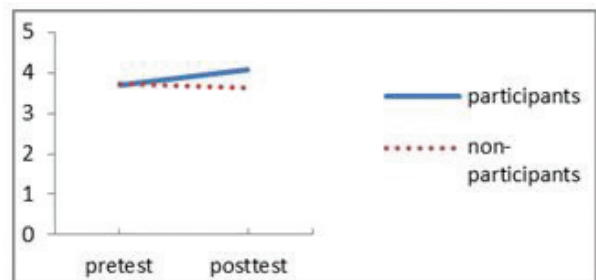


Fig. 2: Pretest and posttest of of existential identity of the groups

Figure 2 show the results of pretest and posttest of existential identity of experimental group(participants) and control group(non-participants). Existential identity of participants increased much more after participation in the program, while non-participants did not. Actually, there was a significant difference of changes(.36 and .10) between two groups. These results indicated that dancesport participants had much higher sense of existential identity after dancesports program compared to non-participants. ANCOVA to test main effect of the participation validated a statistical significance($F=34.608, df=1, p<.000$).

Effect of participation in dancesports program on ego integrity

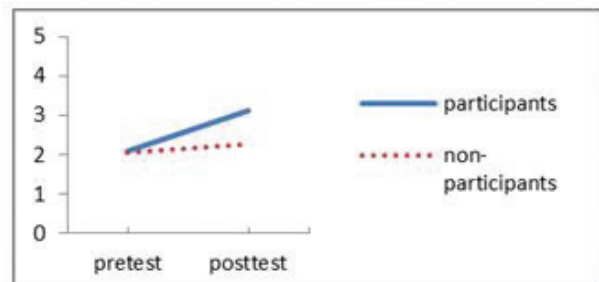


Fig. 3: Pretest and posttest of of ego integrity of the groups

Figure 3 show the results of pretest and posttest of ego integrity of experimental group(participants) and control group(non-participants). Ego integrity of participants increased much more after participation in the program, while non-participants did not. Actually, there was a significant difference of changes(1.00 and .22) between two groups. These results indicated that dancesport participants had much higher sense of ego integrity after dancesports program compared to non-participants. ANCOVA to test main effect of the participation validated a statistical significance ($F=31.411, df=1, p<.000$).

Structural relationships among participation in dancesports program, age Identity, existential Identity, and ego Integrity

Figure 4 shows the results of path analysis in multi-level model of structural equation modeling by using M-plus program.

As shown in Figure 4, the direct effect is affected by the participation of dancesports on age identity($\beta = .323$), the effect on existential identity($\beta = .438$), and the effect on ego integrity($\beta = .631$) and the direct effects of age identity on existential identity and ego integrity are $\beta = .128$ and $\beta = .471$. In addition, the direct effect of existential identity on ego integrity is found to be $\beta = .321$, which is statistically significant.

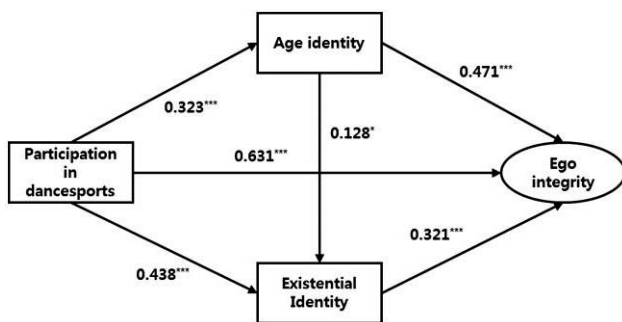


Fig. 4: Verification of the structural relationship among dancesports participation, age identity, existential identity, and ego integrity

As indirect effects, the effect of participation in dancesports on ego integrity through age identity($\beta = .323 \times .471 = .152$) and the effect of participation in dancesports on ego integrity through existential identity($\beta = .438 \times .321 = .140$). Structural effects are the result of total effect of direct effect ($\beta = .2312$) and indirect effect ($\beta = .292$), $\beta = 2.604$ showing high structural effect.

Table I: Index of goodness fit test for the research model

Overall Index	X ²	X ² /df(17)	sig	TLI	CFI	RMSEA
Research Model	130.971	7.70	.000	.926	.915	.082
Fit Index Standard		<3.0	>0.05	≥0.9	≥0.9	≤0.05~0.1

As shown in Table I , goodness of fit-test of this research model was significantly validated as 59.132, TLI = .921 (≥0.9), CFI = .934 (≥0.9), RMSEA = .072 (≤0.05 ~ 0.1)

Therefore, participation in dancesports directly affects the elderly ‘s sense of age identity, existential identity, and ego integrity proves that it is an important factor that indirectly affects ego integrity through age identity and existential identity. As a result, participation in dancesports program has a structural and causal relationship with age identity, existential identity, and ego integrity of the elderly.

DISCUSSION

Participation in dancesports has a statistically significant effect on age identity, existential identity and ego Integrity. In addition, age identity has a significant effect on the existential identity and ego Integrity. Existential identity also appears in the structural relationship that has a statistically significant effect on ego Integrity, while age identity due to participation in dancesports has a positive correlation with existential identity there was. There is also a correlation between all sub-domains of ego integrity and a positive correlation between existential identity and ego integrity. In this study, the elderly who has a young perceived age identity shows a high existential identity. This result is consistent with previous study^[7]. The elderly who participated in the rhythm exercise welfare program can overcome the basic adversity experienced in daily life through interpersonal relationships, feel that they are worthwhile^[8]. In addition, the psychological age is younger than the actual age of the person. By recognizing the age identity, the young person is recognized as a self-concept rather than the actual figure of his or her own, and the elderly is positively affirmed, And that the negative happiness, loneliness, alienation, shame, sickness, and harshness are perceived to be low. Also, Existential identity is a

subjective evaluation that perceives the present state of oneself, leading to successful aging, enhancing existential identity and providing psychological stability with satisfaction of old age. Also relationship with the family should be smooth, healthy, affordable, and active in social activities. It is considered that the active social participation and physical activities such as dance sports have an influence on the existential identity feeling in their subjective evaluation^[9].

Dancesports are artistic and physical activities that express the inner emotions, maintain harmonious relationship within members, enhance emotional stability, positively affect ego-integrity. The results of previous related study^[10] was consisted with this study, which reported that the elderly were more emotional and happy when they participate more in sports activities.

CONCLUSION

This study aimed to identify the effects of participation in dancesports program on age identity, existential identity, and ego integrity of the elderly for effectively preparing the successful aging and welfare of the elderly in face of 'super aged society'. Meaningful conclusions of the study can be summarized as followings: First, participation in dance sports positively affects the elderly' sense of age identity. In other words, the elderly feel much younger rather than their real age after dancesports participation. Second, participation in dancesports positively affects the existential identity of the elderly; the elderly have much higher sense of existential identity after dancesports participation. Third, participation in dance sports positively affects the ego integrity of elderly people; the elderly have much higher sense of ego integrity after dancesports participation. Fourth, dance sport participation had a positive influence on age identity, existential identity, and ego integrity both directly and indirectly. In addition, dancesports participation had a positive influence on ego integrity mediated by age identity and existential identity.

Ethical Clearance: Chungnam National University

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Daily Economics, "June/ fifteen," Korea, <https://www.dailyeconomics.gr/>, 2011.
2. M. S. Lee, "The mature women's attitudes toward menopause and menopause symptoms and management," Thesis of Master D, Graduate School of Hallym University, 2012.
3. O. B. Jung, D. B. Kim, S. W. Jung and H. H. Son, "Social welfare with the aged," Seoul: Hak Ji Sa, <https://www.hakjisa.co.kr>, 2011.
4. G. J. Westefhof and A. E. Barret, "Age identity and subjective well-being: A Comparison of the United States and Germany," *Journals of Gerontology, Series B, Psychological Sciences and Social Sciences*, 2005, 60(3), 129-136.
5. C. E. Osgood, G. J. Succi and P. H. Tannenbaum, "The measurement of meaning". Urbana, IL: Illinois University Press, 1977.
6. J. J. Ah, "(A) Study on the Influencing Factors of Ego Integrity in the Elderly: Centering on the Social Support and Depression," Thesis of Master D, Graduate School of Seoul Women's University, 2006.
7. S. S. Lee, "The Study on the relationships between age-identity, Attitude toward the elderly and self-esteem of the elderly," *Korean Association of Human Ecology*, 2013, 22(1), 57-73.
8. E. H. Kim and J. O. Jeong, "The relationships among self-esteem, age-identity, and psychological happiness in rhythm exercise welfare program of elders," *Journal of Korean Society for Rhythmic Exercises*, 2013, 6(1), 1-12.
9. Y. C. Byuu, D. H. Lee and H. S. Ryu, "Effect of Chronic Dance Sports Activity on Ego-resilience, Subjective Happiness and Balance in Elderly Women," *Korean Society of Sport Psychology*, 2014, 25(1), 39-50.
10. S. H. Oh, "(The) Relation between the Ego Integrity and the Old's Participations in Recreational Sports," Thesis of Master D, Graduate School of Ewha Womans University, 2001.

Impact of Collaborative R&D Projects in Determining Innovative Performance

Richa Kumari¹, Inje Kang¹, Byeong-Hee Lee², Byeongjeong Kim², Kiseok Choi²

¹University of Science and Technology, 217, Gajeong-ro, Yuseong-Gu, Daejeon, Republic of Korea;

²National Science & Technology Information Service Center, Korea Institute of Science and Technology Information, 245, Daehak-ro, Yuseong-gu, Daejeon, Republic of Korea

ABSTRACT

Background/Objectives: Korea is focusing to improve its innovative system and performance based on collaborative structure and it is important to analyze impact of R&D collaboration on innovative performance of the nation.

Method/Statistical analysis: We empirically analyze the role of collaborative research and its influence in determining innovative performance. For that, we developed certain hypothesis to examine the role of input factors and its impact and further tested our hypothesis. We empirically analyzed data of national collaborative R&D projects conducted between 2012-2016 in Korea. We used the negative binomial regression method for analysis the result and to find a meaningful implication of our study.

Findings: The result proposes that collaborative research input factors and collaborative partners have significant impact on technology and knowledge innovation outcomes. The study also provides evidence that university, industry and research institutes as research partners has different influence on innovative performance. Moreover, collaborative research factors like number of participants, duration of projects and government investment has specific effects on determining the innovative capabilities of the nation.

Improvements/Applications: The result gives insight on effect of collaborative research on innovative performance and specifies the implications for better management of input factors in order to improve its impact on performance.

Keywords: Collaborative R&D, Innovative performance, Research Input, Innovative Performance, Innovation System

INTRODUCTION

Korea, as a knowledge economy has long history of development and restructuring of its institutions and innovation system. In last 40 years, Korea has undergone various evolutionary processes on its R&D structure for improving and strengthening National Innovation System (NIS). With reorganization of R&D organization structure and reforming the R&D policies, Korea is strengthened innovation system of the country based on collaborative interactions. Korean government made continuous effort to create various policies and programs to boost collaborative network and its role in renovating NIS structure and performance. Moreover, Korea has focused on developing the knowledge and technology intensive industry up to international level,

as these industries are substantial to the development of innovation system¹. Development of these industries and their integration within the country helps to strengthen innovative performance of the nation.

With the different mode and level of collaboration between universities, industries, public, private firms and research institutes in Korean innovation system, each mode has its own efficiency and contribution on NIS performance. There are formal and informal modes at individual level, firm level, regional level and national level. Based on level of linkage and network relations between partners, these collaborations are classified as strategic partnership, consultation based, research contracts or many other types. For example, R&D based collaboration is regarded as formal and at high level in

topology as per involvement and relationship between partners². R&D collaborations, viewed as a major and efficient way of enhancing the contribution of actors and establishing innovation ability in Korean economy. Moreover, R&D collaboration is also an efficient way to utilize external technology and knowledge resources and exchanging internal one, thus enhancing innovation³. Liu et al⁴ showed the coupling relationship between knowledge and technological innovation, and explained that knowledge innovation is the foundation of technology innovation, where technology innovation acts as promoting agent for knowledge innovation⁴. Therefore, collaborative research is important for improving the innovation capability and enabling partners to resolve their technological issues by accessing more resources, sharing expenses and risks.

Although, collaborative research seems useful in improving knowledge base and research productivity, but in reality collaboration has not seen to be very effective in action due to various reasons; one of the major problems is the lack of mutual trust between research partners. In addition, differences in the research objective and motives of the collaborative actor's produce inefficient outcome. Lee et al⁶ analyzed that bonding or cohesiveness between actors is more important than network efficiency in order to improve research effectiveness and productivity. Active interaction and communication between actors are beneficial for development of innovative ideas and outcome performance is deeply interlinked with the relationship of actors⁷. Therefore, although networking is essential for the success of collaboration, mutual trust, communication and relationship are keys to establish relation and improve innovative performance, and consequently lead to a successful collaboration.

LITERATURE REVIEW

Existing literature on collaborative research mostly focused on performance of collaboration at regional level. For example, a study done by Yimet al⁸ described collaboration as a part of regional innovation system for Gyeonggi province of Korea and highlighted the importance of collaboration in regional innovation. Moreover, recent studies on collaboration focused on demonstration of network linkage or structure between partners using network analysis techniques. Shapiro et al⁹ analyzes the inter-regional collaboration and its impact on innovation system based on network

analysis and concluded that decentralization of network structure could be useful for improving knowledge and technological innovation of nation. The study states that obstructions in network structure of collaboration could lead to inefficiency in research capabilities of system. The study Another study done by Yoon¹⁰ states that Korea still needs to improve network interaction and make strong collaboration in order to improve efficiency and capability in innovation system. Improving networking and connection is important to strengthen collaboration, thus it will enhance innovation outcome.

Previous studies also focus on importance of diffusion and flow of knowledge between partners. For instance, Cohen et al¹¹ analyzed that information exchanged through the process of collaboration is important to generate and develop new ideas and thus, contribute to innovation. Subsequently, exchange of knowledge improves innovative performance by integrating the ideas of collaborative actors and improving capability through utilization of external resources. Capaldo et al¹² performed a study on Italian university-industry collaboration states that motive of interaction and networking between partners are critical to make collaboration successful. The study also emphasizes that role of collaboration is significant in solving technology needs and related technological issues efficiently and effectively. This enhance technology capabilities of collaborative actors.

Although, previous studies provide useful insights on importance of collaboration and demonstrates collaborative actors as the part of the NIS, there is limited study on measuring the aspects of collaboration and analyzing the role of collaborative research input on knowledge and technology innovation. This study tries to add on existing research by examining the role of collaborative input activities in production of innovation and commercialization of innovative outcome in Korean NIS. Since Korea is focusing on improving innovative environment and national system of innovation based on collaboration, it is important to understand innovative system concept for further analysis. In addition, the study will help us to analyze the significance effects of collaborative research input in determining the performance of innovative outcome. To understand this effect more, we first discuss the theory and concept related to NIS.

COLLABORATIVE RESEARCH

Collaborative research is helpful in exploitation of resources of organizations and also considered as good source of new resource creation. Different institutions or actors have various input and resources complementary to each other in producing innovative outcome. University is considered as source of basic research whereas industry main motive is product development and commercialization. Efficient collaboration between these two actors provides experts to industry and improve commercialization rate as well as entrepreneurship motive of university. On the one hand industry provides practical experience and future opportunities to manpower, on the other hand university provides consultancy to industry. Thus, university-industry (U-I) relationship is considered beneficial for performance improvement and skill utilization. Korean universities has a source of education and research infrastructure and capabilities provides new and innovative ideas and cultural environment, thus serve complementary role in collaboration⁷. Similarly research institutes are more focused towards applied research activities and technical innovation therefore collaboration of University-Research Institute (U-R) improves technical quality of experts by providing them better lab facilities and resources thus improve technical outcome¹⁶. Industry- Research (I-R) improves commercialization rate of technical outcome of research institutes and it provides better research resources and financial support in technology innovation, thus collaboration helps to reduce the time gap and facilitate research and development.

NATIONAL INNOVATION SYSTEM (NIS)

In the recent years, the concept of innovation and approach to define NIS has undergone considerable changes. There are no universally accepted concept and definition of innovation system. However, traditional approach based on linear model of innovation considering standardization of input output measurement does not explain much about growth and performance of national economy. Therefore, systemic approach, which defines innovation system as nonlinear and iterative model where institutions and culture has greater role in value creation, was developed for better exploration of growth and performance model of a nation. NIS mainly depends on the interaction of the institutions within system that work

to improve innovative performance. Freeman¹³ defined innovation system of a nation as the web of linkage between actors whose action and interactions within the system leads to creation, improvement, absorption, and diffusion of knowledge and technology^{13,14}. Nelson¹⁵ defines NIS as the institutional set within the system that interacts and their interaction measures innovative performance of nation. In short, Institutions or actors are the subsystem of NIS, whose interconnection and activities results generation, diffusion and absorption of new technology by using knowledge and ideas as input. Therefore, collaboration between these actors are important to understand and analyze the system components and innovative performance.

Transition in Korean Innovation Structure: South Korean economy has undergone drastic change in its R&D structure to improve the system. Korea has long history of chaebols which run in house organization and research centers are important part of Korean economy. But after financial crisis of 1997, Korea has done many changes to protect its organization and economy as whole. It improves its research and technology capabilities to enhance its research and economic outcome. Korea not only increased its R&D investment to the highest percentage among OECD nation (around 4.2 percent of GDP in 2015) but also improved its R&D capability to build NIS. Figure 1 shows the evolution of Korean research and innovation system. Korean government has also implemented various policies to improve outcome and performance of innovation system by encouraging collaborative structure. Korean innovative system, majorly divided into major periods as 1970s to 1980s, 1990s, and 2000s onwards as per the major changes in the structure and elements of innovative system of Korea. These periods, recognized as imitation phase, catch-up phase and creative phase respectively. In 1970-80s, Korea primary focus was on building basic infrastructure and industry by imitating technology of foreign nation (Imitation Phase). Government funded research institutes (GRI) served as leading actor during this phase. In 1990s, the period named as catch-up phase, industry served as main role in Korean innovative system. During this period, main agenda was development of indigenous technology and improvement of personal skills of human resources by domestic or international training. However, there was not much focus on collaborative and interactive research till this phase. Period in 2000s and afterwards, considered as the

creative phase of Korean economy, in which university played as major role in innovative society. During this phase, development of research capabilities was the main aim. Government started its focus on collaborative system and research infra and capabilities. In addition, Korean government initiated various policies to foster innovation clusters in the system¹⁰. Establishment of

various research organizations led in strengthening of basic research capacity and improvement of technology transfer rate significantly. Also Transition in role and structure of actors in korean innovation system make it necessary to analyze role of collaborative partners and its impact on innovative performance.

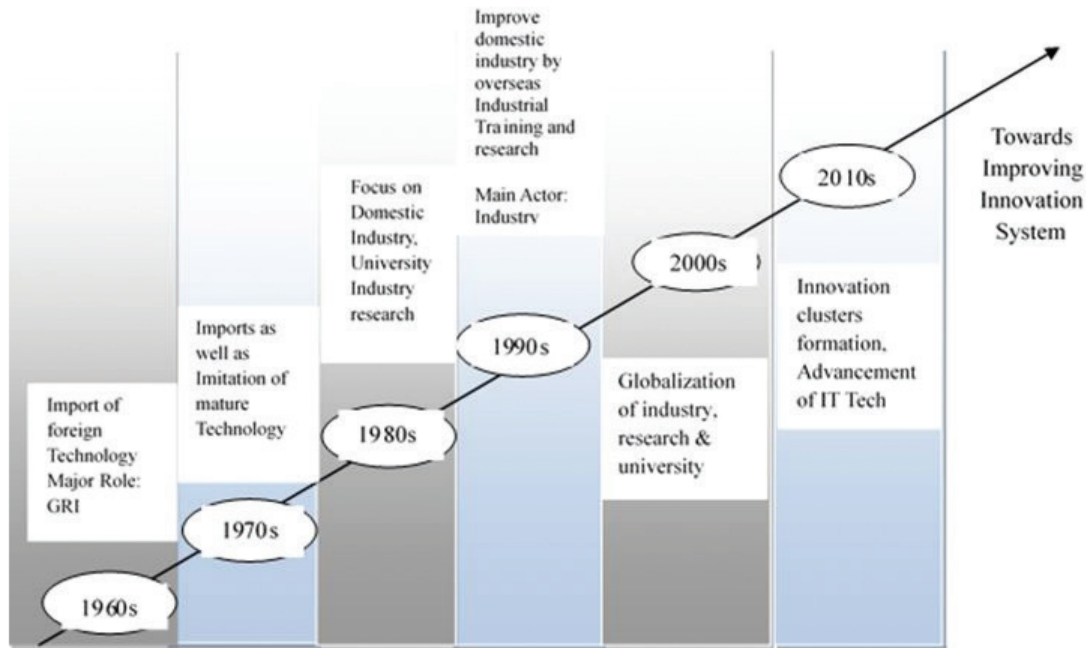


Figure 1: Important Transition in Innovative Structure, Korea

Source: Compiled Based on Previous Literature^{10,32}

HYPOTHESIS DEVELOPMENT

Role of collaborative actors as Research Partner:

University, research institute, industry are main actors in collaborative research. As these research partners has different capabilities and outcome, their performance affects the innovative capability of the nation. These partners in national collaborative research projects lead to knowledge and technology creation, which serves an integral part of Korean innovation system. Universities traditionally serve as foundation for knowledge supply and conduct basic research that adds value to the development and innovation process done by the industry. However, with changing role of universities in economic environment such as academic entrepreneurship, universities are emerging as an important source in technology innovation¹⁷ and it is making its status prominent in national growth and development.

H1a: *There is positive relation between university participating as research partners in collaborative research and innovative and commercial performance of NIS*

Industries, on the other hand serve as source of new product or services mainly focus on commercialization of innovative outcome. Industry is source of technology development beneficial for improving patenting and commercial outcome¹⁶. Consequently, collaboration between universities and Industries increases the chances of R&D success and boosts innovative performances^{7,18}. Industry main aim is revenue generation and profit maximization which provide value for the economic development of nation. Therefore, collaboration with industry has role in enhancing innovative and commercial performance.

H1b: *There is positive relation between industry participating as research partners in collaborative research and innovative and commercial performance of NIS*

Apart from above two actors, public research institutes (PRIs) act as a connecting link between university and industry in Korean innovation system. Research Institutions are source of applied research, acts as supporting base for university and industry. Government and Public Research Institutes assist the university and industry by providing infrastructure, resources support and other facilities to them. These institutes are also cause of knowledge and technology spill over and lead to creation of spin-off firms. Thus, research institutes are also source of technical innovation and beneficial for generation of publication and patents¹⁶. Collaboration with research institutes are beneficial for strengthening the innovative performance and capacity of the national innovation system.

H1c: *There is positive relation between research institutes participating as partners in collaborative research and innovative and commercial performance of NIS*

Factors affecting role of collaborative Research:

The success of collaborative research in generation of innovation depends on composition of input factors. Better availability of input resources and better accessibility of cooperative partners are essential to improve the innovative performance of collaborative projects. To analyze the effects, we do an analysis of input factors used in collaborative research projects and empirically deduce the aspects that have influence on innovation capability and performance in term of technology, knowledge innovation and commercial outcome. This will help us to propose how government could improve innovative performance to develop better innovation system for the nation. Some researchers studied the impact of government investment on research performance. Kang and Park¹⁹ investigated that government fund have a significant effects on technology innovation performance of firms. In addition, government funding in R&D projects supports collaboration and promote innovative outcome^{19,20}. Government support and funding help actors to gain additional resources and facilities for research and innovation, consequently contributes to success of the projects. However, the effect of government subsidy on performance of the outcome is still debatable. As some studies also analyzed that high amount of expenditures has seen no significant impact on research performance. The reason could be due to failure to utilize large amount of public fund in efficient manner²¹. Hence, continuous increase in government investment has decreasing

impact on performance of innovative and commercial output, which will exhibit diminishing performance.

H2: *There is inverse U-shaped relation between government funding in collaborative research and innovative and commercial performance of NIS*

Number of participants working on the projects plays important role in the success of collaborative projects. Success of the projects depends on the performance and coordination of these participants. Innovative performance of the collaborative research depends on researcher ability to take advantage to external knowledge and resources. Imaginative participants stimulate innovative ideas that bring technology innovation. Large number of participants in collaboration has more access to different ideas and solution to technology issues. However, large number of participants increases the management and administrative burden that in turn increases the project cost²². In addition, large number of participants in collaborative projects faces more problems in coordination and communication, thus negatively affect the innovative outcome²³. Innovative performance will affect negatively with increase in number of participants in project. .

H3: *There is inverse U-shaped relation between number of participants in collaborative research projects and innovative and commercial performance of national innovation system.*

The period of collaboration also affects the performance outcome in national innovative system. Long-term cooperation and collaboration between actors help them to build their relationship stronger. Moreover, time is an important factor that helps to develop trust and understanding between partners, critical in determining the innovative outcome of the projects²². Period of collaboration helps collaborative partners to understand each other's motive consequently, improve interaction and coordination between them. With increase in time of collaboration, exchange of resources and information also improves, which makes better utilization of those resources by partners and helps in strengthening innovative performance of system. Therefore, period of collaboration research could exhibit positive relation on innovation performance of NIS.

H4: *There is positive relation between period of collaborative research projects and innovative and commercial performance of national innovation system.*

MATERIALS AND METHOD

Database and Key Variables: For the empirical analysis, we have utilized the data of 30723 national R&D collaborative projects of South Korea from the year 2012 to 2016 and the data is taken from the National Science and Technology Information System (NTIS), Korea. NTIS, Korea manages national R&D projects and it has information regarding national research projects of Korea. The collaborative research have done with different research partners including 14,382 universities, 1798 research institutes 19,224 industries and rest 7858 with others partners (not categorized in first three). While the innovation has been shifted more towards systemic concept, role of collaboration has become more significant in improving innovative performance³. Thus, this study included sample of collaborative research projects to analyze the innovation performance.

We analyzed the data of collaborative research projects in terms of scientific output and graphically represented the status of joint publication, joint patents and commercialization outcome based on different modes of collaborative network. Figure 2 shows scientific outcome based on different collaborative networks. Figure indicates co-publication of SCI papers by different collaboration. It shows around 45.5% co-authorship is from U-I collaboration, 31% from U-I-R collaboration, 19.2% from U-R and 6.8% from I-R. Similarly, 53.9% of co-patents is from U-I collaboration, 30.1% from U-I-R collaboration, 7.4% and 6.8% patent output from U-R and I-R respectively. Trend is similar in case of commercialization outcome with 71.1% of commercialization is from University-Industry collaboration. Thus research outcome shows the university-industry collaboration results more amount of research outcome as compared to any other kind of collaboration.

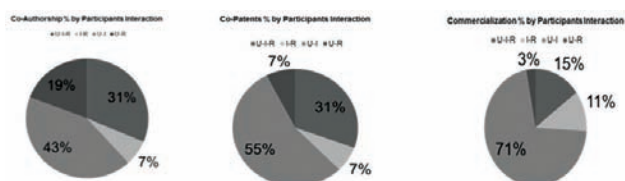


Figure 2: Research output by type of collaboration

Innovative performance of NIS measured in terms of knowledge and technology innovation, generated from collaborative research projects. Since innovation system depends on the relationship between institutions

whose action and interactions lead to knowledge and technology creation, absorption and diffusion¹⁴. NIS has different layers with various components and elements, which make its measurement difficult. It is also almost impossible to analyze all components of the system at a time. Thus, this research measures specific component of innovation system in terms of knowledge innovation (SCI publications) and technology innovation (patent applied). SCI publications (SCI) and Patents (PAT) considered as indicators of innovation and considered as proxy to quantify the innovation components. Furman et al²⁴ analyzed the patent as knowledge stock that brings technology innovation, an important determinants of innovative capability of a nation. Thus, choice of SCI and PAT appear to be suitable as dependent variables for this research.

With the focus to show commercial value of innovative outcome, we choose commercialization as another dependent variable along with knowledge and technology innovation. This helps to evaluate relationship between collaborative research and economic gain from the innovation performance to the nation. Although, patents itself is considered as a source of commercial output, we choose number of commercialization resulted from collaboration projects separately to check the result. Commercialization is significant for use of knowledge or technology in practice and shows the economic aspects of innovation process. Commercialization leads to utilization of innovation with the objectives of financial gain aided to economy and society²⁵ and is an important source of value generation in NIS. Thus, three variables knowledge innovation outcome, technology innovation outcome and commercial outcome resulted from collaborative research projects, selected as the dependent variables for this research.

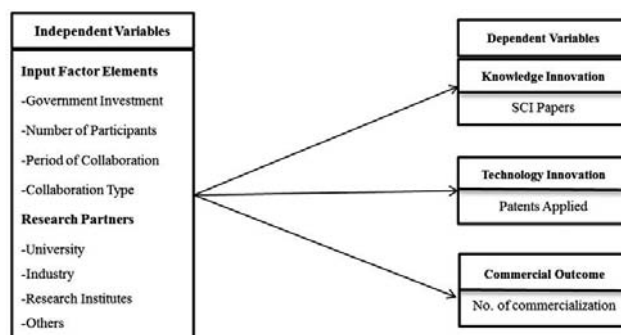


Figure 3: Research Model for Empirical Analysis

The objective of this study is to deduce factors that influences the innovative and commercial performance and

test the hypothesis result. Thus, based on the previous studies and hypothesis, we construct the research model for empirical analysis. Figure 3 shows the research model used for empirical analysis with dependent and independent variables. Independent variables consist of factor elements including inputs affecting collaborative research and partners participating in research. Collaborative partners are taken as dummy variables in this study.

Table 1 lists the operational definition of variables used in the study. Research partners taking participation in collaborative projects are taken with value as 1 (otherwise 0). So, if university is available as research partners in collaborative research then its value as 1, and if not then its value taken as 0. Similarly, partners like research institutes, industry and others partners are used as dummy variable.

Table 1: Operational Definition of Variables

Category	Variables	Description
Dependent Variables	KNOWL_INNOV	Total number of SCI papers taken as publication in SCI journals (indicative of knowledge innovation)
	TECH_INNOV	Total number of patent applied taken as source of technology innovation
	COMMER	Total number of Commercialization contributed as commercial output
Independent Variables Input Factors:	INV	Amount of Government Investment in collaborative research projects (In 100 Million KRW)
	INV2	Square Value of Government Investment
	PARTIC PARTIC2	Total Number of Participants in collaborative research Square Value of Participants
	TERM	Total Research Period (Term in Months)
	COLAB_TYPE dummy	-Domestic: Collaboration with domestic partners -International: Collaboration with overseas partners
Research Partners:	UNIV: REI: IND: OTHERS:	-University : Participation of university as partners -Research Institutes: Participation of public research institutes and government funded research institutes -Industry : Participation of small, medium, or large enterprises -Others: Participation of partners not grouped into any of the above category

STATISTICAL METHOD

In order to analyze the effect of collaboration on the development of innovation system, we evaluate our model for each dependent variable. Since our dependent variables are integer count data with non-negative value, linear model is not suitable for analysis as it could cause variation in estimation due to presence of heteroscedasticity or abnormal error distribution and could lead to inconsistent and biased results^{26,27}. To analyze the integer count data, non-linear models like Poisson model is suitable for the analysis.^{28,29}

Poisson model has assumption of Poisson distribution of dependent variable, which means that conditional mean and variance of distribution are equal. As per Poisson model assumption of equal dispersion, conditional mean $E(y_i | x_i)$ is equal to $Var(y_i | x_i)$

$$E(y_i | x_i) = Var(y_i | x_i) = \lambda_i \dots(1)$$

However, comparison of sample mean to variance showed over dispersion in data. Table 5 shows variance to mean ratio of dependent variables in this research have an over-dispersion. Poisson is not efficient to deal with the over dispersion problem

$$Var(y_i | x_i) > E(y_i | x_i) \dots(2)$$

In case of over dispersion of y, introduction of h_i as heterogeneous parameters is required for estimation which replaces the mean, as random error term as in equation 3

$$E(y_i | x_i, \epsilon_i) = \exp(\alpha + x_i\beta + \epsilon_i) = h_i \lambda_i \dots(3)$$

Therefore, to deal with over-dispersion problem, we use negative binomial regression model for our analysis.

RESULTS AND DISCUSSION

Table 2 summarizes the descriptive statistics for the variables. Out of total 30,723 collaborative

projects, 29,396 projects are the projects with domestic collaboration and only 1327 projects are with international collaboration. The average period of research project was seen to be around 2.5 years and government invested an average around 560 million on the collaborative project.

Table 2: Descriptive statistic

Variable		N	Mean	S.D	Min	Max
No. of Participants	PARTIC	30723	5.878	6.290	1	390
	PARTIC2	30723	74.160	1104.080	1	152100
Total Number of SCI Paper	SCI	30723	0.668	2.570	0	102
Number of Patents Applied	PAT	30723	1.285	3.920	0	155
No. of Commercialization	COMMER	30723	0.656	6.010	0	392
Total Research Period (Term in Months)	TERM	30723	31.340	18.950	1	295
Government Investment (In 100 Million KRW)	INV	30723	5.664	8.871	0.07	301.29
	INV2	30723	110.930	1151.290	0.004	90778.41
Collaboration Type	Domestic (0)	29396	-	-	-	-
	International (1)	1327	-	-	-	-
Research Partners	UNIV (1/0)	14382	0.460	0.491	0	1
	REI (1/0)	1798	0.051	0.232	0	1
	IND (1/0)	19224	0.625	0.482	0	1
	OTHERS (1/0)	7858	0.253	0.430	0	1

It also shows that collaborative projects produce more no. of patents in average (1.28) as compared to number of SCI publication but average number of commercialization is low (0.65) from the collaborative research projects. It shows patents, as a source of technology innovation, is main outcome of collaborative research projects.

Table 3: Correlation coefficient plot between variables*

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1) TERM	1												
2) INV	0.37	1											
3) INV2	0.10	0.73	1										
4) PARTIC	0.28	0.31	0.11	1									
5) PARTIC2	0.05	0.09	0.04	0.63	1								
6) COLAB_TY	0.09	-0.05	-0.01	-0.03	0.01	1							
7) UNIV	0.25	0.27	0.07	0.14	0.03	-0.06	1						
8) IND	-0.04	0.11	0.01	0.02	0.00	-0.23	0.05	1					
9) OTHER	0.14	0.23	0.08	0.08	0.01	-0.04	0.37	0.04	1				
10) REI	0.07	0.06	0.03	0.00	0.00	0.10	0.11	-0.01	0.04	1			
11)KNOW_INV	0.30	0.18	0.07	0.16	0.04	0.12	0.13	-0.02	0.05	0.04	1		
12)TECH_INV	0.25	0.33	0.12	0.15	0.03	-0.01	0.13	0.07	0.09	0.04	0.24	1	
13) COMER	0.00	0.01	0.00	0.01	0.00	-0.02	0.01	0.02	0.01	0.00	-0.01	0.02	1

*Numbers in Italics indicate significant level on 0.05 p-value level

Table 3 represent correlation matrix illuminates the correlation between the variables. Table 4 shows value of VIF for variables. All the variables values ranging fromV 1.1 to 3.5, which shows values are low (and lesser than 5). This means there is no multicollinearity seen between variables and model is fit for analysis.

Table 4: Variance Inflation Factor

Variables	VIF Values	Variables	VIF Values
TERM	1.417	IND	1.084
INV	3.469	OTHERS	1.189
PARTIC	2.039	REI	1.028
COLAB_TYPE	1.100	KNOW_INNOV	1.158
UNIV	1.278	TECH_INNOV	1.210

Our data shows problem of over-dispersion in dependent variables. Since Variance to mean ration of dependent variables are greater than one ($V/M > 1$), it shows over-dispersion in variables. Coefficient of Variation is ration of standard deviation to mean as shown in Table 5 shows index of dispersion and coefficient of variation which indicates high level of dispersion (over-dispersion) around the mean.

Table 5: Over-dispersion in Dependent Variables

Dependent Variables	Mean	Variance	SD	Index of Dispersion VMR	Coefficient of Variation(CV)
KNOWL_INV	0.668	6.610	2.570	9.891	3.841
TECH_INV	1.285	15.421	3.930	12.000	3.060
COMMER	0.656	36.161	6.010	55.112	9.163

We established six models to check the influence of independent variables on innovation and commercial performance. We check our hypothesis by examining the model for each dependent variable based on negative binomial regression analysis method. Table 6 shows all tested models that analyze the effect of collaborative input and partners elements on the innovative performance. Each model examined the collaboration input items, government investment (INV), period of participation (TERM), number of collaborative participants (PARTIC), type of collaboration dummy and research partners dummy as our explanatory variables and check its effects on innovation and commercial outcome performance. First three models are reduced model without squared term of input variables. Last three models (model 4, 5 and 6) are the full and comprehensive models, which includes squared term of government investment and squared number of participants to see the non-linear inverted U-shaped relationship between the variables. While AIC of comparable models (1/4, 2/5, 3/6) have little difference in values but last three full models shows smaller values in comparison, thus, we considered those three models for analysis.

Table 6 shows the result of analysis indicates that university as research partners has positive and significant relationship with knowledge and technology innovation in models, which is consistence with our hypothesis **H1a**.

However, in case of commercial outcome, university shows negative and significant relationship. It indicates that universities are good source of new knowledge and technology creation¹⁷ but universities are lacking behind in commercialization process of innovative outcome. Thus, results partially satisfies hypothesis in terms of innovation outcome but not in commercial outcome (**H1a** partially satisfied) . In case of Industries, the result indicates positive significant relation with innovative and commercial outcome, which fully support our hypothesis **H1b** that industry has positive relation with knowledge, technology as well as commercial outcome performance. Previous study shows that industry improves the likelihood of R&D success and enhances innovative performances^{7,18}. Industries are capable to produce innovative as well as commercial outcome due to its capability to develop new technology and manage resources to convert its outcome into commercial value. However, In case of research institutes, relation is positive and significant with innovation but negative non-significant relation with commercial outcome value. It imply that research institutes are source of technical and knowledge innovation outcome but less role in producing commercial value. This could be due to lack of suitable resources, collaborative structure and poor management³⁰. However, the result indicating impact of research institutes on knowledge and technology creation is consistence to our hypothesis **H1c**.

Table 6: Results of Negative Binomial on various Models

	Model 1 KNOWL_ INV	Model 2 TECH_INV	Model 3COMMER	Model 4 KNOWL_INV	Model 5 TECH_INV	Model 6 COMMER
Constant	-1.6934*** (0.0182)	-0.9122*** (0.0144)	-0.6658*** (0.0289)	-1.9280*** (0.0185)	-1.1170*** (0.0146)	-0.6943*** (0.0294)
INV	0.0165 *** (0.0001)	0.0162*** (0.0001)	-0.0101*** (0.0003)	0.0399*** (0.0004)	0.0446*** (0.0004)	- 0.0017* (0.0009)
INV2	N/A	N/A	N/A	-0.0001*** (0.000)	-0.0002*** (0.000)	-0.00007*** (0.000)
PARTIC	0.0022*** (0.0004)	0.0082 *** (0.0003)	-0.0006 (0.0008)	0.0037*** (0.0009)	0.0185*** (0.0008)	0.0011 (0.0014)
PARTIC2	N/A	N/A	N/A	-0.0001*** (0.0000)	-0.0002*** (0.0000)	-0.00002** (0.0000)
TERM	0.0196*** (0.0002)	0.0170*** (0.0002)	-0.0069*** (0.0005)	0.0203*** (0.0003)	0.1143*** (0.0002)	-0.0080*** (0.0005)
COLAB_ TYPE	0.9906*** (0.0469)	0.1059 ** (0.0388)	-0.4692*** (0.0853)	0.6393*** (0.0455)	0.1177** (0.0381)	-0.4776*** (0.0860)
UNIV dummy=1	0.7514*** (0.0124)	0.4863 *** (0.0097)	-0.0312* (0.0196)	0.7177*** (0.0123)	0.4196*** (0.0095)	-0.0446* (0.0196)
IND dummy=1	0.2101*** (0.0131)	0.5961*** (0.0105)	0.5957*** (0.0211)	0.1520*** (0.0130)	0.4986*** (0.0102)	0.5691*** (0.0212)
REI dummy=1	0.4809 *** (0.0334)	0.5270 *** (0.0271)	-0.0767 (0.0581)	0.7667*** (0.0321)	0.0347*** (0.0263)	-0.0996 (0.0586)
Others dummy=1	-0.2986*** (0.0122)	-0.0880 *** (0.0096)	0.7512*** (0.0193)	-0.4507** (0.0463)	-0.1129 *** (0.0094)	0.7562*** (0.0194)
AIC: 2* log-likelihood:	449630 -449609.99	680245 -680224.82	261362 -261342.44	445018 -447993.72	671014 -670990.25	261222 -261198.21
Significance level: * p < 0.05 ** p < 0.01, *** p < 0.001; Standard Error terms are in lower rows in brackets.						

In case of relation between input factors and innovative performance, government investments exhibit significant relationship in model. With knowledge and technology innovation, investment exhibit inverted U-shaped relationship but fails to exhibit same relation with commercial outcome. This partially support hypothesis **H2**. The evidence could be supported by fact that with increase of government subsidy, innovative outcome start decreasing could be due to inefficiency in utilization of large funding in proper manner to produce innovation²¹. In case of effects of number of participants on innovative performance, it also exhibits statistically significant relation in model 4 and 5, which demonstrates that participants has inverted U-shaped relation with innovative outcome performance which is partially consistence to hypothesis **H3**. Increase of participants has diminishing return on innovation after a point could be due to problem of coordination between

large number of participants²³. Period of collaboration (TERM) exhibit positive and statistically significance relation with knowledge and technical innovation but with respect to commercial outcome, it shows significant negative relation. Collaboration provides efficient solution to technology issue and and effective in saving time and cost¹². This result partially supports to our hypothesis **H4**.

This study developed six hypotheses to analyze input factor elements and research partners elements to deduce their impact on innovative and commercialization performance. The results showed that collaborative input factors like number of participants in projects, government investments, collaboration type, period of collaboration and research partners has significant effect on knowledge (SCI papers), technology innovation (Patents). In case of role of research partners, industries emerged as best partners in production of innovation

as well as commercial outcome. Universities are good source of knowledge and technical innovation but still lagging far behind in commercialization process. Korean government needs to focus more on improving the role of universities as entrepreneurship. Improving coordination and encouraging interaction between university-industry could be the way to improve commercial outcome of university. Similar to university, research institutes has its role in production of innovative and technical output like patenting but has limited impact on commercialization.

Input factors like funding and participants has its impact on creation of new innovative outcome. Since the government, funding shows inverted U-shaped relation with innovation. It is important to consider and analyze associated factors before increasing the funding amount. The success of collaborative research impact on innovative performance depends on the effectiveness of collaboration. Effective utilization of government investment and relation between partners in collaboration could be critical factor that affects innovative outcome. Results also imply that government should decide threshold value of funding based on the aim of the collaborative research and outcome it produces in order to support development of national innovation system. Similarly, improvement of coordination and communication between participants is important to consider in case of increasing their numbers. In case of period of collaboration, it could be significant factor in building the relationship between actors but extended period of projects can make technology outdated for commercialization. So, it is important to consider deadline of projects and consider result impact before extension.

CONCLUSION

We analyzed the data of national collaborative research projects by using negative binomial regression study. The results proposed that collaborative research can be important determinants of innovative performance in the development of NIS. The study provides useful understanding of collaborative research and its impact in improving innovation and commercial outcome performance. The role of research partners and collaborative input came as important determinants in development of innovation. The study provides evidence that collaborative research input - like government investment, number of participants and

period of collaboration is seen as influencing factors in determining the innovative capabilities of the nation. In addition, role of different research partners, university, industry and research institutes are also analyzed in producing innovation and commercial outcome performance. Since national innovation system depends on interaction of collaborative actors, role of these factors in improving innovative outcome is significant. The result findings suggests that better management of input and effective orchestration of partners can improve innovative outcome performance.

The study has limitation that the paper focusses only on role collaboration in terms of public funded R&D projects in Korea national innovation system. Further study on analyzing the other forms of collaboration on innovation system would give more insight. Moreover, more study is required in terms of analyzing the interaction among the actors of collaborative research to strengthen the national innovation system. As the role of collaboration is significant in national innovation system, the comparative study with other country collaborative structure could be useful to generalize the idea and impact on NIS.

Ethical Clearance: University of Science and Technology

Source of Funding: This research was supported by Maximize the Value of National Science and Technology by Strengthen Sharing/Collaboration of National R&D Information funded by Korea Institute of Science and Technology Information (KISTI).

Conflict of Interest: Nil

REFERENCES

1. Park H W, Leydesdroff L. **Longitudinal trends in networks of university–industry–government relations in South Korea: The role of programmatic incentives.** *Research Policy*, 2010, 39 (5), pp. 640-649.
2. Perkmann M, Walsh K. **University-Industry Relationships and Open Innovation: Towards a Research Agenda.** *International Journal of Management Reviews*, 2007, 9 (4), pp. 259–280.
3. Kim E, Lee D, Bae K, Rim M. **Developing and Evaluating New ICT Innovation System: Case Study of Korea's Smart Media Industry.** *ETRI Journal*, 2015, 37 (5), pp. 1044-1054.

4. Liu W W, Sun R, Li Q. **Measurement of coupling degree between regional knowledge innovation and technological innovation: An empirical analysis based on provincial panel data in China during 2010-2014.** *Journal of Interdisciplinary Mathematics*, 2017, 20 (1), pp. 125-139.
5. Dasgupta P, David P A. **Toward a new economics of science.** *Research Policy*, 1994, 23 (5), pp.487–521.
6. Lee D H, Seo I W, Choe H C, Kim H D. **Collaboration network patterns and research performance: the case of Korean public research institutions.** *Scientometrics*, 2012, 91, pp. 925-942.
7. Lee K R. **University–Industry R&D Collaboration in Korea’s National Innovation System.** *Science Technology and Society*, 2014, 19 (1), pp.1-25.
8. Yim D S, Lee S, Kim S J. **Creating and managing regional innovation network in Korea.** *Technology Management for Global Economic Growth (PICMET)*, 2010, Proceedings of PICMET 10, IEEE, pp.1-6.
9. Shapiro A M, So M, Park H W. **Quantifying the National Innovation System: Inter-Regional Collaboration Networks in South Korea.** *Technology Analysis and Strategic Management*, 2010, 22 (7) pp. 845-857.
10. Yoon J. **The evolution of South Korea’s innovation system: moving towards the triple helix model?** *Scientometrics*, 2015, 104(1) , pp. 265–293.
11. Cohen W M, Nelson R R, Walsh J. **Links and Impacts: The Influence of Public Research on Industrial R&D.** *Management Science*, 2002, 48 (1), pp.1-23.
12. Capaldo G, Costantino N, Roberta P, Rippa P. **Factors affecting the diffusion and success of collaborative interactions between university and industry: the case of research services.** *Journal of Science and Technology Policy Management*, 2016, 7 (3), pp.273-288.
13. Freeman C. **Technology Policy and Economic Performance: Lessons from Japan.** Frances Printer Publishers, 1987, Printer, London.
14. Lundvall B A. **National Innovation Systems: Towards a Theory of Innovation and Interactive Learning.** Printer, 1992, London. pp. 317.
15. Nelson R R. **National Innovation System: A Comparative Analysis.** Oxford University Press, 1993, Oxford, New York.
16. Lee H, Kim P R, Z H. **Impact of Cooperative R&D Projects on ICT-Based Technology Convergence.** *ETRI Journal*, 2017, 39, pp. 467-479. (<http://dx.doi.org/10.4218/etrij.17.0116.0874>)
17. Etzkowitz H, Webster C, Gebhardt C, Terra B. **The future of the university and the University of the Future: Evolution of ivory tower to entrepreneurial paradigm.** *Research Policy*, 2000, 29 (2), pp. 313–330.
18. Lee J D, Park C. **Research and development linkages in a national innovation system: Factors affecting success and failure in Korea.** *Technovation*, 2006, 26 (9), pp.1045-1054.
19. Kang K N, Park H. **Influence of Government R&D Support and Inter-Firm collaborations on innovation in Korean Biotechnology SMEs.** *Technovation*, 2012, 32(1), pp. 68-78.
20. Zeng S X, Xie X M, Tam C M. **Relationship between cooperation networks and innovation performance of SMES.** *Technovation*, 2010, 30(3), pp.181-194.
21. Hsu F M, Hsueh C C. **Measuring relative efficiency of government-sponsored R&D projects: A three-stage approach.** *Evaluation and Program Planning*, 2009, 32(2), pp. 178-186.
22. Schwartz M, Peglow F, Fritsch M, Günther J. **What drives innovation output from subsidized R&D cooperation?-Project-level evidence from Germany.** *Technovation*, 2012, 32 (6), pp. 358-369.
23. Dyer J H, Powell B C, Sakakibara M, Wang A J. **The determinants of Success in R&D alliances.** *Proceedings of the Academy of Management Annual Meeting*, 2007 August 3–8 (Meeting Abstract Supplement), pp.1-6.
24. Furman J, L Porter, M E, Stern S. **The determinants of national innovative capacity.** *Research Policy*, 2002, 31, pp.899–933.

25. Perkmann M, Tartari V, McKelvey M, Autio M, Broström A, D'Este P, Fini R, Geuna A, Grimaldi R, Hughes A, Krabel S, Kitson M, Llerena P, Lissoni F, Salter A, Sobrero M. **Academic Engagement and Commercialization: A review of the literature on university–industry relations.** *Research Policy*, 2013, 42 (2), pp. 423-442.
26. Greene W H. *Econometric Analysis*. Pearson Education, 2002, India.
27. Greene W H. *Econometric Analysis*. Upper Saddle River, 2008, NJ: Prentice Hall.
28. Fleming L, King C, Juda A I. **Small Worlds and Regional Innovation.** *OrganSci*, 2007, 18(6) pp. 938-954.
29. Hausman J, Hall B H, Griliches Z. **Econometric Models for Count Data with an Application to the Patents-R&D Relationship.** *Econometrica*, 1984, 52 (4), pp. 909-938.
30. Rasiah R, Lin Y, Sadoi Y. **Innovation and Industrialization in Asia.** Routledge, 2012, Taylor and Francis, NY.
31. OECD. *National Innovation System*. 1997, Paris: OECD.
32. STEPI. *The 40-Year History of Science and Technology Establishment of National Research and Development System, Korea's S&T Policy English Translation Project.* [http://www.stepi.re.kr/app/resources/view.jsp?cmsCd = CM0267 & ntNo = 1 & dvsn = &src = & srcTemp = & currPg =1](http://www.stepi.re.kr/app/resources/view.jsp?cmsCd=CM0267&ntNo=1&dvsn=&src=&srcTemp=&currPg=1) (accessed on 25/06/2017)

Evaluation of Quality of Life in Patients Undergoing Orthodontic Treatment in Eastern India Population

Snigdha Pattanaik¹, Subhrajee Narayan Sahoo², Smruti Bhusan Nanda³, Tusar Kanti Nayak⁴

¹Associate Professor, ²Senior Lecturer, ³Professor & HOD, ⁴Professor, Department of Orthodontics and Dentofacial Orthopaedics, Institute of Dental Sciences, Siksha O Anusandhan (Deemed to be University), Bhubaneswar, Odisha

ABSTRACT

Background: The demand for orthodontic treatment has been increasing with the increase in esthetic concern among people. Quality of life significantly affects various aspects of life including function, appearance, and interpersonal relationship. The concept of oral health related quality of life (OHRQOL) relates the impact of oral health to the individual's life quality thereby shifting the focus of the clinician from the oral cavity alone to a patient as a whole.

Aims: The purpose of this study was to assess to assess whether orthodontic treatment would affect the OHRQOL of general population.

Method and Material: This cross-sectional study was conducted in Department of Orthodontics and Dentofacial Orthopaedics. The sample consisted of 247 individuals aged between 15-30 years who were candidates for orthodontic treatment. Participants were divided into 3 groups as follows: patients with malocclusion, patients undergoing orthodontic treatment and patients after completion of orthodontic treatment. OHRQOL was assessed with the short form of the Oral Health Impact Profile (OHIP-14). Multiple logistic regression was used in the data analysis.

Results: A response rate of 100% was obtained. Patients who had completed orthodontic treatment had fewer oral health-related impacts compared to the other two groups.

Conclusions: Adolescents who had completed orthodontic treatment had a better oral health-related quality of life than those currently under treatment or those who never had treatment.

Keywords: Oral health-related quality of life, orthodontic treatment, orthodontic treatment need, esthetics, quality of life.

INTRODUCTION

The term Quality of life is used to evaluate the general well-being of individuals and societies. WHO defines Quality of Life as "individuals' perception of their position in life in the context of the culture and value

systems in which they live and in relation to their goals, expectations, standards and concerns". Quality of life is a multidimensional concept -- physical, psychological and social function, as well as subjective well being. Majority of dental treatments are seldom life threatening, there is a need to evaluate the impact of dental care on quality of life.¹ According to United States Surgeon General's report on oral health, Oral Health related Quality of Life (OHRQOL) is defined as "a multidimensional construct that reflects (among other things) people's comfort when eating, sleeping, and engaging in social interaction; their self-esteem; and their satisfaction with respect to their oral health."² The concept of OHRQOL is significant to 3 areas of dental health in particular; these are the clinical practice of dentistry, dental research and dental education.³

Corresponding Author:

Dr Snigdha Pattanaik
Associate Professor,
Department of Orthodontics and Dentofacial Orthopaedics,
Institute of Dental Sciences,
Siksha O Anusandhan (Deemed to be University),
Bhubaneswar-751003, Odisha
Email: dr.snigdhapattanaik@gmail.com

At the community research level, the concept of OHRQOL is especially vital to promote oral health care and access to care. Dentists can better appreciate the impact of the disease and its effect on the quality of life. People of other profession may only quantify the magnitude of the disease but not the impact of that magnitude on an individual's daily life and general health.³

OHRQOL is a better tool to educate individuals about their oral health. People are more likely to behave positively when they understand how oral diseases affect their general health and quality of life rather than simply the affect of such disease on their teeth or gums.⁴

It is important to establish what the patients' perceptions are towards Dental treatment, since the subject's perception is central to the assessment of treatment. To capture that perception, a number of oral health-related quality of life questionnaires have been developed to assess the impact of treatment on daily living and the quality of life.

However, no studies have ever used OHRQOL criteria in patients undergoing orthodontic treatment in eastern India population. Therefore, the quality of life as related to oral health in patients undergoing fixed orthodontic treatment was evaluated in order to shed more light on the effect of orthodontic treatment on OHRQOL in orthodontic patients in eastern India population.

The objective of this research is to assess whether orthodontic treatment would affect the oral health related quality of life.

MATERIAL AND METHOD

In the present cross-sectional study, the quality of life as related to oral health was evaluated in patients undergoing orthodontic treatment and after the completion of the treatment and was compared with the subjects with malocclusion. The subjects were selected from the patients who reported to the dept. of orthodontics and were diagnosed with a malocclusion by an orthodontist. Total of 247 individuals aged between 15-30 years were included in the study. Subjects were divided into three groups.

Group A : 84 individuals - who were undergoing orthodontic treatment since six months.

GROUP B : 83 individuals - who were not undergoing orthodontic treatment but had orthodontic problem.

GROUP C: 80 individuals –who had completed their orthodontic treatment

The control group subjects were selected from patients who had reported to the dept. of orthodontics with a malocclusion and were candidates for orthodontic treatment. These subjects were included in the study to evaluate the OHRQOL in subjects with malocclusion. Sampling was carried out for all groups consecutively.

A questionnaire was prepared for assessing the impact of orthodontic treatment on Quality of Life. The shortened version of the "Oral Health Impacts Profile (OHIP)" was used to assess oral health-related impacts. Questionnaires were filled out during one of the follow-up sessions after treatment.

The questionnaire consisted of fourteen questions, which measures the quality of life in seven fields of functional limitations, physical problems, mental and emotional problems, physical handicaps, mental and emotional handicaps, social handicaps and complete handicap.

In this questionnaire, question one of each two questions evaluates one of those fields. The interviewee answers each of these questions in relation to experiencing a problem arising from the teeth and the oral condition during the past twelve months. The subject's answers are scored in the Lickert's scale as "zero" for "never", "1" for "seldom", "2" for "sometimes", "3" for "mostly" and "4" for "almost always". On the whole, a score ranging between "0" and "56" is calculated for each subject. Higher scores indicate a lower quality of life for the subjects. In the present study, in the final evaluation of answers, the "zero" response was considered a lack of effect and answers 1 to 4 were considered an effect so that the comparisons would be more comprehensible¹. The original questionnaire is in English, which has been translated into Odia and the validity and reliability of the translated version has been confirmed⁵.

Data was entered and analyzed by SPSS 17 for Windows (SPSS Inc., Chicago, Illinois, USA). Demographic characteristics of case and control groups were compared using Chi-square and independent T test for categorical and numerical variables, respectively. We fitted a linear regression model to predict the mean of

OHIP score considering potential confounding variables. The association between oral health-related quality of life and orthodontic treatment were measured by Chi-squared test and the effect sizes were reported by odds ratio.

RESULTS

A total of 247 subjects were evaluated in the present study, of which 84 individuals were undergoing orthodontic treatment since six months and 80 individuals had completed their orthodontic treatment. In the control group 83 individuals were selected who

were not undergoing orthodontic treatment but had orthodontic problem. All the subjects answered the questionnaire questions (response rate=100%).

Study revealed that few patients who were undergoing orthodontic treatment were not able to eat some foods because of the way their teeth meet and they feel hesitated to eat in public places. Few patients cover their teeth when they meet others for the first time and they hesitate to smile when they were socially out and some patients felt difficulty in pronouncing words. (Table 1).

Table 1: Comprehensive Questionnaire

Sl. No.	Daily Activities		Undergoing n(%)	Untreated n(%)	Treated n(%)	Chi-square value	P- value
i.	Have an idea about the teeth.	Impact	77(33.5)	76(33.0)	77(33.5)	1.812	0.404
		NO impact	7(41.2)	7(41.2)	3(17.6)		
ii.	Problem in chewing.	Impact	29(40.3)	25(34.7)	18(25.0)	2.925	0.232
		NO impact	55(31.4)	58(33.1)	62(35.4)		
iii.	Don't eat some foods due to the way the teeth meet.	Impact	51(60.0)	22(25.9)	12(14.1)	41.402	<0.001
		NO impact	33(20.4)	61(37.7)	68(42.0)		
iv.	Don't like eating in public places.	Impact	50(48.1)	36(34.6)	18(17.3)	23.124	<0.001
		NO impact	34(23.8)	47(32.9)	62(43.4)		
v.	Don't like seeing face from side view.	Impact	36(49.3)	24(32.9)	13(17.8)	13.957	0.001
		NO impact	48(27.6)	59(33.9)	67(38.5)		
vi.	Spend a lot of time seeing teeth in the mirror.	Impact	27(32.1)	30(35.7)	27(32.1)	0.301	0.86
		NO impact	57(35.0)	53(32.5)	53(32.5)		
vii.	Spend a lot of time seeing face in the mirror.	Impact	25(36.8)	24(35.3)	19(27.9)	0.756	0.685
		NO impact	79(39.7)	59(29.6)	61(30.7)		
viii.	What do you observe in others face?	eyes	28(40.6)	26(37.7)	15(21.7)	8.515	0.203
		teeth	46(31.3)	51(34.7)	50(34.0)		
		nose	5(33.3)	3(20.0)	7(46.7)		
		lips.	5(31.3)	3(18.8)	8(50.0)		
ix.	Try to cover teeth when meet others for the first time	Impact	49(55.7)	24(27.3)	15(17.0)	30.449	<0.001
		NO impact	35(22.0)	59(37.1)	65(40.9)		
x.	Not confident when socially out.	Impact	30(45.5)	24(36.4)	12(18.2)	9.287	0.010
		NO impact	54(29.8)	59(32.6)	68(37.6)		
xi.	Don't like smiling when socially out.	Impact	35(50.0)	21(30.0)	14(20.0)	12.352	0.002
		NO impact	49(27.7)	62(35.0)	66(37.3)		
xii.	Get depressed when people joke about me.	Impact	28(36.8)	30(39.5)	18(23.7)	3.953	0.139
		NO impact	56(32.7)	53(31.0)	62(36.3)		
xiii.	Find difficulty in pronouncing words.	Impact	23(51.1)	14(31.1)	8(17.8)	8.461	0.015
		NO impact	61(30.2)	69(34.2)	72(35.6)		

Conted...

xiv.	Have pain in face and teeth often.	Impact	17(39.5)	14(32.6)	12(27.9)	0.807	0.668
		NO impact	67(32.8)	69(33.8)	68(33.3)		
xv.	Feel others are watching.	Impact	20(32.8)	27(44.3)	14(23.0)	5.002	0.082
		NO impact	64(34.4)	56(30.1)	66(35.5)		

n: sample size %: percentage of response.

Statistically significant differences are in **bold** at 5% level of significance.

Table.1 indicates statistical significance with respect to following parameters: (iii), (iv), (v), (viii), (ix), (x), (xi) (xiii).

DISCUSSION

The assessment of oral health-related quality of life has an important role to play in clinical practice. Of all the dental treatments that require the use of oral health-related quality of life measures, the treatment of malocclusion, which has a large psychosocial component, calls for the use of these measures.⁶ Oral health-related quality of life measures can and should be used in the assessment of need and the outcomes of dental care.⁷ That was the basis for this study.

Subjective aspects such as dental aesthetics, self-perception of dental appearance, as well as attitudes toward malocclusion and orthodontic treatment are important factors in deciding to seek orthodontic treatment. The patients undergoing orthodontic treatment were more likely to have oral health impact than those from the untreated group.⁸

People who never had orthodontic treatment were more concerned with aesthetics than with function. Results of this study correlated with study conducted by Oliveira et al¹ (2004) which showed there is negative impact during orthodontic treatment when compared with untreated group. Concern about appearance is the main factor motivating people to seek orthodontic treatment and is recognized as such by orthodontists. It has been estimated that 80% of orthodontic patients seek their services out of a concern for aesthetics, rather than health or function.⁹ Indeed, psychological factors, rather than the severity of the actual occlusal condition, determine demand for orthodontic treatment.¹⁰

CONCLUSIONS

Orthodontic treatment had reduced the quality of life in patients undergoing treatment. Few patients who were

undergoing orthodontic treatment were not able to eat some foods because of the way their teeth meet and they feel hesitated to eat in public places. Few patients cover their teeth when they meet others for the first time and they hesitate to smile when they were socially out. Orthodontic treatment may have negative impacts on quality of life for few patients during the treatment time. Orthodontists should be aware of this impact caused by treatment and regularly remind patients of the positive outcomes.

Conflict of Interest: None

Source of Funding: Self-funded

Ethical Clearance: The ethical clearance was obtained from Institutional Human Ethics committee, Institute of Medical science and SUM Hospital, Bhubaneswar, Odisha.

REFERENCES

1. C. M. de Oliveira and A. Sheiham. Orthodontic treatment and its impact on oral health-related quality of life in Brazilian adolescents. *J Orthod* 2004; 31: 20–27.
2. Mariko Nait, Hidemichi Yuasa, Yoshiaki Nomura, Takeo Nakayama, Nobuyuki Hamajima, Nobuhiro Hanada. Oral health status and health-related quality of life: a systematic review. *J. Oral Sci* 2006; 48: 1-7.
3. M. Al Shamrany. Oral health-related quality of life: a broader perspective. *Eastern Mediterranean Health Journal* 2006; 12(6): 894-901.
4. Cunningham SJ , Hunt NP. Quality of life and its importance in orthodontics. *J Orthod.* 2001;28 (2) :152-158.

5. Yusuf H, Gherunpong S, Sheiham A, Tsakos G. Validation of an English version of the child-OIDP index, an oral health-related quality of life measure for children. *Health Qual Life Outcomes*. 2006; 4: 38-44.
6. Hatch JP, Rugh JD, Clark GM, Keeling SD, Tiner BD, Bays RA. Health-related quality of life following orthognathic surgery. *Int J Adult Orthod Orthognath Surg* 1998;13: 67–77.
7. Cohen L, Jago J. Toward the formulation of sociodental indicators. *Int J Health Serv* 1976; 6: 681–687.
8. Slade GD. Derivation and validation of a short-form oral health impact profile. *Community Dent Oral Epidemiol* 1997; 25: 284–290.
9. Kiyak HA, Hohl T, West RA, McNeill RW. Psychological changes in orthognathic surgery patients: a 24-month follow-up. *J Oral Maxillofac Surg* 1984; 42(8): 506–512.
10. Brook PH, Shaw WC. The development of an orthodontic priority index. *Eur J Orthod* 1989; 11: 309–320.

Comparative Study on Efficacy of Advanced and Conventional Methods Used for Detection of *Streptococcus mutans* in Saliva of Dental Caries Patients

Devi Prasad Mandal¹, Chandrasekhar Panda², Shakti Rath³, Neeta Mohanty⁴

¹Ph.D. Scholar, Department of Oral Pathology and Microbiology, Institute of Dental Sciences;

²Assistant Professor, Department of Microbiology, Institute of Medical Sciences and Sum Hospital;

³Assistant Professor (Research), Central Research Laboratory; ⁴Professor & Head, Department of Oral Pathology and Microbiology, Institute of Dental Sciences; Siksha 'O' Anusandhan

(Deemed to be University), Bhubaneswar, Odisha, India

ABSTRACT

Objectives: Antibiogram and evaluation of the saliva-check mutans (SCM) kit was done to ascertain the presence of *Streptococcus mutans* in saliva samples as a rapid method. It was further compared with conventional methods of microbial diagnosis followed with confirmation with agglutination latex kit.

Methodology: Saliva was collected from all patients under all precautionary aseptic was cultured on Sheep blood agar plates were subjected to incubation for the growth of *S. mutans*. The colony estimation was followed by estimation with agglutination latex kit-D. SCM kit (rapid method) was used chair side to quantify *S. mutans*. The cultures were subjected antibiotic sensitivity test based on Kirby-Bauer's method

Result: Rapid method yielded positive ($p < 0.001$) results for individuals having 3 or more carious teeth and poor oral hygiene. Significant correlation was seen between latex agglutination kit examination and rapid kit experiment. The *S. mutans* strains were highly resistant to gentamicin whereas they were susceptible to vancomycin.

Conclusion: The SCM kit was found to be more accurate than conventional methods. The conventional method was more time consuming and required more proficient observations in comparison to the rapid method; however, it was economical than the rapid method. More clinical trials are required to establish the social benefits of rapid method.

Keywords: *Streptococcus mutans*; Dental caries; Antibiotic sensitivity test; Agglutination latex kit-D; Saliva-Check Mutans kit

INTRODUCTION

Dental caries is an irreparable microbial infection of the calcified tissues of the teeth, characterised by demineralization of the inorganic portion and deterioration of the organic substance of the tooth leading to cavitations¹. The World Health Organisation (WHO) reports corroborates with the worldwide prevalence of dental caries¹. In oral flora, *Streptococcus mutans* (*S. mutans*) is one of the major etiological bacteria causing for dental caries. *S. mutans* primarily gets transmitted from the parents to their child oral flora, where it colonizes for the rest of their life¹.

Corresponding Author:

Dr. Devi Prasad Mandal

Ph.D. Scholar,

Department of Oral Pathology and Microbiology,

Institute of Dental Sciences,

Siksha 'O' Anusandhan (Deemed to be University),

Bhubaneswar-751003, Odisha, India

Email: dr.deviprasadmandal@gmail.com

The detection of *S. mutans* strains by using conventional culture-based assays and chair side culture-based test kits are reported regularly. But in recent past, Saliva-Check Mutans (SCM) kit, an immunoassay-based detection system, has been introduced as rapid detection for *S. mutans* strains, in saliva of patients with more than 10^5 colony forming units (CFU)/ml of saliva². The SCM IgA kit detects secretory anti-mutans *Streptococci* IgA in saliva. As reported, the kit was designed based on the hypothesis that, the colonization of *S. mutans* can be prevented by high levels of salivary IgA by inhibiting its adherence to the tooth surface, whereas, a low titer of anti-mutans *Streptococci* IgA may result in the adherence of *S. mutans* to teeth leading to their subsequent proliferation in the teeth and thereby increasing the risk for the development of dental caries^{3,4}.

The current study evaluates the efficacy and effectiveness of SCM kit (GC America, USA) for quantitative estimation of *S. mutans* as rapid method was analysed and the results were compared to the findings of the conventional method followed with agglutination assay with latex kit.

MATERIAL AND METHOD

Selection and categorization of patients: A total of 100 patients (male 66, female 34) were carefully chosen from patients seeking treatment for their chief complain as dental caries reported at our Institute of Dental Sciences, Bhubaneswar, during last 6-months period (July 2017 –December 2017). They were divided into 3 age groups, where Group 1: patients below 14 years age, Group 2: patients between 14 to 40 years of age and Group 3, where the patients were above 40 years of age. All patients were having mixed diet, excluding 7 patients, who were having exclusively vegetarian diet. Mean caries prevalence calculated was 15.7 ± 8.5 (DMFT). Oral hygiene was found poor in 30 patients, average in 52 patients and good in 18 patients. Good health conditions with no history of antibiotics therapy in past 3 months were taken as inclusion criteria. Prior consent and permission were taken from the patients before the study.

Saliva collection: The saliva sample was collected by making the patient chew a piece of paraffin wax for 3 to 5 minutes. Nearly 5 -6 ml of saliva was collected from each patient. In a sterile container 1 ml of saliva was diluted with 0.05% phosphate buffer (pH 7).

Isolation and identification of *S. mutans* from collected saliva samples: Diluted saliva of 0.1 ml was plated onto Sheep Blood Agar (SBA) for the growth of *S. mutans*⁴. The inoculated SBA plates were incubated aerobically at 37 for 24 hours. Post incubation period, the plates were examined under stereomicroscope where the number of non-haemolytic β streptococci colonies were counted (Figure 1). The CFU per ml of saliva was determined using a colony counter⁵. *S. mutans*, strain number 890 from Microbial type culture collection (MTCC) and Genebank, Imtech, Chandigarh was used as reference control for experiments.



Figure 1: Non-haemolytic β Streptococci on Blood agar

Antibiotic sensitivity of the isolated *S. mutans* strains: All the isolated strains of *S. mutans* were subjected for antibiotic sensitivity by Kirby-Bauer's method⁶. 12 antibiotics discs of 5 different groups were used for the test, as prescribed CLSI, 2018⁷

Latex Agglutination Test: In a sterile test tube, 4 to 5 average sized bacterial colonies were mixed with 0.4 ml of extraction enzyme and it was allowed emulsify thoroughly by 15 minutes incubation at 37. On a reaction card 20 μ l of latex reagent-D was mixed with 20 μ l of well mixed extract for one minute and was observed for agglutination reaction^{8,9} (Figure 2).

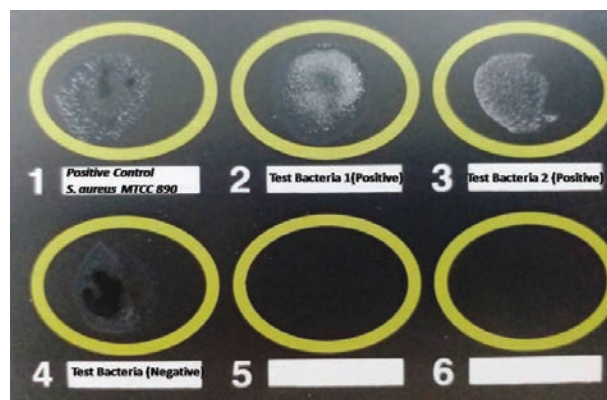


Figure 2: Confirmation of *S. mutans* strains by latex agglutination assay

Saliva-Check Mutans Kit Test: In a mixing container 250 µl of the collected saliva sample was mixed with 50µl of Tris-NaOH (reagent #1) thoroughly for 10 seconds. Further, to neutralize the pH of the mixture, 100 µl of Tris-citrate of (reagent #2) was added. After proper mixing, the colour of the solution was allowed to change to green. From the above solution, 0.3 ml of the sample was dispensed to the sample window of the test device with the help of a micropipette. A red line appeared on the control (C) window. Formation of thin line appeared on the test (t) window indicated the presence of *S. mutans* with a count of $>5 \times 10^5$ CFU/ml and the result was recorded as positive. The salivary *S. mutans* count was inferred low in the absence of red line (Figure 3).



Figure 3: Confirmation of *S. mutans* by saliva-check mutans kit

STATISTICAL ANALYSIS

The statistical analysis of the data was done using SPSS 18.0 software. The difference between groups were analysed using ANOVA. The significant level was set at 0.05.

RESULTS

An overall prevalence of 83% *S. mutans* was recorded after examining 100 patients. The prevalence of *S. mutans* is significantly associated ($P < 0.01$) with oral hygiene of the patients, but no association was found between age, gender and diet habit (Table 1). By conventional method, out of 100 samples 73 samples were tested positive cases, while 27 were negative. Using SCM kit 83 positive cases and 17 negative results were reported. Here, 10 patients were having clinically less caries incidence and were negative to latex Kit-D, but showing positive result for SCM kit, suggesting the accuracy of SCM kit. The count of *S. mutans* is more than 105 CFU/ml, which was confirmed by the latex agglutination kit test for anti-D and it had significant association with SCM kit results (Table 2). It was also observed that, the prevalence of *S. mutans* significantly increased with the increase in number of carious teeth. Evaluation of caries risk among patients was done by comparing both latex agglutination test results and SCM test results. Those patients who had both the tests negative were slightly low *S. mutans* count in their saliva and were free from caries risk. Accordingly, those patients who had both the test results positive were high on *S. mutans* count in their saliva and had high caries risk. By taking precautionary measures for high caries risk patients further carious lesions incidences can be avoided.

Antibiotic sensitivity test revealed that the strains were highly resistant to gentamicin (61%), followed by amikacin (59%) and were most susceptible to Vancomycin (18%). The detailed antibiotic sensitivity results are presented in Table 3

Table 1: Evaluation of Latex Agglutination Kit results and Saliva-Check Mutans Kit results with all clinical parameters

Parameters		Counts (%)	Latex Kit-D (%)		Saliva-Check Mutans Kit (%)	
			Positive	Negative	Positive	Negative
Age	<14ys	7	4	3	6	1
	>14yrs -<40yrs	74	54	20	60	14
	>40yrs	19	15	4	17	2
Gender	Male	66	53	13	56	10
	Female	34	20	14	27	7
Diet	Vegetarian	07	06	1	06	1
	Mixed	93	66	27	76	17
Oral hygiene	Poor	30	29	1	29	1
	Average	52	42	10	51	1
	Good	18	2	16	15	3

Table 2: Correlation between Latex Agglutination Kit-D and Saliva-Check Mutans Kit

Latex Kit D	Saliva-Check Mutans Kit		Total	Significance Pearson (Chi-square test)
	Positive	Negative		
Positive	72	1	73	0.001
Negative	11	16	27	
Total	83	17	100	

Table 3: Antibiotic sensitivity of isolated *S. mutans* strains

Antibiotic group	Antibiotics (µg/disc)	Resistance (%)
Aminoglycosides	Amikacin 30	59
	Gentamicin 10	61
β-lactams	Amoxyclav 30	45
	Ampicillin 10	49
	Penicillin 10	56
Fluoroquinolone	Gatifloxacin 05	58
Glycopeptides	Teicoplanin 10	30
	Vancomycin 30	18
Lincosamide	Clindamycin 02	32
Macrolides	Azithromycin 15	52
	Erythromycin 15	50
Others	Chloramphenicol 30	52
	Linezolid 30	27
	Tetracycline 30	45

DISCUSSIONS

Dental caries is infectious disease that leads to decalcification of the hard tissues of the teeth. Association between *S. mutans* and dental caries in humans is clearly established in medical literature¹. Present study evaluates the use of a rapid kit test for detection of dental caries and compares it with conventional methods. The use and efficacy SCM kit has been established in many other studies where it was used as a reference method for dental caries diagnosis¹⁰⁻¹². Patients showing positive test result for both the test kit have high *S. mutans* count in saliva and should be treated properly to avoid the chance of new carious lesion. Since, a clinic is always necessary the risk factor of future occurrences of dental caries; the test combination predicted that, when compared with the clinical findings, 83 out of 100 patients had a true caries risk (83%). This figure was in cohort with a previous report¹³.

In the present study, it was established that, SCM kit can be effectively used as rapid diagnostic tool for *S. mutans* as compared to the laboratory gold standard. There was a significant correlation between these two ($r=0.684$). Findings in this study were in accordance with results obtained in another study done in Japan¹⁴. As compared to various researchers, in this study also, correlation was not observed with respect to age (0.67), gender (0.49) or diet (0.59) of the patients with their caries incidence^{9,10,15}. However, a positive correlation was found between oral hygiene and *S. mutans* count (0.01) in the patients.

Latex particles were sensitized with antibodies against whole cells of *S. mutans*. These sensitized particles were agglutinated within a few minutes after addition of 1.0–10ng serotype-specific antigen from the homologous organisms or the nitrous acid extract of whole cells at 10^5 – 10^6 cfu/ml. In a clinical trial carried out by Takei et al⁹, found highly significant correlation between latex kit and *S. mutans* count. In our study we considered Latex kit and found similar correlation. Alike another study, in the present study it was found that, the accuracy of SCM kit was more in comparison to the latex kit-D; suggesting that SCM kit is more sensitive for *S. mutans* then the conventional method

CONCLUSIONS

This study highlights the fact that if *S. mutans* count can be detected as earlier as by rapid method in a clinic, it is likely to get better treatment plane to reduce the incidence rate. The SCM Kit is highly effective in detection *S. mutans* in saliva and can help in providing the best oral care for the patients. It can be used a regular diagnostic test for detection of salivary *S. mutans*, however it can be slightly costlier than the conventional methods. Moreover the drug resistance in these strains makes the rapid diagnosis even more important.

Ethical statement: This study was approved institutional ethical board of Siksha ‘O’ Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India with the approval number DMR/IMS.SH/SOA/180048

Conflict of Interests: The authors declare that they have no conflicts of interest

Source of Funding: Self-financed

REFERENCES

1. Pitts NB, Zero DT, Marsh PD, Ekstrand K, Weintraub JA et al. Dental caries. *Nature Revs: Dis Primers* 2017; 3: 17030
2. Saravia ME, Silva LAB, Silva RAB, Lucisano MF, Echevarría AU, Echevarría JU. Evaluation of chair-side assays in high microbiological caries-risk subjects. *Brazilian Dental J* 2015 26(6): 592-595
3. Lim JH, Song SH, Park HS, Lee RJ Lee SM. Spontaneous detachment of *Streptococcus mutans* biofilm by synergistic effect between zwitterions and sugar alcohol. *Nature Scientific Reports*. 2017; 7 (8107): 1-9.
4. Krzysciak W, KoVcielniak D, Papiel M, Jurczak A, Vyhouskaya P . Methods of biotyping of *Streptococcus mutans species* with the routine test as a prognostic value in early childhood caries Evidence Based Complement Alt Med 2017; Article Id: 6859543;
5. Gao X, Lo ECM, Chu CH, Hsu CS, Wong, MCM. 2013. Validity of caries risk assessment programmes in preschool children. *J Dentistry* 2013;41(9), 787–795.
6. Rath S, Padhy RN. Prevalence of community and hospital acquired multidrug resistant *Klebsiella oxytoca* and *Klebsiella pneumoniae* in an Indian tertiary care hospital. *J Infec Publ Health* 2014; 7: 496- 507.
7. CLSI– Clinical and Laboratory Standards Institute. Performance standard for antimicrobial susceptibility testing: twenty-first informational supplement. *Document M200-S21*; Wayne; 2018
8. Vanzo SJ, Washingto, JA. Evaluation of a rapid latex agglutination test for identification of group D streptococci. *J Clin Microbiol* 1984: 20(3), 575–576.
9. Takei T, Ogawa T, Alaluusua S, Fujiwara T, Morisaki I, Ooshima, T et al. Latex agglutination test for detection of *Streptococci mutans* in relation to dental caries in children. *Arch Oral Biol* 1992; 37(2), 99–104.
10. Wennerholm K, Emilson, CG.. Comparison of saliva-check mutans and saliva-check iga mutans with the cariogram for caries risk assessment. *European J Oral Sci* 2013 121(5), 389–393.
11. Singh S, Sharma A, Sood PB, Sood A, Zaidi I, Sinha, A.. Saliva as a prediction tool for dental caries: An *in vivo* study. *J Oral Biol Craniofacial Res* 2015: 5(2): 59–64.
12. Strickland M, Duda P, Merdad HE, Pelaez-Shelton RE, Rosivack RG, Markowitz K. The clinical performance of chairside caries risk assessment kits. *Quintessence International* (Berlin, Germany: 1985), 2017; 48(2), 161–171.
13. Twetman L, Twetman, S. Comparison of two chair-side tests for enumeration of mutans Streptococci in saliva. *Oral Health Dental Management* 2014: 13(3), 580–583.
14. Ohmori K, Harada C, Takao AE Momo Y. Comparison of 4 salivary Test Kits in Detecting *Streptococci mutans* Abstract 3452 - 82nd General Session of IADR, March 10-13, 2004, Honolulu, HI, USA
15. Plonka KA, Pukallus ML, Barnett AG, Walsh LJ, Holcombe TH, Seow WK. *Streptococci mutans* and *Lactobacilli* colonization in predentate children from the neonatal period to seven months of age. *Caries Res* 2012; 46(3), 213–220.

Evaluation of Post Operative Soft Tissue Complications of Orthodontic Mini-Implants at Different Loading Times— An in-Vivo Study

Subhrajeet Narayan Sahoo¹, Snigdha Pattanaik², Tusar Kanti Nayak³, Smruti Bhusan Nanda⁴

¹Senior Lecturer, ²Associate Professor, ³Professor, ⁴Professor & HOD, Department of Orthodontics and Dentofacial Orthopaedics, Institute of Dental Sciences, Siksha O Anusandhan (Deemed to be University), Bhubaneswar, Odisha

ABSTRACT

Introduction: Achieving absolute anchorage demanding orthodontic treatment is always a challenge for the orthodontics. This lead to search for an ideal anchorage which results in bone borne or skeletal anchorage devices that do not require and is independent of soft tissue on dentition. OMI is one of which can offer great anatomic and biomechanical flexibility in providing anchorage to the effective tooth movement. The objective of this present study was to evaluate and compare post-operative soft tissue discomfort experienced by the patients after insertion of orthodontic mini-implants during different loading size and to formulate a definite clinical protocol for loading of orthodontic mini implants.

Material: 16 subjects between the age group of 18 to 25 years who reported to the department of orthodontics, Institute of Dental Sciences, SUM hospital, for the correction of malocclusion were selected for the study.

Result: The results based on demographic data of the patient and the visual analogue scale score of the questionnaires filled by the patients gave us an idea about success rate and post operative discomfort after the mini-screw placement. The variability between the immediate & delayed loading of the implant was also concluded from the study.

Conclusion: The delayed loading of the OMIs create less pain and discomfort to the patient. The swelling, discomfort and bleeding were reported more with the immediate loading group. Also the patients experienced difficulty during the speech and brushing in the immediate loading group. Mini-screws had a high success rate of approximately 100%, and they provided sufficient anchorage immediately after placement surgery for any orthodontic tooth movement.

Keywords: Orthodontic Mini-Implants, Immediate Loading, Delayed Loading, Visual Analogue Scale, Swelling, Ulceration.

INTRODUCTION

Proclination of anterior teeth is one of the most commonly reported malocclusion in an orthodontist's clinic around the globe. It is characterized by dento-alveolar flaring of either maxillary or mandibular teeth, resulting in protrusion of lips & convexity of face. One of the best methods to treat such cases is by extraction of first premolars, followed by retraction of anterior teeth to obtain desired dental & soft-tissue profile changes¹. In such cases preservation of anchorage during space closure is very critical.

Corresponding Author:

Dr Subhrajeet Narayan Sahoo
Senior Lecturer,
Department of Orthodontics and Dentofacial Orthopaedics,
Institute of Dental Sciences,
Siksha O Anusandhan (Deemed to be University),
Bhubaneswar-751003, Odisha
Email: drsubhrajeetnsahoo1789@gmail.com

Anchorage control throughout the treatment is essential for an uncompromised result. It can be achieved either extra-oral support or tooth-borne. Nance holding arch, Trans-palatal arch, multiple teeth as the anchorage segment and differential moments are so commonly used techniques as tooth-borne anchorage. However these mechanics do not provide absolute anchorage. Extra-oral anchorage can be used to supplement tooth-borne anchorage, delivering excellent results, but it requires maximum patient co-operation. Skeletal anchorage, however, offers tooth movement in any direction by providing an absolute anchorage & so, does not require any patient compliance.

Mini-implants used for orthodontic anchorage, is a versatile option in treatment planning. Mini-implants are smaller in diameter & come in several lengths, can be inserted in any desired location including inter-radicular space. They can be loaded immediately and can withstand orthodontic forces during the entire treatment period. They can also be easily removed, without any invasive procedure after completion of the treatment.

However there are some side-effects of insertion of mini-implants- swelling, and bleeding. The objective of this study is to evaluate & compare post-operative soft tissue discomfort experienced by the patients in immediate & delayed loading groups.

MATERIALS & METHODOLOGY

A total of 16 subjects between the age group of 18 to 25 years who reported to the department of orthodontics, Institute of Dental Sciences, SUM hospital, for the correction of malocclusion were selected for the study.

Ethical committee clearance was obtained from the Ethical committee of Siksha 'O' Anusandhan University for using of mini implant for orthodontic retraction in the study. The treatment protocol was explained to every patient and written consent was obtained from them before including them in the study.

Inclusion criteria: In this present study the total no of 32 mini implants were used in 16 orthodontically treated patients to evaluate the success rate of OMIs under various clinical variables. Under the age group 18 to 25 years of age with Angle's Class I or Class II div 1 malocclusion with average growth pattern (FMA = 25 – 30 degree) crowding less than 2mm requiring extraction of all 1st premolar and enmasse retraction and intrusion.

Exclusion criteria: Un-cooperative patients with compromised periodontal health were excluded from the study. Malocclusion other than Angle's Class I or Class II div 1 malocclusion and horizontal and vertical growth pattern (FMA less than 25 degree and more than 30°) should be excluded from the study. Patients with any Systemic and bone diseases were excluded. Patients with any developmental anomalies including cleft lip & palate were excluded from the study.

Method of study: After the extraction of the first premolars all the patients selected for the study, were bonded with full fixed orthodontic appliances system (American orthodontics) of 0.022 MBT prescriptions. The patients had follow-up appointments at regular intervals. The initial leveling and alignment phase continued until 0.019x0.025 inch stains-less steel arch-wire passively placed. The intra-arch malocclusion and the deep bite was corrected during the initial phase and no active space closure was initiated.

In this study OMIs were selected as the source of absolute anchorage for obtaining maximum orthodontic retraction. All OMIs used in this study were of 1.5mm in diameter by 10 mm in length. Depending on the loading time the implants were divided into two groups. Each group consisted of 16 OMIs which was placed on one of the maxillary quadrant in each patient. The selection of quadrant for the placement of a particular group of OMI was selected by random sampling technique.

Before placement of mini-implants all patients were asked to rinse with 0.2% chlorhexidine mouth wash. The area for implant placement was anaesthetized by buccal infiltration with Lox 2% manufactured by NEON. The mini implants were placed on the buccal side of maxilla between 2nd premolar and 1st molar by a single operator to avoid any intra-operative error and the OMIs were placed directly through the attached gingiva and into bone under manual pressure with the OMI driver supplied by manufacture. The insertion angle ranged between 30 to 45 degree to obtain the maximum cortical bone contact. The vertical height was determined to be little below the mucco gingival junction to ensure the placement of the OMIs in the attached gingiva. Post operatively the patients were advised to use 0.2% chlorhexidine mouthwash (Clohex Plus, Dr.Reddy's Lab) twice daily. All the cases were verified with intra oral peri-apical radiograph to check the position of OMIs and any damage to the adjacent roots were over

ruled. The OMIs in the group I were loaded immediately after their placement. In the group II, the OMIs were loaded after one month of their placement. After the placement, the orthodontic retraction was started by placing the E-chain (American Orthodontics, North America-3524 Washington Avenue) which was extended from the implant head to the crimpable hook that was placed in between lateral incisor and canine on both the site. The retraction force was 250 gm as measured by the Dontrix gauge (Dyanometer, Captain Ortho) per side. The subjects were reviewed on the first day, seventh day, first month, third month and on the sixth month until adequate space closure was achieved. All the OMIs were evaluated every month for any mobility or loss of any implant and for the soft tissue and periodontal health. The mini implant that gets out of the insertion site while loading of the orthodontic force or any peri-implantitis or mobility were also considered as a case of failure.

After 1 month of evaluation of mini-implants to observe presence or absence of the bleeding on probing, presence or absence of any redness/erythema in the colour of the gingiva. The hygiene care around the implant was evaluated by the presence or absence of plaque.

STATISTICAL ANALYSIS

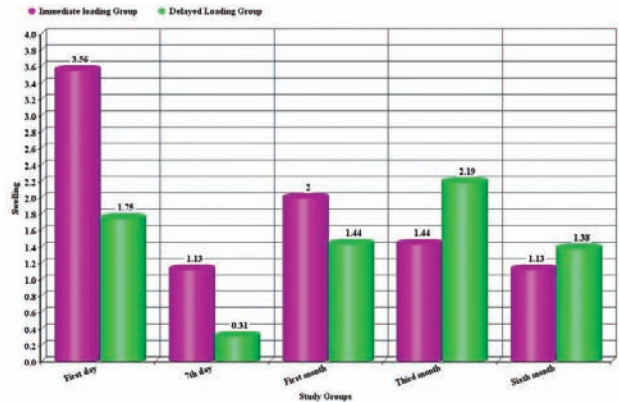
After the collection of the data the chi-square test and the paired ANOVA test was performed to compare the pain and discomfort of each OMIs in 16 subjects with 32 implants that were reported by the patients in the VAS. Any values of P < 0.05 was considered significant. These analysis were made with statistical analysis software (IBM SPSS 20 USA).

RESULTS

The results based on demographic data of the patient and the visual analogue scale score of the questionnaires filled by the patients gave us an idea about success rate and post operative discomfort after the mini-screw placement. The variability between the immediate & delayed loading of the implant was also concluded from the study.

1. Swelling: (Graph-I): In the group – I (immediate loading) the patient complained of mild swelling on the 1st day of insertion which gradually reduced by the 7th day. The group –II (delayed loading) patients did not complain of any swelling due to mini-

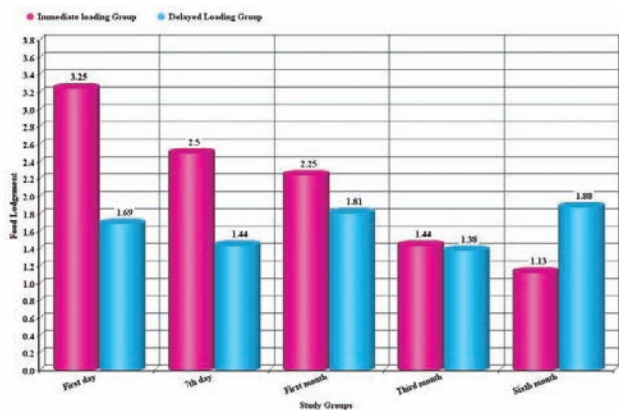
implant. The mean score of swelling on a visual analogue scale was 3.56 for immediate loading group & 1.75 for the delayed loading group. In both the groups the patients did not complain of any swelling on subsequent visits. The paired ANOVA test showed a statistically significant difference (p≤0.005) between both the groups.



Graph I: Comparison of the mean values of the swelling between different groups

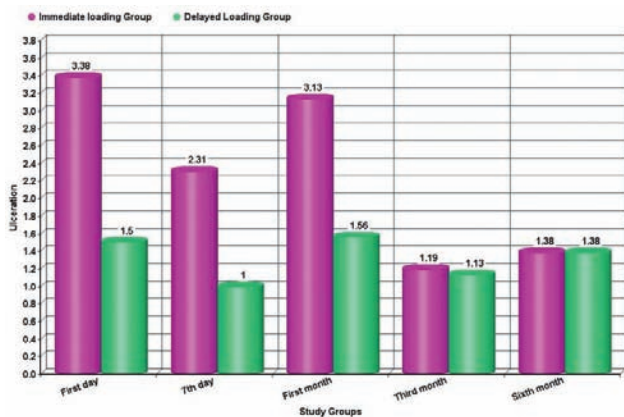
2. Food Lodgment: (Graph-II): The food lodgment experienced due mini implant showed a significant difference during immediate and delayed loading of the implant.

In the group–A (immediate loading) patients the food lodgment experienced was maximum during insertion of the mini implant which gradually reduced. The group –B (delayed loading) patients also showed a minimum food lodgment experience due to mini-implant. The paired ANOVA test showed a statistically significant difference (p≤0.005) between both the groups.



Graph II: Comparison of the mean values of the food lodgment between different groups

3. Ulceration: (Graph-III): The mean score of ulceration on a visual analogue scale was 3.38 for group-I & 1.56 for group-II. The immediate loading group complained of more ulceration than the delayed loading group. There was a significant difference in the ulceration between both the groups. The paired ANOVA test showed a statistically significant difference ($p \leq 0.005$) between both the groups.

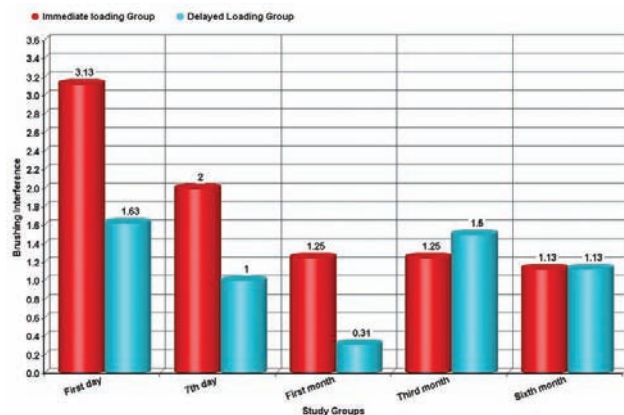


Graph III: Comparison of the mean values of the ulceration between different group

4. Interference During Brushing: (Graph-IV): The interference during brushing reported due mini-implant was statistically significant difference between both the groups.

The mean score of brush interference on a visual analogue scale was 2.81 for immediate loading group & 1.88 for the delayed loading group.

The paired ANOVA test showed a statistically significant difference ($p \leq 0.005$) between both the groups.



Graph IV: Comparison of the mean values of the brushing interference between different groups

DISCUSSION

This study was conducted to evaluate post-operative soft-tissue discomfort due to immediate and delayed loading of OMIs using a Visual Analogue Scale (VAS).

The mini implants used in this study showed a success rate of 100% without any ulceration, peri-implantitis or the loss of implant was reported by the patients. In a similar study conducted by Madhur Upadhyay et al² success rate with mini-implants was about 93% where mini-implants were used as orthodontic anchorage unit. The total success rate in this study (100%) was higher than the 37.0% reported by Kim and Choi³ and 78.6% by Moon⁴ and was similar to the 83.9%–85.0% by Miyawaki et al⁹ and the 81.1%–88.6% reported by Kuroda et al.⁵

In our study a significant differences in the discomfort ($p \leq 0.005$), swelling ($p \leq 0.005$), speech difficulty ($p \leq 0.005$) and chewing difficulty ($p \leq 0.005$) after placement of the OMIs was found between both the groups. The patients experienced more discomfort and swelling by the immediate loading of the implant. Delayed loading of the implant was more comfortable for the patients. Speech interference during brushing and chewing difficulties due to mini implant placement might be correlated with the intensity of swelling. The OMIs used in our study were of self drilling type therefore did not require any pilot drill or incision. They were also placed at the attached gingiva so were less likely to develop infection and inflammation. Very mild bleeding and ulceration was experienced by the patients with immediate loading group which was not statistically significant. These results coincided with the study done by Shingo Kuroda et al.⁵

CONCLUSION

A total number of 16 cases with Angle’s class I malocclusion with bimaxillary dento-alveolar protrusion and Angles class II division 1 malocclusion with average mandibular plane angle (FMA 25-30°) were taken for the study. Analyzing the results obtained from this study, the following conclusions were made-

In cases where absolute anchorage was needed, the treatment of choice is the use of orthodontic mini-screw. This anchorage plan requires a little surgical procedure for the placement of OMIs which might cause pain and

discomfort to the patient. In this study where in patients mini-screw were delayed loaded, there was significantly less pain and discomfort than immediately loaded patients. The swelling, discomfort and bleeding were reported more with the immediate loading group. Also the patients experienced difficulty during the speech and brushing in the immediate loading group.

Conflict of Interest: None

Source of Funding: Self-funded

Ethical Clearance: The ethical clearance was obtained from Institutional Human Ethics committee, Institute of Medical science and SUM Hospital, Bhubaneswar, Odisha.

REFERENCES

1. Upadhyay M, Yadav S. Treatment effects of mini-implants for en-masse retraction of anterior teeth in bialveolar dental protrusion patients. a randomized controlled trial. *Am J Orthod Dentofacial Orthop.* 2008;134(1):18-29.
2. Upadhyay M, Yadav S. Mini-implant anchorage for en-masse retraction of maxillary anterior teeth. a clinical cephalometric study. *Am J Orthod Dentofacial Orthop.* 2008;134(6):803-10.
3. Kim YH, Choi JH. The study about retention of miniscrews used for intraoral anchorage. *J Korean Dent Assoc.* 2001;39:684-7.
4. Moon CH. *Clinical Use and Failure of Skeletal Anchorage System.* Seoul. Narae Publishing Inc; 2002;3(4):14-79.
5. Kuroda S, Sugawara Y, Deguchi T, Kyung HM, Takano-Yamamoto T. Clinical use of miniscrew implants as orthodontic anchorage: Success rates and postoperative discomfort. *Am J Orthod Dentofacial Orthop* 2007; 131:9-15.
6. Campbell W I, Lewis S. Visual analogue measurement of pain. *The Ulster Medical Journal,* 1990;(59):2:149-54.
7. Miyawaki S, Koyama I, Inoue M, Mishima K, Sugahara T, Takano-Yamamoto T. Factors associated with the stability of titanium screws placed in the posterior region for orthodontic anchorage. *Am J Orthod Dentofacial Orthop* 2003;124:373-8.
8. Liou EJ, Pai BC, Lin JC. Do miniscrews remain stationary under orthodontic forces? *Am J Orthod Dentofacial Orthop* 2004;126:42-7 .
9. Neal D. K, Budi K. Risks and complications of orthodontic miniscrews. *Am J Orthod Dentofacial Orthop* 2007;131:S43-51.
10. Bong C. K, Lee H, Lee N, Choi D, Baek S. Soft tissue thickness for placement of an orthodontic miniscrew using an ultrasonic device. *Angle Orthodontist* 2008;78:403-8
11. Baek S H, Bo-Mi Kim, Seung-Hyun Kyung, Joong Ki Lim, Young Ho Kim. Success Rate and Risk Factors Associated with Mini-Implants Reinstalled in the Maxilla. *Angle Orthodontist* 2008;78:317-28.
12. Tae-Woo Kim, Seung-Hak Baek, Jong-Wan Kim, Young-Il Chang. Effects of Microgrooves on the Success Rate and Soft Tissue Adaptation of Orthodontic Miniscrews. *Angle Orthodontist* 2008;78:1057-64.
13. Cesare Luzi, Carlalberta Verna, Birte Melsen. Immediate loading of orthodontic mini-implants: a histomorphometric evaluation of tissue reaction *European Journal of Orthodontics.*2009;31:21- 9.

Study on Antimycobacterial Properties of Selected Ethnomedicinal Plants: An Alternative Therapeutic Choice Against Multidrug Resistant *Mycobacterium tuberculosis*

Shakti Rath

Assistant Professor, Faculty of Dental Sciences and Nursing, Central Research Laboratory, Institute of Dental Sciences, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India

ABSTRACT

Aim: To evaluate the antimycobacterial efficacy of 10 ethnomedicinal plants against one clinical isolate of *Mycobacterium tuberculosis* and the standard TB strain, H37Rv.

Method: A strain of *M. tuberculosis* was isolated from a patient's sputum sample. It was identified by Ziehl–Neelsen (acid fast staining) method and was cultured on the Lowenstein–Jensen (LJ) medium. Aqueous, ethanol and methanol extracts of 10 plants, *Acacia catechu*, *Acorus calamus*, *Adhatoda vasica*, *Aegle marmelos*, *Andrographis paniculata*, *Catharanthus roseus*, *Moringa oleifera*, *Ocimum basilicum*, *Vitex negundo* and *Withania somnifera* were prepared. The antimycobacterial properties were evaluated by incorporating the extracts into the LJ medium at concentration of 2.5%, 5%, 10% and 20% volume/volume, prior to inspissation and counting the colony forming units (CFU) after incubation period.

Results: Methanol extracts of *A. vasica*, and *M. oleifera* had promising antimycobacterial properties. In general, the methanol extracts were more effective against H37Rv strain, as compared to the clinical isolate. Ethanol extracts of *A. vasica*, *C. roseus*, *M. oleifera* and were also effective in controlling the growth of *M. tuberculosis* colonies (both H37Rv and clinical isolate) on LJ medium. Particularly, at 20% level ethanol extract of *C. roseus*, the CFU count was 17 and 19 for the H37Rv strain and for the clinical isolate, respectively

Conclusions: Bacteria do not become resistant to phytochemicals, because of their complex structure. The aim of isolation of a pure phytochemical against MDR TB strains is rational and achievable. Particularly, plants, *A. vasica*, and *M. oleifera*, can be further be utilized as anti-tubercular drugs.

Keywords: *Tuberculosis, Multidrug resistance, Medicinal plants, Alternative drug, Antimycobacterial Property*

INTRODUCTION

Tuberculosis is one of the most uncontrollable health hazards. Currently, morbidity and mortality due to TB infection in most developing countries is a serious concern, for the emergence of drug-resistant strains, due to continual usage of tuberculosis-drugs since the last 5 decades¹. In fact, two antibiotics (rifampicin and streptomycin) and two chemotherapeutic agents (ethambutol and isoniazid or INH) are used for the control of this fastidious pathogen in the present treatment regimen as the first line drugs. Most of these have mild to serious side effects. Furthermore, the second lines of TB drugs, capreomycin, cycloserine,

Corresponding Author:

Dr. Shakti Rath
M.Sc., PhD, Microbiology,
Assistant Professor (Research),
Faculty of Dental Sciences and Nursing,
Central Research Laboratory,
Institute of Dental Sciences,
Siksha 'O' Anusandhan (Deemed to be University),
Bhubaneswar-751003, Odisha
Email: dr.shaktirath@gmail.com

kanamycin, ethionamide have severe side effects². Fluoroquinolones such as, ofloxacin and norfloxacin are also recommended that are too expensive and those are not used. Unfortunately, a TB patient must take the first line drugs for an extended period of 6-8 months to complete the course. Due to irregular intake of anti-tuberculous drugs MDR strains develop, which were recorded as responsible for the 58% morbidity from TB in India³. The situation is alarming realized, as 9.7 million new TB cases worldwide have been recorded in the survey of 2017³. The situation has become recently more complicated because of association of TB and human immune-virus (HIV) that each is endemic in the developing world including India. Eventually, stocks of MDR and at times extremely drug resistant (XDR) TB strains are maintained in the community⁴. Neither HIV nor TB is curable/eradicable, as each is indolent and slow in manifestation. Thus, enough of HIV patients are present in community, who remain as stock for TB, confirming the popular adage in microbiology, "Microbial predators and pathogens do not eliminate their prey and host in environment", said by Martin Alexander (soil microbiologist), as both diseases co-exist. Unfortunately, no new suitable anti-tuberculous drug has been introduced, nor phytochemicals are used yet for the treatment of TB⁴. In this perspective, it is never a choice, rather it is a matter of compulsion to search for alternative drug strategies for MDR/XDR TB strains, because 'ill health begets poverty and poverty begets ill health'. When the infecting TB strain is MDR/XDR the failure of TB chemotherapy with the first line drugs gets often ineffective⁵.

Plants have been regularly used in the contemporary medicinal system as alternative therapeutic agents/drugs against grievous infectious ailments. Very few plants have been specifically identified for the control of infamous/dreadful MDR/XDR TB strains *in vitro*. Thus, practice of medicinal plants for the treatment of tuberculosis is suggested by many research organisations and research work are been carried out to find suitable phytodrugs. In this article, 10 ethnomedicinal plants, namely *Acacia catechu*, *Acorus calamus*, *Adhatoda vasica*, *Aegle marmelos*, *Andrographis paniculata*, *Catharanthus roseus*, *Moringa oleifera*, *Ocimum basilicum*, *Vitex negundo* and *Withania somnifera*, were collected from Kalahandi district, Odisha were evaluated for their antimycobacterial potentiality using a clinical isolate of *M. tuberculosis* and the standard TB strain, H37Rv.

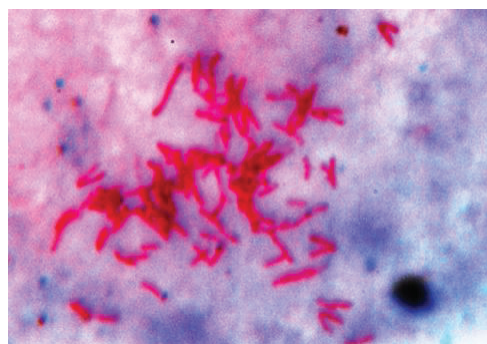


Figure 1: Acid-Fast staining of a sputum sample showing presence of pink coloured *M. tuberculosis* bacilli

MATERIALS AND METHOD

Isolation of identification of *Mycobacterium tuberculosis*: Sputum sample was collected from a person suspected for pulmonary tuberculosis and was subjected for acid-fast bacilli (AFB)/smear test and culturing in the Lowenstein–Jensen (LJ) medium on the same day as mentioned elsewhere⁶. Results was reported viewing under 100 fields as, (i) negative with no red/pink bacteria, or (ii) scanty for 1-9 bacilli, or (iii) + for 10-99 bacilli, or (iv) ++ for more than 100 bacilli, or (v) +++ for bacilli more than 100 per field. Further, duplicate tubes of LJ medium were inoculated from the prepared suspension and were incubated at 37°C for the growth of colonies that were checked up, in 6-8 weeks with weekly intervals⁷.

Preparation of extracts: A lot of 20 g of powder from clean leaf-samples of the 20 medicinal plants were dissolved separately in aliquots of 200 ml sterile double-distilled water for aqueous extract, 200 ml 80% ethanol for ethanol extract and 200 ml in methanol for methanol extract, in wide-mouth bottles and were incubated at room temperature for 72 hours. Each mixture was hand-shaken at every 3-4 hours and filtered. The alcoholic-filtrates (ethanol and methanol) were concentrated in a rotary evaporator at 40°C, till a sticky mass was obtained that was weighed and dissolved in 1 ml of 10% v/v DMSO. For each plant sample, these steps were repeated, and both extracts were stored at 4°C until further use⁸.

Screening of medicinal plants extracts for antimycobacterial activities: The plant extract was incorporated in the LJ medium at concentration of 2.5%, 5%, 10% and 20% volume/volume (1.25 ml, 2.5 ml, 5 ml and 10 ml of fresh plant extract was dissolved into 25 ml of

culture medium) prior to inspissation. Antimycobacterial test was performed with two strains, the standard strain of *M. tuberculosis* strain H37Rv and one clinical isolate, obtained from Department of Microbiology, IMS and Sum hospital. The medium sets inoculated with both the standard and clinical isolate bacterial suspension and were incubated at 37°C for 42 days. For negative control, two extract free control LJ slants (one with standard strain and one with clinical isolate) were used and for the positive control two LJ slants incorporated with 10% v/v rifampicin were used. Results were noted after 3 days of incubation. All the inoculation work was carried out at class III biosafety level.

RESULTS

Antimycobacterial assay of medicinal plants: Ten plants, *A. catechu*, *A. calamus*, *A. vasica*, *A. marmelos*, *A. paniculata*, *C. roseus*, *M. oleifera*, *O. basilicum*, *V.negundo* and *W. somnifera* (Figures 2 to 7) were selected based on their ethnomedicinal and Ayurvedic uses (Table 1). These 10 plants are also listed in the Indian Pharmacopeia for various medicinal uses. Plants reported were collected from Kalahandi forest; 15 hamlets (villages) of Junagarh block of Kalahandi district were surveyed.



Figure 2: *Aegle marmelos*



Figure 3: *Andrographis paniculata*



Figure 4: *Catharanthus roseus*

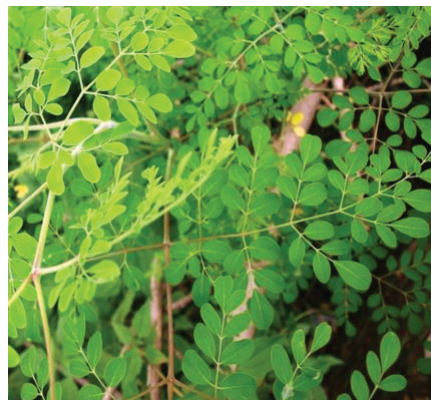


Figure 5: *Moringa oleifera*



Figure 6: *Ocimum basilicum*



Figure 7: *Withania somnifera*

Table 1. Ethnomedicinal uses of 10 antimycobacterial plants used in the study

Plant and Family name	Local Name, Parts used	Ethnomedicinal uses
<i>Acacia catechu</i> (L.f) Willd. Mimosaceae	Khaira, Leaf	In Ayurveda, it is used against cough, asthma, cold, tuberculosis, respiratory problems, UTI, diarrhoea, fever, typhoid, gonorrhoea, wounds, toothache and inflammations.
<i>Acorus calamus</i> L. Araceae	Bacha, Leaf	It is used against cough, tuberculosis and chest congestion and as an antiseptic.
<i>Adhatoda vasica</i> Nees. Acanthaceae	Basanga, Leaf	The leaves, flowers, fruit, and roots are used for treating cold cough, whooping cough, chronic bronchitis asthma and tuberculosis.
<i>Aegle marmelos</i> L. Corr Rutaceae	Bela, Leaf	In Indian traditional medicine it is used against diarrhoea, diabetes, dyspepsia, hepatitis, indigestions, gut-worms and tuberculosis.
<i>Andrographis paniculata</i> (Burm. f.) Wall. ex. Nees Acanthaceae	Bhuinnimba, Leaf	It is used in traditional medicine as an immune system booster, to treat infections in gastrointestinal tract and upper respiratory tract, fever, herpes, sore throat, tuberculosis.
<i>Catharanthus roseus</i> (L.) G. Don. Apocyanaceae	Sadabihari, Leaf	Indian Ayurvedic medicine and traditional herbal systems use this plant for the treatment of diabetes, painful menstruation and tuberculosis.
<i>Moringa oleifera</i> Lam. Moringaceae	Sajana, Leaf	Therapeutic uses of <i>M. oleifera</i> both in Ayurveda and traditional medicine includes anaemia, asthma, blood pressure, bronchitis, diabetes, diarrhoea, hysteria, gut-worms, jaundice, malaria, ulcers, tonsillitis, tuberculosis and UTI
<i>Ocimum basilicum</i> L Lamiaceae	Tulasi, Leaf	Leaves have antibacterial, antifungal, antiviral anti-malarial and antimycobacterial properties.
<i>Vitex negundo</i> L. Verbenaceae	Nirgundi, Leaf	Traditionally leaves are documented to possess antibacterial, antitumor, astringent, febrifuge, vermifuge, antimycobacterial properties.
<i>Withania somnifera</i> L. Dunal Solanaceae	Ashwagandha, Leaf	Leaves used externally, rheumatism, arthritis, dyspepsia, tumours, UTI, throat infections, tuberculosis, and bronchitis.

The antimycobacterial assay of leaf extracts of 10 plants with three different solvents was carried out on LJ medium. 4 different concentrations of each plant extract were used in the study. It was discernible from the study that methanol leaf-extracts of the plant, *A. catechu* and *A. calamus* were completely ineffective in controlling the growth of *M. tuberculosis* colonies (both H37Rv and the clinical isolate) on LJ medium, as the number colony forming units (CFUs) were more than 50 (50+) at all the 4 concentrations used. Similarly, methanol leaf-extracts of plants, *A. marmelos*, *A. paniculata*, *O. basilicum* and *V. negundo* were completely ineffective in controlling the growth of *M. tuberculosis* colonies (both H37Rv and the clinical isolate) on LJ medium at 2.5%

and 5% concentrations, whereas, they were moderately effective at 10% and 20% concentration. Methanol leaf-extracts of plants, *A. vasica*, *C. roseus*, *M. oleifera* and *W. somnifera* were effective in controlling the growth of *M. tuberculosis* colonies (both H37Rv and the clinical isolate) on LJ medium as the number CFUs decreased when the concentration of plant extracts was increased (Table 2). Particularly, at 20% concentration, methanol leaf-extracts of plants, *A. vasica* and *M. oleifera*, the CFU counts were 13 and 16 for H37Rv strain and 17 and 15 for the clinical isolate, respectively. In general, the methanol leaf-extracts were more effective in controlling the growth of H37Rv strain as compared to the clinical isolate (Table2).

Table 2: Antimycobacterial assay of methanol leaf-extracts of 10 medicinal plants in LJ medium

Plant	Colony forming units (mean of three readings)											
	H37Rv				Clinical isolate of <i>M. tuberculosis</i>				Positive control		Negative control	
	2.5%	5%	10%	20%	2.5%	5%	10%	20%	PC 1	PC 2	NC 1	NC 2
<i>A. catechu</i>	50+	50+	50+	50+	50+	50+	50+	50+	3	10	50+	50+
<i>A. calamus</i>	50+	50+	50+	50+	50+	50+	50+	50+				
<i>A. vasica</i>	29	23	15	13	34	30	21	17				
<i>A. marmelos</i>	50+	50+	35	31	50+	50+	50+	40+				
<i>A. paniculata</i>	50+	40+	37	29	50+	39	34	26				
<i>C. roseus</i>	37	32	27	23	40+	34	25	20				
<i>M. oleifera</i>	35	27	22	16	32	25	19	15				
<i>O. basilicum</i>	50+	50+	50+	34	50+	50+	40+	38				
<i>V. negundo</i>	50+	40+	33	28	50+	38	34	26				
<i>W. somnifera</i>	40+	37	30	24	39	32	27	21				

Note: PC 1, H37Rv with 10 %v/v rifampicin; PC 2, Clinical isolate of *M. tuberculosis* with 10 %v/v rifampicin; NC 1, H37Rv with no rifampicin or plant extract; NC 2, Clinical isolate of *M. tuberculosis* with no rifampicin or plant extract.

Ethanol leaf-extracts of plants, *A. catechu* and *A. calamus* were completely ineffective in controlling the growth of *M. tuberculosis* colonies (both H37Rv and the clinical isolate) on LJ medium as the number CFUs were more than 50 (50+) at all the 4 concentrations used. Similarly, ethanol leaf-extracts of plants, *A. marmelos*, *A. paniculata*, *O. basilicum*, *V. negundo* and *W. somnifera* were moderately effective in controlling the growth of *M. tuberculosis* colonies (both H37Rv and the clinical isolate) on LJ medium at all the 4 concentrations used, as, as the number CFUs slightly decreased when the concentration of plant extracts increased from 2.5% to

20%. Ethanol leaf-extracts of plants, *A. vasica*, *C. roseus*, *M. oleifera* and were effective in controlling the growth of *M. tuberculosis* colonies (both H37Rv and the clinical isolate) on LJ medium as the number CFUs significantly decreased when the concentration of plant extracts was increased. Particularly, at 20% concentration, ethanol leaf-extract of the plant, *C. roseus*, CFU counts were 17 and 19 for H37Rv strain and for the clinical isolate, respectively. In general, the ethanol leaf-extracts were also more effective on H37Rv strain as compared to the clinical isolate (Table 3).

Table 3: Antimycobacterial assay of ethanol leaf-extracts of 10 medicinal plants in LJ medium

Plant	Colony forming units (mean of three readings)											
	H37Rv				Clinical isolate of <i>M. tuberculosis</i>				Positive control		Negative control	
	2.5%	5%	10%	20%	2.5%	5%	10%	20%	PC 1	PC 2	NC 1	NC 2
<i>A. catechu</i>	50+	50+	50+	50+	50+	50+	50+	50+	3	10	50+	50+
<i>A. calamus</i>	50+	50+	50+	50+	50+	50+	50+	50+				
<i>A. vasica</i>	37	32	26	21	40+	34	27	23				
<i>A. marmelos</i>	50+	40+	36	32	50+	40+	39	34				
<i>A. paniculata</i>	40+	40+	33	30	50+	40+	35	31				
<i>C. roseus</i>	40+	34	24	17	40+	30	27	19				
<i>M. oleifera</i>	37	34	31	27	39	33	31	26				
<i>O. basilicum</i>	40+	40+	35	31	40+	40+	39	33				
<i>V. negundo</i>	40+	40+	40+	38	40+	40+	40+	40+				
<i>W. somnifera</i>	50+	40+	36	31	50+	40+	40+	33				

Note: PC 1, H37Rv with 10 %v/v rifampicin; PC 2, Clinical isolate of *M. tuberculosis* with 10 %v/v rifampicin; NC 1, H37Rv with no rifampicin or plant extract; NC 2, Clinical isolate of *M. tuberculosis* with no rifampicin or plant extract.

Most aqueous leaf-extracts were ineffective in controlling the growth *M. tuberculosis* colonies (both H37Rv and the clinical isolate) as the number of CFUs on LJ medium were more than 50+ and 40+ (Table 3). Aqueous leaf-extracts of *A. paniculata*, *C. roseus* and *M. oleifera* were moderately effective at 5, 10 and 20% concentrations in controlling the growth both the strains level *M. tuberculosis* colonies. Notably, aqueous leaf-extracts of *M. oleifera* at 20% were the most effective leaf-extract, having antimycobacterial activity (Table 4).

Table 4: Antimycobacterial assay of aqueous leaf-extracts of 10 medicinal plants LJ medium

Plant	Colony forming units (mean of three readings)											
	H37Rv				Clinical isolate of <i>M. tuberculosis</i>				Positive control		Negative control	
	2.5%	5%	10%	20%	2.5%	5%	10%	20%	PC 1	PC 2	NC 1	NC 2
<i>A. catechu</i>	50+	50+	50+	50+	50+	50+	50+	50+	3	10	50+	50+
<i>A. calamus</i>	50+	50+	50+	50+	50+	50+	50+	50+				
<i>A. vasica</i>	40+	40+	40+	36	40+	40+	37	32				
<i>A. marmelos</i>	50+	50+	40+	40+	50+	40+	40+	36				
<i>A. paniculata</i>	50+	40+	38	35	50+	40+	40+	38				
<i>C. roseus</i>	40+	40+	34	32	40+	40+	36	31				
<i>M. oleifera</i>	40+	38	35	30	40+	40+	33	29				
<i>O. basilicum</i>	50+	50+	40+	38	50+	40+	40+	37				
<i>V. negundo</i>	50+	50+	50+	50+	50+	50+	40+	50+				
<i>W. somnifera</i>	50+	40+	40+	33	50+	40+	40+	40+				

Note: PC 1, H37Rv with 10 %v/v rifampicin; PC 2, Clinical isolate of *M. tuberculosis* with 10 %v/v rifampicin; NC 1, H37Rv with no rifampicin or plant extract; NC 2, Clinical isolate of *M. tuberculosis* with no rifampicin or plant extract.

DISCUSSION

In the current study, at 20% concentration, methanol extracts of *Adhatoda vasica*, and *M. oleifera*, the CFU counts were 13 and 16 for H37Rv, the standard strain and 17 and 15 for the clinical isolate, respectively. In general, the methanol plant extracts were more effective against H37Rv strain, as compared to the clinical isolate. Ethanol leaf-extracts of *A. vasica*, *C. roseus*, *M. oleifera* and were effective in controlling the growth of *M. tuberculosis* colonies (both H37Rv and three clinical isolates) on L-J medium. Particularly, at 20% level ethanol extract of *C. roseus*, the CFU count was 17 and 19 for the H37Rv strain and for the clinical isolate, respectively. Antimycobacterial property of alkaloids of *C. roseus* was also reported, elsewhere⁹. In general, the ethanol plant extracts were also more effective on the H37Rv strain as compared to the clinical isolate. Most aqueous leaf-extracts were ineffective as the number of CFUs were less in controlling the growth *M. tuberculosis* colonies (both H37Rv and the clinical isolate) on L-J medium with more than 50+ and 40+.

Aqueous leaf-extracts of *A. paniculata*, *C. roseus* and *M. oleifera* were moderately effective at concentrations, 5, 10 and 20% in controlling the growth of *M. tuberculosis* as colonies. Notably, aqueous leaf-extract of *M. oleifera* at the concentration 20% had the most effective antimycobacterial activity. In a separate study, phytochemicals isolated from aqueous extracts of *M. oleifera* was effective in inhibiting growth of the H37Rv strain¹⁰. Results obtained in this study using aqueous extracts of *A. marmelos*, *A. paniculata*, *O. basilicum* and *V. negundo* corroborated negativity in antimycobacterial properties, studied elsewhere¹¹⁻¹³.

Anti-mycobacterial activity of extracts of medicinal plants (*Lippia origanoides* and *L. alba*, *Swinglea glutinosa*, *Hyptis mutabilis*, *Achyrocline alata*, *Piper auritum* and *P. bogotense*, *Cananga odorata*) have been reported from Colombia. Oil extracts of *A. alata* and *S. glutinosa* were the highly active having MIC values of 62.5±0.1 and 100±36 µg/ml, respectively. Carvacrol, thymol, *p*-cymene, 1, 8-cineole and β-limonene were the major components, recognized in these plant extracts¹⁴.

All the plants, screened for anti-mycobacterial activity *in vitro* so far, have promising results. Incidentally, the drug-targeting endeavour from plant sources for control of TB is very much neglected, particularly with Indian medicinal plants, despite the emergence of XDR/MDR *M. tuberculosis* strains in unhygienic rural communities and urban slums of India¹⁵. It is plausible that the XDR strain should be evolving for resistance to the other second-line drugs^{16,17} due to the lack of a viable emulating check against its natural spread in communities. Further, the probability of resistance is according to the effectiveness of drugs in use, as signposted— (1) High, thiacetazone, ethionamide, capreomycin, cycloserine, viomycin; (2) Intermediate, isoniazid, streptomycin, ethambutol, kanamycin, para-aminosalicylic acid; (3) Lowest: rifampicin^{4,18}.

MDR and XDR strains of TB are reported from a few populous developing countries. These MDR strains are of concern of control, eventually are agents of increase of morbidity. Only *Clavija procera*, a Colombian plant and *Lantana hispida* from Mexico had been reported to have antimycobacterial activity against MDR strains. Phytochemicals have an added advantage as here, if they are exposed in a systematic scientific way. For this reason, neither the first line nor the second line drugs include phytochemicals, nonetheless, a myriad of plants are reported by Gautam et al to have antimycobacterial activity^{19,20}.

CONCLUSION

As it is known bacteria do not become resistant to phytochemicals, because of their complex structure, the present dream of isolation of a pure phytochemical against MDR TB strains is rational and achievable. Hence, our study concludes, plants like *A. vasica* and *M. oleifera* can be subjected for further research to make it a potential antimycobacterial drug.

Conflict of Interest: The author declares that there is no conflict of interests.

Ethical Clearance: Prior ethical permission was taken from the institutional ethical committee of IMS and Sum Hospital, Siksha 'O' Anusandhan (Deemed to University), before conducting the study.

Source of Funding: None

REFERENCES

1. Gilpin C, Korobitsyn A, Migliori GB, et al. The World Health Organization standards for tuberculosis care and management. *Eur Respir J* 2018; 51: 1800098.
2. World Health Organization. Global Tuberculosis Report 2017. Document WHO/HTM/TB/2017.23. Geneva, World Health Organization, 2017. Available from: <http://apps.who.int/iris/bitstream/10665/259366/1/9789241565516-eng.pdf?ua=1>. Date last accessed: July 4, 2018.
3. Chatterjee S, Poonawala H, Jain Y. Drug resistant tuberculosis: is India ready for the challenge? *BMJ Glob Health* 2018;3: e000971. doi:10.1136/bmjgh-2018-000971
4. Dubey D, Rath S, Sahu MC, Nayak N, Debata NK, Padhy RN. Status of multidrug resistance in tubercle bacillus and phytochemicals for the control. *J Publ Health* 2013; 21: 115-119.
5. Arinaminpathy N, Batra D, Khaparde S, et al. The number of privately treated tuberculosis cases in India: an estimation from drug sales data. *Lancet Infect Dis* 2016; 16:1255–60.
6. Sahu MC, Rath S, Dubey D, Debata NK, Padhy RN (2013). Evaluation of two microbiological diagnostic methods for the pulmonary tuberculosis based on Bayes rule. *J Publ Health* 2013; 21: 123-130.
7. Rath S, Dubey D, Sahu MC, Mishra SS, Padhy RN. Statistical evaluation of two microbiological diagnostic methods of pulmonary tuberculosis after implementation of directly observed treatment short-course program. *Osong Publ Health Res Persp* 2013; 4: 45-51
8. Rath S, Padhy RN. Antibacterial efficacy of five medicinal plants against multidrug resistant enteropathogenic bacteria infecting under-5 hospitalized children. *J Integr Med* 2015; 13 (1): 45-57
9. Macabeo APG, Franzblau SG, Cordell GA, Aguinaldo MM. A plumeran indole alkaloid from the bioactive antimycobacterial fraction of *Catharanthus roseus* G Don. *Acta Manilana* 1999; 47:53-59.

10. Sachan D, Jain SK, Singh N. *In vitro* and *in vivo* efficacy of *Moringa oleifera* plant constituents in urolithiasis as antilithiatic drug. *Int J Pharm Sci Res* 2011; 2: 1638-1644.
11. Ladda PL, Naikwade NS, Magdum CS. Antimycobacterial and antimicrobial activity of leaf extracts of *Vitex negundo* Linn. *Res J Pharma Phytochem*; 2: 166-168.
12. Siddiqui BS, Bhatti HA, Begum S, Perwaiz S. Evaluation of the antimycobacterium activity of the constituents from *Ocimum basilicum* against *Mycobacterium tuberculosis*. *J Ethnopharmacol* 2012; 144: 220-222.
13. Tawde KV, Gacche RN, Pund MM. Evaluation of selected Indian traditional folk medicinal plants against *Mycobacterium tuberculosis* with antioxidant and cytotoxicity study. *Asian Pacif J Trop Dis* 2012; 2: S685-S691.
14. Bueno-Sanchez JG, Martínez-Morales JR, Stashenko EE, Ribon W. Anti-tubercular activity of 11 aromatic and medicinal plants occurring in Colombia. *Biomedicine* 2009; 29:51–60
15. Singh S. Scaling of antimicrobial drug susceptibility testing services in India: it is high time. *Indian J Med Microbiol* 2008; 26: 209-211.
16. Gagneux S, Long CD, Small PM, Van T, Schoolnik GK, Bohannan BJM. The competitive cost of antibiotic resistance in *Mycobacterium tuberculosis*. *Science (NY)* 2006; 312:1944–1946
17. Raviglione MC. XDR-TB: entering the post-antibiotic era? *Int J Tuberc Lung Dis* 2006;10: 1185-1187.
18. Udhwadia ZF. MDR, XDR, TDR tuberculosis: ominous progression. *Thorax*; 2011; 67: 286-288.
19. Gautam R, Saklani A, Jachak SM. Indian medicinal plants as a source of antimycobacterial agents. *J Ethnopharmacol* 2007; 110: 200-234.
20. Singh S (2008) Scaling up anti-mycobacterial drug susceptibility testing services in India: it is high time. *Indian J Med Microbiol* 26:209–211

Oral Spindle Cell Carcinoma: A Rare Lesion Masquerading Many

Swatika Panda¹, Ipsita Mohanty², Alkananda Sahoo², Neeta Mohanty³

¹Associate Professor, ²Assistant Professor, ³Professor & Head, Department of Oral Pathology and Microbiology, Institute of Dental Sciences, Siksha'O'Anusandhan, deemed to be University, Bhubaneswar, Odisha, India

ABSTRACT

Monoclonal dedifferentiated form of conventional squamous cell carcinoma is recently recognized as spindle cell carcinoma. The biphasic microscopic appearance of this neoplasm simulates many pathological entities. Here we are reporting a case of spindle cell carcinoma in the gingivobuccal sulcus of an adult male with special emphasis on immunohistochemical markers in an effort to differentially exclude similar looking lesions. This report may help the pathologist to diagnose biphasic spindle cell neoplasms with judicial use of immunohistochemistry.

Keywords: *Bi-morphic, Spindle cell carcinoma, Immunohistochemistry,*

INTRODUCTION

Spindle cell carcinoma has been recently defined as a monoclonal dedifferentiated form of conventional squamous cell carcinoma. Although the frequency of spindle cell carcinoma of breast, larynx, oesophagus and lungs has been reported the frequency of oral spindle cell carcinoma is unknown yet because of the less number of reported cases. A single study has focused an occurrence of 63.1% of oral spindle cell carcinoma (SPC) among a total of 103 head and neck mucosal SPC¹. However there are a number of biphasic benign and malignant spindle cell tumours which makes the diagnosis cumbersome. We have delineated few spindle cell lesions with their diagnostic features to help the pathologists reach a conclusive diagnosis.

Case report: A forty-two year old male presented with a painful ulceroproliferative lesion in left side of gingivobuccal sulcus from left lower second premolar to left lower second molar measuring 3 × 4

centimetres in diameter with irregular margin since two months. Tenderness and minimal induration was found during palpation. Left submandibular node was tender and palpable. There was no history of preceding trauma, previous malignancy, radiotherapy and/or any association with co-morbid disease. There was a habit of tobacco chewing since last 5 years. A panoramic radiograph revealed buccal cortical bone loss in relation to left lower molars.

Clinical and radiographic findings were suggestive of a wide spectrum of lesions ranging from localized reactive process to neoplastic proliferations of epithelial, haemato-lymphoid, vascular, odontogenic, and mesenchymal tissues and metastatic carcinoma, sarcoma and non-Hodgkin's lymphoma were the other possibilities too.

The microscopic features (figure 1) of the biopsied tissue revealed tumor cells arranged in an irregular pattern with focal storiform pattern. Among the atypical cells few resemble to epithelial cells with roughly polygonal shape, large hyperchromatic nucleus, altered nucleus cytoplasmic ratio, and few mitotic figures. Predominantly atypical fibroblasts are seen with many mitotic figures distributed in a storiform arrangement. Focal necrosis was present. Ten high power fields (HPF) contained a maximum of 3-4 mitosis. Focally, the tumor was intensely infiltrated by lymphocytes, neutrophils, plasma cells and few histiocytes. The periphery of the lesion is showing few giant cells.

Corresponding Author:

Dr. Swatika Panda
Associate Professor
Department of Oral Pathology and Microbiology,
Institute of Dental Sciences,
Siksha'O'Anusandhan, deemed to be University
Bhubaneswar-751030, Odisha, India
Email: dr.swatika@gmail.com

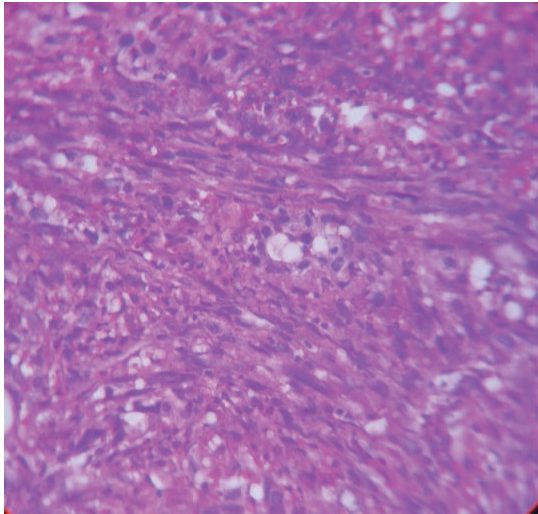


Figure 1: Photomicrograph of Haematoxylin and eosin staining (10X) showing atypical epithelioid cells and fibroblasts

Microscopical differential diagnosis: Because of morphological patterns of compact spindle cells in a solid confluent area and collagen dense pattern² we considered Inflammatory myofibroblastic tumor (IMT). It is composed of myofibroblastic mesenchymal spindle cells accompanied by an inflammatory infiltrate of plasma cells³. Presence of marked cytologic atypia and scarcity of plasma cell in the given tissue excluded the diagnosis of IMT [3]. ALK-1, vimentin, smooth muscle actin and muscle specific actin positivity along with cytokeratin negativity shall help in diagnosis⁴ although focal cytokeratin positivity is found in up to 60% of cases when using AE1/AE3².

High cellularity, pleomorphic tumor cells, areas of haemorrhage and necrosis⁵ in the given tissue also indicated towards Solitary fibrous tumor (SFT). Originally regarded as separate entity, WHO in 2013 unified both SFT and hemangiopericytoma as SFT. Bland spindle cells with vesicular nuclei and thick hyalinised collagen interspersed between tumour cells showing pattern less pattern with alternating hypo and hypercellular areas are typical microscopic features⁶ which insisted us to exclude SFT. The tumor cells are positive for vimentin and CD34⁷.

Initial impression of microscopic findings was giant cell variant of malignant fibrous histiocytoma as it shows areas of necrosis and hemorrhage in addition to giant cells and multiple histiocytes. Recently introduced as undifferentiated pleomorphic sarcomas it shows positivity for only vimentin immunomarker. Histiocytic markers are no longer useful in the diagnosis of MFHs⁸.

Careful observation of proliferating epithelial and mesenchymal cells indicated towards biphasic tumours which include Leiomyosarcoma (LMS), fibrosarcoma (FS), amelanotic melanoma (AMM), head and neck synovial sarcomas (HNSS), spindle cell carcinoma (SPC) and other sarcomatoid carcinoma.

FS is a frequently over diagnosed malignant neoplasm of fibroblast which has been many times applied to any tumour with rich cellularity and collagen forming ability of spindle cells. High-grade lesions show an intense nuclear pleomorphism, rich cellularity and atypical mitosis similar to the present findings⁹ which made us diagnose the lesion provisionally as high grade fibrosarcoma. The positive immunostaining for vimentin along with negativity for muscular immunomarkers and epithelial markers shall help in diagnosing the fibrosarcoma⁹.

Polypoid masses composing of pleomorphic spindle cells, varying degrees of nuclear pleomorphism, hyperchromatism with or without melanin pigments may also indicated us towards AMM. S-100, HMB 45 and anti-vimentin shall serve to rule out this diagnosis¹⁰.

LMS is a malignant mesenchymal neoplasm characterized by densely packed spindle cells with abundant fibrillar eosinophilic cytoplasm and arranged as sheets of sweeping alternating bundles and fascicles. The tumor cells show marked cellular pleomorphism with irregular shaped large hyperchromatic bizarre nuclei similar to our case. Immunohistochemical positivity for smooth muscle actin, muscle specific actin and vimentin as well as negativity for S-100 protein, cytokeratin and desmin shall confirm the diagnosis¹¹. Focal cytokeratin positivity¹² makes the diagnosis difficult in limited biopsy.

Unrelated to synovial tissue HNSS represents a spindle-cell tumor that has variable epithelial differentiation and is associated with the fusion gene SYT-SSX. Biphasic variant is characterized by two distinct cell populations: primary spindle cell elements and secondary epithelioid component most of which disposed to form duct like structures. Absence of duct like structure in the tissue and rarity of this neoplasm were the reasons of exclusion. Along with positivity to cytokeratin, epithelial membrane antigen and vimentin, SS18 gene rearrangement by fluorescent in situ hybridization is ultimate investigation to diagnose HNSS.

The bi-morphic appearance of the tumour, atypical spindle cells as well as tumour epithelioid cells in connective tissue stroma arranged in streaming fashion,

mitotic figures and giant cells together led us to include the possibility of SPC¹⁸. Distinction of intraosseous SPC from sarcomas with a spindle cell appearance is extremely difficult even with the help of IHC because of evidence of sarcoma being cytokeratin positive¹³. Prominent cytokeratin and vimentin positivity shall favor the diagnosis of SPC.

Upon immunohistochemical evaluation the tissue was strongly positive for vimentin (Figure 2) and focally positive for pan-cytokeratin (Figure 3). This helped us reaching a differential diagnosis of SPC and LMS. Negative expression of further immunohistochemistry with smooth muscle actin (Figure 4) confirmed the diagnosis of SPC.

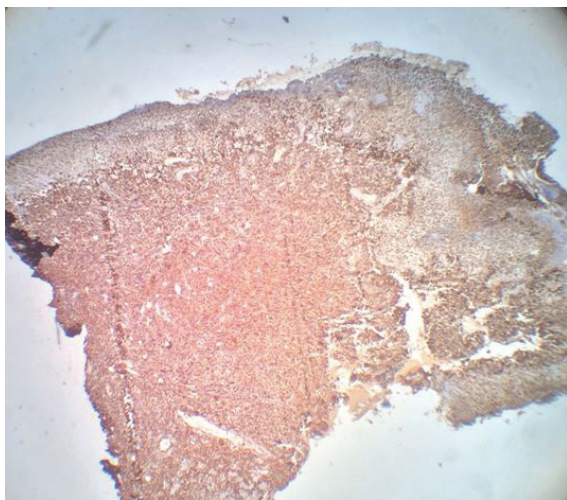


Figure 2: Strong diffuse positivity for vimentin

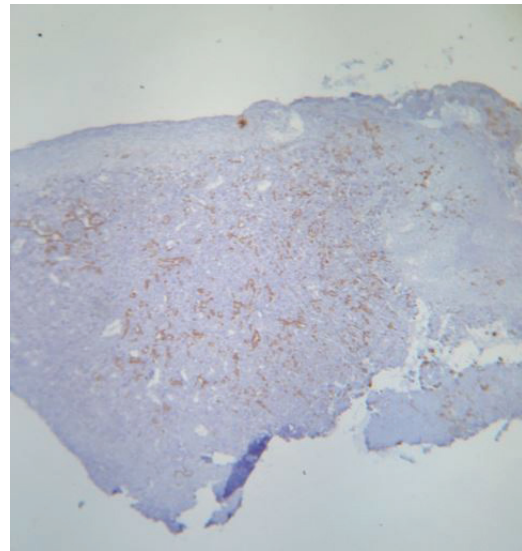


Figure 3: Focal positivity for pan-cytokeratin

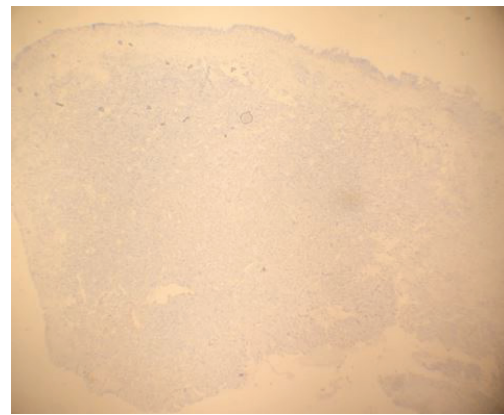


Figure 4: Negative expression of Smooth muscle actin

Microscopic findings	Diagnosis	Exclusion criteria
<ul style="list-style-type: none"> • Atypical epithelioid cells and fibroblast • Focal storiform arrangement of tumour cells • Focal areas of hemorrhage and necrosis • Mixed population of inflammatory cells chiefly lymphocytes • Few histiocytes and giant cells 	IMT	Marked cytologic atypia and absence of plasma cells (H&E) ALK-1, Vimentin, SMA, MSA – (+) Cytokeratin – (-)
	SFT	Absence of bland spindle cells and thick hyalinised collagen interspersed between tumour cells and alternating hypo/hypercellular areas (H&E) Vimentin, CD 34 – (+)
	MFH	Vimentin (+), epithelial and histiocytic marker (-)
	AMM	Vimentin, S-100, HMB 45 (+)
	FS	Vimentin (+), cytokeratin (-)
	LMS	Vimentin, SMA, MSA (+), cytokeratin (-) (occasional focal cytokeratin positivity)
	SPC	Vimentin and cytokeratin (+), SMA (-)
	HNSS	Vimentin and cytokeratin (+), SMA (-), SS 18 gene rearrangement in FISH

Figure 5

DISCUSSION

Four theories have been proposed to explain the histogenetic concept of SPCs. While the collision theory opines simultaneous derivation of spindle cells and epithelial cells from separate stem cells the combination theory suggests that both components are derived from a single stem cell which undergoes a divergent differentiation early in the evolution of the tumour^{14,15}. Composition theory explained that the spindle cell component is a result of pseudosarcomatous stromal reaction to the carcinomatous component. Conversion theory says that sarcomatous element is derived from the carcinoma during the evolution of the tumour by virtue of the driving force of the malignant epithelial cell. The dual antigen positivity for both cytokeratin and vimentin suggests that the cells are in transition and it may represent sarcomatous metaplasia of a squamous cell carcinoma¹⁷. Other markers like epithelial membrane antigens, KI, and K18, vimentin, desmin, S-100, Osteopontin, and BMP are also positive in SPCs¹⁶⁻¹⁸. p53, a transcription factor important for epithelial proliferation and differentiation, is also useful for diagnosing SPC of the head and neck region¹⁹. There occurs a great resemblance of microscopic features among several reactive, benign and malignant lesions owing to a careful systematic evaluation of both hematoxylin eosin stained tissue as well as multiple immunomarkers

CONCLUSION

Microscopic features of spindle cell carcinoma resemble many benign and malignant oral lesions. Therefore careful delineation with the aid of routine haematoxylin and eosin along with immunohistochemistry using appropriate markers is necessary to diagnose spindle cell carcinoma.

Conflict of Interest: None

Source of Funding: Self-funded

Ethical Clearance: The ethical clearance was obtained from Institutional Human Ethics committee, Institute of Medical science and SUM Hospital, Bhubaneswar, Odisha.

REFERENCES

1. Viswanathan S, Rahman K, Pallavi S, Sachin J, Patil A, Chaturvedi P, et al. Sarcomatoid (spindle cell) carcinoma of the head and neck mucosal region: a clinicopathologic review of 103 cases from a tertiary referral cancer centre. *Head and neck pathology*. 2010;4:265-75. PMID:20730609
2. Coffin CM, Watterson J, Priest JR, Dehner LP. Extrapulmonary inflammatory myofibroblastic tumor (inflammatory pseudotumor). A clinicopathologic and immunohistochemical study of 84 cases. *The American journal of surgical pathology*. 1995;19:859-72. PMID:11406658
3. Wenig BM, Devaney K, Bisceglia M. Inflammatory myofibroblastic tumor of the larynx. A clinicopathologic study of eight cases simulating a malignant spindle cell neoplasm. *Cancer*. 1995;76:2217-29. PMID:8635024
4. Volker HU, Scheich M, Holler S, Strobel P, Hagen R, Muller-Hermelink HK, et al. Differential diagnosis of laryngeal spindle cell carcinoma and inflammatory myofibroblastic tumor--report of two cases with similar morphology. *Diagnostic pathology*. 2007;2:1. PMID:17212821
5. Enzinger FM, Smith BH. Hemangiopericytoma. An analysis of 106 cases. *Human pathology*. 1976;7:61-82. PMID:1244311
6. Carlos R, de Andrade BA, Canedo NH, Abrahao AC, Agostini M, de Almeida OP, et al. Clinicopathologic and immunohistochemical features of five new cases of solitary fibrous tumor of the oral cavity. *Oral surgery, oral medicine, oral pathology and oral radiology*. 2016;121:390-5. PMID:26852825
7. Chan JK. Solitary fibrous tumour--everywhere, and a diagnosis in vogue. *Histopathology*. 1997;31:568-76. PMID:9447390
8. Szollosi Z, Nemeth T, Egervari K, Nemes Z. Histiocyte-like cells expressing factor XIIIa do not belong to the neoplastic cell population in malignant fibrous histiocytoma. *Pathology, research and practice*. 2005;201:369-77. PMID:16047946

9. Wadhwan V, Chaudhary MS, Gawande M. Fibrosarcoma of the oral cavity. *Indian journal of dental research : official publication of Indian Society for Dental Research.* 2010;21:295-8. PMID:20657104
10. Devi P, Bhovi T, Jayaram RR, Walia C, Singh S. Malignant melanoma of the oral cavity showing satellitism. *Journal of oral science.* 2011;53:239-44. PMID:21712630
11. Yan B, Li Y, Pan J, Xia H, Li LJ. Primary oral leiomyosarcoma: a retrospective clinical analysis of 20 cases. *Oral diseases.* 2010;16:198-203. PMID:20374505
12. Miettinen M. Immunoreactivity for cytokeratin and epithelial membrane antigen in leiomyosarcoma. *Archives of pathology & laboratory medicine.* 1988;112:637-40. PMID:2454091
13. Layfield LJ, Emerson L, Crim JR, Randall L. Squamous differentiation and cytokeratin expression in an osteosarcoma: a case report and review of the literature. *Clinical medicine Pathology.* 2008;1:55-9. PMID:21876652
14. McCluggage WG. Malignant biphasic uterine tumours: carcinosarcomas or metaplastic carcinomas? *Journal of clinical pathology.* 2002;55:321-5. PMID:11986333
15. Thompson L, Chang B, Barsky SH. Monoclonal origins of malignant mixed tumors (carcinosarcomas). Evidence for a divergent histogenesis. *The American journal of surgical pathology.* 1996;20:277-85.
16. Thompson LD, Wieneke JA, Miettinen M, Heffner DK. Spindle cell (sarcomatoid) carcinomas of the larynx: a clinicopathologic study of 187 cases. *The American journal of surgical pathology.* 2002;26:153-70. PMID:11812937
17. Katase N, Tamamura R, Gunduz M, Murakami J, Asaumi J, Tsukamoto G, et al. A spindle cell carcinoma presenting with osseous metaplasia in the gingiva: a case report with immunohistochemical analysis. *Head & face medicine.* 2008;4:28. PMID:19040765
18. Lewis JE, Olsen KD, Sebo TJ. Spindle cell carcinoma of the larynx: review of 26 cases including DNA content and immunohistochemistry. *Human pathology.* 1997;28:664-73. PMID:9191000
19. Lewis JS, Ritter JH, El-Mofty S. Alternative epithelial markers in sarcomatoid carcinomas of the head and neck, lung, and bladder-p63, MOC-31, and TTF-1. *Modern pathology : an official journal of the United States and Canadian Academy of Pathology, Inc.* 2005;18:1471-81. PMID:20614332

Oblique Mandibular Parasymphysis Fracture Treated with Cannulated Herbert Bone Screws: Case Reports

Harsh Mohan Pathak¹, Sobhan Mishra², Subrat Kumar Padhiary³, Bijaylaxmi Panigrahi⁴

¹Reader, ²Professor & HOD, ³Professor, ⁴PG trainee, Dept. of Oral and Maxillofacial Surgery, Institute of Dental Sciences, Siksha 'O' Anusandhan (Deemed to Be University), Bhubaneswar.

ABSTRACT

Introduction: Maxillofacial trauma is in querulous expansion by clinical and biomechanical studies in order to enhance the well-established techniques and to utilize new materials to reduce immobilization period and enhancement of the rigid fixation.²³ The principle of axial compression for better adaptation of fracture segments, with the advantage of increased stability and early function, is a promising means of avoiding the bulky rigid plates used previously.²¹ Since 1984 the cannulated Herbert Bone Screw (HBS) proves to be a successful mean of fracture fixation in various fields of orthopaedic surgery, nonetheless with no sufficient evidence about its performance in the maxillofacial trauma field.²³

Objectives: Purpose of this study was to evaluate clinically and radiographically the performance of Herbert Bone Screw in the treatment of anterior mandibular oblique fractures.

Materials & Method: Three Patients with non-comminuted oblique anterior mandibular fracture who had reported to the dept. of OMFS, Institute of Dental Sciences, Siksha 'o' Anusandhan University (Deemed to be University) following RTA were treated using Herbert bone screw. Clinical follow up was conducted after one week, four weeks, six weeks and twelve weeks for postoperative occlusion, inter-fragmentary mobility, pain and isodensity values on panoramic radiographs.

Results: By the end of the follow up period, all cases showed normal occlusal and good stability, a decrease in level of pain intensity and an uneventful wound healing with no records of developed infection. Mean bone density after twelve weeks showed a statistically significant.

Conclusion: Fixation of anterior mandible fracture using this technique can achieve good stability and appropriate compression.

Keywords: Anterior mandibular fracture, Herbert Bone Screw, Cannulated Screw, Traction Osteosynthesis.

INTRODUCTION

The mandible is the second most commonly fractured part of the maxillofacial skeleton, even though it is the largest and strongest facial bone. Mandibular fractures comprise between 40 and 62% of all facial fractures. The

anterior region of the mandible represents the central horizontal part of the mandible, it is bounded bilaterally by vertical lines just distal to the mandibular canine teeth, including those that run in the midline of the mandible; the symphysis and parasymphysis regions. Anterior mandible fractures (AMFs) represent a considerable entity of mandibular injuries, where the literature gave them as high as 30% of all mandibular fractures.

Open reduction and internal fixation of these fractures is considered the gold standard treatment option in which various hardware were used in order to incline the patients into an early return to the pre-existing state of function and aesthetics. The use of two monocortical miniplates was described by Champy et al following

Corresponding Author:

Dr. Bijaylaxmi Panigrahi
PG Trainee (DEPT. OF OMFS),
Dept. of Oral and Maxillofacial Surgery,
Institute of Dental Sciences,
Siksha 'O' Anusandhan (Deemed to Be University),
Bhubaneswar

the concept of ideal lines of osteosynthesis in order to counteract the torsional and rotational trajectories in the anterior mandible.

Traction osteosynthesis was introduced in the maxillofacial region in 1970 by Brons and Boering as a rigid scheme for management of mandibular fracture. This was first utilized in anterior mandibular fractures (AMFs), as this region of the mandible is uniquely shaped for application of the screw. Brons and Boering mandated the placement of two lag screws in AMFs considering the biomechanics of this area. Other studies inquired about the need for two fixation devices, especially in the parasymphiseal region, and they advised the use of a lower border miniplate or lag screw along with a mandibular arch bar. Choosing one treatment modality over the other is based on the surgeon's preference, experience and the armamentarium availability.

In 1984, Herbert and Fisher proposed a new method for rigid fixation to manage scaphoid bone fracture, from this point forth, it demonstrates to be a successful, minimally invasive, mean of providing rigid internal fixation between fracture segments in various terrains of orthopaedic surgery. Their design overcomes the drawbacks of the lag screw, such as limited mobility of adjacent joint and difficulty in determining the screw length. Herbert bone screws (HBS) are a compressive, cortical, headless, cannulated titanium screws. Unlike the lag screws, they gain their compressive power from the differential pitch pattern of threads at both ends of the screw. The distal end threads are of the reverse buttress type, they are longer in length and with a smaller diameter than those at the proximal end which are of the standard V-shaped type. The central shaft of the screw is smooth, which edges over the threaded design of the lag screw were threads cross the fracture line. The utilization of the HBS in the maxillofacial field was recently adopted, where the contemporary literature contains two in-vitro biomechanical studies, a case series for its performance in condylar fractures, a study about its use along with three dimensional navigation systems in angle fractures.²²

The Herbert screw is a headless screw, has threads at both ends and a blank shaft in between. The threads at the leading end have a larger pitch and smaller diameter, while the threads at the trailing end have a smaller pitch and a larger diameter. This screw was introduced mainly to address the disadvantage of the lag screw head,

which interfered in the articulation sur-faces. Due to the differential pitch, the screw does not utilize the head to cause compression between the segments but draws both segments towards each other. As the leading end threads engage the inner cortex, the cortex is pulled out and compression is eventually caused as the trailing end threads engage the outer cortex. A further advantage is the blank shaft in the centre with no threads along the fracture line.²¹

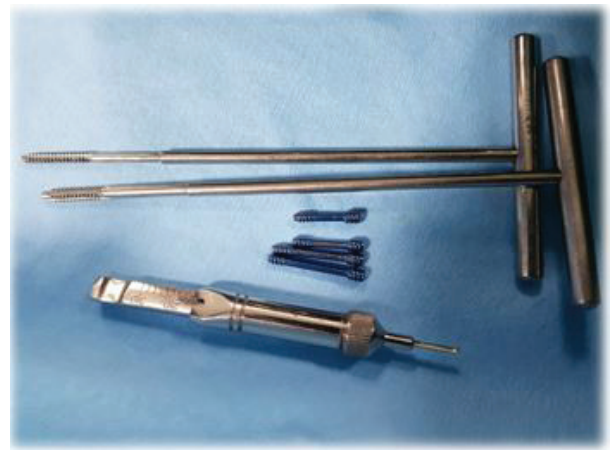


Fig. 1: Bone Tap, Herbert Bone Screw, Depth Gauge

The specific aims were: 1) design and implement a randomized clinical trial, 2) detect and compared the presence of interfragmentary mobility between the different tested fixation modalities, 3) estimate and compare the radiodensitometric mean bone density across the fracture line, and 4) determine the clinical advantages and disadvantages of this newly utilized fixation device.²³

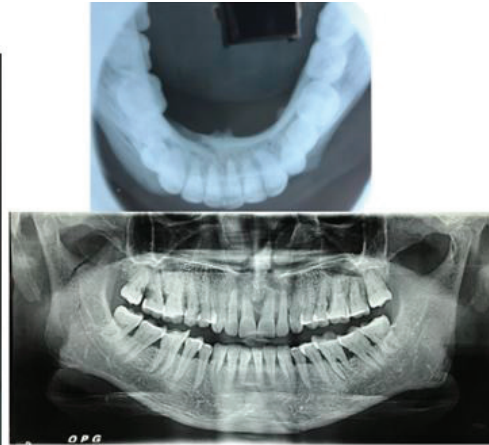
MATERIALS AND METHOD

Patients: Three patients with oblique displaced or undisplaced mandibular fractures requiring open reduction and internal fixation (ORIF), who reported to the maxillofacial unit of Institute of Dental Sciences, Siksha 'o' Anusandhan University (Deemed to be University) were included. Inclusion criteria- Subjects with oblique fractures or sagittally split fractures of the symphysis, parasymphysis with no bone loss, were included.

Exclusion criteria: Subjects with systemic diseases that could have interfered with healing (e.g., diabetes, chemotherapy or radiotherapy, and collagen disorders), comminuted fracture patterns, and patients not willing to participate were excluded from the study.



2a. Pre op picture of occlusion



2b. Pre op occlusal radiograph and OPG

Figure 2: a. Preop Occlusion, b. Mandibular Occlusal view & OPG

Presurgical Phase: Written informed consent was obtained from all of the patients before the procedures. Prior to surgery, full case histories and clinical examinations were recorded on standardized forms. The preoperative radiographic assessment was done using digital panoramic radiographs^(PIC.2b). The radiographs for each patient were standardized by keeping the exposure time, voltage, and patient position constant at each follow-up. Other radiographic views i.e. occlusal radiograph^(PIC.2b) or 3D computed tomography were requested as deemed necessary. The preoperative radiographic assessment was done to identify the fracture lines, presence of a tooth in the line of fracture, degree of displacement, and inferior alveolar nerve location (Fig. 2). All patients were treated by ORIF with titanium Herbert screws by a single surgeon. The Herbert screws used had a shaft diameter of 1.25 mm.

Surgical Phase: Prophylactic antibiotic therapy was administered preoperatively in the form of Cefotaxime 1 gm/12 hours intravenously to prevent postoperative infection. All of the patients were treated under general anaesthesia using nasal intubation. The surgical site is swabbed using povidone iodine solution (Betadine 7.5%), then draped with sterile towels.

The occlusion was secured with temporary IMF and the fracture line was exposed and manually reduced. Fractures anterior to the mental foramen were exposed via intraoral vestibular degloving approach by making a curvilinear incision 3mm apical to the mucogingival junction. Exposure of the fracture site was obtained by standard layered dissection through mucosa, mentalis muscle, and the periosteum in the intraoral vestibular degloving approach.

A 0.8mm Kirschner guide wire was drilled and tapped into the opposite cortex of the distal fracture segment. The depth of the K-wire was measured using a depth gauge to determine the length of the screw to be utilized. A 2mm cannulated spiral drill was used under the guidance of the K-Guide to make the osteotomy, followed by Herbert Bone Screw (2 mm cortical head and 2.5 mm cancellous head and a length ranging from 8 mm to 24 mm) placed with the aid of the cannulated torque shank screwdriver. Two screws were placed if the fractured segments were unstable. All patients received intravenous antibiotics from the time of admission, followed by a course of oral antibiotics for 5–7 days after discharge. Clinical and radiographic postoperative evaluations were performed. The clinical assessment included postoperative occlusion, interfragmentary mobility (assessed by bi-manual palpation across the fracture site), and pain (assessed by visual analogue scale). Nerve sensation was compared with the preoperative condition using mechanoreceptive (static light touch, brush directional stroke, and two-point discrimination) and nociceptive methods (pin pressure). Complications such as bone tap fracture was recorded. The postoperative radiographic assessment was done to determine the density of the healing fracture line and comparing them in the panoramic radiographs taken at each follow up visit. Three points were marked along the fracture line: (1) point A: 1 mm below the upper border of the mandible; in the case of a tooth being involved in the fracture line, then 1 mm below the apex of the tooth. (2) Point B: 1 mm below the inferior corticated border of the inferior alveolar canal; a line was drawn connecting the lower ends of the mental foramen on both sides and

the point formed where this line bisected the fracture line was considered. (3) Point C: 1 mm above the lower border of the mandible.

The occlusion of all patients was checked by releasing the temporary IMF closing wires to confirm stable and reproducible occlusion. The incision sites were irrigated with normal saline solution wound closure in layers was performed, using Vicryl suture material.²²

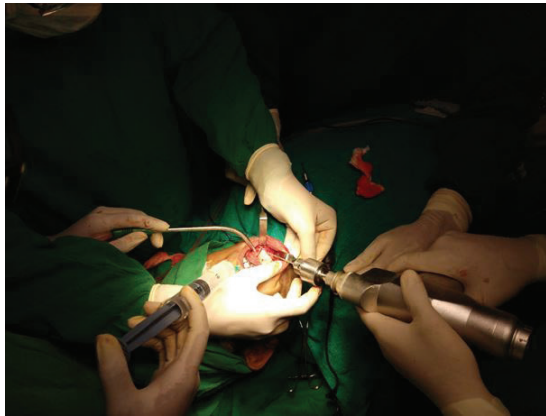


Fig. 3a. Intraop picture



Fig. 3b & c. Intraop clinical pictures with Herbert bone screw in position

Postoperative Phase-findings: The assessment of occlusion showed that two patient had an abnormal occlusion during the early follow-up period^(pic 2a), which eventually settled^(pic 4).

The inter-fragmentary mobility was absent by the second postoperative follow-up (4 weeks). Postoperative pain was present in the early follow-up period but seen to reduce faster by the second follow-up (4 weeks). All patients recovered uneventfully and were free of any pain at the subsequent follow-up assessments.

Radiographic isodensity values were compared to assess the changes seen from the first to the second, third, and fourth follow-up assessments. The changes from the first to the third and fourth follow up assessments were statistically significant, while the change from the second to the third follow up assessment was not significant and that from the third to the fourth follow-up was also not significant. This indicates that the isodensity attained at the second follow-up (4 weeks) was comparable to the isodensity seen at the third follow-up (3 months), and hence a value comparable to the final follow-up isodensity value was attained by 4 week.

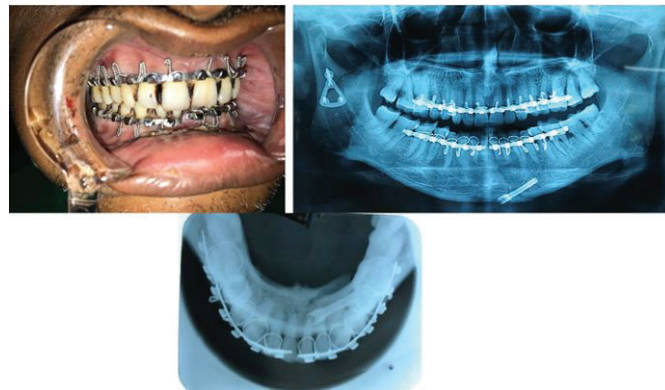


Fig. 4: Postop clinical occlusion, OPG, Mandibular occlusal view Radiograph

CONCLUSION

Despite that it is a technique sensitive treatment modality that requires surgical expertise and strict attention to its placement prerequisites, the use of Herbert Bone Screw for mandibular fractures management showed a satisfactory and predictable wound and bone healing outcomes.

Conflict of Interest: None

Source of Funding: Self-funded

Ethical Clearance: The ethical clearance was obtained from Institutional Human Ethics committee, Institute of Medical science and SUM Hospital, Bhubaneswar, Odisha.

REFERENCES

- Jadhav A, Mundada B, Deshmukh R, Bhutekar U, Kala A, Waghvani K, et al. Mandibular ramus fracture: an overview of rare anatomical subsite. *Plast Surg Int.* 2015;1-5, 2015.
- Leathers R, Le AD, Black E, McQuirter JL. Orofacial injury in underserved minority populations. *Dent Clin North Am.* 47:127-39, 2003.
- Al-Moraissi EA, Ellis E. Surgical management of anterior mandibular fractures: a systematic review and meta-analysis. *J Oral Maxillofac Surg.* 72:2507. e1-. e11, 2014.
- de Oliveira K, de Moraes P, da Silva J, de Queiroz W, Germano AR. In vitro mechanical assessment of 2.0-mm system three-dimensional miniplates in anterior mandibular fractures. *Int J Oral Maxillofac Surg.* 43:564-71, 2014.
- Fasola A, Obiechina A, Arotiba J. Incidence and pattern of maxillofacial fractures in the elderly. *Int J Oral Maxillofac Surg.* 32:206-8, 2003.
- Agnihotri, A. Prabhu S, Thomas S. A comparative analysis of the efficacy of cortical screws as lag screws and miniplates for internal fixation of mandibular symphyseal region fractures: a randomized prospective study. *Int J Oral Maxillofac Surg.* 43: 22-8, 2014.
- Chen S, Zhang Y, An J, He Y. Width-Controlling Fixation of Symphyseal/Parasymphyseal Fractures Associated with Bilateral Condylar Fractures with 2 2.0-mm Miniplates: A Retrospective Investigation of 45 Cases. *J Oral Maxillofac Surg.* 74(2):315-27, 2016.
- Brons R, Boering G. Fractures of the mandibular body treated by stable internal fixation: a preliminary report. *J Oral Maxillofac Surg.* 28:407-9, 1970.
- Emam H, Stevens M. Can an Arch Bar Replace a Second Lag Screw in Management of Anterior Mandibular Fractures? *J Oral Maxillofac Surg.* 70:378-83, 2012.
- Erol B, Tanrikulu R, Görgün B. Maxillofacial Fractures. Analysis of demographic distribution and treatment in 2901 patients (25-year experience). *J Craniomaxillofac Surg.* 2004;32:308-13.
- Gandhi S, Ranganathan L, Solanki M, Mathew G. Pattern of maxillofacial fractures at a tertiary hospital in northern India: a 4-year retrospective study of 718 patients. *Dental Traumatol.* 2011;27:257-62.
- Chrcanovic B, Abreu M, Souza L. 1,454 mandibular fractures: A 3-year study in a hospital in Belo Horizonte, Brazil. *J CranioMaxillofac Surg.* 2012;40:116-23.
- Ghodke M, Shah S, Bhojar S. Prevalence of mandibular fractures reported at C.S.M.S.S Dental College, Aurangabad from February 2008 to September 2009. *J Int Soc Prev Community Dent.* 2013;3:51-8.
- Brons R, Boering G. Fractures of the mandibular body treated by stable internal fixation: a preliminary report. *Journal of oral surgery (American Dental Association: 1965).* 1970;28:407-15.
- Hebert T, Fisher W. Management of the fractured scaphoid using a new bone screw. *Plast Reconstr Surg.* 1986;78:836.
- Kirkpatrick L, Feeney B. A simple guide to IBM SPSS: for version 22.0. Students ed. Boston, MA: Cengage Learning; 2015.
- Kotz S, Balakrishnan N, Read C, vidakovic B. *Encyclopedia of statistical sciences* 2nd ed. Hoboken, NJ: Wiley-Interscience; 2006.

18. Luhr H. The development of modern osteosynthesis. Mund-, Kiefer- und Gesichtschirurgie: MKG. 2000;4(1):S84-90.
19. Moses H, Powers D, Keeler J, Erdmann D. Opportunity cost of surgical management of craniomaxillofacial trauma. Craniomaxillofac Trauma Reconstr. 2016;9:76-81.
20. Lakota RA. Fixation of dicapitular fractures of the mandibular condyle with a headless bone screw. Br J Oral Maxillofac Surg 2007;45:399-401.
21. Kotrashetti S, Singh A. Prospective study of treatment outcomes with lag screw versus Herbert screw fixation in mandibular fractures. Int J Oral Maxillofac Surg. 2017;46:54-8.
22. Yehia A. El-Mahallawy BDS, Sherief H El-Ghamrawy PhD, Mervat M. Khalil PhD. THE USE OF HERBERT CANNULATED BONE SCREW IN THE TREATMENT OF MANDIBULAR FRACTURES (A CLINICAL AND RADIOGRAPHIC STUDY) Alexandria Dental Journal. (2018) Vol.43 Pages:142-148
23. Yehia El-Mahallawy., MSc, Haytham Al-Mahalawy., PhD. Herbert cannulated bone screw osteosynthesis in anterior mandibular fractures treatment: a comparative study with lag screw and mini-plate. (*Journal of Oral and Maxillofacial Surgery*) 26 January 2018

Apicoectomy with Placement of PRF in Periapical Lesions: Case Reports

Subrat Kumar Padhiary¹, Harsh Mohan Pathak², Santosh Subudhi³, Shibasis Biswas⁴

¹Professor, ²Reader, ³Professor, ⁴PG trainee, Dept. of Oral and Maxillofacial Surgery,
Institute of Dental Sciences, Siksha 'O' Anusandhan (Deemed to Be University), Bhubaneswar

ABSTRACT

Platelet-rich fibrin (PRF), a second-generation platelet concentrate, has shown to be superior to PRP. It was first developed in France. PRF allows one to obtain fibrin membranes enriched with platelets and GF after starting from an anticoagulant-free blood harvest. Recently, studies have demonstrated that the PRF membrane has a very significant slow sustained release of many key GF for at least 1 week and up to 28 days, which means that PRF could release GF with its own biological scaffold for wound healing process. The aim of this case report is to describe two cases of radicular cysts in the maxillary anterior region that were individually managed, depending on the underlying etiology, by using an interdisciplinary approach including nonsurgical restorative and endodontic therapy followed by surgical enucleation of the cyst followed by apicoectomy and placement of PRF.

Keywords: Apicoectomy; Platelet-rich fibrin; Periapical lesions

INTRODUCTION

Periapical lesion is a local response of bone around the apex of tooth that develops after the necrosis of the pulp tissue or extensive periodontal disease. The successful treatment of periapical inflammatory lesion depends on the reduction and elimination of the offending organism. Root canal therapy, periapical surgery, or extraction of the tooth might be the treatment alternatives. Periapical surgery includes the curettage of all periapical soft tissues and sometimes application of different biomaterials to enhance the new bone formation in the defect site. Bone grafts and barrier membrane have been used for optimal healing of the periapical defect area after degranulation of the lesion.^[1,2] All these approaches are known as regenerative therapies.^[3]

Platelet-rich plasma (PRP), introduced by Whitman *et al.* in 1997, is a natural source of growth factors (GF) used to enhance bone regeneration. It is an autologous concentrate

of platelets suspended in plasma. It is well known that platelets have many functions beyond that of simple hemostasis. Platelets contain important GF that, when secreted, are responsible for increasing collagen production, recruiting other cells to the site of injury, initiating vascular ingrowth, and inducing cell differentiation. These are all crucial steps in early wound healing.^[4]

On the other hand, platelet-rich fibrin (PRF), a second-generation platelet concentrate, has shown to be superior to PRP.^[5] It was first developed in France by Choukroun *et al.* in 2001.^[6] PRF allows one to obtain fibrin membranes enriched with platelets and GF after starting from an anticoagulant-free blood harvest.^[7-9] Recently, studies have demonstrated that the PRF membrane has a very significant slow sustained release of many key GF for at least 1 week^[10] and up to 28 days,^[11] which means that PRF could release GF with its own biological scaffold for wound healing process.

The aim of this case report is to describe two cases of radicular cysts in the maxillary anterior region that were individually managed, depending on the underlying etiology, by using an interdisciplinary approach including nonsurgical restorative and endodontic therapy followed by surgical enucleation of the cyst followed by apicoectomy and placement of PRF.

Corresponding Author:

Dr. Shibasis Biswas
PG trainee, Dept. of Oral and Maxillofacial Surgery,
Institute of Dental Sciences,
Siksha 'O' Anusandhan (Deemed To Be University),
Bhubaneswar

CASE REPORTS

Case 1: A 22 year old male patient reported to our Maxillofacial unit with a gross swelling over the maxillary anterior region since last 1 year. Patient also gave a history of intermittent swelling which used to disappear and again reoccur with pus discharge from the palatal aspect.

Patient had a similar problem about 3 years ago for which he had underwent extraction of the lateral incisor from a local dentist. As patient had no old records of his previous visit to the dentitst we did an OPG(Fig: case 1(B)) and also an maxillary occlusal view(Fig: Case 1(C)).

Radiographic evaluation revealed a 2x1.5 Cm lesion involving the upper left incisor and canine.

Management: As the patient was young and willing to keep the tooth we sent the patient for Root Canal Treatment of both the involved teeth. On the day of obturation we had planned for surgical excision of the lesion along with apicoectomy and PRF placement as a growth factor.

The incision was a standard trapezoidal flap and the underlying lesion was exposed(Fig: Case 1(E)) and after that a bony window was created using a round bur to facilitate the exposure of the cystic lining(Fig: Case 1(F)). Cystic lining was enucleated in-toto(Fig: Case 1(G)) and the specimen(Fig: Case 1(H)) was sent for H/p study. The resultant defect was planned to be filled with PRF(Fig: Case 1(I)) as a growth modulator. Root end resection as done and the tip was prepared to receive retrograde filling material which was MTA. PRF preparation was performed using the procedure described by Dohan *et al.*^[7-9] The PRF protocol is very simple. A blood sample was taken without anticoagulant in 10 ml tubes, which was immediately centrifuged at 3000 rpm for 10 min.

After PRF processing, three distinct samples were collected.

- The supernatant represented acellular plasma (or platelet-poor plasma (PPP)
- The fibrin clot (PRF)
- The exudates resulting from PRF clot corresponded to the solution trapped in the fibrin meshes

For collection, it was necessary to leave the PRF clots in a sterile metal cup for approximately 10 min to

let slowly release the serum contained therein The PRF clot was then packed into the defect to completely fill the bony crypt. Wound closure was then obtained with 3-0 silk sutures.



(A)



(B)



(C)



(D)



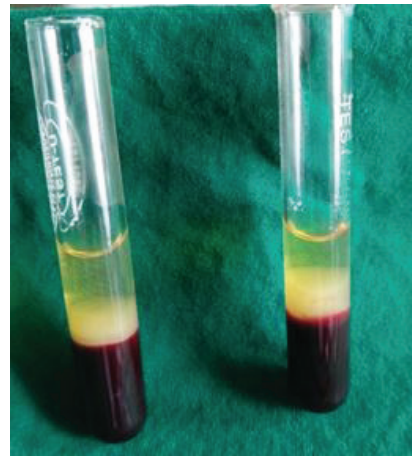
(E)



(I)



(F)



(J)



(G)



(K)



(H)



(L)



(M)

Case 1: (A)Pre-Op Patient profile (B)OPG (C) Occlusal Radiograph (D)Pre-Op Intraoral Pic (E) Intr-op: Flap elevated(F)Intra-Op: Bony Window created (G)Intra-Op: Cyst Enucleation(H)Cystic Lining (I)Post Enucleation Defect(J)Prepared PRF(K)Placement of PRF(L)PRF placed in the bony Defect (M) Post Op



(A)



(B)

Case 2: A 26 year old male patient reported to us with a swelling over the right maxillary region since the last months with intermittent discharge of pus from the palatal aspect. Patient also gave a history Trauma to the mid face region about 1.5 years ago due to assault. Radiographic interpretation (Fig: case 2(A))of the patient revealed a lesion a a large lesion about 2.5x2cm size involving the maxillary central, lateral incisors and canine on the right side.



(C)

Management: We started with the normal protocol of Root canal therapy of the involved teeth and on the day of obturation we planned to surgically enucleate the cyst followed with apicoectomy and placement of PRF as a growth modulator.



(D)

Standard Trapezoidal incision was given and the a full thickness flap was elevated. The labial cortical plate was already thinned out due to the underlying lesion (Fig: case 2(C))thus no overlying bone was to be removed. Cyst enucleation was done(Fig: case 2(D)) in toto and the cystic lining was sent for H/P study(Fig: case 2(E)). The resultant defect was planned to be filled with PRF(Fig: Case 2(F)) as a growth modulator. Root end resection as done and the tip was prepared to receive retrograde filling material which was MTA. The PRF clot was then packed into the defect to completely fill the bony crypt. Wound closure was then obtained with 3-0 silk sutures.



(E)



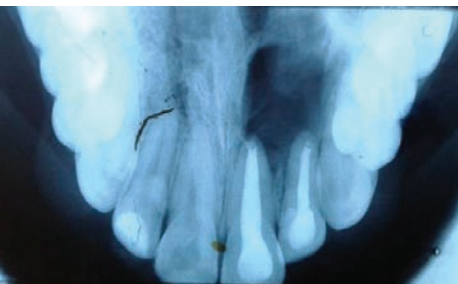
(F)



(H)



(I)



(J)

Case 2: (A) Pre-Op IOPA (B) Pre-Op Patient Picture (C) Intra-op: Flap elevated (D) Intra-Op: Cyst Enucleation (E) Cystic Lining (F) PRF placed in the bony Defect (G) Post-Op Suturing (H) Post Op Pic (I) Post-Op IOPA (J) Post-Op Maxillary Occlusal View

DISCUSSION

PRF prepared using Choukroun's technique, is prepared naturally, without the addition of thrombin. It is hypothesized that the PRF has a natural fibrin framework that can protect growth factors from proteolysis.¹²It is organized as a dense fibrin scaffold,¹³with a specific slow release of growth factors.¹⁴PRF can be considered as a natural fibrin-based biomaterial to guide cell migration into the wound. In addition, growth factors are active for a relatively longer period and are effective in stimulating tissue regeneration. This leads to the idea of using PRF as a biomaterial for periapical tissue regeneration. The reason PRF can improve periapical osseous healing can be explained as follows. This fibrin matrix can guide the healing processes. Recently, we found that PRF can upregulate phosphorylated extracellular signal-regulated protein kinase expression and suppress osteoclastogenesis by promoting the secretion of osteoprotegerin (OPG) in osteoblasts cultures. PRF also was demonstrated to stimulate osteogenic differentiation of human dental pulp cells and periodontal ligament cells¹³ by upregulating OPG and alkaline phosphatase expression. Many growth factors, such as platelet-derived growth factor and transforming growth factor, are released from the PRF.¹²In addition, PRF may play an important role in the revascularization of the graft by supporting angiogenesis. When all of this is considered, PRF can be recognized as an autologous biomaterial. PRF as a membrane and grafting material offers an improved space-making effect on the barrier, which is conducive to cell events leading to periapical tissue regeneration and facilitation of mineralized tissue formation due to osteoconductive and/or osteoinductive properties possibly inherent in PRF. Thus, this preparation could lessen the treatment duration and may assist in the decision making of upcoming implant or prosthetic processes. It also could be developed as an option coupling for conventional surgical removals. The clinical use of PRF as the sole grafting material in periapical bony defect will need to be studied in further cases. PRF via Choukroun's technique is simple and inexpensive, and the systematic use of this biomaterial for endodontic regeneration seems a very promising option.

CONCLUSION

This case report demonstrates that the use of PRF did not appear to "prevent" healing of the apical lesion in the two reported cases. In addition, it showed satisfactory healing of the periapical pathosis and it positively influenced the apical osseous tissue. As

a shortcase series, this is an innovative topic, but its clinical value is somewhat debatable at this stage as no definitive conclusions can be drawn from two case reports. In addition to the recruitment of other extensive cyst cases, further controlled clinical trials are necessary to determine whether the addition of PRF alone or in combination significantly enhances bone formation and maturation in cyst lesions.

Conflict of Interest: None

Source of Funding: Self-funded

Ethical Clearance: The ethical clearance was obtained from Institutional Human Ethics committee, Institute of Medical science and SUM Hospital, Bhubaneswar, Odisha.

REFERENCES

1. Stassen LF, Hilsop WS, Still DM, Moos KF. Use of anorganic bone in periapical defects following apical surgery-a prospective trial. *Br J Oral Maxillofac Surg* 1994; 32:83-5.
2. Uchin RA. Use of a bioresorbable guided tissue membrane as an adjunct to bony regeneration in cases requiring endodontic surgical intervention. *J Endod* 1996; 22:94-6.
3. Demiralp B, Keçeli HG, Muhtarogullar M, Serper A, Demiralp B, Eratalay K. Treatment of periapical inflammatory lesion with the combination of platelet-rich plasma and tricalcium phosphate. *J Endod* 2004; 30:796-800.
4. Freymiller EG, Aghaloo TL. Platelet-rich plasma: Ready or not? *J Oral Maxillofac Surg* 2004; 62:484-8.
5. Su CY, Kuo YP, Tseng YH, Su CH, Burnouf T. *In vitro* release of growth factors from platelet rich fibrin (PRF): A proposal to optimize the clinical applications of PRF. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2009; 108:56-61.
6. Choukroun J, Adda F, Schoeffler C, Vervelle A. Une opportunit  en parodontologie: le PRF. *Implantodontie* 2000; 42:55-62.
7. Dohan DM, Choukroun J, Diss A, Dohan SL, Dohan AJ, Mouhyi J, *et al.* Platelet-rich fibrin (PRF): A second generation platelet concentrate- part I: Technological concept and evolution. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006; 101: E37-44.
8. Dohan DM, Choukroun J, Diss A, Dohan SL, Dohan AJ, Mouhyi J, *et al.* Platelet-rich fibrin (PRF): A second-generation platelet concentrate part II: Platelet-related biologic features. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006; 101: E45-50.
9. Dohan DM, Choukroun J, Diss A, Dohan SL, Dohan AJ, Mouhyi J, *et al.* Platelet-rich fibrin (PRF): A second-generation platelet concentrate part III: leucocyte activation: A new feature for platelet concentrates? *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006; 101: E51-5.
10. Dohan Ehrenfest DM, de Peppo GM, Doglioli P, Sammartino G. Slow release of growth factors and thrombospondin-1 in Choukroun's platelet-rich fibrin (PRF): A gold standard to achieve for all surgical platelet concentrates technologies. *Growth Factors* 2009; 27:63-9.
11. He L, Lin Y, Hu X, Zhang Y, Wu H. A comparative study of platelet-rich fibrin (PRF) and platelet-rich plasma (PRP) on the effect of proliferation and differentiation of rat osteoblasts in vitro. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2009; 108:707-13.
12. Dohan Ehrenfest DM, de Peppo GM, Doglioli P, Sammartino G. Slow release of growth factors and thrombospondin-1 in Choukroun's platelet-rich fibrin (PRF): A gold standard to achieve for all surgical platelet concentrates technologies. *Growth Factors* 2009; 27:63e9.
13. Dohan Ehrenfest DM, Del Corso M, Diss A, Mouhyi J, Charrier JB. Three-dimensional architecture and cell composition of a Choukroun's platelet-rich fibrin clot and membrane. *J Periodontol* 2010; 81:546e55.
14. Dohan Ehrenfest DM, Diss A, Odin G, Doglioli P, Hippolyte MP, Charrier JB. In vitro effects of Choukroun's PRF (platelet-rich fibrin) on human gingival fibroblasts, dermal prekeratinocytes, preadipocytes, and maxillofacial osteoblasts in primary cultures. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2009; 108:341e52.

A Complete Displaced Right Mandibular Body and Left Parasymphysis Fracture Operated Using Locking Miniplates: A Case Report

Santosh Kumar Subudhi¹, Satyabrata Pattanaik², Harsh Mohan Pathak³, Sonu Sanyal⁴

¹Professor, ²Reader, ³Senior Lecture, ⁴Post Graduate Student, Department of Oral and Maxillofacial Surgery, Institute of Dental Sciences, Siksha O Anusandhan (Deemed to be University) Bhubaneswar

ABSTRACT

Background: Several types of bone-plating systems have been evolved to provide proper fixation for the mandibular fractures and osteotomies. The main disadvantage of conventional miniplates system is that the plate must be perfectly adapted to the underlying bone to prevent alterations in the alignment of the segments and changes in the occlusal relationship. The introduction of locking miniplates reconstruction plating systems for the treatment of mandibular fractures and continuity defects has offered certain advantages over other plating systems. The locking miniplates function as internal fixators, achieving stability by locking the screws to the plates. The most advantage of locking screws/plates systems is that it becomes unnecessary for the plate to have intimate contact with the underlying bone, making plate adaptation easier. In this article we report a case of complete displaced mandibular right body and left Parasymphysis fracture, which was operated using locking miniplates.

Keywords: *locking miniplate, Parasymphysis*

INTRODUCTION

The mandibular fractures are the most common facial injuries treated by an oral and maxillofacial surgeon. Fractures of the mandible are the most common and occur more frequently than any other fracture of the facial skeleton.³ The techniques of open reduction and internal fixation of mandibular fractures have evolved during the past several decades.¹

Maxillofacial surgeons have attempted to achieve four main goals for the treatment of mandibular fractures, i.e. anatomical restitution, immobilization, prevention of infection and rehabilitation of function.⁴ Rigid fixation by using compression plates has decreased the period of MMF and provided early return of mandibular function. The basic concept for rigid fixation gives absolute stability and there are several techniques advocated to achieve this goal. According to Champy et.al engaging a single cortex is sufficient to achieve rigid osteosynthesis.

The mini locking- system (UniLock 2.0, Synthes, Oberndorf, Switzerland) developed by the Albert-Ludwigs University of Freiburg in cooperation with the AO/ASIF Institute (Davos, Switzerland) was evaluated

in an in vitro study by Gutwald and co-workers and was shown to provide better accuracy in bone reduction and stability when compared to the conventional miniplates.⁵

Two main principles required to obtain adequate rigid internal fixation for comminuted mandibular fractures are- First, the fixation needs to support the full functional loads (load-bearing osteosynthesis) and Second, absolute stability of the fracture construct must be achieved.^{6,7} Advantage of bone plate osteosynthesis is that the patient does not require to undergo inter-maxillary fixation for several weeks post-operatively.

Open reduction with rigid internal fixation allows improved stability and early mobilization. A potential advantage of the locking head plating system is that fewer screws might be necessary to achieve maximal resistance to load. This would enable use of smaller incisions or fixation of smaller bony segments and still allow full functional loading.²

CASE REPORT

A 22 year old male reported to the Department of oral and maxillofacial surgery, Institute of dental

sciences and SUM hospital, Bhubaneswar with complaints of pain, swelling and inability to chew after RTA with fall from bike under influence of alcohol 3 days before. The patient was stable, well oriented and conscious. He had a diffused swelling in his right cheek and stepped deformity was palpable on right mandibular body and left parasymphysis region of mandible. (Figure no.-1) Intraorally laceration present on lower lip, restricted mouth opening, Coleman's sign positive and displaced anterior segment of mandible. (Figure no.-5) The occlusion was deranged. (Figure no.-2, 3)

Radiograph (Orthopantomogram) and routine blood investigations were advised prior to surgery. The radiograph reveals a displaced fracture in respect to right mandibular body behind the mental foramen extending posteriorly downward in between 44-45 and in left parasymphysis region the fracture site extending from 32-33 region to lower border of mandible. (Figure no.-5) The diagnosis and treatment plan were explained to the patient. He was undergone upper and lower arch bar placement before surgery.

Under aseptic condition nasoendotracheal intubation was done and general anaesthesia administered. Local anaesthetic solution (2% lidocaine with adrenaline) was injected locally at lower vestibular region. The fractured sites were exposed through intraoral incision on the lower vestibule from 35-46 region. (Figure no.-6,7) Proper anatomical reduction of the right body and left parasymphysis region of mandible was done. Right body region was fixed with 1 titanium 4-hole 2mm locking plate above the mental foramen with 8mm 4no.screws and left parasymphysis region was fixed with 1no.titanium 4-hole 2mm locking plate with 8mm 3no.screws at the lower border and 1no. titanium 3-hole 2mm locking plate with 8mm 3no.s screws at the upper border. (Figure no.-8) The incision was closed layer by layer by using 3.0 vicryl. Postoperatively antibiotic therapy (Piperacillin-tazobactam 4.5gm IV BD) was administered. The postoperative course was uneventful and patient was discharged after 3 days with elastic band intermaxillary fixation for two weeks. Post-operative Orthopantomogram was taken, which was showing adequate reduction of the fractured site of both the right mandibular body and parasymphysis region including the lower border of the mandible. (Figure no.9)



Figure 1: Pre-operative Profile picture



Figure 2: pre-operative deranged occlusion of left side



Figure 3: pre-operative deranged occlusion of right side



Figure 4: Complete displaced anterior segment



Figure 5: Pre-operative OPG



Figure 6: Fractured site of Right Mandibular Body

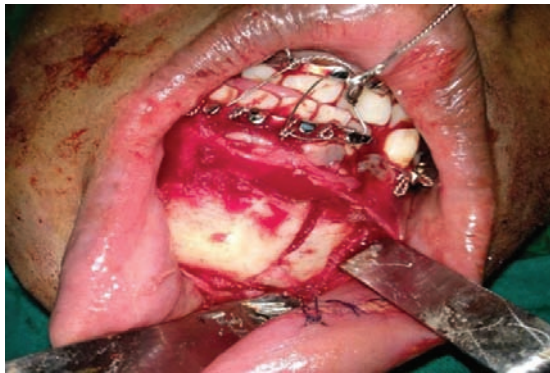


Figure 7: Fractured site of left Mandibular Parasymphysis region



Figure 8: Fixation done using Locking plates



Figure 9: Post-operative OPG

DISCUSSION

Locking plate/screw systems have been available for greater than 3 decades, but a recently rejuvenated interest in these systems has occurred. The locking plate/screw system has only minor additions to the instrument armamentarium. This system requires perpendicular placement of the plate/screw interface, thereby requiring a locking drill guide. The technical difficulty added to the case is fairly minor for even the inexperienced surgeon. In fact, the average operating time for the locking system was 6.5 minutes shorter than the standard plate/screw system.⁸

In comminuted or defect fractures fixation with conventional plating systems can lead to secondary dislocation as soon as the pressure between plate and bone is no longer guaranteed. Plate fixation with locking screws can avoid this kind of secondary dislocation. Also in poor quality bone anchoring of screws can lead to screw loosening and subsequent loss of reduction. Due to the secure locking of the screw in the plate this problem can be avoided with the Mini-Locking-System.⁵

The 2.0-mm LMP system has conical threaded holes that lock the corresponding threaded screw to the plate. The screws, plate, and bone form a solid framework with higher stability than the traditional miniplate system. The LMP system has demonstrated higher stability across a fracture/osteotomy gap compared with the conventional nonlocking 2.0-mm miniplate in invitro studies. It is postulated that the LMP requires less precise adaptation of plate to underlying bone and decreases the chance of screw stripping with associated inflammation. Noncompression decreases necrosis of fracture segments and produces less stress shielding.⁹

Although the possible advantages to a locking plate/screw fixation system are theoretical, whether clinical results can be improved could not be measured in this study. To show real improvements in outcomes over conventional nonlocking fixation systems requires a prospective study that compares one fixation system with the other.¹⁰

CONCLUSION

In conclusion, single locking miniplates osteosynthesis provide greater advantage of good stability and early restoration of function, due to less intermaxillary fixation after open reduction and internal

fixation. It was also found that less precision was required in plate adaptation. We suggest that there is not much difference in surgical outcome with the use of either single locking miniplate or two conventional miniplates in anterior mandibular region and single locking miniplate has adequate strength to counter torsional and rotational forces acting in this region. So, we strongly suggest that single 2.0 mm locking miniplate could be a viable option instead of using two miniplates as advocated by Champy, as it provides equally good outcome along with placement of lesser implant material. However, studies with larger sample size are required to validate our findings

Conflict of Interest: None

Source of Funding: Self-funded

Ethical Clearance: The ethical clearance was obtained from Institutional Human Ethics committee, Institute of Medical science and SUM Hospital, Bhubaneswar, Odisha.

REFERENCES

1. George J. Haidukewych, MD: Innovations in Locking Plate Technology. *Journal of the American Academy of Orthopaedic Surgeons*. Vol 12, No 4, July/August 2004
2. Solve H, Olofson J: Titanium coated hollow screw and reconstruction plate system in mandibular reconstruction. *J Craniomaxillofac Surg* 16:173, 1987
3. Chandan Prabhakar, Jayaprasad N. Shetty, Hemavathy O. R., Yadavalli Guruprasad: Efficacy of 2-mm locking miniplates in the management of mandibular fractures without maxillomandibular fixation. *National Journal of Maxillofacial Surgery*, Vol 2, Issue 1, Jan-Jun 2011
4. Bhupendra Harjani, R K Singh, U S Pal, Geeta Singh: Locking v/s non-locking reconstruction plates in mandibular reconstruction. *National Journal of Maxillofacial Surgery*, Vol 3, Issue 2, Jul-Dec 2012
5. Gutwald R, Alpert B, Schmelzeisen R: Principle and stability of locking plates. *Keio J Med* 2003;52:21-4.
6. Prein J, Kellman RM. Rigid internal fixation of mandibular fractures: Basics of AO technique. *Otolaryngol Clin North Am* 1987;20:441-6
7. Spiessl B. Internal fixation of the mandible. Berlin-Heidelberg, Germany: Springer-Verlag; 1989. p. 23.
8. Chad P. Collins, DMD, Galia Pirinjian-Leonard, DDS, MD, Andrew Tolas, DDS and Rafael Alcalde, DDS, PhD: A Prospective Randomized Clinical Trial Comparing 2.0-mm Locking Plates to 2.0-mm Standard Plates in Treatment of Mandible Fractures. *J Oral Maxillofac Surg* 62:1392-1395, 2004
9. Ayman Chritah, DDS, MD, Stewart K. Lazow, MD, DDS, FACS and Julius R. Berger, DDS: Transoral 2.0-mm Locking Miniplate Fixation of Mandibular Fractures Plus 1 Week of Maxillomandibular Fixation: A Prospective Study. *J Oral Maxillofac Surg* 63:1737-1741, 2005
10. Edward Ellis III, DDS, MS, and John Graham, DDS, MD: Use of a 2.0-mm Locking Plate/Screw System for Mandibular Fracture Surgery. *J Oral Maxillofac Surg* 60:642-645, 2002

A Completely Intraosseous Circumferential Dentigerous Cyst in Close Vicinity of Mental Nerve Associated with Impacted Supernumerary Premolar in Mandible: A Rare Case Report

Harsh Mohan Pathak¹, Sobhan Mishra², Satyabrata Patnaik³, Kalyan Sundar Pal⁴

¹Reader, ²Professor and HOD, ³Reader, ⁴PG trainee, Dept. of Oral and Maxillofacial Surgery, Institute Of Dental Sciences, Siksha 'O' Anusandhan (Deemed To Be University), Bhubaneswar

ABSTRACT

Dentigerous cyst which arises from dental follicle of unerupted permanent tooth is 2nd most common cyst involving the maxillofacial region after radicular cyst. This type of cyst generally associated with unerupted 3rd mandibular tooth. A case of a dentigerous cyst located in the mandible of a 36 year old woman was reported in Dept Of Omfs, Institute Of Dental Sciences, Siksha 'O' Anusandhan (Deemed To Be University), Bhubaneswar. The patient complaining swelling and discomfort in the left mandibular body region. on radiographic examination there was a well circumscribed radiolucent lesion associated with a impacted supernumerary tooth. lesion was excised under local anesthesia and specimen was sent for histopathological examination. Microscopic examination of the excised tissue showed it to be well-circumscribed with fibrous tissues, and the cystic space lined by keratinized epithelium

Keywords: Mandible, Unerupted supernumerary teeth, Dentigerous cyst, Enucleation.

INTRODUCTION

Dentigerous Cyst developed from odontogenic origin. It surrounds the crown of impacted, embedded, developing, unerupted teeth. This is second most common cyst of the oral cavity after radicular cyst. Incidence of dentigerous cyst frequently occurs during 2nd – 3rd decades of life and predominant in male. Also occurs in children and adolescence during mixed dentition period¹.

A dentigerous cyst is an epithelial-lined developmental cavity that encloses the crown of an unerupted tooth at the cemento-enamel junction. A dentigerous cyst almost exclusively occurs in the permanent dentition, especially in association with third molars and maxillary canines, which commonly remain impacted².

CASE REPORT

A ,36 year old lady reported to the Department of Oral And Maxillofacial Surgery, Institute Of Dental Sciences, Siksha 'O' Anusandhan Deemed To Be University, Bhubaneswar complaining asymptomatic swelling in the left lower back teeth region since last 2 year and there is no history of pain in that region. The swelling gradually increasing in size since last 2 years.

On extra oral examination: A hard well circumscribed swelling present in the left mandibular body region which is not compressible nor fluctuant. There is no changes in temperature or colour of overlying skin. Non tender on palpation.^(pic.1)

On intraoral examination: Intraoral swelling in the left mandibular body region in respect to 34,35,36,37 region due to expansion of buccal cortical plate. Vestibular obliteration in the same region. On palpation swelling is hard in respect to 34,35,36 region but soft on palpation in respect to 37. Egg shell crackling present in some places.^(pic.1)

No abnormality detected in the lingual cortical plate.^(pic.1)

Corresponding Author:

Dr. Kalyan Sundar Pal
PG trainee, Dept. of Oral and Maxillofacial Surgery,
Institute Of Dental Sciences,
Siksha 'O' Anusandhan (Deemed To Be University),
Bhubaneswar

Overlying mucosa appears normal in color and there is no draining sinus in respect to the swelling. (pic.1)

There is no paresthesia in that region.

On radiological examination: OPG reveals a well defined unilocular radiolucent area characterized by sclerotic border in the region of permanent left mandibular 1st molar surrounding the crown of vertically impacted supernumerary premolar. Evidence of root resorption of the overlying mandibular 1st molar is also present. IOPAR a radiolucent lesion in respect to 36 and there is root resorption of 36 present. (pic.2)

Occlusal view reveals: Expansion of the buccal cortical plate with destruction of the cortical plate in respect to 37. (pic.2)

On histopathological study: Histopathology suggestive of cystic lesion (dentigerous cyst). (pic.6)



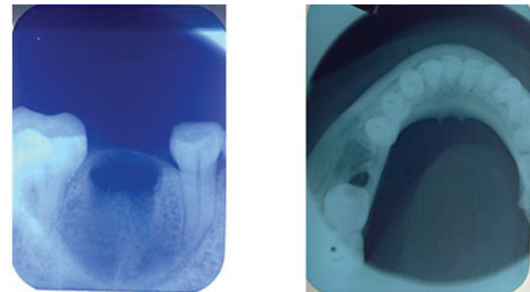
Pic. 3: Intra Operative Picture



Pic. 4: Cyst with Tooth



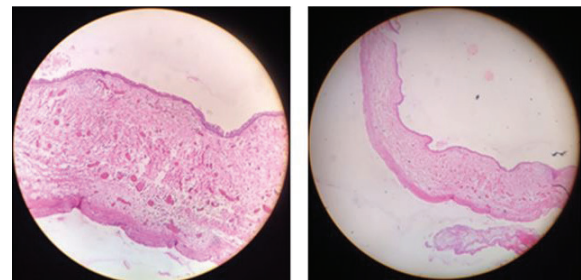
Pic. 1: Pre Operative Profile and Intra oral Picture



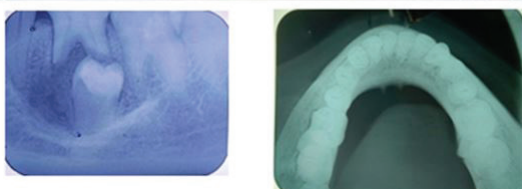
IOPAR irt 35,36,37

OCCUSAL VIEW

Pic. 5: Post operative Radiological Picture (1 Week Post operative)



Pic. 6: Histopathological Picture



Pic. 2: Diagnostic OPG, Iopar and Occlusal View

DISCUSSION

Dentigerous cysts, which is the second most common occurring cyst in the maxillofacial region usually solitary, slow growing and asymptomatic lesions and generally found during routine radiographs accidentally^{3,4}. They can occur at any location of the jaw but frequently seen

in relation to impacted mandibular third molars followed by the maxillary canines and maxillary third molars but rare in respect to the unerupted supernumerary premolar teeth⁵. Occasionally these cysts become painful when infected causing swelling and erythema. The large cyst may cause the expansion and thinning of the cortex leading to pathological fracture^{6,7}. Although the clinical presentations are classical of a dentigerous cyst, in our case it is associated with vertically impacted supernumerary mandibular premolar which is enucleated and specimen sent for histopathological examination.^(pic.3 and pic.4) Patient examined after 1 week and postoperative radiograph taken.^(pic.5) Surgical reveals proper healing.

Radiographic features are specific to the lesion characterized by a well defined radiolucency circumscribed by a sclerotic border, associated with the crown of an impacted or unerupted supernumerary tooth. The borders become ill-defined when infected. Rarely may they be found with odontoma or a supernumerary tooth⁸. Although they mimic a normal tooth follicle, literatures suggest any follicular space of more than 4 mm to be a dentigerous cyst. Radiographically the cyst is classified according to its relation with the involve tooth crown as central, lateral and circumferential type. The central type is the most common and presents surrounding the crown⁹. In lateral dentigerous cyst the crown partially surrounds by the cystic lining and extends along the side of the root. In circumferential variant lining surrounds both the crown and the root of the involved tooth¹⁰.

Generally the lumen is filled with straw color fluid occasionally blood tinged. In case of infected cyst there is Rushton body present within lining epithelium.

This lesion must be differentiated from radicular cyst, calcifying odontogenic cyst or eruption cyst. In differential diagnosis unicystic ameloblastoma, odontogenic keratocyst must be considered although they are generally involving the molar region.

Histologically, the lumen is lined by 2 to 4 cell layers of cuboidal to flattened nonkeratinized epithelial cells. It may form keratin by metaplasia. The connective tissue is more collagenous when inflamed and contain varying degree of chronic inflammatory cell infiltration. Occasionally the cyst lining may contain ciliated and mucous secreting cells due to pluripotentialities of the lining cell. Dentigerous cysts are treated by means of

Enucleation, Marsupialization and decompression of cyst by fenestration. If the cyst is small in size then it should be enucleated.

CONCLUSION

Several potential complication like ameloblastoma, mucoepidermoid carcinoma may arise from dentigerous cyst, which cause more destruction of jaw. There is chances of relapse of the cyst if any cystic lining remains even after enucleation. Therefore early diagnosis and aggressive treatment procedure needed to treat these type of cystic lesion.

Conflict of Interest: None

Source of Funding: Self-funded

Ethical Clearance: The ethical clearance was obtained from Institutional Human Ethics committee, Institute of Medical science and SUM Hospital, Bhubaneswar, Odisha.

REFERENCES

1. Regezi, AJ.; Sciubba, JJ. Cysts of the oral region in oral pathology: Clinical pathologic correlations. 3rd ed. Philadelphia: WB Saunders; 1999. p. 288-321.
2. Rubin DM (Department of Oral and Maxillofacial Surgery, NSUCDM, Ft Lauderdale, FL 33328-2018, USA), Vendrenne D, Portnof JE. Orthodontically guided eruption of mandibular second premolar following enucleation of an inflammatory cyst: A case report. J Clin Pediatr Dent 2002 Fall;27(1):19-23.
3. Arotiba JT (Department of Oral and Maxillofacial Surgery, Dental School, University College Hospital, Ibadan, Nigeria), Lawoyin JO, Obiechina AE. Pattern of occurrence of odontogenic cysts in Nigerians. East Afr Med J 1998 Nov;75(11):664-666.
4. Ziccardi VB (Mount Sinai School of Medicine, Department of Oral and Maxillofacial Surgery, Elmhurst Hospital Center, NY 11373, USA), Eggleston TI, Scheinder RE. Using fenestration technique to treat a large dentigerous cyst. J Am Dent Assoc 1997 Feb;128(2):201-205.
5. Benn A (Department of Conservative Dentistry, University of the Witwatersrand, Johannesburg,

- South Africa), Altini M. Dentigerous cysts of inflammatory origin: A clinicopathological study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1996 Feb;81(2):203-209
6. Daley TD, Wysocki GP (1995) The small dentigerous cyst: a diagnostic dilemma. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 79:77-81
 7. Shear M (2006) *Cysts of the oral and maxillofacial region*, 4th edn. Blackwell, Johannesburg
 8. Sharma M, Pardhe ND, Gupta N, Mittal M, Gaikwad A, Pathak M. Inflammatory dentigerous cyst: A rare entity. *J Res Adv Dent* 2014;3:2s:4-7.
 9. Findik Y, Baykul T. Huge Dentigerous Cyst in the Mandible Treated under Local Anesthesia. *Int J Exper Dent Sci* 2012;1(1):45-47.
 10. Mishra R, Tripathi AM, Rathore M. Dentigerous Cyst associated with Horizontally Impacted Mandibular Second Premolar. *Int J Clin Pediatr Dent* 2014;7(1): 54-57.

Oral Ornamentation an Upcoming Public Health Issue in India

Smita R Priyadarshini¹, Pradyumna Kumar Sahoo², Abhilash Mohapatra², Abhijita Mohapatra³,
Kajal Kiran Sahoo⁴

¹Reader, Department of Oral medicine & Radiology, ²Reader, ³Professor, ⁴Tutor, Department of Prosthodontics,
Institute of Dental Sciences, Siksha O Anusandhan (Deemed to be University), Bhubaneswar, Odisha

ABSTRACT

Modification of appearance using tattoos, branding, scars or piercings is on a rise with oral ornamentation & decorations. Thus, increasing the concern as body art professionals should be thoroughly trained with a comprehensive approach amongst the dental medical and body art professionals. They should be educated about the vital structures present in the oral cavity with the short term and long-term complications of oral ornamentations. Not only this Dentists encounter complications while treating individuals with tongue piercings; be set up to supervise post infiltrating anaesthesia or intraoral dental appliances or prosthesis leading to complexities in treating such patients

Keywords: Oral Piercings, Tattoos, Dentists

INTRODUCTION

Tooth jewellery, tattooing and oral soft tissue piercing are part of oral ornamentation. It is widely becoming a fashion statement and also acts as a bonus to aesthetics to while restoring function. The trend of oral body art is increasing in India & is primarily adopted from the western culture.¹ Teeth jewellery is a form of oral body art and it involves decoration of the teeth with white and coloured jewels made in gold and silver. Oral piercing too involves the oral cavity which has a prospective concern to the dental practitioners. Even these patients have possible complications during surgery and anaesthesia.^{1,2}

The dental jewellery is identical to chin and cheek piercing with probable damage to intraoral soft tissues during treatment. This fashion trends are primarily

adopted by 18 to 35-year-old mostly hip-hop musical artists and radio/disc jockeys which is believed to have an added effect on to their performance and influence the younger mass. It is becoming a current fashion trend & amongst the higher socio economical group of people. Its presumed to be a non-invasive, harmless procedure with lesser side effects.³ It is comparatively a cheaper procedure with varying prices depending on the designs of the jewels used. It is a less painful procedure which takes approximately 10-15 minutes for its completion.

There is a definite demarcation in ornaments amongst the rural and urban population. The rural prefer gold restoration in the anterior and posterior tooth along with tattooing for status or religious ground where as in urban population people use piercings as a fashion trend.⁴

HISTORICAL ASSOCIATION

The historical association of oral ornamentation dates back to 2500 B.C. The Mayans were initially known to fabricate stone inlays that were carved in prepared cavities on the front teeth. The Native Americans prepared notches and grooves that were restored with semiprecious stones that was believed to amplify their smile. Even in Hindu & Chinese history tattooing was considered holy was primarily used as body art.^{2,3}

Corresponding Author:

Dr. Smita R Priyadarshini
Reader, Department of Oral medicine & Radiology,
Institute of Dental Sciences,
Siksha O Anusandhan (Deemed to be University),
Bhubaneswar, Odisha
Phone: +918339999846
Email: drsmitapriyaadrshini@gmail.com

Inking customs are additionally regular to clans of South East Asia and sacrosanct Buddhist writings are ordinarily inked by Thai individuals. These texts are believed to possess powers and magical potency.⁴

Types of oral ornamentation: Oral body ornamentations & adornments is typically connected to the lips and the tongue which now includes the teeth. Usually Gold, silver or gems in diverse shapes are used. Traditionally in India gold and silver were used for restorations by the dental practitioners which was considered a status symbol. Lately greater portion of the adornment are transitory and are connected to tooth surfaces with dental glue that could be easily re applied and fixed⁵

These can be broadly classified into HARD TISSUE ornamentations which includes

1. Tooth Jewellery

- Tooth Gems consists of Skyce and Sapphire crystals out of which Skyce adds an extra sparkle.
- Dazzlers are specially delineated to be bonded to the tooth patented backside of an orthodontic bracket.
- Twinkles are pure gold with precious stones like diamond, sapphires and rubies
- Dental crystals are easily available which could be glass mounted on a thin foil of aluminium to establish an attractive smile with varied shapes from diamond, star, triangle, droplet, heart to round.

2. Tooth Tattooing are applied to dental crowns before the crowns are sealed and set in the mouth with varied styles, colours and designs.

3. Characterizing tooth

Ornamentations in the ORAL SOFT TISSUES can also be categorised into

1. Tongue & lip piercing: It involves perforation of the piercing site with a 12- or 16-gauge needle followed by cleansing with a antiseptic mouthwash. A barbell that is initially placed in longer in order to harbour edema. Following a three- to six-week healing time with a shorter permanent barbell. Postoperative instructions are to be strictly followed using an antibacterial

mouthwash after each meal, use new toothbrush, abstinence of smoking, alcohol, chewing gum, spicy, salty or acidic foods and oral sexual contact.⁶

In Tongue the primary lesions disappear after 3-5 weeks & local inflammation within 6-8 hrs after the piercing with peak on day 3 or 4. Though the Inflammation persists for weeks and it is temporary.^{3,4}

2. Tattooing/inking: Done primarily in inner lip inking as a latest trend with the lower labial mucosa being the common site. These are unique, expensive & not readily visible. The inks consist of metallic salts, carbon, aluminium, oxygen, azo pigments and polycyclic compounds.⁶

ADVANTAGES pertaining to oral ornamentation

- Usually Painless & has less chance of harm until infected or piercings done damaging vital structures
- Temporary in case of tooth jewellery and can be removed easily.
- The Materials or metals primarily used do not tarnish/ corrode else could lead to super added infections. 14 or 18K gold, titanium, stainless steel, niobium, tygon, acrylic, stone, wood, bone, or ivory
- The tooth tattooing and characterisation of the tooth are Specifically designed for individual
- These ornamentations & Decorations sometimes conceal the damaged enamel & pigmentations. They could act as a protective mask.⁶

Types of Piercing materials used: Four primary types of piercing jewellery are commonly used in the oral/perioral area.

- 1. LABRET:** It consists of a bar with ball or a disc or point at one end with a flat closing disc at the other.
- 2. BARBELL:** a straight or curved bar with balls at each end. Unclosed ring with a ball at one or both ends.

These materials are designed in such a manner that it consists of two components the jewellery with magnetic force the magnetic force which is 10-fold greater than conventional magnet.

3. Twinkles: It consists of 24-carat gold and white gold different designs Expensive gems Including diamonds, sapphires and rubies are also used.

4. Dental Gems: Mostly consists of Glass crystals of different colours (Diamond, rainbow, ruby, sapphire, emerald, emerald green, aquamarine, pink, sapphire light)⁷

5. Special facet

Procedure for placement of tooth ornaments: Initially the coronal surface is dried and the tooth is isolated. Its etched with 37% orthophosphoric acid for about 20-30 sec. The surface is rinsed with water and blow dried. The light-curing bonding agent is applied to the surface for 20 sec thereafter composite is flown through the tooth surface. The jewel is placed into composite & Composite curing with application of topical fluoride to remineralize the etched area.^{3,4}

COMPLICATIONS

- Mucosal injury by oral/perioral piercings can cause bleeding, erythema, oedema followed by hyperplastic scarring accompanied by agony and oedema damage/parasthesias.
- Tissue overgrowth can be occurred by continuous irritation from the ornaments causing ulcerations and mucosal keratosis forcing evacuation of the gems.
- Tongue piercings may cause alternation in the papillae, leading to alteration in the taste sensations.
- cause gingival recessions, abrasions or ulcerations
- use of unsterilized instruments cause and act as a factor in transmission of disease like hepatitis B and C, HIV, herpes simplex virus.²
- Difficulty in dental procedures as piercings produce radiopaque areas & are not indicated during radiological examinations.
- There is granulomatous inflammation interfering with mastication, swallowing & under severe cases they cause asphyxia or respiratory difficulties.
- In Tongue piercings -there are chances of Infections in 10-20% cases. oral cavity is a complex environment for microbes primarily Staphylococcus aureus, A group *Streptococcus*, *Pseudomonas aeruginosa*, Erysipelas and beta haemolytic *Streptococcus*. Due to proximity of lymph-node and rich vascular supply the chances of Bacteraemia increases leading to Ludwig's angina in severe cases.
- Chances of anaphylactic reactions is possible due to the metals uses post insertion of Ni- alloys.^{3,4}
- In the area of ornamentation and piercing accumulation of plaque and calculus is definite if hygiene is not maintained with retention of food and supra- and sub gingival plaque accumulation & halitosis with Localised recessions in the lower jaw.⁶
- Formation of growth & swellings is common like mucocles, inflammatory fibrous hyperplasia or mucous retention cysts, traumatic fibroma etc could be painful until removed.⁷

Other complications:

- chewing, phonation and speaking distorts the pronunciation of certain sounds, “s”, “sh”, “th”, “ph”, “t” or “v”.⁸
- increased chances of ingestion or aspiration of barbells, labrets or rings is present with a even higher risk for magnetic piercings. This leads to digestive or respiratory disorders primarily due to an incorrect fixing, poor handling during placement or exertion of high pressure.^{6,8}
- Piercings & ornamentations causes sialorrhoea with increased salivary flow in 63% individuals.

CONCLUSION AND RECOMMENDATION

Oral ornamentation is said to have specific problems where in hazardous oral sites like uvula, lateral tongue surface should be avoided. the use of Jewellery that are soft, hypoallergenic, non-toxic should be utilised. Which in turn would minimise the anaphylactic reactions and trauma to adjacent oral structures. The professional artists performing these procedures should be educated on appropriate infection control and sterilization with similar regulations used by health care professionals. The patients with cardiac disorders and have an increased risk for endocarditis be counselled against tongue piercing, because the dental trauma pertaining to oral ornamentation could increase the risk for the development of infective endocarditis.⁹

As oral ornamentation is increasing the generalised lack of awareness of complications should be addressed by the dental professionals. Even researches should be done in pertaining detailed information about knowledge and practice and complications associated with these as majority of it would be unreported.

Individuals should be advised to maintain oral hygiene, educational programmes could be organised about possible complications & dentist should play an active role in examining and informing patients along with treatment of short- and long-term complications. Even there should be a comprehensive approach of body art professionals with dental as well as medical professionals.¹⁰

Conflict of Interest: None

Source of Funding: Self-funded

Ethical Clearance: The ethical clearance was obtained from Institutional Human Ethics committee, Institute of Medical science and SUM Hospital, Bhubaneswar, Odisha.

REFERENCES

1. Bhatia S, Arora V, Gupta N, Gupta P, Bansal M, Thakar S. Tooth Jewellery- Its Knowledge and Practice Among Dentists in Tricity, India. *J Clin Diagn Res.* 2016;10(3): ZC32-5.
2. Patil AG. Tooth jewellery: A simple way to add sparkle to your smile. *Ind J Dent Adv.* 2010;2(4):356–58.
3. Peter T, Titus S, Francis G, Alani MM, George AJ. Ornamental dentistry- an overview. *J Evolution Med Dent Sci.* 2013;2(7):666–76.
4. Yu CH, Minnema BJ, Gold WL. Bacterial infections complicating tongue piercing. *Can J Infect Dis Med Microbiol.* 2010;21(1): e70-4.
5. Vazhiyodan A, Mohan S, Kayal VG, Khan R. Sparkling smile-dental jewellery. *J I Dent.* 2013;1(1):1–3.
6. Tweeten SS, Rickman LS. Infectious complications of body piercing. *Clin Infect Dis.* 1998; 26:735–40.
7. Boardman R, Smith RA. Dental implications of oral piercing. *J Calif Dent Assoc.* 1997; 25:200–7.
8. Shacham R, Zaguri A, Librus HZ, Bar T, Eliav E, Nahlieli O. Tongue piercing and its adverse effects. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2003; 95:274–6. [PubMed]
9. Akhondi H, Rahimi AR. Haemophilus aphrophilus endocarditis after tongue piercing. *Emerg Infect Dis.* 2002;8:850–1
10. Dubose J, Pratt JW. Victim of fashion: Endocarditis after oral piercing. *Curr Surg.* 2004; 61:474–7.

Conscious Sedation in Pediatric Dentistry

Sthitiprajna Lenka¹, Karishama Rathor², Sashikant Sethy², Narottam Praharaj², Dharamashree. S³, Rucha Varu⁴

¹Associate Professor, Dept. of Oral and Maxillofacial Surgery; ²Lecturer, ³Professor, Dept. of Public Health Dentistry, Institute of Dental Sciences; ⁴Assistant Professor, Dept. of Oral Pathology, Siksha O Anusandhan (Deemed to be University), Bhubaneswar, Odisha

ABSTRACT

Sedation for dental procedures (with or without local anaesthesia) includes the administration by any route or technique of all drugs which result in depression of the central nervous system. Conscious sedation is administered with an aim to produce a degree of sedation without loss of consciousness, in order to perform a desired function without any hindrance. This technique is being widely followed by paediatric dentists, who utilize the method on uncooperative and anxious patients during any treatment. This technique has many adverse effects. This article reviews the various aspects of conscious sedation in general and paediatric dentistry.

Keywords: *Conscious Sedation, Hypnotics and Sedatives, Nitrous Oxide, Dental Anesthesia, Patient Compliance*

INTRODUCTION

Conscious sedation is an effective method of reducing preoperative anxiety in children and in adult patients who suffer from anxiety, especially prior to surgical procedures requiring general anesthesia. When administered before dental treatments, conscious sedation methods have been shown to aid in the reduction of patient pain and anxiety.¹ Conscious sedation is very useful in encouraging patient cooperation and improving overall patient satisfaction with dental treatment. However, conscious sedation methods do involve some level of risk for patients and dental practitioners. It is well known that conscious sedation allows dental practitioners to treat uncooperative patients. Some patients simply cannot be treated with locoregional anesthesia alone for various reasons, generally due to behavioral problems resulting from some form of disability or because the patient is

a child.² In these cases, procedures must be performed with the patient under conscious sedation. However, in some cases requiring very complex dental procedures, or if the patient is in poor condition, conscious sedation may be inadvisable or the class of drugs used may be contraindicated. The adverse effects associated with conscious sedation are a result of the class of drugs used, with hallucinations being the most frequently observed adverse reaction linked to the use of benzodiazepines, propofol and nitrous oxide. Nitrous oxide may also cause damage to immune and hematologic systems, and it can cause fertility problems in women.³ However, the biggest disadvantage of conscious sedation is that it can mask symptoms of a medical emergency, so clinicians should remain very conscious of proper methods of sedation for dental procedures and their importance. Clinics that employ methods of conscious sedation are required to have the equipment necessary to handle medical emergencies such as hypoventilation or central nervous system depression. The most important consideration when dealing with a potential emergency is to have a highly qualified team capable of handling any issues that may arise, especially any respiratory complications.^{4,5} Today, there are a wide variety of drugs that can be used to sedate patients; however, there are relatively few studies that compare the safety and effectiveness of different kinds of sedatives.

Corresponding Author:

Dr Sthitiprajna Lenka
Associate Professor,
Dept. of Oral and Maxillofacial Surgery,
Institute of Dental Sciences,
Siksha O Anusandhan (Deemed to be University),
Bhubaneswar-751003, Odisha
Email: sthitiprajnalanka@gmail.com

Goals of Conscious Sedation:

- Promote patient welfare and safety.
- Facilitate the provision of quality care.
- Minimize the extremes of disruptive behaviour.
- Promote a positive psychological response to treatment.

The drug groups used for paediatric dental sedation include inhalational agents, benzodiazepines, Midazolam (oral sedative), laughing gas (nitrous oxide sedative)

Nitrous Oxide: Nitrous oxide (N₂O) is a non-irritating respiratory tract gas, which presents fast action on induction as well as during recovery (these effects occur within a few minutes). It presents low solubility in the tissues, as well as a minimal alveolar concentration (MAC) which is so high that its anesthetic effect is poor under normal atmospheric pressure.⁶ Machines intentionally designed for the administration of inhalation sedation in dentistry should be used and be capable of administering N₂O to a maximum limit of 70% with not less than 30% of oxygen in volume, even though in the majority of cases, adequate analgesia is achieved with concentrations of N₂O that do not exceed 50% in volume.

These machines must be in conformity with the European (or otherwise applicable) legislation and be maintained and serviced according to the producers' orientations. It is also important that regular maintenance be documented, where all safety rules must be respected, such as for instance, the presence of a device that cannot fail in an emergency (if the oxygen pressure drops, N₂O supply must automatically stop).⁷ Nitrous oxide causes minor depression in cardiac output while peripheral resistance is slightly increased, thereby maintaining the blood pressure. This is of particular advantage in treating patients with cerebrovascular system disorders. Nitrous oxide is absorbed rapidly, allowing for both rapid onset and recovery (two to three minutes). It causes minimal impairment of any reflexes, thus protecting the cough reflex.⁸ Studies have reported negative outcomes associated with use of nitrous oxide greater than 50 percent and as an anesthetic during major surgery.⁹

Nitrous oxide has been associated with bioenvironmental concerns because of its contribution to the greenhouse effect. Nitrous oxide is emitted naturally by bacteria in soils and oceans; it is produced

by humans through the burning of fossil fuels and forests and the agricultural practices of soil cultivation and nitrogen fertilization. Altogether, nitrous oxide contributes about five percent to the greenhouse effect. Only a small fraction of this five percent (0.35 to two percent), however, is actually the result of combined medical and dental applications of nitrous oxide gas.¹⁰ Adverse effects of nitrous oxide: Nitrous oxide has an excellent safety record. When administered by trained personnel on carefully selected patients with appropriate equipment and technique, nitrous oxide is a safe and effective agent for providing pharmacological guidance of behaviour in children. Acute and chronic adverse effects of nitrous oxide on the patient are rare.¹¹ Nausea and vomiting are the most common adverse effects, occurring in 0.5 percent of patients. A higher incidence is noted with longer administration of nitrous oxide/ oxygen, fluctuations in nitrous oxide levels, and increased concentrations of nitrous oxide. The practitioner, however, may recommend that only a light meal be consumed in the two hours prior to the administration of nitrous oxide. The long-term exposure to nitrous oxide used as a general anesthetic has been linked to bone marrow suppression and reproductive system disturbances.¹²

Pyramidal (Oral Sedative):¹⁶⁻¹⁹ Midazolam, one of the commonly used oral sedation agent in children has several characteristics such as safety of use, rapid onset and some degree of amnesia that makes it a desirable sedation agent in children. Therefore, oral midazolam sedation is recommended for short dental procedures in children. A variety of sedative drugs has been used for oral sedation in young children including benzodiazepines. Midazolam is a newer-generation benzodiazepine with wide toxic/therapeutic ratio and safety margin, and does not produce prolonged sedation associated with other benzodiazepine such as diazepam. When taken orally, midazolam is rapidly absorbed in the gastrointestinal tract, produces its peak effect in relatively shorter time of about 30 minutes, and has a short half-life of about 1.75 hours. When given in doses between 0.5 to 0.75 mg/kg of body weight, oral midazolam has been found to be a useful sedative agent for pediatric dental outpatients. Midazolam has also been shown to enhance anterograde amnesia when used preoperatively in pediatric patients. Midazolam is a short acting anxiolytic agent, with short duration of action, that makes its use limited to short dental procedures only. The clinical use of midazolam

is primarily reserved as premedication/sedation drug, though it also has anticonvulsant and muscle relaxant properties. One of the limiting factors in the use of midazolam for sedation is the short length of action. So, midazolam can be used effectively in pediatric patients for short, mildly painful and minimally invasive procedures. Paediatric dosage of midazolam: Midazolam has been used orally at doses between 0.2-1.0 mg/kg with onset of action between 20-30 minutes. Several studies have been conducted to determine an optimal dose of oral midazolam for sedation by comparing various doses of oral midazolam. Oral midazolam in a dose of 0.5 mg/kg is suitable premedication for child patients (ASA Category I) during short dental procedures. Another study compared two dosages of oral midazolam (0.3 mg/kg or 0.5 mg/kg) in 31 physically and neurologically compromised pediatric (3-18 years) dental patients; both dosages proved successful, without intraoperative or postoperative complications.

ORAL MIDAZOLAM WITH NITROUS OXIDE

Oral midazolam is often used in combination with nitrous oxide for dental sedation in children. A study compared the effectiveness of oral diazepam and midazolam alone and in combination with nitrous oxide for sedating autistic patients during dental treatment; the midazolam/nitrous oxide combination was found significantly more effective than diazepam/nitrous oxide combination. A study reported that combination of oral midazolam (0.6mg/kg) and nitrous oxide (30-50%) is effective and safe in young dental patients who need minimal restorative treatment. Some study have also recently reported similar results with combination of 0.5 mg/kg oral midazolam and nitrous oxide (50%) in 4-6 year old children. The use of nitrous oxide may prolong the working time to some extent and simultaneously incorporates its own desirable effects (such as analgesia) in the clinical situation.²⁰⁻²³

COMPLICATIONS

The main complications related to conscious sedation are:^{22,23}

- Hypoxia
- Nausea and vomiting
- Inadvertent general anaesthesia (over sedation).

CONCLUSION

The provision of adequate anxiety control is an integral part of the practice of dentistry. All patients deserve appropriate anxiety control for any dental procedure. The application of conscious sedation should be carried out effectively and precisely so that it maintains a healthy gap from general anesthesia and unconsciousness. More concern should be taken when this process is applied on pediatric patients. Sedationist must be aptly trained to perform sedations on patients.

Conflict of Interest: None

Source of Funding: Self-funded

Ethical Clearance: The ethical clearance was obtained from Institutional Human Ethics committee, Institute of Medical science and SUM Hospital, Bhubaneswar, Odisha.

REFERENCES

1. Nathan JE. Management of the difficult child: a survey of pediatric dentists' use of restraints, sedation and general anesthesia. ASDC Journal of Dentistry for Children 1989; 56: 293-301.
2. Roberts GJ, Brook AH, Page J, Davenport ES. British Society of Paediatric Dentistry. A policy document on sedation for paediatric dentistry.
3. International Journal of Paediatric Dentistry 1996; 6: 63-66. 3. General Dental Council. Maintaining Standards. Guidance to dentists on professional and personal conduct. Publisher City, Country: Publisher, 1997; modified 1998.
4. Guidelines for the elective use of conscious sedation, deep sedation and general anesthesia in pediatric dental patients: Reference manual 1999-2000. Pediatric Dentistry 1999; 21:68-73.
5. Major E, Winder M, Brook AH, Berman DS. An evaluation of nitrous oxide in the dental treatment of anxious children. A physiological and clinical study. British Dental Journal 1981; 151: 186-191.
6. Veerkamp JS, Gruythuysen RJ, Hoogstraten J, van Amerongen WE. Anxiety reduction with nitrous oxide: a permanent solution? ASDC Journal of Dentistry for Children 1995; 62: 44-48.

7. Parbrook GD, James J, Braid DP. Inhalational sedation with isoflurane: an alternative to nitrous oxide sedation in dentistry. *British Dental Journal* 1987; 163: 88–92.
8. Laskin JL, Williamson KG. An evaluation of the amnesic effects of diazepam sedation. *Journal of Oral & Maxillofacial Surgery* 1984; 42: 712–716.
9. Harris D, O’Boyle C, Barry H. Oral sedation with temazepam: controlled comparison of a soft gelatin capsule formulation with intravenous diazepam. *British Dental Journal* 1987; 162: 297–301.
10. Lundgren S, Ekman A, Blomback U. Rectal administration of diazepam in solution. A clinical study on sedation in paediatric dentistry. *Swedish Dental Journal* 1978; 2: 161–166.
11. Parbrook GD, Still DM, Parbrook EO. Comparison of i.v. sedation with midazolam and inhalation sedation with isoflurane in dental outpatients. *British Journal of Anaesthesia* 1989; 63: 81–86.
12. Rodrigo MR, Chan L, Hui E. Flumazenil reversal of conscious sedation for minor oral surgery. *Anaesthesia & Intensive Care* 1992; 20: 174–176.
13. Dworkin SF, Schubert M, Chen AC, Clark DW. Psychological preparation influences nitrous oxide analgesia: replication of laboratory findings in a clinical setting. *Oral Surgery, Oral Medicine, Oral Pathology* 1986; 61: 108–112.
14. Shapira J, Holan G, Botzer E, Kupieztky A, Tal E, Fuks AB. The effectiveness of midazolam and hydroxyzine as sedative agents for young pediatric dental patients. *ASDC Journal of Dentistry for Children* 1996; 63: 421–425.
15. Houpt MI. Project USAP – Part III: Practice by heavy users of sedation in pediatric dentistry. *ASDC Journal of Dentistry for Children* 1993; 60: 183–185.
16. Laskin JL, Williamson KG. An evaluation of the amnesic effects of diazepam sedation. *Journal of Oral & Maxillofacial Surgery* 1984; 42: 712–716.
17. Rita L, Seleny FL, Mazurek A, Rabins SY. Intramuscular midazolam for pediatric preanesthetic sedation: a doubleblind controlled study with morphine. *Anesthesiology* 1985; 63: 528–531.
18. Cote CJ, Notterman DA, Karl HW, Weinberg JA, McCloskey C. Adverse sedation events in pediatrics: a critical incident analysis of contributing factors (see comments). *Pediatrics* 2000; 105: 805–814.
19. Cote CJ, Karl HW, Notterman DA, Weinberg JA, McCloskey C. Adverse sedation events in pediatrics: analysis of medications used for sedation. *Pediatrics* 2000; 106: 633–644.
20. Wilson S. Conscious sedation and pulse oximetry: false alarms? *Pediatric Dentistry* 1990; 12: 228–232.
21. Wilson S. Patient monitoring in the conscious sedation of children for dental care. *Current Opinion in Dentistry* 1991; 1: 570–576.
22. Iwasaki J, Vann WFJ, Dilley DC, Anderson JA. An investigation of capnography and pulse oximetry as monitors of pediatric patients sedated for dental treatment. *Pediatric Dentistry* 1989; 11: 111–117.
23. Rohlffing GK, Dilley DC, Lucas WJ, Vann WFJ. The effect of supplemental oxygen on apnea and oxygen saturation during pediatric conscious sedation. *Pediatric Dentistry* 1998; 20: 8–16.

Recall Scheduling in Removable Prosthesis Patients

Debarchita Sarangi¹, Sitansu Sekhar Das², Abhilash Mohapatra³

¹Assistant Professor, ²Professor, ³Associate Professor, Department of Prosthodontics, Institute of Dental Sciences, Siksha O Anusandhan (Deemed to be University), Bhubaneswar, Odisha

ABSTRACT

A patient provided with a certain removable prosthesis is given instruction regarding how to use, maintain the prosthesis and when to report in the clinic for the clinician's intervention. This article shall review the recall scheduling of patients after insertion of prosthesis for further examination and modification as described by various authors.

Keywords: Recall, removable, scheduling, post-insertion, follow-up, prosthesis

INTRODUCTION

Removable prostheses include complete dentures, partial dentures (treatment partial dentures, cast partial dentures, immediate dentures, etc.), maxilla-facial prosthesis, extra-oral appliances (Fig.1) The need of removable prosthesis may have decreased, but the demand to cater patients still exists from the past. Even the advent of various technologies has not been able to exhibit fall in the requirement of prostheses.

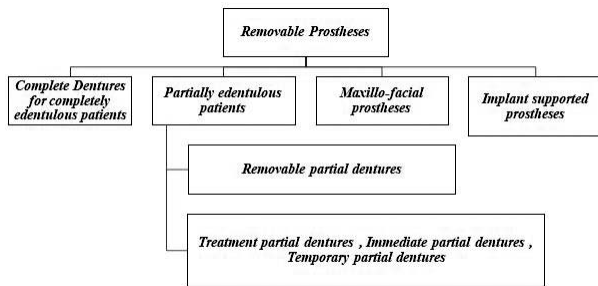


Fig 1: Types of Removable prostheses

Counseling should be done for: insertion and removal of the prosthesis; maintenance of remaining natural teeth and prosthesis; follow-ups. Therefore, maintenance of

prostheses by the patient and follow-up after insertion by the dentist collectively, not only lead to a better longevity of the prostheses, but also better acceptance of the same by the patient. This subsequently amounts to a good doctor-patient relationship and psychological satisfaction of the patient. To achieve this, communication during insertion and follow-ups after it are a must.¹

All the verbal instruction can be given in a printed format as some points may be misunderstood only on explaining. Moreover, written instruction are more impactful, the instruction leaflet can be written down in the following headings: Need of a partial/removable prostheses or appliance; break-in period; learning to speak clearly, eat; sore-spots after insertion; care of the prosthesis; maintenance; hygiene.²

DISCUSSION

There are various approaches to schedule the patient for the next visit after prosthesis insertion. Patient's first follow-up appointment scheduled post-insertion of complete denture is after ten days. By this time, usually the patient is in better state of acceptance. But, during the last visit, the patient should be explained that s/he should call for appointment if a "sore-throat" persists for 3-days continuously. The follow-up schedule after the first follow-up should be:

- 3 weeks from the first (second visit)
- 6 weeks from the first (third visit)
- 3 months after the third visit (fourth visit)
- 3 months after the fourth visit (fifth visit)
- Subsequently every six months³

Corresponding Author:

Dr. Debarchita Sarangi
Assistant Professor, Department of Prosthodontics,
Institute of Dental Sciences,
Siksha O Anusandhan (Deemed to be University),
Bhubaneswar-751003, Odisha
Mobile: 9439742118
Email: debarchita2016@gmail.com

There is another protocol for scheduling appointments for removable partial dentures:

- First appointment: 24 hours after insertion. Minor changes are supposed to be made if any erythematous areas are examined, only after determining the cause.
- Second appointment: 48 to 72 hours after the first appointment.²

Another protocol for recalling removable partial denture patients:

- First appointment: 24 hours after insertion to correct occlusal errors and to check immediate tissue reaction.
- Second appointment: after 7 days after the first visit.
- The next revisits are: every 3-6 months.⁴

In case of presence of remaining natural teeth, periodontal maintenance is also a must. According to a study by Farooqi et al., periodic recalls for periodontal condition maintenance should be scheduled. There can be no “One size Fits all” rule for such appointments. The recalls vary from patient to patient as per the condition of their remaining teeth.⁵

Patient should report immediately when there is a problem or when adverse tissue reactions are seen .⁶ The patient should report for the first review in a week’s

time and it should be no longer than that .⁷In case of cementation of restorations, the first visit should be ten days after cementation. This is done to chiefly examine the gingival sulcus. Recall visits atleast every 6 months should be planned for patients with cast-restorations.⁸

Boucher has advocated a recall appointment 24 hours immediately after insertion and then a periodic reappointment phase.⁹A single post-delivery adjustment usually is enough but additional adjustments can be made 48-72 hours after the first adjustments. Maintenance visits scheduled every 3,6 and 12 months should be advised to the patient.¹⁰

In case of insertion of insertion of a definitive obturator, the patient is recalled 24 hours after the insertion and necessary corrections are made. The subsequent follow-up depends upon the findings in the above appointment.¹¹The follow-up for palatal lift prosthesis should ideally be within 2-3 days of insertion.¹²The recall visits have been summarized in Table 1,2,3and 4.

According to Wagner, a positive attitude of the patient helps him to get accustomed to the new removable prosthesis . Wearing it regularly helps the patient to be confident with the same. Even though , complete restoration of chewing ability as natural teeth is not expected , healthy nutritious denture-friendly diet should be followed for general well-being .¹³

Table 1: Recall appointments for Complete Denture Patients

Appointment after insertion	John J Sharry ³	Boucher ¹⁰	Basker and Davenport ⁷
Complete Dentures			
First	10 days	24 hours immediately after insertion	In a week’s time and no longer than that.
Second	3 weeks from first	-----	-----
Third	6 weeks from first	-----	-----
Fourth	3 months from third	-----	-----
Fifth	3 months from fourth	-----	-----
Subsequently	Every six months	-----	-----

Table 2: Recall appointments for Removable partial Denture Patients

Appointment after insertion	Grasso and Miller ²	Mccracken’s ⁴	Stewarts ¹⁰
Removable partial dentures			
First	24 hours after insertion	24 hours after insertion	Single post-delivery appointment. (Time not specified)
Second	48-72 hours after first appointment	7 days after first visit	48-72 hours after first appointment.
Subsequently	-----	Every 3-6 months	Maintenance visits every 6 months.

Table 3 : Recall appointments for Maxillo-facial Prosthesis Patients

Appointment after insertion	Definitive obturator ¹¹	Palatal lift prosthesis ¹²
Thomas Taylor: Clinical Maxillofacial Prosthetics		
First	24 hours after insertion	Within 2-3 days after insertion

Table 4: Recall appointments in presence of remaining natural teeth

Appointment after insertion	Farooqi	Rosenstiel
	Periodontal health of remaining natural teeth	Insertion involving a cementation procedure
First	No “One size fits all “appointmentschedule.	10 days after cementation to examine gingival sulcus.
Subsequent visits	Patient recalled periodically according to need.	Recall visits every 6 months

CONCLUSION

The minimum time for each appointment should be around 15minutes .¹⁰ A student may require more time for the same. The patient should report as per the scheduled recall appointment. In conditions when the first recall appointment are scheduled 2-3 days or more after , the patient should report whenever necessary and should discontinue the use of the prostheses for some-time in presence of soreness and pain . The design and maintenance of every removable differs from each other which should be supplemented by the dentist in the post-insertion instruction .Thus, the whole idea of recall visits should be need-driven and be decided by the clinician and not only be theoretically followed.

Conflict of Interest: None

Source of Funding: Self-funded

Ethical Clearance: The ethical clearance was obtained from Institutional Human Ethics committee, Institute of Medical science and SUM Hospital, Bhubaneswar, Odisha.

REFERENCES

1. Winkler S. Essentials of Complete Denture. 3rd ed. AITBS; 2015; 422-23
2. Miller E, Grasso J. Removable Partial Prosthodontics. 2nd ed. Lippincott Williams and Wilkins; 1981;257-263
3. Sharry John J. Complete Denture Prosthodontics. 3rd edition. McGraw-Hill Inc.,US; 1974; 286
4. Carr A, McGivney G, Brown D. McCracken’s Removable Partial Prosthodontics. 11th ed. Elsevier ; 2004; 330-337
5. Farooqi O, Wehler C, Gibson G, Jurasic M, Jones J. Appropriate Recall Interval for Periodontal Maintenance: A Systematic Review. Journal of Evidence Based Dental Practice. 2015;15(4):171-181.
6. Davenport J, Basker R, Heath J, Ralph J. A Colour Atlas of Removable Partial Dentures. Mosby; ; 1989; 184
7. Basker R, Davenport J. Prosthetic Treatment of the Edentulous Patient. 4th ed. Wiley-Blackwell; 2008.
8. Rosenstiel S, Land M, Fujimoto J. Contemporary Fixed Prosthodontics. 4th ed. Mosby; 2006;928-29
9. Bolender C, Zarb G, Jacob R, Eckert S. Boucher’s Prosthodontic Treatment for Edentulous Patient. 11th ed. Mosby; 2003; 30
10. Stewart K, Rudd K, Kuebkar W. Clinical Removable Partial Prosthodontics. 2nd ed. All India Publishers and Distributors; 2004;516-17
11. Taylor T. Clinical maxillofacial prosthetics. Chicago: Quintessence Publishing; 2000; 118
12. Taylor T. Clinical maxillofacial prosthetics. Chicago: Quintessence Publishing; 2000; 140.
13. Wagner, A. G. Instructions for the use and care of removable partial dentures. The Journal of Prosthetic Dentistry,1971 ; 26(5), 477–480.

Soil Stabilization using Lime Precipitation Technique

Heeralal M¹, Pandu Kurre², G V Praveen³

¹Assoc. Professor, Dept. of Civil Engg, National Institute of Technology, Warangal; ²Asst. Professor, Dept. of Civil Engg, Sri Indu Instt.of Engg. & Technology, Hyderabad; ³Professor, Dept. of Civil Engg, S R Engineering College, Warangal

ABSTRACT

Many relevant studies on lime stabilization have been done with regard to swell – shrink behaviour of expansive soils. Sequential lime mixing technique was also proven to be effective in limiting the swell shrink behaviour. But, strength and deformation are generally the most important parameters in assessing the effect of soil stabilization in pavement and other geotechnical practices. Therefore, the impact of these modification techniques has to be studied in terms of unconfined compressive strength of lime-treated soft clays. Such studies would definitely imbibe confidence in the practitioners to take up these advanced stabilization techniques which would in turn make our designs more robust and safer. In this regard, the current investigation is taken up to examine the efficiency of lime precipitation technique by sequential mixing of sodium hydroxide (NaOH) and calcium chloride (CaCl₂). The lime precipitated in expansive soil is likely to change the basic properties by short term modification reaction and long term pozzolanic reactions between soil and lime. In expansive soils, Initial Consumption of Lime (ICL) was established based on the experiment proposed by Eades and Grimm. All the laboratory tests were done by maintaining these moisture and compaction conditions. Lime precipitation was employed on the mixes and its time dependent impact on physico - chemical behaviour of expansive soil and formation of various cementation products were studied. The study discusses the effect of these reactions on Particle size, Unconfined Compressive Strength (UCS) and California bearing ratio (CBR). The soil-lime modification reactions had significant impact on the index properties and Particle size of the expansive soil. Due to strong short time modification reactions and long term pozzolanic reactions, a notable increase in the CBR and UCS values of the expansive soil was observed

Keywords: *Expansive Soils, Lime Precipitation, Soil Stabilization, CBR, UCS*

INTRODUCTION

Locally available expansive soils, which are well known in India by the name black cotton soils, are highly fertile for agriculture but are treacherous for pavements, runways, and light to medium loaded residential buildings resting on them due to the high swell-shrink potentials caused by moisture fluctuation in these soils^[18]. This swell-shrink behavior causes damage to the structures resting on them. The swell-shrink behavior is due to the existence of a mineral called Montmorillonite. This clay mineral, when comes in contact with moisture, expands. Soils rich in these minerals are present in many regions all over the world, particularly in semi-arid and arid regions^[8].

The damage due to expansive soils to the structures built on them is immense. National Science Foundation (NSF) sponsored studies stated that the structural damage

due to expansive soils - mainly to pavements and light buildings is more than any other natural calamity^[4]. As per the detailed review of expansive soils by Gromko (1974), it can be estimated that the annual cost of damage from these soils in the United States alone is \$9 billion^[3]. Problems with expansive soils have been reported worldwide.

Various treatment procedures were recommended to stabilize expansive soils. Based on the soil modification mechanism, soil stabilization have been classified into thermal, physicochemical, chemical and mechanical stabilizations. Among these, the most used methods are mechanical and chemical stabilization as they provide rapid and reliable improvements to soil properties. Even among chemical stabilization, the most popular material used to limit the swell-shrink potential is lime. Stabilization with lime achieves improved plasticity, compressive strength and elastic moduli of expansive clays^{[6][7]}.

Lime Stabilization: With addition of lime to expansive soil either in the form of Quick lime or hydrated lime (Slaked lime), the soil properties are altered by short term modification reaction and long term pozzolanic reaction [11]. Short term modifications partly imparts strength to the soil by modifying the physicochemical properties while long term pozzolanic reactions impart strength by producing cementitious gels such as Calcium-Silicate-Hydrates (CSH) and Calcium-Aluminate-Hydrates (CAH) as the calcium from the lime reacts with the silicates and aluminates [12][13]. The long-term pozzolanic reactions can last for long periods as long as sufficient lime is available and the pH remains greater than 10. Due to these reactions, lime treatment can yield great and lasting increase in strength.

In view of the above difficulties and limitations in certain conditions, Thyagaraj in 2012 proposed a new method called ‘In situ lime precipitation technique’ in which NaOH and CaCl₂ are permeated consequently into the expansive soil from bore holes, such that lime gets precipitated in the soil. Lime precipitation takes place as per the reaction below:



Thyagaraj et al in 2014 compacted expansive soil in cylindrical mould and sequentially permeated with CaCl₂ and NaOH solutions through a hole in the centre filled with soil of high permeability. Results from this model test concluded that the pH of the soil increased to 12 which would be favourable for pozzolanic reactions to occur [16].

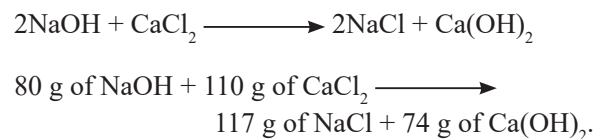
Previous studies on in-situ lime precipitation by sequential mixing have reported positive findings; however, it is not examined in detail, especially for pavement applications and this project aims to investigate in detail the effect of sequential mixing of CaCl₂ solution and NaOH solution on the index properties, particle size, UCS and CBR of compacted expansive soils [17].

EXPERIMENTAL STUDY AND METHODOLOGY

The expansive soil used in the study is the Black cotton soil, which is locally available and has the following properties:

Property	Value
pH	8.25
Specific gravity(G _s)	2.65
Grain size Distribution	
Gravel (%)	4
Sand (%)	29
Silt (%)	27
Clay (%)	40
IS classification	CH
Index properties	
Liquid Limit (%)	69
Plastic Limit (%)	25
Shrinkage limit (%)	11
Plasticity Index (%)	44
Compaction characteristics	
Maximum dry density (g/cm ³)	1.68
Optimum moisture content (%)	20
Unconfined compressive strength (kg/cm ²)	2.2
California Bearing Ratio (soaked) (%)	2.15

In the current study chemically pure Sodium Hydroxide (NaOH) and Calcium Chloride (CaCl₂) are used. In-situ lime precipitation can be done by sequential mixing of NaOH and CaCl₂ solutions in the soil. When NaOH and CaCl₂ are mixed in soil, lime is precipitated as per the following equation:



NaOH and CaCl₂ solutions are prepared keeping the ratio of them same and to increase the amount of lime precipitated is increased by adding more concentrated of CaCl₂ and NaOH solutions.

For determining the index properties of the soil, 120g of air dried soil passing 425µm was taken. As the liquid limit of the untreated soil is 69%, 41.4 ml of NaOH solution and 41.4 ml of CaCl₂ solution of desired concentration is mixed and tested after placing the samples in desiccator for 24hr. The corresponding calculated amount of lime precipitated and the % of lime precipitated for various concentrations of CaCl₂ and NaOH is as shown in Table 1. For determining UCS and CBR values of the soil, the samples are prepared at OMC. The index properties of the soil are found out

according to Indian standards [19-23]. The OMC of the soil is 20%, so both UCS and CBR samples are prepared by mixing corresponding amount of CaCl₂ and NaOH solutions. Table 2 shows the corresponding % of lime precipitated for various concentrations of CaCl₂ and NaOH.

Table 1: Index Properties samples-lime precipitation corresponding to different samples

Sample	Percentage of solution con. on weight basis: %	Calculated amount of lime precipitation(g)	% of lime precipitation by weight of soil
S1	10 % CaCl ₂ + 7.3% NaOH	2.78	2.31
S2	20% CaCl ₂ + 14.6% NaOH	5.57	4.63
S3	35 %CaCl ₂ + 25.5% NaOH	9.73	8.08
S4	50 %CaCl ₂ + 36.4% NaOH	13.9	11.55
S5	65 %CaCl ₂ + 47.3% NaOH	18.07	15

Table 2: Engineering Properties (UCS & CBR) samples-lime precipitation corresponding to different samples

Sample	Percentage of solution con. on weight basis: %	% of lime precipitation by weight of soil
S1	10 % CaCl ₂ + 7.3% NaOH	0.67
S2	20% CaCl ₂ + 14.6% NaOH	1.34
S3	35 %CaCl ₂ + 25.5% NaOH	2.3
S4	50 %CaCl ₂ + 36.4% NaOH	3.3
S5	65 %CaCl ₂ + 47.3% NaOH	4.3

RESULTS

Index Properties:

Table 3: Atterberg limits corresponding to % lime precipitated in soil

Sample	Lime %	Liquid Limit	Plastic Limit	Plasticity Index	Shrinkage Limit
S1	2.31	57	29	28	16
S2	4.63	53.5	35	18.5	23.5
S3	8.08	50	38	12	34
S4	11.55	48.5	40	8.5	36.6
S5	15	47.5	41.5	6	39.3

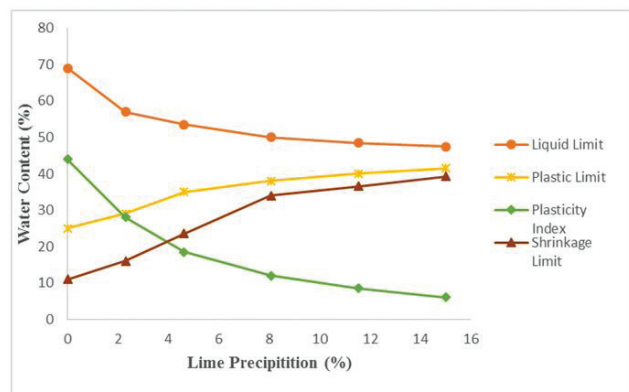


Figure 1: Variation of Atterberg limits with % of lime precipitation

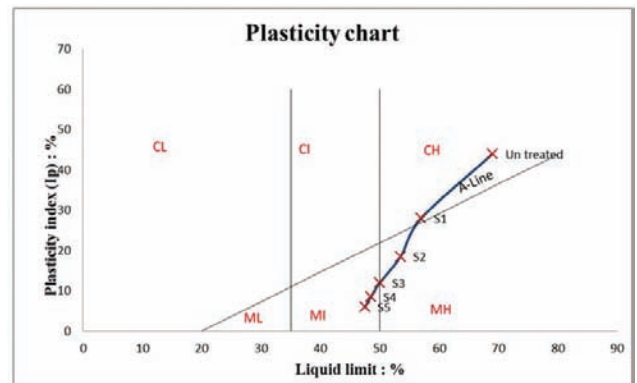


Figure 2: Liquid limit and plasticity index of untreated and lime treated soils plotted in casagrande's Plasticity chart

Fig 1 plots the variations of index properties of soil with percentage lime precipitation occurring (calculated) on sequential mixing of NaOH and CaCl₂ in soil. The liquid limit of samples treated with lime reduced to 47.5 – 57% from an untreated value of 69%. The plasticity index of lime treated samples also reduced to 6–28% from 44%. The shrinkage limit of lime treated specimens increased significantly to 16–39.3% from 11%. It is evident from the figure that the shrinkage potential reduced drastically with the increase in % of lime precipitation. The liquid limit and plasticity index decreased significantly, and plastic limit increased considerably. This can be mainly attributed to strong

short-term lime modification reactions occurring on lime precipitation treatment as most of the pozzolanic reactions occur at curing periods greater than 7 d [1]. The short-term modification reactions occur from the replacement of monovalent exchangeable cations on the negatively charged clay surface by divalent calcium ions (Ca²⁺). This cation exchange decreases the thickness of diffuse ion layer, which in turn increases the net inter-particle attraction and promotes particle flocculation/aggregation, and alters the plasticity characteristics of expansive soil [5][14].

The significant increase in shrinkage limit of lime precipitation treated specimens indicates mainly the amount of clay fraction. As the amount of clay fraction (<0.002 mm) decreases, shrinkage limit increases while shrinkage of the soil decreases. The reduction in shrinkage of lime precipitation treated specimens on drying was due to particle aggregation due to cation exchange and particle agglomeration reactions [8].

The increase in particle flocculation/aggregation changes a part of the clay fraction into a silt size fraction, and alters the plasticity characteristics. This is illustrated in Figure 2, which plots the liquid limit and plasticity index in Casagrande’s plasticity chart.

The lime precipitation treatment alters the expansive clay classification to MI (medium compressible silt) and MH (high compressible silt) from CH (high compressible clay).

Particle Size Analysis:

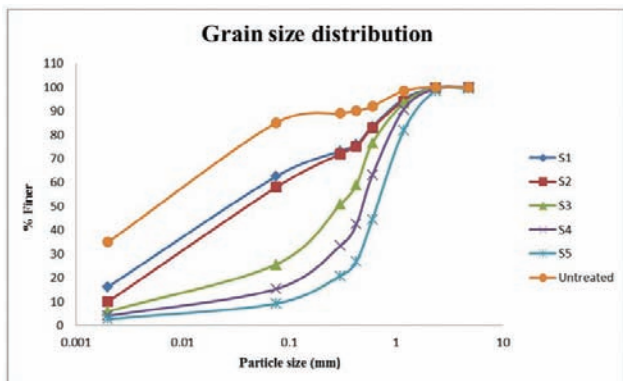


Figure 3: Variation in gradation curve with % lime precipitation

Figure 3 shows that the grain size distribution of lime treated soil. As the amount of lime added increased there was an increase in sand and silt fractions due to which the clay fractions reduced.

Unconfined Compressive Strength (UCS):

Table 4: UCS at different curing periods and corresponding pH

Specimen designation	Calculated % lime	7 Days		14 Days		28 Days	
		UCS (kg/cm ²)	pH	UCS (kg/cm ²)	pH	UCS (kg/cm ²)	pH
S1	0.67	3.5	9.33	3.7	9.5	4	9.71
S2	1.34	3.7	10.25	4	10.33	4.3	10.4
S3	2.3	4.2	11	4.4	11.25	4.7	11.5
S4	3.3	4.9	12.01	5.1	12.1	5.5	12.1
S5	4.3	5.3	12.14	5.8	12.2	6.7	12.2

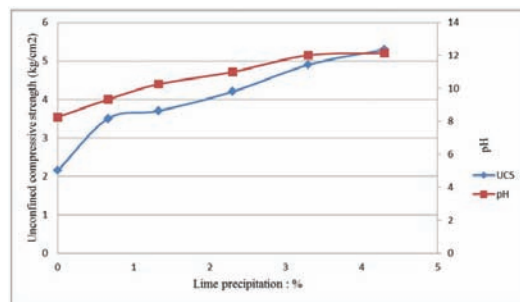


Figure 4: Variation of UCS at 7 days curing period and soil pH with lime precipitation %

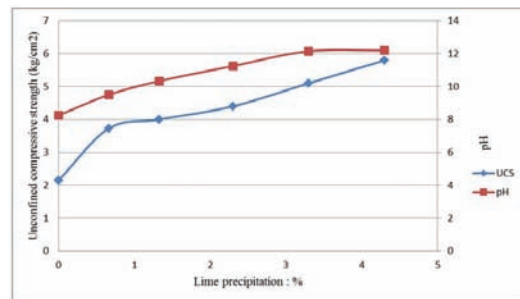


Figure 5: Variation of UCS at 14 days curing period and soil pH with lime precipitation %

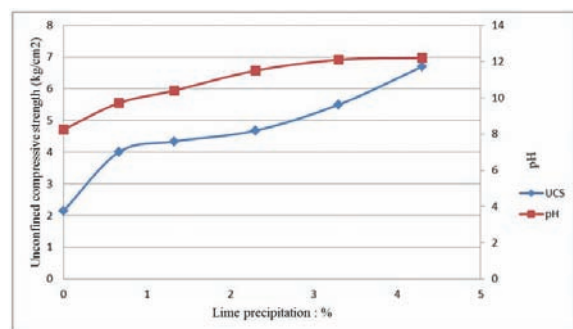


Figure 6: Variation of UCS at 28 days curing period and soil pH with lime precipitation %

Fig 4, 5 and 6 show the variation of UCS of the expansive soil with the calculated % of lime precipitated on mixing of NaOH and CaCl₂. As the % of lime precipitated increased, the UCS of the expansive soil increased. Figures also show that the pH of specimens increases as the % lime precipitation increases. Previous studies suggested that the dissolution of silica (SiO₂) and alumina (Al₂O₃) from the clay lattice begins at a pH of 8.0, and at a pH of about 10.0, maximum dissolution occurs (Barker et al., 2006; Boardman et al., 2001; Rogers et al., 2000). The dissolved alumina and silica combine with calcium ions to form Calcium-Silicate-Hydrate (CSH) and Calcium-Aluminate-Hydrate (CAH), which cements the clay particles together and increases the strength^{[2][9]}. Bell (1988) suggested that at initial periods of curing, the compressive strength increase is due to poorly formed cementation products^[1].

California Bearing Ratio:

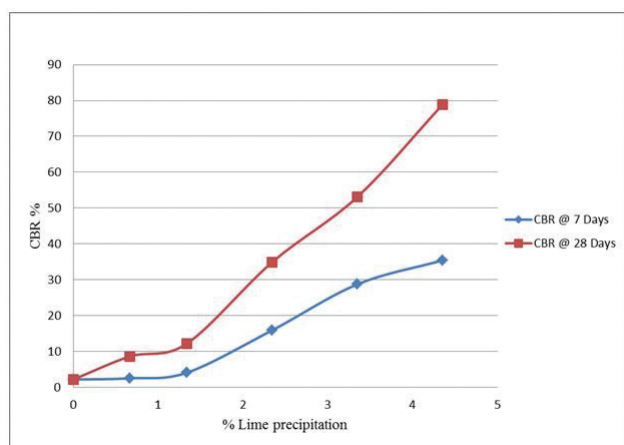


Figure 7: Variation of CBR with % lime precipitation and curing period

From Fig 7, it can be concluded that there is a slight variation in CBR at 7 and 28 days of curing for S1 and S2 whereas there is noticeable increase of CBR from S3 to S5. As already discussed, samples having % lime precipitation greater than ICL were found to give good results i.e. precipitated lime improves the soil and provides favourable conditions to pozzolanic reactions to occur. This noticeable increase in CBR is mainly attributed to long term pozzolanic reactions which occur when calcium ions combine with dissolved alumina and silica (in alkaline conditions pH >12) from clay lattice to form CAH and CSH, which cement the clay particles together leading to an increase in CBR (Barker et al., 2006; Diamond et al., 1963; Eades and Grim, 1960; Rajasekaran and Rao, 1998; Wang et al., 1963).

CONCLUSIONS

- The soil modification reactions have significant impact on the index properties and particle size (gradation curve) of the expansive soil.
- The modification reactions shifted the gradation curve to the right as the % lime precipitation increase which shows alteration of fine particles into coarser particles.
- The lime modification reactions along with soil-lime pozzolanic reactions increased the unconfined compressive strength by 3 times at 4.3 % of calculated lime precipitation at 28 days curing period.
- At 4.3% calculated lime precipitation, the CBR of soil samples cured for 28 days improved from 2.15 to 78.9
- The strength properties such as UCS and CBR values of samples have been increased with increase in % lime precipitation and curing period.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: NIL

REFERENCES

1. Bell F.G. (1996), "Lime stabilization of clay minerals and soils", *EngGeol* 42:223–237
2. Eades, J. L., and Grim, R. E. (1960). "The reaction of hydrated lime with pure clay minerals in soil stabilization" *Highw. Res. Board, Bull.*, 262, 51–63.
3. Gromko, G. J. (1974). "Review of Expansive soils" *Journal of Geotechnical Engineering division*, 100(6), 667-687.
4. Holtz, R.D.R.D. and W.D. Kovacs, (1981). "An introduction to geotechnical engineering" Robert D. Holtz, William D. Kovacs: Prentice-Hall.
5. Mitchell, J. K. (1993). "Fundamental of soil behaviour". 2nd. Edition. John Wiley and Sons, Inc., New York.
6. Murty VR and Krishna PH (2007) Amelioration of expansive clay slopes using calcium chloride. *ASCE Journal of Materials in Civil Engineering* 19(1): 19–25.

7. Pathak, R. C., and Kate, J. M. (1987). "Construction techniques in expansive soils of India." *Proc., 6th Int. Conf. on Expansive Soils*, New Delhi, India, 483–487.
8. Prakash, K., Sridharan, A., and Rao, S. M. (1989). "Lime addition and curing effects on the index and compaction characteristics of a montmorillonitic soil" *Geotech. Eng.*, 20(1), 39–47.
9. Rajasekaran G and Rao SN (1998) X-ray diffraction and microstructural studies of lime-marine clay reaction products. *Geotechnical Engineering* 29(1): 1–27.
10. Rao SM and Thyagaraj T (2003) Lime slurry stabilization of an expansive soil. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* 156(3): 139– 146.
11. Rao SM and Venkataswamy B (2002) Lime pile treatment of black cotton soils. *Proceedings of the Institution of Civil Engineers – Ground Improvement* 6(2): 85–93.
12. Sivapullaiah PV, Sridharan A and Raju KVB (2000) Role of amount and type of clay in the lime stabilization of soils. *Proceedings of the Institution of Civil Engineers – Ground Improvement* 4(1): 37–45.
13. Snethen, D.R et al. (1975): "A Review of Engineering Experiences With Expansive Soils In Highway Subgrades", interim report, prepared for Federal Highway Administration, U.S. Department of Transportation , Washington.
14. Sridharan A, Rao SM and Murthy NS (1986) Compressibility behaviour of homoionised bentonites. *Geotechnique* 36(4): 551–564.
15. Thyagaraj T, Rao SM, Suresh PS and Salini U (2012) Laboratory studies on stabilization of an expansive soil by lime precipitation technique. *Journal of Materials in Civil Engineering ASCE* 24(8): 1067–1075
16. Thyagaraj, T., and Suresh, P. (2012). In-situ stabilization of an expansive soil in desiccated state. *International Journal of Geotechnical Engineering*, 6(3), 287-296.
17. Thyagaraj, T., and Zodinsanga, S. (2014). "Swell-shrink behaviour of lime precipitation treated soil." *Ground Improv. Inst. Civ. Eng. London*.
18. Thyagaraj, T., Samuel, Z., & Kumar, K. S. R. (2016). Relative efficiencies of electrolytes in stabilization of an expansive soil. *International Journal of Geotechnical Engineering*, 10(2), 107-113.
19. Bureau of Indian Standards. (1972). "Methods of test for soils: Determination of shrinkage factors (first revision)." IS 2720 (Part 6), New Delhi, India.
20. Bureau of Indian Standards. (1980a). "Methods of test for soils: Determination of specific gravity. Section 1: Fine grained soils (First revision)." IS 2720 (Part 3), New Delhi, India.
21. Bureau of Indian Standards. (1980b). "Methods of test for soils: Determination of water content-dry density relation using light compaction (second revision)." IS 2720 (Part 7), New Delhi, India
22. Bureau of Indian Standards. (1985a). "Methods of test for soils: Grain size analysis (second revision)." IS 2720 (Part 4), New Delhi, India.
23. Bureau of Indian Standards. (1985b). "Methods of test for soils: Determination of liquid limit and plastic limit (second revision)." IS 2720, (Part 5), New Delhi, India.

A Review on Permanent Deformation of Granular Material

Heera Lal M¹, Venkatesh Noolu², Rakesh J Pillai³, Pandu Kurre⁴, G. V. Praveen⁵

¹Assoc. Professor, ²Research Scholar, ³Asst. Professor, Dept. of Civil Engg, National Institute of Technology, Warangal; ⁴Asst. Professor, Dept. of Civil Engg, Sri Indu Instt. of Engg. & Technology, Hyderabad; ⁵Professor, Dept. of Civil Engg, S R Engineering College, Warangal

ABSTRACT

Long-term behavior of a granular material under repeated loading plays a vital role to understand the behavior of rutting in pavements. Many researchers observed the behavior of permanent strain accumulation in the granular material under cyclic loading condition. The permanent deformation of granular material caused by numerous factors varies with the degree of each factor influence on granular material. This paper summarizes and discusses the impact of individual factors on permanent deformation of granular material through reference to published scientific data. As well, this paper outlines the different constitutive models to find the permanent strain and discusses the permanent strain modelling using shakedown theory.

Keywords: Permanent deformation, Shake down theory, Granular material, Numerical modeling

INTRODUCTION

The growth of developed and industrialized countries depends on the quality and connectivity of roads. Governments invest the significant amount of money on pavement construction and maintenance. In an early 20th century and 19th century, pavements were constructed using the rule of thumb procedure. As there wasn't a standard procedure of pavement construction back in those days, they adopted some methods from the knowledge gathered from long-term observations. Later on, empirical methods were developed and were standardized based on performance observations, but were confined only to the local materials available and thus couldn't be adopted in case of new or alternate materials. Materials were characterized based on simple index tests, and these methods did not consider the procedure of construction and frost susceptibility of pavement materials. The main problem of traditional design methods is that they are restricted only to few types of pavement materials and design procedures. Due to urbanization, the rate of availability of local virgin aggregates decreased, as result engineers were forced to adopt by-products and recycle aggregates as pavement materials. On the other hand, due to increase in traffic, the deformation of roads increased resulting in a hike in maintenance cost. The empirical methods fail to adopt the situations as mentioned above. To overcome these drawbacks, mechanistic design procedures were developed. These techniques are used to figure out deformations of pavement materials and layers

under different loading and environmental conditions. These methods provide resilient modulus factor for better understanding the characterization and permanent deformation used to find out rutting in the pavement layers.

Rutting, generally seen as a groove or despondency on the surface of flexible pavements. It also provides steering difficulties for drivers. To overcome the problems due to rutting, we must understand the elasto-plastic performance of a granular material under different loading conditions. Permanent strain and elastic strain of granular materials are illustrated in Figure.1. This paper summarizes and discusses the impact of individual factors on permanent deformation of granular material and constitutive models.

Factors affecting permanent strain

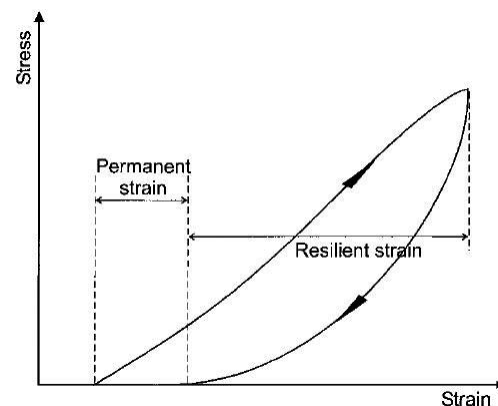


Figure 1: Strains in granular materials during one cycle of load application

Effect of stress: Stress plays a vital role in the accumulation of permanent deformation of the granular material.

Morgan (1966), Conducted repeated triaxial load test on granular material and observed that with an increase in deviator stress, accumulation of permanent strain decreases and for confining pressure it was seen vice versa. Lashine *et al.*, (1971) studied behavior of crushed stone under repeated load in drained condition and observed that permanent strain interrelated to the ratio of deviator stress to confining stress. Similar results observed by

Raymond and Williams (1978), Pappin (1979), Thom (1988) characterized permanent deformation for static shear test and stated that static failure line is considered as a boundary for permanent strain under repeated loading. Lekarp and Dawson (1998) argued that as the accumulation of permanent strain was not a sudden process, it is not necessary to consider static failure stage in finding the permanent deformation of the granular material.

^[4] studied the behavior of the geo-textile reinforced granular material and found that geo-textile reinforcement does not show a significant effect in the decrement of permanent deformation above 200kpa stress level. ^[14] initiated the study of permanent deformation behaviour of stabilized silty sand with fly ash and fiber. They reported that nearly 21% decrement in permanent strain with silty soil+30% flyash stabilized with coir fiber whereas 18% percentage decrement observed in permanent strain when stabilized with synthetic fiber. They also reported that accumulation of plastic strain of soil (both stabilized and un established soil is directly proportional to deviator stress level and inversely proportional to confining pressure.

Effect of number of load applications: The accumulation of permanent strain is not a sudden process. Each increment of stress in repeated load triaxial test (R.L.T.T) contribute the considerable amount of permanent deformation, so the number of load cycles are to be taken into account in finding permanent deformation.

^[16] observed permanent deformation behavior of the granular material under repeated triaxial test and found that it was increased even after applying two million load cycles. Barksdale (1972) correlated the permanent deformation with log number of repetitions,

and his studies show that there was a sudden increase in permanent deformation at a higher number of load repetitions. Yang and Huang (2008) studied the long-term behavior of cohesive subgrade and observed that accumulation of permanent deformation was same from 10,000 cycles to 1,00,000 cycles. Similar behavior was observed by Farsakh *et al.*, (2012) for a stabilized granular base with geogrid.

^[14] studied the behavior of reinforced silty sand with fibers and reported that at 100 repetitions fiber reinforcement decreases permanent strain by only 1.35% whereas for 10,000 cycles it was 21%. Anupam *et al.*, (2014) conducted a series of triaxial tests to observe the accumulation of plastic strain of unreinforced and fly ash-rice husk ash stabilized low plasticity clayey soil. They found that 64% reduction in plastic strain when soil stabilized with fly ash whereas 67% reduction observed when soil stabilized with rice husk ash. One more interesting observation observed that up to 1000 load cycles the rate of accumulation of permanent strain is following the same trend for both unstabilized and stabilized low plasticity clayey soil.

Effect of moisture content: The stiffness of granular materials depends on the amount of water present in it. Up to ample amount of water, stiffness increases then decrease. According to Lekarp and Dawson *et al.*, (1998) pore pressure increases and even permanent strain also increases due to the availability of free moisture in the pavement. Similar results were obtained by Saevarsdottir (2013), who studied pavement materials using an A.P.T track

Haynes and Yoder observed 100% more permanent strain when a degree of saturation increased from 60% to 80%. Lin also observed similar behavior for silty subgrade soil and stated that 5-20% increment in optimum moisture results in 300% increment in permanent strain. Barksdale (1972) studied the permanent strain behavior of base course material and came up with the result that 68% of permanent strain was observed for the soaked condition when compared to the partially saturated condition. Similar results were observed by Aiban *et al.* (2006)^[4], who studied the permanent strain behavior of geotextile and cement stabilized subgrade and observed that geotextile stabilized subgrade showed higher loading capacity under soaked condition compared to unsoaked condition. Thom and Brown considered the effect of pore pressure and stated that permanent strain is not only due to the increase in pore pressure but also due to lubricant effect.

Abu-Farsakh considered the effect of reinforcement on resilient and permanent deformation of base materials and observed that the effect of geogrid at optimum moisture stage is more when compared to dry of optimum and wet of optimum. Abu-Farsakh et al., (2012) observed that OMC+2.5% stage untreated granular material show less permanent deformation than geogrid reinforced granular base materials at 100 load cycles. The reason is that sample compacted wet of optimum needs more load cycles to interlock due to dispersed fabric structure. Murab et al. (2014) investigated the effect of cement stabilization on the deformation behaviour of weak subgrade soils and observed that stabilization more effective when soil compacted at wet of optimum condition than optimum moisture condition. They concluded that effect of moisture and deviator stress levels are driven forces for the accumulation of plastic strain.

Effect of density: Effect of density in the granular material is predominantly expressed in terms of compaction effort. In general, the rate of compaction is inversely proportional to permanent strain. Barksdale tested several base course material and 185% increment in permanent strain is observed between 95% and 100% compaction effort. Allen conducted several repeated load tri-axial tests for granular base material and crushed limestone and observed 80% reduction in strain for granular base material and 22% reduction for crushed limestone when the samples were compacted using modified proctor density instead of standard proctor density. It was supported by the Holubec and explained that rounder particles are less pounced than angular particles because of initial higher relative density.

Khedr observed that base and sub-base material mainly consists of crushed rock having same grain size because of which increase of permanent deformation resistance increased with compaction effort. Aiban et al. (2006)^[4] observed that as the density increases the geotextile effect on load carrying capacity decreases. Lin et al. observed 15% decrement in permanent deformation for silt subgrade when density increases from 91% to 95%. Bilodeau et al. (2008) found 41% less permanent deformation for aggregates when the compaction effort changed from 92% to 100%. Wayne studied the behavior of geo-grid stabilized unbound aggregates and stated that geo-grid reinforcement was effective in the decrement of permanent strain even when the lower layers of geogrid are compacted with less density compared to top layers of geogrid.

Effect of fines content: Barksdale^[7] observed the effect of fines content on the granular material and found that with an increase in fines content there was a decrease in permanent deformation resistance. According to Mishra if the fines having plasticity index more than ten, it shows a drastic effect on permanent deformation of the unbound granular material. This was supported by the Cerni et al. (2012), who investigated on unbound granular material with calcareous fines (non-plastic) and silty clay fines under similar stress and moisture and found that calcareous fines have less permanent strain compare to silty clay fines. Mishra *et al.*, observed that 8% fines are limiting value for crushed aggregates whereas 4% fines are limiting for uncrushed gravel and stated that fines effect is more pronounced in permanent deformation compared to the resilient modulus. Soliman and Shalaby (2015) observed that 9% fines are optimum content for gravel material whereas 4.5% for limestone.

Effect of grading and aggregate type: ^[16] observed a decrement in permanent deformation when the relative density is increased by grading under similar compaction effort.

Allen observed plastic strain accumulation for rounded particles is high compared to angular particles (crushed stone) with similar density and surface characteristics due to better interlocking in angular particles. Barksdale^[7] observed that blade shape crushed aggregates are more pronounced to permanent strain accumulation compared to other shapes of crushed aggregates. Rao. C et al. (2002) believed that crushed particles exhibit higher resistance to accumulation of permanent strain compared to uncrushed particles due to the load distribution capacity.

Effect of principal stress reorientation: Principle stress reorientation plays a predominant role in soils stiffness. The concept of reorientation principle is difficult to understand as the lab behavior is not simulating the field condition. Youd (1972) observed that when ever a rotation in principle stress axes occur, there was an increase in density for sands in a shear box. Ansell and Brown (1978) studied behavior of crushed limestone and stated that density is directly associated with the amount of observed cyclic shear. Chan (1990) reported that lime stone shows lesser resistance to permanent strain compared to no shear stress condition when shear stress is used in cyclic tests. From the results, we can observe that bi-directional shear stress pronounce lesser resistance to the accumulation of permanent strain compared to unidirectional shear stress.

Effect of stress history: For granular materials stress history is directly associated with the accumulation of permanent strain. Brown and Hyde observed that immediate application of higher stress pronounced more plastic strain compared to the successive application of stresses due to which materials get stiffer for each load application up to a limited number of load cycles. CEN 2004a introduced multi-stage repeated load triaxial test (M.S.R.L.T) procedure to determine the accumulation of permanent strain in the granular material. M.S.R.L.T test procedure is applied on a single specimen in several stress paths and the test results can be related to field situation due to the inclusion of stress history. Rahman and Erlingsson, (2015) studied the behavior of accumulation of strain using M.S.R.L.T test procedure and revised VTT model developed by Korkiala-Tanttu according to M.S.R.L.T Procedure.

Modelling permanent strain with respect to number of load cycles

Lentz and Baladi conducted a repetitive triaxial test on the sand. Based on the observations, he proposed a model to find out the permanent deformations with a number of load cycles and the difference between principle stresses and co-relate with the static triaxial test results.

$$\epsilon_{1,p} = \epsilon_{0,95s} \ln(1 - q/s) - 0.15 + \ln(N) \left\{ \frac{a(q/s)}{1 - b(q/s)} \right\}$$

Barksdale^[7] conducted several cyclic tri axial tests on base course material to find the relation between the number of load applications and permanent deformation and proposed a relation with respect to the log-number of repetitions.

$$\epsilon_{1,p} = a + \text{blog}(N)$$

Sweere (1990) performed a large number of cyclic triaxial tests on granular base materials using 10,00,000 load repetitions. He didn't agree on regression equation which was proposed by Barksdale^[7] and proposed another equation which is in log-log form.

$$\epsilon_{1,p} = a N^b$$

Khedr(1985) observed permanent strain accumulation of crushed limestone by using cyclic triaxial test and proposed an equation using a number of load cycles under variable confining pressure (VCP).

$$\frac{\epsilon_{1,p}}{N} = A_1 N^{-b}$$

Paute et al. (1988) observed continuous increment in permanent accumulated strain towards asymptotic value. He proposed an equation without considering first 100 load cycles.

$$\epsilon_{1,p}^* = \frac{A_4 \sqrt{N}}{\sqrt{N} + D_4}$$

In the separate study paute et al. (1996) expressed an equation regarding permanent strain with respect to first 100 load repetitions.

$$\epsilon = A * \left(1 - \left(\frac{N}{100} \right)^{-b} \right)$$

According to Lekarp and Dawson (1998), this model is not fit for higher stress conditions.

Modelling permanent strain with respect to a stress condition

Lashine^[26] carried cyclic triaxial test at 20,000 load cycles with different stress levels and proposed below model.

$$\epsilon_{1,p} = 0.9 \frac{q}{\sigma_3}$$

Pappin observed plastic strain behavior of lime stone in the cyclic triaxial test and proposed an equation for an accumulated permanent strain with respect to the length of stress path.

$$\epsilon_{s,p} = (fnN)L \left(\frac{q^0}{p^0} \right)_{\max}^{2.8}$$

Pappin stated that higher permanent strain occurs at static failure stage only.

Paute et al. (1996) proposed a constant value for permanent strain and it changes with maximum shear stress ratio.

$$A = \frac{\frac{q}{(p + p^*)}}{b \left(m - \frac{q}{(p + p^*)} \right)}$$

Theyse, H.L (2002) proposed an equation for permanent deformation with respect to the number of load cycles using heavy Vehicle simulator (HVS)

$$\epsilon_{1,p} (\%) = (m, N) + (A_2) (1 - e^{-B_2 N})$$

Tseng and Lytton (1981) correlated the resilient and permanent deformation with respect to the number of load cycles. This model is used for base, sub-base and sub grade also.

$$\epsilon_p = \beta_1 \left(\frac{\epsilon_0}{\epsilon_r} \right) \epsilon_v^{-(p/N)^B}$$

VTT model is used to determine the accumulated permanent deformation in the unbound granular material(UGM) this model is derived by Korkiala-Tanttu (2005)based on the mohr’s -Columb theory by considering the number of load cycles and stresses.

$$\epsilon_p(N) = BN^b \frac{R}{A - R};$$

$$R = \frac{q}{q_f} = \frac{\sigma_1 - \sigma_3}{q_0 + M_p}$$

$$M = 6. \sin \phi/3 - \sin \phi; q_0 = c, 6, \cos \phi/3 - \sin \phi$$

Modelling of permanent strain with respect to resilient modulus:

Veverka (1979) performed several cyclic triaxial tests on granular materials with respect to the number of repetitions to determine resilient deformation and plastic strain. He correlated resilient modulus and permanent deformation and proposed another model.

$$\epsilon_{1,p} = a\epsilon_r N_b$$

Yang et al. (2008) performed cyclic triaxial tests on cohesive soils and derived a model based on the influence of stresses and load cycles with different moisture conditions with respect to the resilient modulus.

$$\epsilon_p = A \times SL^p \times \left(\frac{M_r}{M_{r,i}} \right)^c \times N^D$$

Mohammad et al. (2006) studied both resilient and plastic deformation on both treated and non-treated base material and correlated with below equation.

$$M_r = 225\epsilon_p^{-0.25}$$

Models based on multi-stage R.LT test: Erlingsson, S., & Rahman, M. (2013) worked on multi-stage repeated load triaxial test (MS RLT) to study the long-term performance of granular material whereas Shu-Rong Yang et al. 2008 and VTT model according to MS RLT condition. These models are validated using different density, moisture conditions, stress levels and grading

Modified VTT model:

$$\epsilon_p(N) = (N - N_{i-1} + N_i^{eq})^{-b} \frac{R}{A - R}$$

Modified Tseng and lytton (1981):

$$\epsilon_p = \beta_1 \left(\frac{\epsilon_0}{\epsilon_r} \right) \epsilon^{- (p/N - N_{i-1} + N_i^{eq}) B} S_{\epsilon_v}$$

Characterization of permanent deformation behavior of granular materials by shake down theory:

For long periods under repeated loading, materials do not behave uniquely up to failure. They follow different stress paths even if all the other conditions are same but for the stress state. Even if a material seemed to have a propensity to attain equilibrium (constant rate of plastic strain accumulation) under a definite load after a certain number of cycles, altering the stress state might cause it to behave quite differently which means there is certain limit of stress for every material above which, after a number of cycles, the material becomes unstable. This limit in literature called the “shakedown limit” or the “critical stress level”. Pauteet al. (1996) observed that the rate of permanent strain accumulation with increasing load cycles decreases constantly to such an extent as to define a limit value for the permanent strain. On the other hand, [16] have reported continuously increasing permanent strain under repeated loading. Maree et al. (1982) also found that for high stress states permanent strain increased at a constant rate but between 5,000 and 10,000 load cycles an exponential increase in permanent strain occurred resulting in failure shortly after. Work by Kolisoja(1998) involving very large numbers of cycles, says that the development of permanent deformation may not be expressible as a simple function. That’s where Shakedown Theory comes in to play. Although Shakedown theory was developed by Melan(1936), it wasn’t until 1983 it was adopted to the pavement engineering field. Sharp and Booker (1984) made use of the shakedown theory for the first time and tried explaining the concept in relation to the response of granular materials under repeated loading. According to Werkmeister et al (2001), the permanent strain development with increasing number of load cycles can follow three different patterns depending on the stress level. (Figure.2)

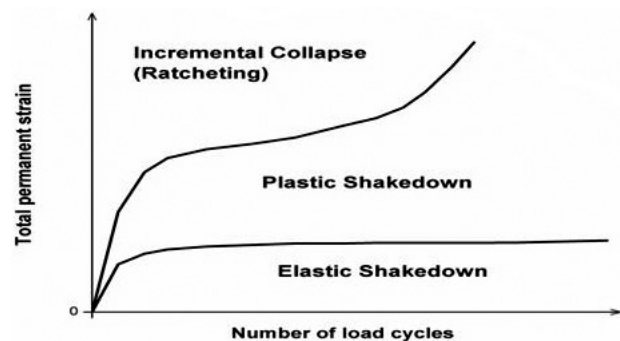


Figure 2: Permanent deformation behavior of UGM according to shakedown

Range A (Elastic shake down) : The permanent strain accumulation ceases after a certain number of loading cycles. The hysteresis loops will be very narrow but for the slight frictional losses. This type of behavior happens when low-stress level is applied to the material. Stress level is defined as the ration between the applied deviator stress and the deviator stress at failure determined by conducting Static Unconsolidated Undrained triaxial tests. This behavior pattern is attributed to the limited reorientation of the soil particles. This range is also called the plastic shakedown range. Range B (Plastic shake down): The plastic strain accumulation will follow an almost linear pattern with the increased load cycles. This pattern of response will be observed for stress levels greater than the ones for Range A. The plastic strain rate will be low and constant. The plastic strain rate can be defined as follows:

$$\text{Plastic strain rate} = \frac{\epsilon_{p,i+100} - \epsilon_{p,i}}{100}$$

Where $\epsilon_{p,i}$ The accumulated plastic strain is after i load cycles and $\epsilon_{p,i+100}$ Is the accumulated plastic strain at $i+100$ load cycles. This response is attributed to the particle contact attrition and is justified due to the slow accumulation of plastic strain. The hysteresis loops will be wider than in Range A due to frictional losses accompanied with ongoing damage. This stage is also called the plastic creep stage since there is a residual incremental plastic strain. Chen et al. (2013) studied the behavior of Geo-grid reinforced the granular material and found that due to Geo-grid Range B behavior occurrence can be slowdown. Range C (Incremental collapse): The plastic strain accumulation will be rapid and uncontrolled resulting in failure at higher stress levels. This type of behavior is defined as Range C. Hysteresis loops will be very wide indicating higher energy losses. It is not favorable to have this range of materials since sudden collapse might happen. Sudden lead to failure is attributed to particle damage and dilation caused by volume changes during repeated loading. This stage is remarked as the incremental collapse or ratcheting. Range A and Range B can be tolerated in a pavement subgrade but not the range C. The stress level beyond which the material goes unstable is called the Critical Stress level. Rahman and Erlingsson (2015) have studied the shakedown approach and they have selected some prediction models, calibrated and validated them. The models include the VTT model developed by Korkiala-

tanttu (2005) at the VTT Research Centre of Finland and Gidel Model. The VTT model related permanent strain to Stress ratio and a number of loading cycles. This model includes a material parameter and a stress state parameter. Erlingsson & Rahman (2013) conducted Multistage RLT tests instead of Single stage RLT tests to find out the critical stress levels. In the single stage RLT tests (SSRLT), a cyclic loading of constant amplitude is used. To study the influence of various stress levels on the material response, different specimens have to be used. On the other hand, a Multi-Stage RLT test can apply cyclic loading of different magnitudes on the same specimen. This arrangement simulates Field conditions better than SSRLT tests since repeated loadings of varying magnitudes are common in the pavements. Effect of stress history on the material behavior will also be considered in this approach. Research works were mainly done using SSRLT and therefore prediction models are based on the results from them. Rahman et al. (2014) have extended these prediction models for permanent deformation based on the results they obtained from MSRLT tests, by the application of the time hardening formulation.

NOTATIONS

The following symbols are used in this paper:

- $A, B, a, b, c, d, u, \beta$ = regression parameters (A is also limit value for maximum permanent axial strain);
- A_1 = material and stress-strain parameter given (function of stress ratio and resilient modulus);
- A_2-A_4, D_2-D_4 = parameters that are functions of stress ratio q/p ;
- C = apparent cohesion;
- e = base of the natural logarithm
- fnN = shape factor;
- Gp = shear modulus with respect to permanent deformation;
- h = repeated load hardening parameter (function of stress to strength ratio);
- K_p = bulk modulus with respect to permanent deformation;
- L = stress path length;
- m = slope of static failure line;
- M_r = Resilient modulus;
- $M_{r,i}$ = Resilient modulus determined by first 10 load cycles

N = number of load applications;

N_{i-1} = number of load applications end of the (i-1) stress path

p = mean normal stress;

p_{\max} = maximum applied hydrostatic stress;

p^0 = modified mean normal stress = $\sqrt{3} \cdot p$

p_0 = reference stress;

p^* = stress parameter defined by intersection of static failure line and p -axis in p - q space;

q = deviator stress;

q_{\max} = maximum applied deviator stress

q_f = deviator stress at failure

q^0 = modified deviator stress = $\sqrt{\frac{2}{3}} \cdot q$

R_f = ratio of measured strength to ultimate hyperbolic strength;

s = intercept static failure line

S = static strength;

ε_i = permanent strain for first load cycle;

ε_N = permanent strain for load cycle N ;

ε_r = resilient strain;

$\varepsilon_{s,p}$ = permanent shear strain for $N > 100$;

$\varepsilon_{v,p}$ = permanent volumetric strain for $N > 100$;

$\varepsilon_{1,p}$ = accumulated permanent strain after N load repetitions;

$\varepsilon_{1,p}^*$ = additional permanent axial strain after first 100 cycles;

$\varepsilon_{1,p}(N_{ref})$ = accumulated permanent axial strain after given number of cycles N_{ref} ($N_{ref} > 100$);

$\varepsilon_{0.95S}$ = static strain at 95% of static strength;

s_3 = confining pressure; and

ϕ = angle of internal friction

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: NIL

REFERENCES

- Abdelkrim, M., De Buhan, P., & Bonnet, G. (2006). A general method for calculating the traffic load-induced residual settlement of a platform, based on a structural analysis approach. *Soils and Foundations*, 46(4), 401–414.
- Abu-Farsakh, M., Nazzal, M., & Mohammad, L. (2007). Effect of reinforcement on resilient and permanent deformations of base course material. *Transportation Research Record: Journal of the Transportation Research Board*, (2004), 120-131.
- Abu-farsakh, M., Souci, G., Voyiadjis, G. Z., & Chen, Q. (2012). Murab terial Using Repeated Load Triaxial Tests. *Journal of Materials in Civil Engineering*, 24(1), 72–83. [http://doi.org/10.1061/\(ASCE\)MT.1943-5533.0000349](http://doi.org/10.1061/(ASCE)MT.1943-5533.0000349).
- Aiban, S., Al-Ahmadi, H., Asi, I., Siddique, Z., & Al-Amoudi, O. S. B. (2006). Effect of geotextile and cement on the performance of sabkha subgrade. *Building and Environment*, 41(6), 807-820.
- Allen, J. (1973). “The effect of non-constant lateral pressures of the resilient response of granular materials,” *Ph.D. thesis, University of Illinois at Urbana-Champaign, Urbana, Ill.*
- Ansell, P., and Brown, S. F. (1978). “Cyclic simple shear apparatus for dry granular material”, *Geotech. Testing J.*, 1(2), 82–91.
- Barksdale, R. D. (1972). “Laboratory evaluation of rutting in base course materials.” *Proc., 3rd Int. Conf. on Struct.Des.of Asphalt Pavements*, 161–174.
- Bilodeau, J.-P., Dore, G., & Pierre, P. (2008). Gradation influence on frost susceptibility of base granular materials. *International Journal of Pavement Engineering*, 9(6), 397–411. <http://doi.org/10.1080/10298430802279819>
- Bilodeau, J. P., Dore, G., & Pierre, P. (2007). Erosion susceptibility of granular pavement materials. *International Journal of Pavement Engineering*, 8(1), 55-66.
- Bilodeau, J. P., Doré, G., & Schwarz, C. (2011). Effect of seasonal frost conditions on the permanent strain behaviour of compacted unbound granular materials used as base course. *International Journal of Pavement Engineering*, 12(5), 507-518.
- Brown, S. F., & Hyde, A. F. L. (1975). Significance of cyclic confining stress in repeated-load triaxial

- testing of granular material. *Transportation research record*, (537).
12. Cerni, G., Cardone, F., Virgili, A., & Camilli, S. (2012). Characterisation of permanent deformation behaviour of unbound granular materials under repeated triaxial loading. *Construction and Building Materials*, 28(1), 79-87.
 13. Chan, F. W. K. (1990). "Permanent deformation resistance of granular layers in pavements," *Ph.D. thesis, Dept. of Civ. Engrg., University of Nottingham, Nottingham, England*
 14. Chauhan, M. S., Mittal, S., & Mohanty, B. (2008). Performance evaluation of silty sand subgrade reinforced with fly ash and fiber. *Geotextiles and Geomembranes*, 26(5), 429–435. <http://doi.org/10.1016/j.geotexmem.2008.02.001>
 15. Chen, Q., Abu-farsakh, M., Asce, M., Voyiadjis, G. Z., & Souci, G. (2013). Shakedown Analysis of Geogrid-Reinforced Granular Base Material, 25(March), 337–346. [http://doi.org/10.1061/\(ASCE\)MT.1943-5533.0000601](http://doi.org/10.1061/(ASCE)MT.1943-5533.0000601).
 16. Dunlap, W. A. (1966). "Deformation characteristics of granular materials subjected to rapid repetitive loading," *PhD thesis, Texas A&M University, College Station, Tex.*
 17. Ekblad, J., & Isacsson, U. (2006). Influence of water on resilient properties of coarse granular materials. *Road materials and pavement design*, 7(3), 369-404.
 18. Erlingsson, S., & Rahman, M. (2013). Evaluation of permanent deformation characteristics of unbound granular materials by means of multistage repeated-load triaxial tests. *Transportation Research Record: Journal of the Transportation Research Board*, (2369), 11-19.
 19. Haynes, J. G., and Yoder, E. J. (1963). "Effects of repeated loading on gravel and crushed stone base course materials used in the AASHO road test." *Hwy. Res. Rec.* 3.
 20. Heath, A. C., Pestana, J. M., Harvey, J. T., and Bejerano, M. O. (2004). "Normalizing behavior of unsaturated granular pavement materials." *J. Geotech. Geoenviron. Eng.*, 130(9), 896–904.
 21. Holubec, I. (1969). "Cyclic creep of granular materials." *Rep. No. RR147, Department of Highways, Ontario, Canada*
 22. Khedr, S. (1985). "Deformation characteristics of granular base course in flexible pavement." *Transp. Res. Rec.* 1043, *Transportation Research Board, Washington, D.C.*, 131–138.
 23. Kolisoja, P. (1998). "Large scale dynamic triaxial tests." *III. Delprosjektrapport 20, Arbeidsfelleskapet KPG, Oslo, Norway.*
 24. Konrad, J.-M. (2008). Freezing-induced water migration in compacted base-course materials. *Canadian Geotechnical Journal*, 45(7), 895–909. <http://doi.org/10.1139/T08-024>
 25. Konrad, J.-M., & Lemieux, N. (2005). Influence of fines on frost heave characteristics of a well-graded base-course material. *Canadian Geotechnical Journal*, 42(2), 515–527. <http://doi.org/10.1139/t04-115>
 26. Lashine, A. K., Brown, S. F., and Pell, P. S. (1971). "Dynamic properties of soils." *Rep. No. 2, Submitted to Koninklijke/Shell Laboratorium, Dept. of Civ. Engrg., University of Nottingham, Nottingham, England.*

A Study on Data Mining towards Cloud Computing

Komuravelly Sudheer Kumar¹, J. Bhavana¹

¹Assistant Professor, Department of CSE, S R Engineering College, India

ABSTRACT

Data mining is considered as an imperative procedure as it is utilized for finding new, substantial, helpful and reasonable types of data. This paper portrays how data mining is utilized in cloud computing. A hazardous growth of personal and organizational data through different sources like Smart phones , informal communities, sensors, client produced content have raised a few issues regarding data stockpiling on cloud. This blast of crude data and reliance on data administrations has seen a fourfold growth later on time of Internet because of capacity proliferation of data escalated administrations and the advanced. Anyway such foundations are confronting a few research difficulties to be tended to so as to conquer restrictions identified with issues like stockpiling access, versatility, cost, vitality, security, interoperability, proficiency, and so forth. The real issue is settling merchant secure and data.

Keywords: *Data mining, Cloud Computing, Multi-Cloud*

INTRODUCTION

Data mining is the errand of finding fascinating examples from a lot of data, where the data can be put away in databases, data stockrooms or other data storehouses. Consequently, in this exploration an exertion is made to plan an effective Multi-Cloud structure which performs security protected data dissemination and enhances data accessibility. This structure ideally uses the storage room by lessening numerous duplicates of data being put away in cloud^[1]. This data is anchored amid calculation as Hybrid Multi-Cloud framework performs handling of data in-preface by recovering the data put away on various Cloud Service Providers (CSP's). Additionally mCloudmSLA structure is actualized as pluggable module into controller or intermediary server which produces ace Service Level Agreement (mSLA) for capacity and recovery of various kinds of data like chronicle, restorative records and for virtual figuring. In the first phase of research the enterprise data is moved to the Multi-Cloud environment to enhance the security to resolve vendor lock-in and improve data availability as the prime focus. Numerous business endeavors are relocating towards Multi-Cloud to store the venture data.

Aspects regarding Cloud Computing: The late 1960s were hopeful days for innovation progressions, reflected headily in the arrival of Stanley Kubrick's notable 2001: A Space Odyssey and its scandalously

keen PC H.A.L. 9000. Around this time the idea of an intergalactic computing network was first mooted by a specific J.C.R. Licklider, who headed up the Information Processing Techniques Office at the Pentagon. Accused of putting the US on the front foot, innovatively, against the Soviets, ARPA was a hotbed of ground breaking that pushed innovation improvements well past their current points of confinement. Inside this unique situation, Licklider imagined a worldwide network that associated governments, organizations, partnerships and people. He predicted a future in which projects and data could be gotten to from anyplace. Sounds somewhat like cloud computing, doesn't it? This vision really propelled the advancement of ARPANET, an early bundle exchanging network, and the first to execute the convention suite TCP/IP. To put it plainly, this was the specialized establishment of the web as we presently know it. It additionally established the framework for matrix computing, an early precursor of cloud, which connected together topographically scattered PCs to make an approximately coupled network. Thusly this prompted the improvement of utility computing which is nearer to what Licklider initially imagined^[12]. It's likewise nearer to what we consider as the cloud today, with a service supplier owning, working and dealing with the computing foundation and assets, which are made accessible to clients on an on-request, pay-as-you-go premise.

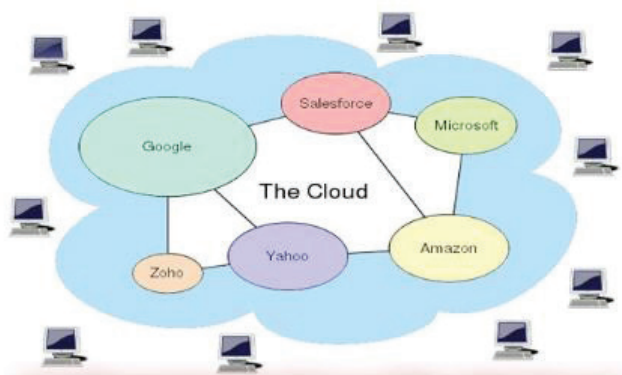


Figure 1: Computing Paradigm Shift

Data mining in Cloud Computing: Data mining involves finding the info, like novels, and useful patterns and applying few algorithms in order to fetch the required data^[13].

From virtualization to cloud: Dovetailing with this is the improvement of virtualization which, alongside expanded data transmission, has been a noteworthy main impetus for cloud computing. Honestly, virtualization finally provoked the ascent of exercises like Salesforce.com in 1999, which led passing on embraced applications by methods for a clear site.

These services firm made ready for an extensive variety of programming firms to convey applications over the web. In any case, the development of Amazon Web Services in 2002 extremely set the cloud ball moving, with its cloud-based services including capacity and figure. The dispatch of Amazon’s Elastic Compute cloud quite a long while later was the principal generally open cloud computing framework service, enabling little organizations to lease PCs to run their own particular PC applications on. It was a divine being send for some private ventures and new companies helping them shun expensive in-house frameworks and get the opportunity to advertise rapidly.

Advantages of Data Mining in Cloud Computing: Data mining in the cloud computing condition can be considered as the eventual fate of data mining in light of the benefits of cloud computing worldview^[14]. For example, the staggering expense of some product as-a-service contributions has gotten a few undertakings out, while the danger of secure with framework as-a-service suppliers is likewise a worry for a few. As the primary flush of cloud computing disperses, endeavors are ending up more wary about being integrated with a

service. The scene is currently set for the eventual fate of cloud, with an emphasis on half and half and multi-cloud arrangements. In five years, phrasing like cross breed IT, multi cloud and oversight services, will a relic of times gone by. It will be guaranteed, and there won’t simply be one cloud arrangement, or one data arrangement, it will be about how clouds interface and about boosting how networks are utilized. Half and half arrangements should imply that remaining burdens.

Benefits of Cloud

There are numerous advantages of clouds. Some of them are recorded underneath.

Lessened Cost: There are different inspirations to property Cloud development with cut down costs. The charging model is pay as indicated by use; the establishment isn’t obtained along these lines cutting down upkeep. Starting expense and rehashing costs are much lower than standard computing.

Increased Storage: With the tremendous Infrastructure that is offered by Cloud providers today, accumulating and upkeep of broad volumes of information is a reality. Sudden outstanding job that needs to be done spikes are moreover supervised enough and viably, since the cloud can scale continuously.

Flexibility: This is a basic trademark. With endeavors altering, substantially more rapidly, to changing business conditions, speed to pass on is fundamental. Cloud computing gives inventive approaches to data mining algorithms. Joining data mining algorithms with cloud computing innovation will turn into the future research drift. As aftereffect of service decent variety in cloud suppliers, choosing cloud suppliers in view of client prerequisite, master rating and past execution of service suppliers, with reasonable service set to shape Multi-Cloud is testing assignment. Additionally, QoS parameters specified in client prerequisite can be clashing or varying level of significance among different cloud suppliers or utilizing diverse strategies for computing characteristics. In view of service decent variety in cloud suppliers, choosing cloud suppliers in light of every one of the three parameters said above is a testing undertaking for the development of Multi-Cloud condition.

Cloud Computing Challenges: In spite of its developing impact, concerns with respect to cloud computing still remain. As we would like to think, the advantages exceed

the downsides and the model merits investigating. Some normal difficulties are:

Data Protection: Data Security is an essential component that warrants examination. Ventures are hesitant to purchase an affirmation of business data security from sellers. They fear losing data to rivalry and the data classification of customers. In numerous occasions, the genuine stockpiling area isn't uncovered, including onto the security worries of ventures. In the current models, firewalls crosswise over data focuses (possessed by endeavors) ensure this delicate data. In the cloud display, Service suppliers are in charge of keeping up data security and endeavors would need to depend on them.

Data Recovery and Availability: All business applications have Service level understandings that are stringently taken after. Operational groups assume a key job in administration of service level understandings and runtime administration of uses. Underway situations, operational groups bolster

Management Capabilities: In spite of there being multiple cloud suppliers, the administration of stage and framework is still in its early stages.

CONCLUSION

In Cloud computing, the data is being moved starting with one server then onto the next server in a distributed exchange. Data mining advancements gave through Cloud Computing is a totally fundamental element for the present organizations to make down to earth, information driven choices as it causes them have future patterns and practices anticipated. Data mining innovations gave through Cloud computing is a completely fundamental trademark for the present organizations to make proactive, learning driven choices, as it encourages them have future patterns and practices anticipated.

This paper gives a diagram of the need and utility of data mining in cloud computing. As the requirement for data mining devices is developing each day, the capacity of incorporating them in cloud computing turns out to be increasingly stringent. Data mining based on Cloud computing is an imperative trademark for the present foundation to improve effective and learning driven choices. This paper gives audit of data mining ideas in

cloud computing and diverse kinds of algorithms that can be utilized for sharing of assets utilizing Data mining and Cloud computing.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: NIL

REFERENCES

1. Peter Mell, and Timothy Grance, "The NIST Definition of Cloud Computing", *The National Institute of Standards and Technology, USA*, (2011), Link: <http://csrc.nist.gov/productions/nistpubs/800-145/SP800-145.pdf>.
2. IT Strategists, "Top Cloud Computing Companies and Key Features", Link: <http://www.itstrategists.com/Top-Cloud-Computing-Companies.aspx>.
3. Merriam-Webster Dictionary, "Meaning of data mining", Link: <http://www.merriam-webster.com/word-reference/data%20mining>.
4. Anuja R. Yeole, Poonam Borkar, Survey Paper on Data Mining in Cloud Computing, *International Journal of Science and Research* (2013): 4.438
5. Mahendiran, N. Saravanan, N. Venkata Subramanian and N. Sairam Implementation of K-Means Clustering in Cloud Computing Environment, *Research Journal of Applied Sciences, Engineering and Technology* 4(10): 1391-1394, (2012)
6. CH.Sekhar. S Reshma Anjum "Cloud Data Mining based on Association Rule" *International Journal of Computer Science and Information Technologies*, 5(2), (2014), 2091-2094
7. Kamala, "A Study On Integrated Approach Of Data Mining And Cloud Mining", *International Journal of Advances in Computer Science and Cloud Computing*, 1(2), 35-38 ,(2013).
8. Vanishree K Prakruthi S N Pratiba D " A Study on Association Rules and Clustering Methods" *International Journal of Computer Science and Information Technologies*, 5(1), (2014), 233-235.
9. Fei Long, Research on algorithms of data mining under cloud computing condition *Journal*

- of Chemical and Pharmaceutical Research, (2014),6(7):1152-1157.
10. Chetna Kaushal, Aashima Arya, Shikha Pathania “Coordination of Data Mining in Cloud Computing” *Advances in Computer Science and Information Technology*, 2(7), (2015), 48 – 52.
 11. Rammohan Burra,N Vijay Kumar,Dr R Vijayaprakash “Public Auditing for Group User Revocation in Cloud Data” *International Journal of Research*, 4(5), (2017), 1240-1244.
 12. Sallauddin Mohmmad, G. Sunil “A Survey On New Approaches Of Internet Of Things Data Mining” *International Journal Of Advanced Research In Computer Science*, 8(8), (2017), 666-673
 13. Praveen Pappula, Rama B “A Parallel Study on Data Mining Techniques for Clustering to use Weather Dataset “ *International Journal of Innovative Research in Computer and Communication Engineering*, 4(4), (2016), ,7774-7779
 14. Syeda Khaja Momina Banu, P.Praveen “A Novel Approach For K-Nn On Unsupervised Distance-Based Outlier Detection” *International Journal For Technological Research In Engineering*, 4(3), (2016), 505-508

Exponential Spline Answer for Boundary Value Problems Employing an Unsure Parameter

C. Balarama Krishna¹

¹Assistant Professor, Department of Humanities and Sciences, S R Engineering College, Warangal

ABSTRACT

The suggested procedure employs period investigation basic principle to handle all the uncertain parameter as well as also the montecarlo Simulations (MCS) have been utilized to confirm that the clear answer and also the truth of the suggested procedure. Additional sensitivity analysis was conducted with different procedures to estimate just how far the remedy is more painful and sensitive for the fluctuations of this perturbation parameter. Numerical results are supplied to reveal that the applicability and efficacy of this suggested system, and it will be ϵ -uniform convergence of virtually instant order.

Keywords: Singular Perturbation Problem, Exponential Spline, Interval Analysis, Monte Carlo Simulations

INTRODUCTION

Various apps in engineering and science believe these sorts of issues that clarify complicated chemical and physical models like heat transport issues, navier stokes stream together with big Reynolds numbers, chemical reactor principle, convection-diffusion procedures, geophysics, aero-dynamics, reaction-diffusion procedures and quantum mechanics and optimum management, etc.,. Its alternative demonstrates 2 layers in both end points of this domainname. The character of this two-parameter dilemma was asymptotically analyzed. It had been unearthed that layer-adapted meshes are essential to acquire a convergent technique however smaller the perturbation parameter ϵ [3] for a lot more information.

Dag and Sahin offered an numerical method of singularly perturbed boundary value issues, making use of finite element system [1]. Their first collocation system was implemented with quadratic and cubic Bspline base works across the geometrically rated net of this domainname. Back in 2010, Rashidina and also Mohammadi [1-2] believed the self-adjoint singularly perturbed TwoPoint border value issues. (2007) [1,3] formulated quintic non- polynomial spline means of its numerical method of fourth sequence Two Point border value issues. At 2006 [14] to get a perturbed normal differential equation using just two modest parameters involving the convection and also diffusion conditions. They utilized Bspline collocation system on piecewise-

uniform Shishkin net, that causes a tridiagonal linear process. Their procedure had been proven to own a uniform convergence of next purchase.

For an even longer moderate investigation of this procedure reply, doubt ought to really be engaged. After the specific significance of some volume is as yet not known, its own approximation and corresponding level of doubt might be hauled through a period, which untimates a wide selection of potential values anticipated to comprise, to start with indicated by numerous mathematicians for bounding round off mistakes, and the period investigation is totally developed from Moore. We will utilize MCS being a tool that is supporting for your own suggested procedure. MCS could be the easiest way of handling any randomness in a method. The arbitrary parameter, a exceptional remedy is characterized by adhering to the p-terministic solver for every one of those realizations. Back in 1967, Stein generalized his version that integrates stochastic consequences as a result of circadian excitations to deal with a supply of post-synaptic possible amplitudes and utilised that the montecarlo procedure for approximating the clear answer. David Edwards FDM way of a special singularly perturbed boundary value issue along with this particular method has been founded on montecarlo techniques.

The principal contribution of the paper would be to build up into a fresh spline system predicated on the Shishkin mesh discretization for acquiring an approximation to your solution of both two-layer border

value issues. Whilst the perturbation parameter isn't deterministic, and so the period investigation will be thought to gauge exactly the solution assortment. The identification of this manufactured solver is going to be accomplished by assessing the same and the approximate remedies of this suggested procedure along with also the MCS results. Even the convergence investigation additionally has been shown invisibly and demonstrates the offered system is all but second-order.

INTERVAL AND SENSITIVITY ANALYSIS

Since doubt is going to be contemplated, the period investigation may function as descriptive actions of doubt in qualitative worth. Thus, the perturbation parameter isn't deterministic, the clear answer must be understood to be an array on the basis of the period of this parameter. Sensitivity steps might be ran with different methods as an example one at a time Sensitivity steps (\pm SD), the Sensitivity Index (SI), the significance Index (II), Differential Sensitivity examination (PD), etc.. We anticipated that the significance steps Employing These approaches One at a Time Sensitivity Steps (\pm SD), "the Sensitivity Indicator, along with also the Differential Sensitivity Examination. One at a time Sensitivity steps (\pm SD) is regarded as most straightforward--yet successful --means of conducting sensitivity analysis, that quotes that the variant of this clear answer whilst the perturbation parameter is raised by means of a variable of its normal deviation or at different words per proportion of its mean worth.

The Sensitivity Index (SI) is yet still another easy way of estimating the sensitivity step will be to compute the comparative solution gap when changing one enter parameter from its minimal value to its highest possible worth, which offers a fantastic indicator of parameter and version variability. The SI is calculated with and maximum answer values, respectively, leading in changing the perturbation parameter within its whole scope.

Differential Sensitivity examination (PD) procedure believes all of random parameters add up with their mean values along with partial distinction of this machine with regard for the arbitrary parameters needs to really be accomplished. The significance coefficient for a Certain parameter -- even perturbation parameter could be quantified in the tight derivative connectiony.

CONCLUSION

A numerical method based on exponential spline using Shishkin mesh discretization is united together with interval analysis viewpoint to evaluate the range of the perfect solution is for its perturbed Two Point border value problems with unclear parameter. The numerical results demonstrate that the present method approximates the alternative very well compared with all the precise option. Therefore, the planned method is almost second-order uniformly convergent with respect for the perturbation parameter. MCS have been used to show the validation and the accuracy of this suggested method. Preliminary investigation Was conducted with distinct Strategies and It's discovered that the solution is not sensitive for this perturbation parameter.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: NIL

REFERENCES

1. Zahra, W.K. and Van Daele, M. (2015) Uniformly Convergent Discrete Spline Scheme on a Shishkin Mesh for the Singular Perturbation Boundary Value Problem. *Proceedings of the 15th International Conference on Mathematical Methods in Science and Engineering, CMMSE (2015)*, 6-10, (2015), 1261-1268.
2. O'Malley, R.E. (1967) Singular Perturbations of Boundary Value Problems for Linear Ordinary Differential Equations Involving Two Parameters. *Journal of Mathematical Analysis and Applications*, 19, 291-308.
3. Zahra, W.K. and Van Daele, M. (2018) Discrete Spline Solution of Singularly Perturbed Problem with Two Small Parameters on a Shishkin-Type Mesh. *Computational Mathematics and Modeling Journal*.
4. Kumar, D., Yadaw, A.S. and Kadalbajoo, M.K. (2013) A Parameter-Uniform Method for Two Parameters Singularly Perturbed Boundary Value Problems via Asymptotic Expansion. *Applied Mathematics & Information Sciences*, 7, 1525-1532. <https://doi.org/10.12785/amis/070436>

5. Ramadan, M.A., Lashien, I.F. and Zahra, W.K. (2007) The Numerical Solution of Singularly Perturbed Boundary Value Problems Using Nonpolynomial Spline. *International Journal of Pure and Applied Mathematics*, 41, 883-896.
6. Zahra, W.K., El-Azab, M.S. and El Mhlawy, A.M. (2014) Spline Difference Scheme for Two-Parameter Singularly Perturbed Partial Differential Equations. *Journal of Applied Mathematics & Informatics*, 32, 185-201. <https://doi.org/10.14317/jami.2014.185>
7. Natesan, S., Gracia, J.L. and Clavero, C. (2004) Singularly Perturbed Boundary-Value Problems with Two Small Parameters: A Defect Correction Approach. *Proceedings of the International Conference on Boundary and Interior Layers, Computational and Asymptotic Methods, BAIL*, Bail, 1-6. <https://www.springer.com/book/9783319257259>
8. Kumar, M. and Rao, S.C.S. (2010) High Order Parameter-Robust Numerical Method for Singularly Perturbed Reaction-Diffusion Problems. *Applied Mathematics and Computation*, 216,1036-1046. <https://doi.org/10.1016/j.amc.2010.01.121>
9. Dag,I.andSahin,A.(2009)Numerical Solution of Singularly Perturbed Problems. *The International Journal of Non linear Science*, 8, 32-39. <http://www.internonlinearscience.org/>
10. Rashidinia, J. and Mohammadi, R. (2010) Non-Polynomial Spline Approximations for the Solution of Singularly perturbed Boundary Value Problems. *TWMS Journal of Pure and Applied Mathematics*, 1, 236-251. <http://www.naturalspublishing.com/show.asp?JorID=53&pgid=0>
11. Ramadan, M.A., Lashien, I.F. and Zahra, W.K. (2009) Quintic Nonpolynomial Spline Solutions for Fourth Order Two-Point Boundary Value Problem. *Communications in Nonlinear Science and Numerical Simulation*, 14, 1105-1114.<https://doi.org/10.1016/j.cnsns.2007.12.008>
12. Gracia, J.L., O’Riordan, E. and Pickett, M.L. (2006) A Parameter Robust Second Order Numerical Method for a Singularly Perturbed Two-Parameter Problem. *Applied Numerical Mathematics*, 56, 962-980. <https://doi.org/10.1016/j.apnum.2005.08.002>
13. Kadalbajoo, M.K. and Yadaw, A.S. (2008) B-Spline Collocation Method for a Two-Parameter Singularly Perturbed Convection-Diffusion Boundary Value Problems. *Applied Mathematics and Computation*, 201, 504-513. <https://doi.org/10.1016/j.amc.2007.12.038>
14. Moore, R.E. (1966) *Interval Analysis*. Prentice-Hall, Englewood Cliff,NJ.
15. Le Maitre, O. and Knio, O.M. (2010) Spectral Methods for Uncertainty Quantification: With Applications to Computational Fluid Dynamics. *Springer Science & Business Media, NewYork*.

A Study on the Applications of IOT

Siripuri Kiran¹, Shoban Babu Sriramoju¹

¹Research Scholar, Kalinga University, India

ABSTRACT

We are planning to actualize these application for smart city implementation. We are utilizing movement sensor, relay,raspberry pi and IOT concept to build up this application. In this we are distinguishing the movement by utilizing movement sensor and if any movement isn't identified then electrical equipments(like light,fan) are power off and if any movement is recognized then naturally electrical equipments(like light,fan) are power on. It likewise watch the exercises of human like when any individual power on turns and when power off changes as for time by utilizing these data it play out the tasks. This concept can be utilized from a little organization to any big organization.

Keywords: IOT,android device,raspberry pi,sensors, relay.

INTRODUCTION

In change of wired and wireless technologies IOT concept is presented. IOT gets more consideration over recent years for improvement of any application. As per IOT implies that each protest or anything is associated and without human cooperation impart through the Internet^[1]. According to the IOT worldwide activity standard,in the global media transmission union,the IOT concept isn't restricted for physical items it likewise incorporates the virtual articles. It implies that to contrasted machine with machine technology should be possible with help of IOT concept.

Some of smart home application utilizes the concept of IOT. IOT based smart home incorporates an IOT Based Monitoring System utilizes the sensor part and correspondence part. The correspondence part incorporates blue-tooth and WIFI to associate with versatile devices,cloud server and articles^[4]. However, blue-tooth have just 10M territory for correspondence. In any case, IR^[5]can not transmit through dividers and any deterrent. So employments of IR is disadvantage of such application. We are utilizing IOT technology to defeat this downside.

The primary objective of IOT is to improve the nature of human life the IOT incorporates the smart homes,smart building, smart cars,etc in human life. We are developing an undertaking for smart city utilizing IOT based application. We are utilizing movement detector sensor that measure the natural information

an examine this information and give yield. Likewise it incorporates a raspberry pi and relay. Raspberry pi it is only a little processor which process the information for sensors and give the yield to relay. Relay is only an electrical circuit which deal with the power stream agreeing the information given by raspberry processor.

SYSTEM ARCHITECTURE

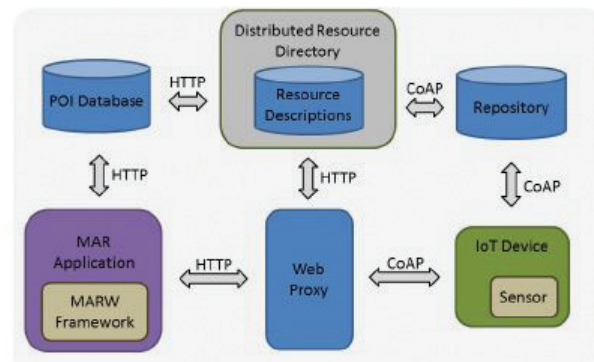


Figure 1: System Architecture

In these application the movement sensors are conveyed in a room or office. The movement sensors are use to distinguish the movement. At that point these sensors send the information to raspberry pi. Raspberry pi process the information as indicated by condition and send the suitable yield to relay. At that point relay take contribution from raspberry pi and perform legitimate activity.

IoT in Applications: Underneath the eyesight of this IoT, software might be totally automatic by minding themselves exposed to some different atmosphere. The

clever behaviour pushed from the machine might be actuated to cope with sudden conditions. Nevertheless, the purposes from the above mentioned domain names will deliver greater analytic consequences in the subsequent hindrances are precisely taken good care of. Apparently the significant players of all set while in the aforementioned application domain names are RFID and GPS. RFID is just one of one of the absolute most useful instruments to transmit and get info via wireless frequency without any cables and in the bottom charge. A obvious downside of the technology may be that the reader crash that might occur once the signs out of more subscribers float or quite a few labels exist in a little location. Even though a lot of systems utilize a anti- accident protocol to allow the tags to shoot turns into transmitting into an individual reader, then that this issue continues to be. Still another sturdy barricade is the fact that the worldwide specifications of RFID aren't yet recognized.

In terms of GPS, it's considered an superb device for information set from various surroundings where by users may generally understand the skies and can access near the items to be mapped. GPS calls for a obvious lineup - of-sight involving your recipient's antenna along with a few orbiting satellites. Whatever concealing the antenna out of the satellite has the potential to impair the sign to this level it gets overly hard to accomplish reliable placement. Obstructions such as trees, buildings, cross-ways, along with other obstacles which block sun may block the GPS signs at which in fact the possibility might be badly paid off (Guo et al.

Due to the fact the conversation of this IoT is no system available over the scope, thus a portable quad-core network that permits devices and people to seamlessly produce a system in parts with no preexisting communicating infrastructure looks like always a greater selection. The greater advantage the further software, and also the further system companies it supports, the more the more greater chances for busy attackers in addition to malicious or malicious nodes to build aggressive strikes. These sorts of assault may badly injury basic purposes of stability, like the ethics, ethics, and solitude of all their node. Right now, the stability aim on mobile networks are only able to be be done as a result of cryptographic mechanics. These mechanics are ordinarily more vulnerable to physical security dangers than mended wired systems. In any case, standardized

communication ports and also dispersed management brains in a business system stay cluttered (López et-al . ,” 2012).

CONCLUSION

In this paper we are utilizing IOT based home monitoring system with the assistance of android devices, relay, sensor, raspberry pi for future smart city application. By utilizing this application we can spare greatest measure of power. The principle focal point of IOT is to enhance nature of human life. By developing this application man endeavors are lessen and without human association machines are worked.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: NIL

REFERENCES

1. C. Perera, A. Zaslavsky, P. Dedicte, and D. Georgakopoulos, “Setting Aware Computing for The Internet of Things: A Survey”, *Communications Surveys and Tutorials, IEEE*, 16(1), 414-454, (2014)
2. K. Lee and H. Lee, “System based fire-location framework through controller region organize for keen home robotization,” *IEEE Trans., Consumer Electronics*, 50(4), 1093-1100, (2004)
3. D. Han and J. Lim. “Keen home vitality administration framework utilizing IEEE 802.15. 4 and zig honey bee,” *IEEE Trans., Shopper Electronics*, 56(3), 1403-1410, (2011)
4. Sunghoi Park, Byeongkwan Kang, Tacklim Lee, Sehyun Park “Using Tri-level Model of Context Making for Home Services”, (2015), *IEEE International Conference On Consumer electronic(ICCE)*.
5. Wei-Guang Teng,, Kuen-Min Lee, Ting-Wei Hou, An Intelligent Universal Remote Control System for Home Appliances, *IEEE TRANSACTIONS ON AUTOMATION SCIENCE AND ENGINEERING*.
6. M.Sheshikala, Mohd Sallauddin, “Survey on Multi Level Security for IoT Network in “ *in Journal of Advanced Research in Dynamical and Cont*, 10(10), 134- 146, (2018)

7. M.Sheshikala, Mohd Sallauddin, “Survey on Multi Level Security for IoT Network in cloud and Data Centers” in *Journal of Adv Research in Dynamical & Control Systems*, 10(10), 134-146, (2018)
8. D. Kothanda Raman, C. Chellappan , “Human Activity Detection System Using Internet Of “ in *International Journal on Computer Science and Engineering*, 9(11), 657 -665, (2017)
9. Ch.Sandeep, V.Thirupathi, “Internet Of Things Based Biometric Electronic Voting Machine “ in *International Journal of Research* , 4(10), 1245 - 1248, (2017)
10. Mohd Sallauddin, G.Sunil, Ranganath Kanakam , “A SURVEY ON NEW APPROACHES OF INTERNET OF THINGS DATA MINING “ in *International Journal of Advanced Research in Computer Science(IJARCS)*, 8(8), 666 - 673, (2017), DOI: <http://dx.doi.org/10>
11. Shoban Babu Sriramoju,Naveen Kumar Rangaraju,Dr .A. Govardhan, “An improvement to the Role of theWireless sensors in Internet of Things” in *International Journal of Pure and Applied Mathematics*, 118(24), (2018), url: <http://www.acadpubl.eu/hub/>

A Study on the Enhanced Approach of Data Mining Towards Providing Security for Cloud Computing

J. Bhavana¹, Komuravelly Sudheer Kumar¹

¹Assistant Professor, Department of CSE, S R Engineering College, India

ABSTRACT

As of late, a few governments have started to use cloud computing models, applications and stages for addressing the necessities of their constituents and conveying administrations. Security possesses the primary rank of hindrances that face cloud computing for administrative organizations and organizations. Cloud computing is encompassed by numerous dangers that may affect administrations and data bolstered by means of this innovation. Likewise, Cloud Computing is one of the promising innovation in which mainstream researchers has as of late experienced. Cloud computing is identified with other research territories, there is no prerequisite for frank enthusiasm for servers or programming licenses, while for the provider, the costs are cut down, since only a singular application ought to be encouraged and kept up. Today SaaS is offered by associations, for instance, Google, Sales drive, Microsoft, Zoho, et.

Keywords: *Cloud computing, Data mining, Cloud security issue*

INTRODUCTION

As per^[4], a cloud is a pool of virtualized assets over the Internet that takes after a compensation for every utilization show and can be progressively reconfigured to fulfill client demands by means of on-the-fly. Likewise, Cloud computing is known as a strategy for expanding the abilities or including limit in powerful way without putting resources into new preparing new staff, framework or authorizing new programming, appropriately it progresses in the direction of broadening the current capacities of Information Technology (IT)^[8]. aS gives principal stockpiling and computing capacities as regulated services over the system. Servers, stockpiling frameworks, organizing hardware, data center space thus around are pooled and made open to manage exceptional jobs that need to be done. The customer would routinely send his own item on the establishment. Some essential delineation is Amazon, GoGrid, 3 Tera, et cetera^[12].

LITERATURE REVIEW

These days, Small and Medium Business (SMB) associations have been comprehended that essentially by getting into the cloud computing, they can acquire quick access to best business applications or progressively fortify the assets of their framework, all at insignificant

expense.^[13]Adventures have been using database organization frameworks in their data center. At first, it was left to fashioners to present, regulate and use their choice of database precedent on the cloud, with the heaviness of all the database association errands being left to the architect. The upside of this is you pick your own specific database and have full control over how the data is regulated. In order to improve the weight on the customers of their cloud commitments, various PaaS traders have started offering database services on the cloud. All physical database association assignments, for instance, support, recovery, managing the logs, et cetera, are regulated by the cloud provider. The obligation with respect to predictable association of the database, including table tuning and request improvement, lies on the originator. An affiliation that allows database service needs to do these errands and offer a motivating force gave it is powerful.

Database service provider gives reliable frameworks to relationship to make, store, and access their databases. Customers wishing to get to data will now get to it using the gear and programming at the service provider as opposed to their own particular affiliation's computing establishment. The application would not be influenced by power outages in view of programming, gear and systems administration changes or frustrations at the

database service provider's site. This would help the issue of purchasing, introducing, keeping up and reviving the item and administrating the system. Instead of doing these, the affiliation will simply use the readied system kept up by the service provider for its database needs.

Database frameworks have wound up being wildly compelling in various cash related, business, and Internet applications. In any case, they have a couple of honest to goodness repressions, for instance,

Database systems are hard proportional.

Database systems are hard to arrange and keep up.

Diversification in accessible systems confuses determination.

Peak provisioning prompts unneeded expenses.

CLOUD COMPUTING AND MAP/REDUCE MODEL

Hadoop is an open source disseminated computing structure [6], which is utilized for dispersed preparing of extensive data sets and intended to fulfill groups scaled from a solitary server to a great many servers. Research in cloud data storage involves many inter-disciplinary fields. This chapter gives background information of these fields and reviews different techniques and architectures involved in achieving secured cloud data storage. The scope of discussion goes beyond traditional information storage to more advanced multi-cloud storage. The review presented in this chapter is limited to the scope of the thesis, and detailed study in other related areas, is available as follows: Survey of error correcting codes, Survey of various cloud security domains, Proof of Irretrievability (POR) and Proof of Possession (POP), Federated Cloud, Composite cloud, Various encryption algorithm and Various Multi Criteria Decision Making algorithms.

Digitization in every business has resulted into explosive rate of growth in data. This Big data is growing beyond our imagination owing to the paradigm shift in Technology

In this digital era, aside from overseeing HR of an organization, there is a need to oversee other unmistakable and immaterial assets. Most significant corporate resource is the data being generated through different gadgets. Compelling storage, access, security and administration of basic data is another test looked by IT

divisions. A typical way is given between storage gadgets and servers as Storage Area Networks (SANs) operate behind the servers not at all like record arranged Network Attached Storage (NAS) arrangements and server based (Direct Attached Storage) DAS arrangements SANs give both square level and document level access to the mutual data. This data is shared between work force and computing assets in SAN arrangements. This innovation utilizes fiber channel arrangement. As of late other new setups like Internet Small Computer System Interface (iSCSI) and Fiber Channel Over Ethernet (FCOE) are getting to be mainstream.

Data Storage is classified into three types like File Storage, Block Storage and Object Storage based on method of storing and accessing data. Since the dawn of the social media like Facebook, Twitter and WhatsApp most of the data is in digital form. This data in an unstructured format had issues of storing and retrieving the information. One of the methods is proposed to resolve these issues.

Encryption Techniques

As touchy data are outsourced to the cloud, these data must be encoded before they are outsourced into the cloud for the protection purpose. In the proposed framework the records are scrambled utilizing RSA encryption work by the executive before outsourcing them into the cloud.

RSA Encryption: RSA calculation is created by Ron Rivest, Adi Shamir and Len Adleman and it is the primary open key encryption calculation. RSA is a square figure in which the plain text and cipher text are numbers among 0 and n-1 for some n.

The accompanying condenses the RSA calculation. Choosing two prime numbers, p and q compute their item n, which is the modulus for encryption and unscrambling. Next, we require the amount $\phi(N)$, alluded to as the Euler totient of n, which is the quantity of positive numbers not as much as n and moderately prime to n. At that point select a whole number e that is moderately prime to $\phi(N)$. At last, compute d as multiplicative opposite of e, modulo $\phi(N)$. To encode a message M the sender gets open key of beneficiary $KU=\{e,N\}$ and processes: $C=Me \text{ mod } N$, where $0 \leq M < N$. To decode the ciphertext C the proprietor utilizes their private key $KR=\{d,p,q\}$ and registers: $M=Cd \text{ mod } N$.

Homomorphic Encryption: A list of catchphrases is developed utilizing record parser interface where the pointless words are disregarded and just the watchwords of the archive is recorded in the vector word file. This record in encoded utilizing homomorphic encryption and transferred to the cloud.

Give p and c a chance to mean the plain text and cipher text of the whole number, separately. Our encryption plan can be communicated as the accompanying detailing: $c=sn+2r+p$ where s signifies the mystery key, n means the different parameter, and r indicates the clamor to accomplish vicinity against savage power assaults. M is the plain text .general society key is $sn + r$.

Based on homomorphism property, the encryption plan can be depicted as four phases: KeyGen, Encrypt, Evaluate, and Decrypt.

Fig 1 demonstrates the holes among desires and saw benefits by cloud clients depends on our understanding [2-5, 7-14]. Additionally a hole between clients' desires and deliverable administrations has been seen. As we would like to think, a considerable lot of the potential customers know about this hole and therefore, they are looking out for the sidelines. Persuading these clients (customers) that the cloud will meet their desire will urge them to join the cloud computing. [2, 7, 8].

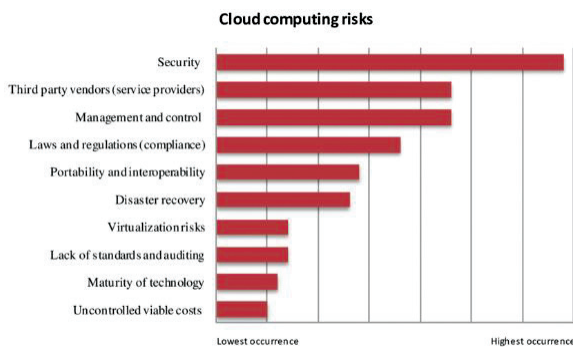


Figure 1: Cloud Computing Risks

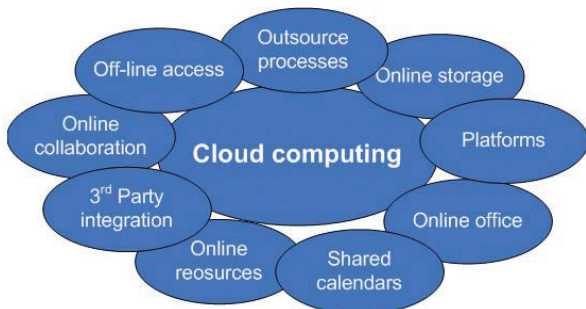


Figure 2: Understanding Cloud Computing

CONCLUSION

In this paper data security difficulties and arrangements are accommodated these difficulties with a specific end goal to conquer the hazard incorporated into cloud computing. The cost increment of any CSP can be an efficient disappointment, which can be foreseen early. The chairmen of the RACS will move the information from such a CSP much before the disappointment happens. It diverts the put ask for from the fizzled archive to the new store. It won't utilize the fizzled archive forget demands. It spares download and after that transfer of $1/m$ of the aggregate protest information. In another stage, we additionally tallied computational many-sided quality for our last determination.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: NIL

REFERENCES

- Schubert L, Jeffery K, et al. The future for distributed computing: *open doors for European distributed computing past (2010)*. Master Group report, (2010), <http://cordis.europa.eu/fp7/ict/ssai/docs/cloud-report-final.pdf>
- Khorshed MT, et al. Trust issues that make dangers for digital assaults in distributed computing. *In Proceedings of IEEE ICPADS*, , (2011).
- Armbrust M, et al. Over the mists: a Berkeley perspective of distributed computing. *EECS Department, University of California, Berkeley*, (2009).
- Brunette G, Mogull R. Security Guidance for basic zones of center in Cloud Computing V2. 1. *CSA (Cloud Security Alliance), USA*. <https://cloudsecurityalliance.org/csaguide.pdf>, 1, (2009).
- Catteddu D, Hogben G. Advantages, dangers and proposals for data security. *European Network and Information Security Agency (ENISA)*, (2009).
- Mell P, Grance T. The NIST meaning of distributed computing. *National Institute of Standards and Technology*, (2009), 53(6).
- Khorshed MT, et al. Monitoring insiders exercises in distributed computing utilizing standard based

- learning. In *Proceedings of IEEE TrustCom-11*, Changsha, China, (2011).
8. Khorshed MT, et al. A study on holes, danger remediation difficulties and a few contemplations for proactive assault recognition in distributed computing. *Future Generation Computer Systems*, (2012).
 9. NIST. (2011). *NIST Cloud Computing Program*. Accessible: <http://www.nist.gov/itl/cloud/>
 10. Ness G. (2009, 2011). *Major Barriers to Cloud Computing*. Accessible: <http://www.infra20.com/post.cfm/3-noteworthy-hindrances-to-distributed-computing>
 11. Vouk, M.A., “Designing of Telecommunications Software”, *High-Speed Diary of Computing and Information Technology*, 16(4), (2008), 235-246.
 12. Brodtkin J. Gartner: seven distributed computing security dangers, (2008). Accessible: <http://www.infoworld.com/d/security-focal/gartner-seven-distributed-computing-security-dangers-853> (2012).
 13. Archer J, Boehm A. Security direction for basic territories of center in distributed computing. *Cloud Security Alliance*, (2009). Accessible: <https://cloudsecurityalliance.org/direction/csaguide.v1.0.pdf>
 14. Archer J, et al. (2010, 2011). Top Threats to Cloud Computing, Version 1.0. Available : <http://www.cloud-securityalliance.org/topthreats/csathreats.v1.0.pdf>
 15. Monfared AT. Checking interruptions and security ruptures in very circulated cloud conditions. (2010).
 16. Cong Wang, Ning Cao, Jin Li, Kui Ren, Wenjing Lou, “Secure positioned catchphrase look over scrambled cloud information,” *IEEE 2010 30th International Conference*, (2010).
 17. S. Zerr, D. Olmedilla, W. Nejdl, and W. Siberski, “Zerber+r: Top-k Retrieval from a Confidential Index,” *Proc. twelfth Int’l Conf. Extending Database Technology: Advances in Database Technology (EDBT)*, (2009).
 18. P. Golle, J. Staddon, and B. Waters, “Secure Conjunctive Keyword Search over Encrypted Data”
 19. L. Ballard, S. Kamara, and F. Monrose, “Accomplishing Efficient Conjunctive Keyword Searches over Encrypted Data,
 20. Jin Li, Qian Wang, Cong Wang, Ning Cao, Kui Ren†, and Wenjing Lou “Fuzzy Keyword Search over Encrypted Data in Cloud Computing”.
 21. Ning Cao, Cong Wang, Li, Ming, Kui Ren, Wenjing Lou, “Protection saving multi-catchphrase positioned look over scrambled cloud information,” *INFOCOM, 2011 Proceedings IEEE*, (2011).
 22. H. Hu, J. Xu, C. Ren, and B. Choi, “Handling Private Queries over Untrusted Data Cloud through Privacy Homomorphism” *Proc. IEEE 27th Int’l Conf. Information Eng. (ICDE)*, (2011).
 23. Y.Nagender, Y. Chanti, B. Vijay Kumar, D.Mahesh, “Protection Issues and Disputes in Wireless Sensor Networks” in *International Journal of Computer Science Engineering*, 6(12), 706 - 713, (2017)
 24. Rammohan Burra, N Vijay Kumar, Dr R Vijayaprakash “Public Auditing for Group User Revocation in Cloud Data” in *International Journal of Research*, 4(5), (2017), 1240-1244.
 25. T.Sampath Kumar, Manjula, D.Srinivas, “3. A New Technique to Secure Data Over Cloud” in *Journal of Advanced Research in Dynamical & Control System*, 11(11), 391 - 396, (2018)
 26. D.Ramesh, Syed Nawaz Pasha, G.Roopa, “A Comparative Analysis of Classification Algorithms on Weather Dataset Using Data Mining Tool” in *Oriental Journal of Computer Science and Technology*, 10(4), 1 - 5, (2017)

A Study on Regression Testing towards Cost Optimization

T. Mahesh Kumar¹

¹Assistant Professor, Kakatiya Institute of technology and science, Department of I.T, India & Research Scholar, KL University, India

ABSTRACT

Regression testing is basic type of updating the software. Testing each piece of software each time is particularly costly in light of advancement of test suites as software develops. Accused of putting the US on the front foot, innovatively, against the Soviets, ARPA was a hotbed of ground breaking that pushed innovation improvements well past their current points of confinement. Inside this unique situation, Licklider² imagined a worldwide network that associated governments, organizations, partnerships and people. He predicted a future in which projects and data could be gotten to from anyplace. Sounds somewhat like cloud computing, doesn't it? This vision really propelled the advancement of ARPANET, an early bundle exchanging network, and the first to execute the convention suite TCP/IP. To put it plainly, this was the specialized establishment of the web as we presently know it. It additionally established the framework for matrix computing, an early precursor of cloud, which connected together topographically scattered PCs to make an approximately coupled network. Thusly this prompted the improvement of utility computing which is nearer to what Licklider² initially imagined. It's likewise nearer to what we consider as the cloud today, with a service supplier owning, working and dealing with the computing foundation and assets, which are made accessible to clients on an on-request, pay-as-you-go premise.

Keywords: Code Graph, Regression Testing, Path Complexity, Subgraph, Cost Optimization.

INTRODUCTION

“Software testing is the way toward executing the program with the aim of discovering error”. Dovetailing with this is the improvement of virtualization which, alongside expanded data transmission, has been a noteworthy main impetus for cloud computing. Honestly, virtualization finally provoked the ascent of exercises like Salesforce.com⁷, which led passing on embraced applications by methods for a clear site. These services firm made ready for an extensive variety of programming firms to convey applications over the web. In any case, the development of Amazon Web Services in 2002⁴ extremely set the cloud ball moving, with its cloud-based services including capacity and figure. The dispatch of Amazon's Elastic Compute cloud quite a long while later was the principal generally open cloud computing framework service, enabling little organizations to lease PCs to run their own particular PC applications on. It was a divine being send for some private ventures and new companies helping them shun expensive in-house frameworks and get the opportunity to advertise rapidly.

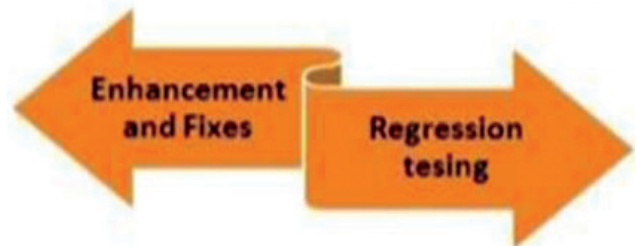


Fig. 1: Regression Testing

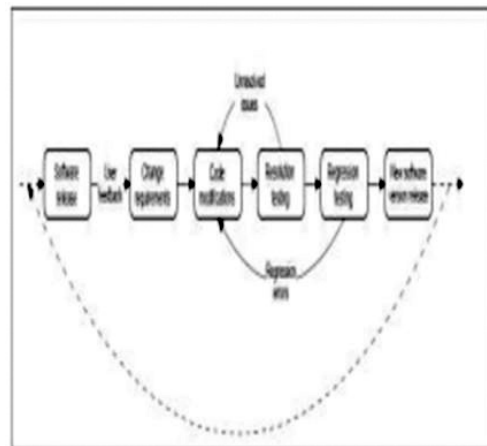


Fig. 2: Activities that take place during software maintenance regression testing

Figure 2 demonstrates the exercises happens in regression testing amid the maintenance phase. As appeared in figure, after software is discharged, While cloud has its advantages, ventures are running into issues, as their relocations proceed. For example, the staggering expense of some product as-a-service contributions has gotten a few undertakings out, while the danger of secure with framework as-a-service suppliers is likewise a worry for a few. As the primary flush of cloud computing disperses, endeavors are ending up more wary about being integrated with a service. The scene is currently set for the eventual fate of cloud, with an emphasis on half and half and multi-cloud arrangements. In five years, phrasing like cross breed IT, multi cloud and oversaw services, will a relic of times gone by. It will be guaranteed, and there won't simply be one cloud arrangement, or one data arrangement, it will be about how clouds interface and about boosting how networks are utilized. Half and half arrangements should imply that remaining burdens.

CODE GRAPH

In, Code Graph strategy we partition the graph into subgraphs by finding minimal cliques and independent sets. This implies you don't get to the data from either your PC's hard drive or over a devoted PC network (home or office network). Cloud computing implies data is put away at a remote place and is synchronized with other web data. One noticeable case of cloud computing is Office 365 which enables clients to store, get to, alter their MS Office archives on the web (in program) without installing the genuine program on their gadget.

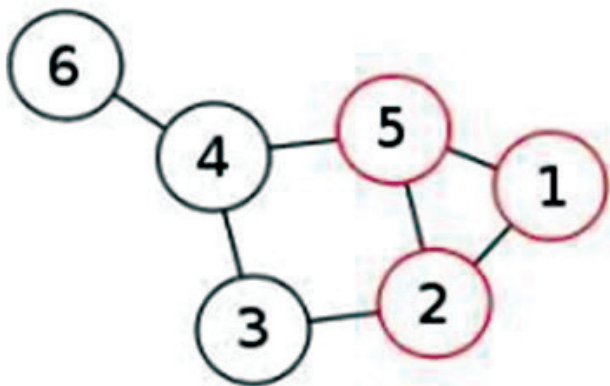


Fig. 3: Clisque

In figure 3 the graph contains one maximum clique, the triangle {1,2,5}, and four maximal clique pairs {4,6}, {4,5}, {3,4}, {2,3}.

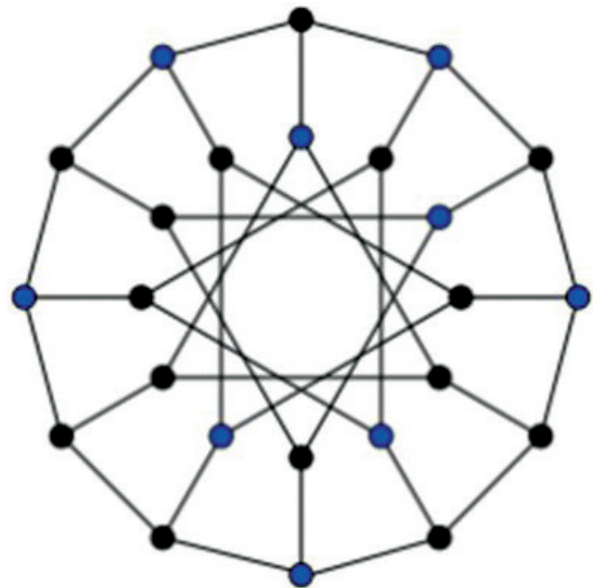


Fig. 4: Independent Set

Figure demonstrates the total block diagram of the proposed system. This figure gives a short review of exercises occur in code graph i.e. complete process of code graph.

LITERATURE SURVEY

Several regression testing techniques are introduced amid numerous years. For the literature survey several papers were studied and tried to get an approach with the help of previous papers, which can optimize the cost.

The ordinary course of action includes assorted costs. In spite of truth that the costs of gear, programming, and system more inclined to decrease persistently, at any rate people costs don't reduce. Later on, it is likely that computing game plan costs will be overpowered by person's expenses. There is in like manner necessity for database fortification, database restore, and database improvement to recoup space or to restore best strategy of data. Movement beginning with one database frame then onto the following, without influencing course of action openness, is a craftsmanship still in its beginning periods. Parts of database game plan, if not the entire course of action regularly wind up blocked off in the midst of variation change.

Adventures⁴ have been using database organization frameworks in their data center. At first, it was left to fashioners to present, regulate and use their choice of database precedent on the cloud, with the heaviness of all the database association errands being left to

the architect. The upside of this is you pick your own specific database and have full control over how the data is regulated. In order to improve the weight on the customers of their cloud commitments, various PaaS traders have started offering database services on the cloud. All physical database association assignments, for instance, support, recovery, managing the logs, cetera⁶, are regulated by the cloud provider. The obligation with respect to predictable association of the database, including table tuning and request improvement, lies on the originator. An affiliation that allows database service needs to do these errands and offer a motivating force gave it is powerful.

Database service provider⁵ gives reliable frameworks to relationship to make, store, and access their databases. Customers wishing to get to data will now get to it using the gear and programming at the service provider as opposed to their own particular affiliation's computing establishment. The application would not be influenced by power outages in view of programming, gear and systems administration changes or frustrations at the database service provider's site. This would help the issue of purchasing, introducing, keeping up and reviving the item and administrating the system. Instead of doing these, the affiliation will simply use the readied system kept up by the service provider for its database needs. Afterside effect of this paper demonstrates the successful need of finding the faults by covering each one of the criteria's as one.

COST OPTIMIZATION TECHNIQUES

Regression Testing is an emergent area. It is performed whenever any alteration has been placed up into a system. In this digital era, aside from overseeing HR of an organization, there is a need to oversee other unmistakable and immaterial assets. Most significant corporate resource is the data being generated through different gadgets. Compelling storage, access, security and administration of basic data is another test looked by IT divisions. A typical way is given between storage gadgets and servers as Storage Area Networks (SANs) operate behind the servers not at all like record arranged Network Attached Storage (NAS) arrangements and server based (Direct Attached Storage) DAS⁵ arrangements SANs give both square level and document level access to the mutual data. This data is shared between work force and computing assets in SAN arrangements. This innovation utilizes fiber

channel arrangement. As of late other new setups like Internet Small Computer System Interface (iSCSI) and Fiber Channel Over Ethernet (FCOE) are getting to be mainstream.

Data Storage is classified into three types like File Storage, Block Storage and Object Storage based on method of storing and accessing data. Since the dawn of the social media like Facebook, Twitter and WhatsApp most of the data is in digital form. This data in an unstructured format had issues of storing and retrieving the information.

CONCLUSION

Regression testing is a kind of testing that assistance designer to ensure that no imperfections has happened after the performing the alteration. The fundamental point of this framework is to give uprightness as opposed to mystery. Consequently, it is more responsive than proactive. It can withstand a portable enemy like a proactive cryptographic framework. HAIL depends on new convention configuration called as TAR (Test and Redistribute). As clarified before TAR utilizes PORs to recognize any information or document debasement and reallocate the assets when required. Once blame is distinguished by means of test reaction in a given server the customer speaks with the other server. This interchanges encourages the customer to recuperate the ruined offers from the encoded documents disseminated on different servers for cross-server repetition. It later resets the flawed server with the right offer. The new figuring is based on these examination techniques yet with new innovative idea so we can lessen the exertion, cost and time of improvement process.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: NIL

REFERENCES

1. J. E. Hopcroft And R. E. Tarjan, Dividing A Graph Into Triconnected Components, Computer Science Department, *Cornell University, Ithaca, New York 14850* : (1973)135-158,
2. IEEE Standard Glossary of Software Engineering Terminology, *IEEE Std* : , (1983) 729-736

3. Randy Carraghan and Panos M. Pardalos, an Exact Algorithm for the Maximum Clique Problem, *Elsevier Science Publishers B.V. Operations Research Letters*, (1990). : 375-382
4. Gregg Rothermel and Mary Jean Harrold, A Framework for Evaluating Regression Test Selection Techniques, *IEEE* : (1994). 201-210,
5. H. Agrawal, Dominators, super blocks, and program coverage, *21st ACM SIGPLAN SIGACT symposium on Principles of Programming Languages, Portland, Oregon*, (1994).
6. David R. Wood, an algorithm for finding a maximum clique in a graph, *Operations Research Letters 21, Elsevier Science B.V*, (1997). : 211-217
7. Gregg Rothermel and Mary Jean Harrold, 1998, Empirical Studies of a Safe Regression Test Selection Technique, *IEEE TRANSACTIONS ON SOFTWARE ENGINEERING*, 24(6) : 401-419.

An Overview of IOT towards Irrigation System

Swathi¹, Rajesh Mothe¹

¹Assistant Professor, Department of CSE, S R Engineering College, India

ABSTRACT

Agricultural division is accepting critical part in Indian economy, in which water system component is of key concern. Our paper plans to locate the right field condition and to control the wastage of water in the field and to give redress controlling of field by using the trickle water system, atomizing the agricultural condition by using the parts and building the imperative gear. For the completely checking and controlling of the farming documented, unmistakable sorts of sensors were used. To execute the proposed framework ARM LPC2148 Microcontroller is used. The water system instrument is observed and controlled simply more proficiently by the proposed framework, or, in other words time criticism control framework. GSM advancement is used to enlighten the end customer about the right field condition. Actually this method for water system framework has been proposed essentially to save resources, yield of harvests and ranch profitability. In India around 70% of populace depends on cultivating and 33% of the nation's capital begins from cultivating. Issues concerning farming have been constantly destroying the change of the country. The principle respond in due order regarding this issue is brilliant agribusiness by modernizing the current regular systems for farming. In this manner the endeavor goes for affecting horticulture to brilliant using robotization and IoT progresses. The including features of this endeavor joins savvy GPS based remote controlled robot to perform assignments like weeding, showering, dampness detecting, winged animal and creature frightening, keeping deliberateness, et cetera. Additionally it fuses brilliant water system with keen control and insightful fundamental authority in perspective of correct ongoing field data. Thirdly, brilliant stockroom organization which consolidates temperature upkeep, moistness support and robbery discovery in the circulation focus. Controlling of each one of these assignments will be through any remote savvy gadget or PC associated with Internet and the exercises will be performed by interfacing sensors, Wi-Fi or ZigBee modules, camera and actuators with smaller scale controller and raspberry pi.

Keywords: automation, IoT, Wi-Fi, WSN, GPS, Smart Device

INTRODUCTION

Water system administration is an unpredictable basic leadership procedure to choose when and how much water to apply to a developing yield to meet particular administration goals. If the rancher is far from the agricultural land he won't be seen of current conditions^[1]. In this manner, proficient water administration accept an essential part in the overflowed agricultural trimming frameworks.

An insignificant exertion elective response for proficient water administration by and by being utilized is dribble water system frameworks that contain a robotized controller to kill on and the control regards, which in this way empowers the ranchers by managing the water to supply to the product fields and further

keeps up the dampness levels of soil that helps in better harvest creation inside the restricted ability to center time.

In this paper an effective response for keeping up the water supply to the harvest fields in perspective of the climate and soil conditions has been proposed. ARM7LPC2148 microcontroller is used for arranging the proposed framework^[2]. GSM based Irrigation Control System is used to support the agriculturists with data about the natural conditions through which the consistency will be kept up. A GPRS included wireless is used for this application which goes about as a correspondence medium between the proposed framework and the end customer (rancher).

Observing natural elements isn't adequate and complete response for improve the yield of the harvests.

There are number of different elements that impact the profitability to unbelievable degree. These components fuse strike of bugs and disturbances which can be controlled by showering the product with genuine bug splash and pesticides. Besides, strike of wild creatures and flying creatures when the harvest grows up. There is similarly likelihood of burglaries when trim is at the period of get-together. For sure, even resulting to gathering, ranchers moreover stand up to issues away of accumulated yield^[4]. Thusly, in order to give answers for each and every such issue, it is critical to make joined framework which will manage all variables affecting the profitability in each stage like; improvement, assembling and post procuring capacity.

This paper in this way proposes a framework which is profitable in observing the field data and what's more controlling the field undertakings which gives the flexibility. The paper goes for making farming shrewd using robotization and IoT developments. The including features of this paper joins shrewd GPS based remote controlled robot to perform errands like; weeding, splashing, dampness detecting, winged animal and creature terrifying, keeping cautiousness, et cetera. Also, it consolidates brilliant water system with shrewd control in light of constant field data. Thirdly, savvy dispersion focus administration which joins; temperature upkeep, dampness support and robbery identification in the stockroom. Controlling of each one of these assignments will be through any remote savvy gadget or PC associated with Internet and the exercises will be performed by interfacing sensors, Wi-Fi or ZigBee modules, camera and actuators with miniaturized scale controller and raspberry pi.

METHODOLOGY

All things considered, the sensors will give basic yield anyway our processor will recognize only the propelled data. So we require a converter ADC^[10], by interfacing the sensors to the ADC coordinate pins which are in-attempted to the processor we get the required sort of yield. The aggregate circuit plan is showed up in the underneath figure (i.e. Fig 1). LCD is for the field indicate reason. Here we are utilizing all out seven sensors to screen the field condition. Those are Temperature, Humidity, Soil dampness, Leaf sensor, PH sensor, Level sensor, Phase sensor. A particular game plan of direction words are used to work the relating

gadgets associated with the smaller scale controller, framing n embedded framework. Right when a working order is set through the controller by the end customer the relating sensor will get instituted and it sends the data it recorded so far which are appeared on the LCD leading group of the framework settled in the field and the yield readings in short casing are send to the mobile phone of the end customer (through which the directions are been started) in the sort of a text. This urges the end customer to response rapidly further to avoid or to give the most ideal supply of water for yield water system.

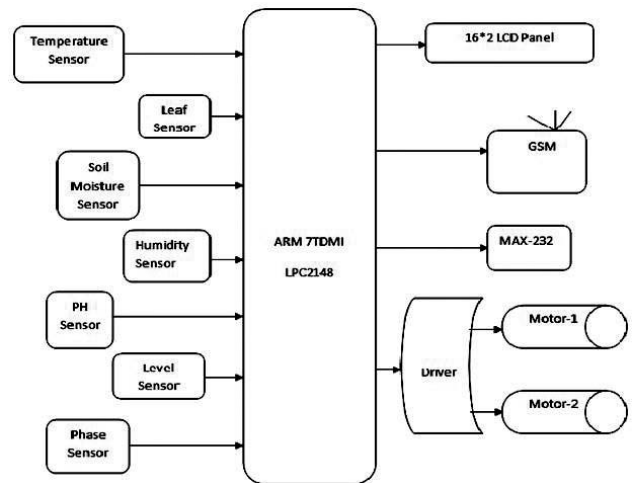


Figure 1: Block Diagram of Real-Time Irrigation System

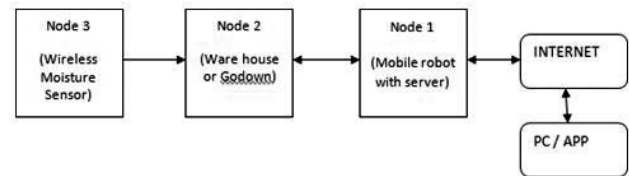


Figure 2: Overview of the System

Here other vital gadgets are AC engines. For soil module and level detecting applications we are utilizing engines. One engine is used to store water and another is for discharging the put away water into the dirt. The circuit game-plan is given underneath and the bare essential stick affiliations are showed up underneath. These will screen the field and gives the exact results to the customer. Here the Leaf sensor, PH, Soil, Level sensors are used to screen climate leaves are sound or not.

- The PH sensor is used to screen the dirt condition, climate the dirt having ruinous acidic nature or typical base nature. If acidic nature is accessible means we have to debilitate the substance and murder it or we will give the crucial compost.

In example of soil dampness, we will check climate soil is dry or wet. In case it is dry means, this condition is amazingly damaging to plants. So in a split second a SMS will send the rancher to release the water into the dirt and make it wet. For this we will use the level sensor and stage sensor will be outstandingly useful.

- Temperature and moistness are important for the circumstance of checking the climate conditions.

Furthermore, we are utilizing the two cooling engines, one is for the carrying the water into the capacity from ground while another is valuable if there ought to emerge an event of sending water into field from the capacity.

SYSTEM ARCHITECTURE

Node 1:

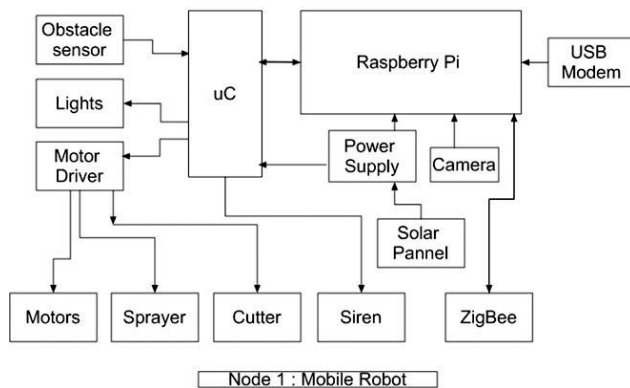


Figure 3: Node 1

Node 2:

It will be the stockroom. Movement indicator will identify the movement in the room when security mode will be ON and on recognition of movement

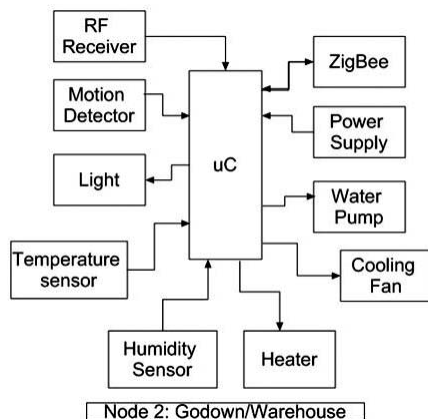


Figure 4: Node 2

Node 3:

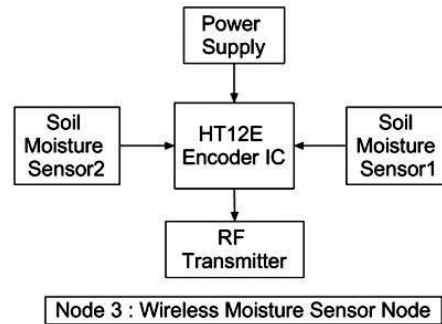


Figure 5: Node 3

In this node, dampness sensor transmits the data utilizing HT12E Encoder IC and a RF transmitter. The transmitted data is gotten by node2 and there it is handled by microcontroller with the end goal to control the assignment of water pump.

CONCLUSION

The sensors and microcontrollers of each one of the three Nodes are adequately interfaced with raspberry pi and remote correspondence is expert between various Nodes. All observations and test tests exhibits that assignment is an aggregate response for field works out, water system issues, and capacity issues utilizing remote controlled robot, shrewd water system framework and a keen stockroom administration framework independently. Use of such a framework in the field can improve the yield of the harvests and as a rule age.

The proposed framework is a continuous criticism control framework which screens and controls the water system framework practices proficiently. The results will be shown on the both LCD board and customer versatile, for testing the yield immediately. GSM is responsible for controlling the water system on field and sends them to the authority. The data is send to the customer on demand for as SMS.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: NIL

REFERENCES

1. K.Prathyusha, M. Chaitanya Suman, "Plan of Embedded System for the Automation of Drip Irrigation". *IJAIEEM* (2012). : 1(2),

2. Chandrika Chanda , Surbhi Agarwal , Er. B.Persis Urbana Ivy, “A Survey of Automated GSM Based Irrigation System”. *IJETAE*, Volume 2, Issue 10, October 2012,2(10)
3. Kshitij Shinghal et. al. “Remote Sensor Networks Agriculture: For Potato Farming”, *International Journal of Engineering Science and Technology* , (2010) (8) : 3955-3963
4. Mahir Dursun, Semih Ozden, “A remote utilization of stream water framework robotization maintained by soil moistness sensors”, *Academic Journals* (2011) : 6(2),
5. Mr. Srinubabu Aravapalli, Mrs. Ch.Sridevi, Dr. N.S.Murthy Sarma, Mr. K.Raja Sekhar, “Plan and Implementation of GSM based Irrigation System Using ARM7”, *IJRCCT* : (2012). 1(7),
6. S. R. Nandurkar, V. R. Thool, R. C. Thool, “Blueprint and Development of Precision Agriculture System Using Wireless Sensor Network”, *IEEE International Conference on Automation, Control, Energy and Systems*, (2014) 1-6
7. JoaquínGutiérrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, and Miguel Ángel Porta-Gándara, “Modernized Irrigation System Using a Wireless Sensor Network and GPRS Module”, *IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT*, (2013)
8. Dr. V .Vidya Devi,G. Meena Kumari, “Persistent Automation and Monitoring System for Modernized Agriculture” , *International Journal of Review and Research in Applied Sciences and Engineering*, (2013) 3(1) : 7-12,
9. Y. Kim, R. Evans and W. Iversen, “Remote Sensing and Control of an Irrigation System Using a Distributed Wireless Sensor Network”, *IEEE Transactions on Instrumentation and Measurement* : (2008). 1379-1387,
10. Ch.Sandeep, V.Thirupathi, “Internet Of Things Based Biometric Electronic Voting Machine” in *International Journal of Research*, (2017) 4(10) : 1245-1248,
11. Mohd Sallauddin, G.Sunil, Ranganath Kanakam , “A SURVEY ON NEW APPROACHES OF INTERNET OF THINGS DATA MINING” in *International Journal of Advanced Research in Computer Science* (2017) , 8(8) : 666-673,
12. Mohd Sallauddin, G.Sunil, “A SURVEY ON NEW APPROACHES OF INTERNET OF THINGS DATA MINING” in *International Journal of Advanced Research in Computer Science* , (2017) 8(8) : 666-673
13. Shoban Babu Sriramoju,Naveen Kumar Rangaraju,Dr .A. Govardhan, “An improvement to the Role of the Wireless Sensors in Internet of Things” in *International Journal of Pure and Applied Mathematics* (2018) : 118(24),
14. B. Srinivas, Gadde Ramesh, Shoban Babu Sriramoju, “An Overview of Classification Rule and Association Rule Mining” in *International Journal of Scientific Research in Computer Science, Engineering and Information Technology* , (2018), 3(1) : 643-650

A Study on using HWT towards the Quality Evaluation of Compressing the Colored Image

P. Sudarshan Ray¹, Ch. D. V. Subba Rao², Polem. Vemulamma³

¹Assistant Professor, Department of Information Technology, Kakatiya Institute of Technology And Science, Warngal; ²Professor, Department of CSE, S.V.U. College of Engineering, Tirupati; ³Assistant Professor, Department of CSE, Vaagdevi College of Engineering, Bollikunta, Warangal, India

ABSTRACT

Images require generous capacity and transmission resources, accordingly image compression is worthwhile to diminish these prerequisites. This paper overlays some foundation of wavelet analysis, compression of data and how the wavelets are been and how it can be utilized for image compression. The paper analyzes an arrangement of wavelet functions (wavelets) for usage in a still image compression system and talks about critical highlights of wavelet change in compression of still images, including the degree to which the nature of image is corrupted by the procedure of wavelet compression and decompression. The impacts of various wavelet functions, image substance and compression proportions are surveyed.

Keywords :wavelet analysis, image compression, wavelet functions, lossless and lossy, run-length encoding (RLE), discrete cosine transform

INTRODUCTION

Image compression is a vital field of research that has been contemplated for about three decades now. Image Compression tends to the issue of decreasing the measure of data required to speak to the computerized image. Compression is accomplished by the expulsion of at least one of three essential data redundancies: (a) Coding redundancy, which is available when not as much as ideal code words are utilized;

(b) Inter-pixel redundancy, which comes about because of correlations in between the pixels of image and (c) psycho visual redundancy that is because of data which is disregarded by the human visual system (i.e. visually insignificant information). Demand for correspondence of multimedia data through the broadcast communications arrange and getting to the multimedia data through Internet is developing violently. Compression of images has various applications in different territories, for example, superior quality TV, videophones, medicinal imaging, on-line item lists and other multimedia applications. Another imperative application is perusing, where the attention is on getting high compression.

There are two sorts of compressing the image: lossy and lossless. With lossless compression, the first image

is recouped precisely after decompression. Sadly, with images of common scenes it is infrequently conceivable to acquire blunder free compression at a rate past 2:1. Considerably higher compression proportions can be gotten if some blunder, which is normally hard to see, is permitted between the decompressed image and the first image ^[1]. This is lossy compression. Much of the time, it isn't important or even alluring that there be sans mistake multiplication of the first image. For instance, if some commotion is available, at that point the mistake because of that clamor will as a rule be fundamentally decreased by means of some de-noising technique. In such a case, the little measure of blunder presented by lossy compression might be satisfactory. Dissimilar to lossless compression, lossy compression decreases image quality. You can't recover the first image subsequent to utilizing lossy compression methods. You will lose some data ^[2].

Lossless image compression is typically utilized as a part of manufactured images that contain sharp-edged lines, for example, specialized illustrations, printed designs, funnies, maps or logos. This is on account of lossy compression methods deliver compression ancient rarities to images and sharp-edged lines wind up fluffy particularly when utilizing solid compression. Rather, lossy compression is a decent decision for normal

images, for example, photographs of landscapes where minor misfortune on sharpness is worthy to accomplish littler record measure. With the exposed eye it is difficult to perceive any contrasts between uncompressed normal image and one with compacted by lossy methods if the compression isn't excessively solid^[3]. The most broadly utilized methods of lossless compression in images are run-length encoding (RLE), entropy coding and lexicon coders. Lossy compression is generally in light of techniques by evacuating points of interest that the human eye commonly doesn't take note. Computerized images are generated out of pixels that speak to color data. At the point when a pixel varies just marginally from its neighbors, its esteem can be supplanted theirs. This will lose some data however it is normally scarcely detectable with human eye if the algorithm is adequate. After this e.g. RLE coding can be utilized to pack data.

Other prominent methods are shading quantization (lessening the shading space) and chroma sub-sampling. These methods depend on a reality that the human eye is more delicate to luminance than shading, so record size can be upgraded by putting away more luminance detail than shading point of interest. Likewise fractal compression is utilized yet it's not all that prevalent. The most mainstream image compression technique is depended towards discrete cosine change (DCT)^[4]. In the current past, wavelets have risen as a vital technique for image compression.

IMAGE COMPRESSION USING WAVELET TRANSFORM

Wavelets are functions characterized over a limited interval and having a normal estimation of zero. The essential thought of the wavelet change is to speak to any arbitrary function (t) as a superposition of an arrangement of such wavelets or premise functions. These premise functions or infant wavelets are gotten from a solitary model wavelet called the mother wavelet, by dilations or contractions (scaling) and translations (shifts).

In the course of recent years, the wavelet change has increased across the board acknowledgment in flag handling all in all and in image compression research specifically. In numerous applications wavelet-based plans (additionally alluded as sub band coding) beat other coding plans like the one in light of DCT. Even though there is no particular reason to obstruct the info image and its premise functions have variable length, wavelet coding plans at higher compression abstain from

blocking ancient rarities. Wavelet-based coding^[5] is more powerful under transmission and decoding blunders, and likewise encourages dynamic transmission of images. What's more, they are better coordinated to the HVS qualities. Due to their characteristic multi-determination nature^[6], wavelet coding plans are particularly appropriate for applications where adaptability and decent corruption are critical.

The methods of lossy compression that we might focus on are the accompanying: EZW algorithm and SPIHT algorithm. These are generally late algorithms which accomplish a portion of the most minimal blunders per compression rate and most elevated perceptual quality yet detailed. Before we look at the algorithms recorded above, we should plot the fundamental advances that are basic to all wavelet-based image compression algorithms. The five phases of compression and decompression are appeared in Figs. 1 and 2.

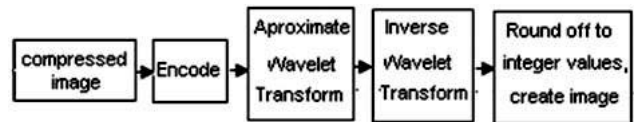


Figure 1: Compression of an image

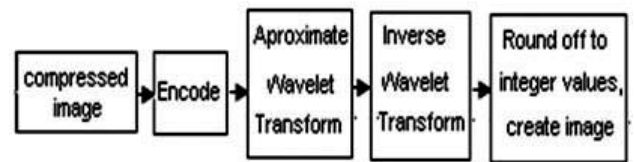


Figure 2: Decompression of an image

The majority of the means appeared in the compression graph are invertable, subsequently lossless, aside from the Quantize step. Quantizing alludes to a lessening of the accuracy of the drifting point estimations of the wavelet change, which are commonly either 32-bit or 64-bit skimming point numbers. To utilize less bits in the packed change which is fundamental if compression of 8 bpp or 12 bpp images is to be accomplished these change esteems must be communicated with less bits for each esteem. This prompts adjusting error. These estimated, quantized, wavelet transforms will create approximations to the images when a backwards change is performed. In this way creating the error intrinsic in lossy compression. The connection between the Quantize and the Encode steps, appeared in Fig. 1, is the crucial part of wavelet change compression. Every one of the algorithms described underneath adopts an alternate strategy to this relationship. The reason served by the Wavelet Transform is that it creates an expansive number of qualities having focused, or almost zero, magnitudes.

Two generally utilized measures for evaluating the error between images are Peak Signal to Noise Ratio and Mean Square Error. The MSE between two images f and g is characterized by

$$MSE = \frac{1}{N} \sum_{j,k} (f[j,k] - g[j,k])^2$$

where the aggregate over j; k indicates the entirety over all pixels in the images, and N is the quantity of pixels in each image. The PSNR between two (8 bpp) images is, in decibels,

$$PSNR = 10 \log_{10} \left(\frac{255^2}{MSE} \right)$$

EZW algorithm: The EZW algorithm was one of the primary algorithms to demonstrate the full energy of wavelet based image compression. It was presented in the historic paper of Shapiro [7]. Numerous algorithms expand upon the central ideas that were first presented with EZW. EZW stands for Embedded Zerotree Wavelet. We might clarify the terms Embedded, and Zerotree, and how they identify with Wavelet-based compression. An inserted coding is a procedure of encoding the change magnitudes that takes into consideration dynamic transmission of the packed image. Zerotrees are an idea that considers a succinct encoding of the places of noteworthy esteems that outcome amid the implanted coding process. The embedding procedure utilized by EZW is defined as bit plane encoding.

Set Partitioning in Hierarchical Trees (SPIHT encoding): The SPIHT [8] image coding algorithm was created in 1996 by Said and Pearlman and is another more proficient execution of the installed zerotree wavelet algorithm by Shapiro. After the wavelet change is connected to an image, the primary algorithm works by dividing the wavelet decayed image into noteworthy.

There are two goes in the algorithm i.e, arranging pass and refinement pass. The arranging pass is operated on the list of insignificant sets (LIS), list of insignificant pixels (LIP) and the list of huge pixels (LSP). The LIP and LSP comprise of hubs that contain single pixels, while the LIS contains hubs that have relatives. The most extreme number of bits required to speak to the biggest coefficient in the spatial orientation tree is gotten and designated as n_{max} , which is

$$n_{max} = \lceil \log_2(\max_{i,j} \{|c_{i,j}|\}) \rceil \dots(2)$$

Amid the sorting pass, those coordinates of the pixels which stay in the LIP are tried for noteworthy

by utilizing eqn. 2. The result, Sn(T), is sent to the yield. Those that are noteworthy will be exchanged to the LSP and in addition having their sign bit yield. Sets in the LIS (which comprises of nodes with relatives will likewise have their importance tried and, if observed to be critical, will be evacuated and divided into subsets. Subsets with a solitary coefficient and observed to be noteworthy will be combined to the LSP, or else they will be combined to the LIP.

The value of n is decremented by 1 and also refinement and sorting passes are repeated. This proceeds until either the coveted rate is come to or $n=0$, and every one of the nodes in the LSP have every one of their bits yield. The latter case will result in relatively idealize reproduction as every one of the coefficients are handled totally. The bit rate is exactly in the SPIHT [8] algorithm in light of the fact that the yield created is of single bits and algorithm is terminated at whenever. The decoding procedure takes after the encoding precisely and is relatively symmetrical as far as processing time.

RESULTS

Compressing shading images proficiently are one of the principle issues in multimedia applications. So we have tried the effectiveness of shading image compression utilizing EZW and SPIHT algorithm. Reproduced image is confirmed utilizing human vision and PSNR. Table 1 demonstrates the results of image compression.

Table 1: Quality Assessment

	MSE	PSNR	CR	BPP
EZW	10.1191	38.0794	18.0450	4.3308
SPIHT	12.5269	37.1524	12.2350	2.9364

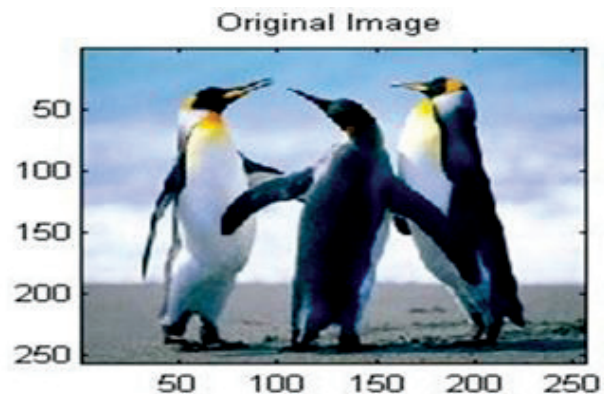


Fig. 1: Original 256 x 256 image

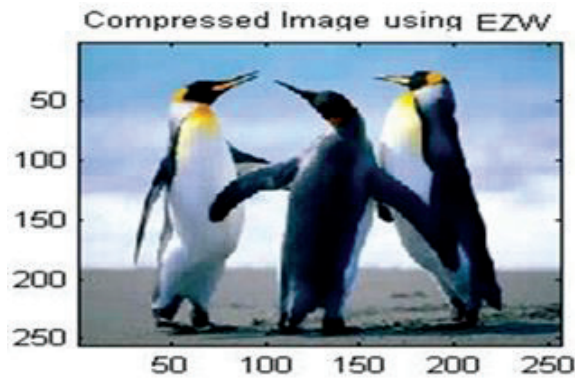


Fig. 2: Compressed image using EZW Haar Wavelet

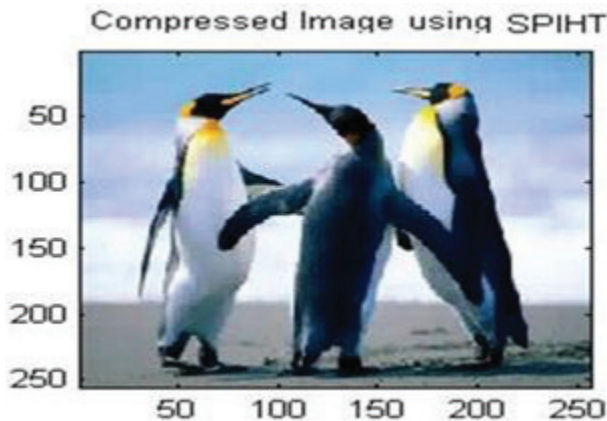


Fig. 3: Compressed image using SPIHT Haar Wavelet

CONCLUSIONS

We have audited and summarized the characteristics of image compression, need of compression and its standards and EZW and SPIHT image compression algorithms based on Wavelet. We utilize 256×256 shading image for comparison. Any of the two approaches is satisfactory when the 0.5 bits per pixel (bpp) is asked. Nonetheless, for a low bit rate, for example 0.25 bpp or lower, the embedded zero tree wavelet (EZW) approach is superior. Also EZW gives better compression ratio and quality of images. Notwithstanding if For practical applications, we presume that (1) Wavelet based compression algorithms are emphatically prescribed, (2) DCT based approach may utilize an adaptive quantization table, (3) VQ approach isn't appropriate for a low bit rate compression although it is basic, (4)

Fractal approach ought to use its determination free decoding property for a low bit rate compression.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: NIL

REFERENCES

1. M.Vetterli, D.Donoho, "Data Compression and Harmonic Analysis," *IEEE Tr. On IT, Special Issue, (2013)*
2. K.Ramchandran, A.Ortega, "Rate-distortion methods for image and video compression," *IEEE Signal Processing magazine, (1998).*
3. P. P. Yip, K. R. Rao, "Discrete Cosine Transform: algorithm, advantages, applications", *Academic Press, New York, (1990).*
4. J. Reichel, M. J. Nadenau, "Wavelet Based Color Image Compression: Exploiting the Contrast Sensitivity Function", *IEEE Transactions Image Processing, (2004).* 12(1),
5. K. Harada, K. H. Talukder, "Haar Wavelet Based Approach for Image Compression and Quality Assessment of Compressed Image" *IAENG International Journal of Applied Mathematics, (2007).*
6. J.M. Shapiro. Embedded image coding using zero trees of wavelet coefficients. *IEEE Trans. Signal Proc.*, (1993). 12,
7. W.A. Pearlman, A. Said, Image compression using the spatial- orientation tree. *IEEE Int. Symposium on Circuits and Systems, Chicago, IL, (1993).* : 279-282
8. W.A. Pearlman, A. Said, A new, fast, and efficient image codec based on set partitioning in hierarchical trees. *IEEE Trans. on Circuits and Systems for Video Technology, , (1996).* 6(3) : 243-250

Enhanced Improvement in Dynamic Behavior of Hybrid Active Power Filter using PI Controllers and Fuzzy Logic

N. Madhuri¹, P. Chandra Sekhar¹, M. Suryakalavathi²

¹Associate Professor, Department of EEE, Mahatma Gandhi Institute of Technology, Hyderabad, Telangana;

²Professor, Department of EEE, JNTU College of Engineering Hyderabad, Telangana, India

ABSTRACT

This paper shows a fuzzy-logic, PI managed shunt active power filter used to compensate to get symphonious writhing in three-phase techniques. The Hybrid Vehicle power filter makes use of a more fundamental procedure for its quote of this benchmark settlement present in gentle of Rapid Fourier change. The exhibited Hybrid Power filter may work-in well-balanced, loading requirements. Exceptional filters may perhaps not need sufficient functionality in speedy varied states. Be as it could, automobile trained active electricity filter presents far better results for symphonious minimization, also THD progress. The suggested auto tempered hybrid power filter retains up the THD very well inside of IEEE-519 standards. The suggested strategy is widely Tri-ED with enhanced unique behavior of hybrid power filter making use of fuzzy-logic, PI controls. The outcome are seen to become somewhat satisfactory to medium Distortions, also enhance high quality. The Nitty-gritty reproductions have been finished on MATLAB surroundings to accept the operation.

Keywords: *Proportional-Integral (PI) control, Hybrid Active Power Filter (HAPF), Fuzzy Logic Controller (FLC), THD, load compensation, power quality (PQ), power factor, voltage-source inverter (VSI).*

INTRODUCTION

With the improvement of power electronic devices and these related control advances, increasingly power electronic gear has been introduced in power framework arrange. In any case, numerous power electronic buyers, for example, circular segment heaters and rectifiers, as a result of these unique activity attributes, would cause genuine voltage change, harmonic current contamination, low power factor (PF), less qualitated power and so forth. Hence, a considerable measure of authorities have offered consideration regarding enhancing such power quality issues. Power quality conditioners, for example, static var compensators (SVCs) and active power filters (APFs), which locally relieve the harmonic current, can successfully improve voltage quality and PF and stifle harmonic contamination

Albeit passive power filters (PPFs) can smother restricted trademark recurrence harmonic current, this dynamic filtering performance isn't adequate to keep away from that the harmonic current from passive power filter causes series- parallel reverberation between the filter and the framework. As of late, APFs have been created rapidly in light of this great filtering performance,

yet the confinements of limit and voltage level of power electronic devices keep APFs from applying in medium-high-voltage systems. Hybrid APFs (HAPFs) join the benefits of APFs and PPFs and are appropriate to be prepared in medium-high-voltage framework.

The expanded seriousness of power quality issues and different issues related with the passive filters, for example, substantial size and weight, higher cost, settled compensation, and reverberation issues with loads and systems have required an emphasis on a power electronic arrangement, that is, active power filters (APF) as appeared in Fig.1. As of late, numerous distributions have likewise showed up on the harmonics concealment utilizing active power filters. Determination of a control strategy and appropriate topology of harmonic concealment, most appropriate to specific conditions, requires that points of interest, impediments and confinements of these devices, which show an exceptionally wide scope of properties.

The control methodology for a hybrid active power filter produces the reference current, that must be given by the power filter to remunerate reactive power and harmonic streams requested by the load^[4-6] This includes

an arrangement of ebbs and flows in the phase area, which will be followed creating the changing signs connected to the electronic converter by methods for the fitting shut circle exchanging control strategy, for example, hysteresis or bum control. A few techniques including double prompt genuine and reactive power hypothesis have been proposed for extricating the harmonic content^[2-5].

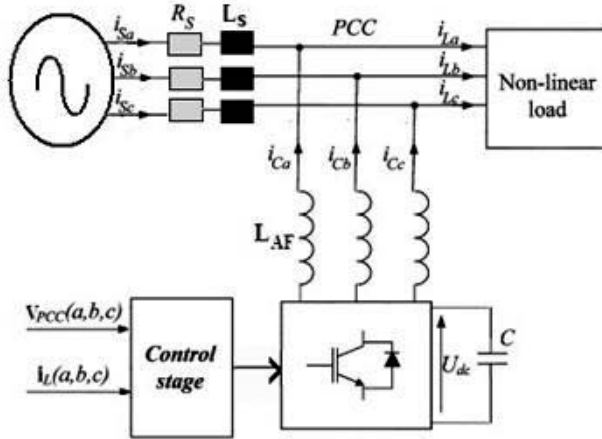


Figure 1: Shunt current compensation in active filter, a basic principle

All these techniques function admirably under enduring state, balanced and Sinusoidal conditions of supply voltage. Among every one of the techniques exhibited in the writing, the double prompt active and reactive power (P-Q) hypothesis is a standout amongst the most widely recognized and likely it is the best method^[4].

As of late, to evade the inborn bothersome attributes of ordinary control approaches, Fuzzy Logic Controller (FLC) is being produced. FLC offers a semantic way to deal with create control calculations for any framework. It maps the information yield relationship in view of human mastery and consequently, does not require a precise scientific model of the framework and can deal with the nonlinearities that are for the most part hard to demonstrate^[2]. This therefore makes the FLC tolerant to parameter variation and more precise and vigorous.

DESIGN OF APF

Principle of APF: An APF, which is schematically depicted in Fig. 2, contains two-level Voltage Source Converter (VSC), a dc vitality stockpiling device, a coupling transformer associated in shunt to the dispersion arrange through a coupling transformer. The VSC changes over the dc voltage over the capacity device

into an arrangement of three-phase air conditioning yield voltages^[7]. Appropriate modification of the phase and greatness of the APF yield voltages permits successful control of active and reactive power trades between the APF and the air conditioner framework. Such arrangement enables the device to ingest or create controllable active and reactive power^[8].

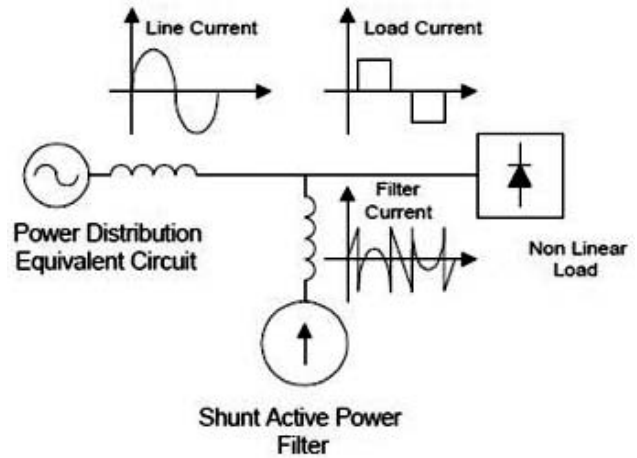


Figure 2: APF Schematic Diagram

The VSC associated in shunt with the air conditioner framework gives a topology which can be utilized for up to three very unmistakable purposes:

1. Compensation of reactive power and Voltage direction
2. Power factor correction
3. Current harmonics elimination.

Here, such device is utilized to give ceaseless voltage direction utilizing an in a roundabout way controlled converter^[9]. As appeared in Fig. 3 the shunt infused current I_{sh} revises the voltage list by modifying the voltage drop over the framework impedance Z_{th} . The shunt infused current I_{sh} can be composed as,

$$I_{sh} = I_L - I_S = I_L - (V_{th} - V_L) / Z_{th} \quad \dots(1)$$

$$I_{sh} / _ \eta = I_L / _ - \theta \quad \dots(2)$$

It might be said that the adequacy of the APF in redressing voltage hang relies upon the estimation of Z_{th} or blame level of the load transport. At the point when the shunt infused current I_{sh} is kept in quadrature with VL, the coveted voltage remedy can be accomplished without infusing any active power into the framework. Then again, when the estimation of I_{sh} is limited, a similar voltage remedy can be accomplished with least evident power infusion into the framework^[10].

Principle of HAPF

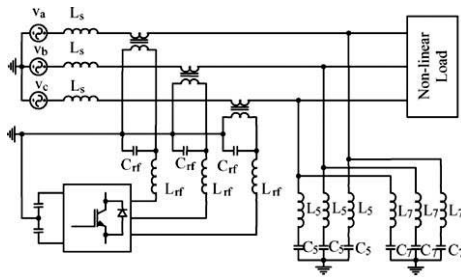


Figure 3: HAPF Schematic Diagram

At the point when this gear is associated in arrangement to the air conditioner source impedance it is conceivable to improve the compensation qualities of the passive filters in parallel connection^[12]. This topology is appeared in Fig. 3, where the active filter is spoken to by a controlled source, where is the voltage that the inverter should produce to accomplish the goal of the proposed control calculation.

FUZZY LOGIC CONTROLLER

Fuzzy Logic Controller is a procedure to encapsulate human-like reasoning into a control framework. FLC can be intended to copy human deductive reasoning, that is, the procedure individuals use to derive conclusions from what they know. In an engine control framework, the function of FLC is to change over linguistic control rules into control system in light of heuristic data or master learning. FLC has a settled arrangement of control rules, generally got from master’s information. The membership function (MF) of the related info and yield linguistic variables is for the most part predefined on a typical universe of talk. For the fruitful plan of FLC’s appropriate determination of information and yield scaling factors (picks up) or tuning of the other controller parameters are urgent employments, which as a rule are done through experimentation to accomplish the most ideal control performance. The structure of FLC is appeared in Fig.4. The structure indicates four functions, every one emerged by block.

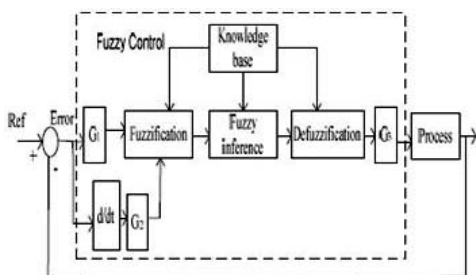


Figure 4: Structure of fuzzy controller

- Membership functions are characterized inside the standardized range (- 1, 1), and related with each name: NB (Negative Big), NM (Negative Medium), NS (Negative Small), ZE (Zero), PS (Positive Small), PM (Positive Medium), and PB (Positive Big). Seven MFs are decided for $e(pu)$ and $ce(pu)$ signs and seven for yield. Every one of the MFs are symmetrical for positive and negative estimations of the variables. Accordingly, most extreme $7 \times 7 = 49$ standards can be framed.
- The membership functions for the sources of info (error and change of error) and yield of fuzzy control for hybrid active power filter.

A learning base (an arrangement of If-Then standards), which contains the meaning of the fuzzy subsets, their membership functions, their universe talk and the entire of the tenets of derivation to accomplish great control
- An surmising instrument (likewise called an “induction motor” or “fuzzy derivation” module), which is heart of a fuzzy control, groups the limit of fake the human choices and copies the master’s basic leadership in translating and applying learning about how best to control the plant.
- A de-fuzzification interface, which changes over the finishes of the surmising instrument into genuine contributions for the procedure.

Fuzzy Logic Membership Functions: Fuzzy controllers don’t require a correct numerical model. Rather, they are planned in view of general information of the plant. Fuzzy controllers are intended to adjust to varying working focuses. The single yield variable (u) is unflinching state flag of the converter, only error free reaction is straightforwardly sustained to the framework.

Fuzzy Logic Rules: The target of this exposition is to control the yield voltage of the converter. The error and change of error of the yield voltage will be the contributions of fuzzy logic controller. These 2 inputs are isolated into seven groups; NL: Negative Large, NM: Negative Medium, NS: Negative Small, ZO: Zero Area, PS: Positive small, PM: Positive Medium and PL: Positive Large and its parameter^[10].

MATLAB/SIMULINK MODELING AND SIMULATION RESULTS

Effects of Short Circuit Fault Currents on Power System: Short circuit fault current depends on the power circuit voltage and configuration, method of neutral connections (solidly grounded, resistance grounded, reactance grounded and ungrounded), presence of the regulating devices (such as shunt reactor, series reactor, shunt and series capacitors and FACT devices), and the speed of disconnection of the faulted circuit section. Different types of short circuit currents can effect the power system in different manners. It is known that, the flow of short circuit currents incident to the occurrence of inter phase short circuits near the generating units frequently results in substantial disturbance to normal operation of the power system.

Simulation results are presented in this section using MATLAB/SIMULINK for Fuzzy based Fault Tolerant control of a four leg Active Power Filter. Initially, we studied Fuzzy based Fault Tolerant Active Power Filter in the presence of open circuit fault/short circuit fault and also line to ground fault and computed total harmonic distortion. Subsequently, we studied the comparison of Fuzzy based Fault Tolerant Active Power Filter with traditional Fault Tolerant Active Power Filter in the presence of fault and also in the absence of fault. The simulation results are obtained for Fuzzy Based Fault Tolerant Active Power Filter in the presence of open circuit/short circuit fault and line to ground fault.

- Sometimes the short circuit takes the form of the arc that may cause considerable damage to the elements of the power system. For example an arc on an over-head transmission lines if not cleared quickly will burn the conductors causing it to break resulting in long time interruption of the supply

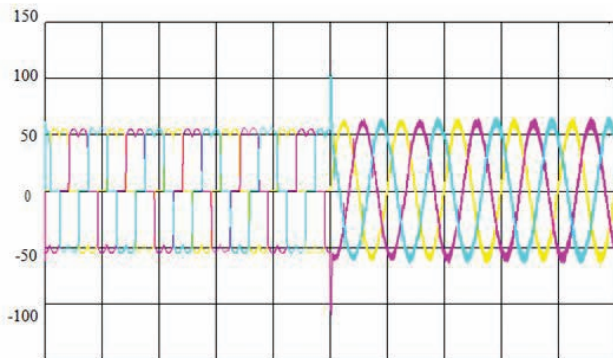


Figure 5: Before compensation and after compensation

- Unsymmetrical short circuit faults (such as line to ground, phase to phase, double phase to ground) introduce unbalance in the symmetrical circuits of the power system
- Stability of the power system may be adversely affected and can even lead to complete shutdown or cascade tripping of the power system
- Damage to other apparatus in the power system due to short circuit currents may be caused due to the over-heating and also due to abnormal mechanical stresses or forces set up by the fault
- A reduction in the voltage in power system due to faults will be sometimes be so large that the relays having pressure coils tends to fail

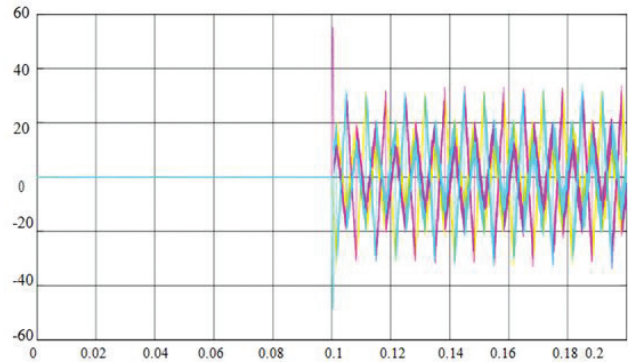


Figure 6: Short circuit analysis

- Due to short circuits in the power system, there may be considerable reduction in the voltage on the healthy feeders connected to the system having fault. This may result in drawing of abnormal high currents by the motors or the operation of no load coils of the motors. In the latter case there will be considerable loss in the industrial output due to the outage of the motors and other drives
- Sometimes in an interconnected systems, when a fault develops it is followed by a fall in voltage and frequency. This may result in loads such as motors which normally takes the power from the supply will start to feed or deliver the power to the fault locations. During the faults, induction motors and synchronous motors feed the fault.

CONCLUSION

The target of this paper is to analyze the time determination performance between conventional controller and artificial intelligence controller (FLC)

controlling the dc interface voltage. A VSI topology for HAPF remunerating air conditioning balanced nonlinear loads and a dc load provided by the dc connection of the compensator is introduced. The proposed Fuzzy based Fault Tolerant control scheme offers continuous operation and gives superior Total Harmonic Distortion in contrast with PI based Fault Tolerant shunt Active Power Filters. A control calculation for conventional pi controller and fuzzy logic controller constituted by a hybrid active power filter, this topology we built up an arrangement active power filter and a passive filter associated in parallel with the load is examined. At long last Matlab/Simulink based model is created and reproduction comes about are introduced.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: NIL

REFERENCES

1. P. Salmerón and S. P. Lit, "Improvement of the Electric Power Quality Using Series Active and Shunt Passive Filters", *IEEE Trans On Power Delivery*, (2010). 25(2),
2. A. Elmitwally, S. Abdelkader, M. Elkateb "Execution appraisal of fluffly controlled three and four wireshunt dynamic power conditioners", *IEEE Power Engineering Society Winter Meeting* (2000) : 23-27,
3. F. Z. Peng and D. J. Adams, "Sounds sources and separating approaches", *Proc. Industry Applications Conf* (1999). ., 1(2) : 448–455,
4. J. C. Das, "Aloof channels potential outcomes and imperatives", *IEEE Trans. Ind. Appli.*, (2004). 40(1) : 232–241,
5. H. L. Ginn, III and L. S. Czarnecki, "A change based procedure for decision of resonating symphonious channel branch parameters", *IEEE Trans. Power Del.*, , (2006). 21(3) : 1445-1451
6. J. A. Pomilio and S. M. Deckmann, "Depiction and pay of music and receptive intensity of private and business loads", *IEEE Trans. Power Del.*, , (2007). 22(2) : 1049– 1055
7. H. Akagi, "Dynamic consonant channels", *Proc. IEEE*, (2005). 93(12) : 2128–2141,
8. B. Singh, K. Al-Haddad, and A. Chandra, "A review of dynamic channels for control quality change", *IEEE Trans. Ind. Electron.*, , (1999). 46(5) : 960–971
9. J. W. Dixon, G. Venegas, and L. A. Moran, "A game plan dynamic power channel in perspective of a sinusoidal current-controlled voltage-source inverter", *IEEE Trans. Ind. Electron.*, , (1997). 44(5) : 612–620
10. S. George and V. Agarwal, "Perfect control of specific and total symphonious curving in Current and voltage under non sinusoidal conditions", *IEEE Trans. Power Del.*, (2008). 23(2) : 935–944,
11. H. Yang and S. Ren, "An utilitarian game plan shunt half and half dynamic power channel in perspective of fundamental appealing potential self-alter", *IEEE Trans. Power Del.*, (2008). 23(4) : 2089–2096,
12. A. Luo, Z. Shuai, W. Zhu, R. Fan, and C. Tu, "Improvement of crossover dynamic power channel in perspective of the flexible fluffly secluding repeat control system", *IEEE Trans Power Del.*, , (2009). 24(1) : 424–432

Critical Success Factors of Contractor's Performance Appraisal System in Malaysian Construction Industry

Khairul Zahreen Mohd Arof¹, Syuhaida Ismail¹, Abd Latif Saleh²

¹Razak Faculty of Engineering and Informatic, Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia;

²Civil Engineering Department, Universiti Teknologi Malaysia, Johor Bahru, Malaysia

ABSTRACT

Performance appraisal system is applied in many organisations to appraise performance of employee. In construction industry, performance appraisal system is applied to appraise contractor's performance with the works done and basically, their performance is appraised based on quality, time and cost performance. In Malaysian construction industry, Construction Industry Development Board (CIDB) has established Contractor's Capability and Capacity (SCORE), Quality Assessment System in Construction (QLASSIC) and Safety and Health Assessment System in Construction (SHASSIC) in 2012. Unfortunately, non-compliance in construction projects still presents. This paper is therefore undertaken with the aim to propose critical success factors (CSFs) towards the efficiency of these performance appraisal systems via literature review, questionnaire survey and expert focus group. A set of questionnaires is designed, undergone the pilot study on 15 respondents for reliability purpose and eventually distributed to 157 contractors from G1 to G7 class upon the confirmation of the questionnaire reliability status. Seven main criteria are found: quality performance; time performance; cost performance; environmental performance; health and safety performance; productivity performance; and human resources performance. Although contractor's performance appraisal system is applied in Malaysian construction industry and benefiting construction players, yet it should be improved. The efficiency of contractor's performance appraisal will be fulfilled by considering these seven CSFs into the current contractor's performance appraisal system in Malaysia.

Keywords: Contractor's Performance; Critical Success Factors; Appraisal System; Malaysian Construction Industry.

INTRODUCTION

A good construction project needs a good project management practice, which will assist those construction players, especially contractors to manage not only people involved in the industry, but also the proper utilisation of resources. Project management refers to the application of knowledge, skill, tool, and techniques to project activities to meet a relatively short-term objective that has been established to complete specific goals and objectives (Project Management Institute¹⁷). This is accomplished through application and integration of the project initiating, planning, executing, monitoring, controlling and closing (Heagney¹³).

Yet, lack of awareness of this part has made copious of construction project do not meet their objectives. Hence, to produce a good outcome, contractors have to come up with a good plan. As the construction project

involves more than one party, thus, a comprehensive project management is very essential. As a matter of fact, to make the project management more effective, an observation, or to be more specific, an appraisal, could be implemented to assess the performance of construction project players, particularly the contractors as they are the major player involved directly in constructing a particular project.

Performance appraisal system is a normal practice in any organisation and is not a new implementation to appraise workers with the quality of work so as in construction industry. In Malaysian construction industry, a few guidelines are established to ensure the works done by the contractor are not just been evaluated for the contractor's performance, but also to enhance their ability and capability by offering a suitable solution, such as training and performance appraisal systems as provided by Construction Industry Development Board

(CIDB). This paper is therefore undertaken with the aim to propose critical success factors (CSFs) towards the efficiency of these performance appraisal systems as currently implemented in Malaysian construction industry.

LITERATURE REVIEW

In Malaysian construction industry, 55 percent of the projects experienced cost overrun, and surprisingly private project is worse than public project (Shehu et al.³⁰). One of the prominent problematic public construction projects, Sultan Mizan Zainal Abidin Stadium's roof, which has collapsed demonstrates that poor technical knowledge and management lead to construction failure (Idris¹⁶). In addition, the stadium construction is also having problem with safety issues, where five workers injured and two were in critical condition (Idris¹⁶).

Collapse of a ramp on the Second Penang Bridge is another example of public construction project failure due to casual and careless manner of the sub-contractor (Mok²²). Another case due to miss behaviour on safety conduct is the falls of 300-tonne concrete span at Mass Rapid Transit (MRT) construction site, where three workers dead (Murad et al.²³). Assaf et al.² have supported this by claiming that accident during construction may lead to time overrun.

Thus, it is observed by this paper that construction industry faces a lot of high-profile problems, such as cost overrun, time overrun, poor quality and even cause of death. In order to solve these problems, contractors should be appraised by authorities to ensure that their performance can be sustained. On top of that, it will also help the authorities or clients in selecting the performed contractors for next construction project. The appraisal also helps the contractors in determining their weaknesses for further improvement.

Performance Appraisal System: Performance appraisal is vitally important for the organisation, who seeks for the improvement of their employee's performance, since through the performance appraisal system, the employer may know what is lacking. As a matter of fact, in the context of human resource management, performance appraisal is directly affecting employees' job satisfaction and the level of organisation commitment towards successful construction project (Deepa et al.⁹).

A successful project management is the management that maintains a balance between the demands of customers, project team and organisation (Hobday¹⁴). Therefore, it is clearly stated that the customers' or clients' satisfaction is not the only party that need to be taken care of, yet the rights and satisfaction of the project players, particularly the contractors as the key players, also need to be dealt with.

Hence, it is important to propose the critical success factors (CSFs) of contractor's performance appraisal system as this will significantly affect the delivery of the construction project. This statement is supported by Benson et al.⁴, who claim that employees with poor perception of performance appraisal were more likely to be dissatisfied with their job, less committed to the organisation and more likely to be contemplating leaving the organisation. Eventually, these low esteemed employees will affect the poor performance of construction industry as well as badly impact the government inspiration in ensuring the National Key Resource Area (NKRA) is successfully achieved.

In Malaysian Construction Industry, Construction Industry Development Board (CIDB) has launched Contractor's Capability and Capacity (SCORE), Quality Assessment System in Construction (QLASSIC) and Safety and Health Assessment System in Construction (SHASSIC) with the aim to appraise the construction contractor's capacity and capability. It turns out that the system is very helpful in selecting the right contractor for the right project in year 2012. This appraisal is strengthened by the newly launched program called Construction Industry Transformation Program (CITP). Four focuses in CITP are: quality, health and professionalism; productivity; environment sustainability and; internationalisation.

SCORE is developed by the Ministry of Work and CIDB, where it is also seen by this paper as an approach that permits the contractor's rating of each class to be based on the basic information of the contractor itself. It also enables contractors to identify their weaknesses and helps the ministry in drafting a programme that can enhance the capability and skill of the contractors. On the other hand, QLASSIC is an independent approach to appraise primarily on the quality of workmanship of building projects undertaken by contractors (CIDB⁵). The components that will be assessed in this appraisal system are structural works, architectural

works, mechanical and electrical (M&E) works and external works. Three main components of contractor’s performance appraisal system in SHASSIC are document check, workplace inspection and employees interview. It covers all components, such as occupational safety and health policy, occupational safety and organisation, hazard identification, risk assessment and risk control (HIRARC), occupational safety and training and promotion, machinery and equipment management, materials management, emergency preparedness, accident investigation and reporting and records management and performance monitoring.

On top of that, CIDB in 2015 has launched CITP, focuses on four strategic thrusts: quality, safety and professionalism; environmental sustainability; productivity and; internationalisation. For quality as well as safety and professionalism, CITP aims to be instilled in the culture of the construction industry (CIDB⁵). For this matter, quality, safety and professionalism are precondition in enhancing the construction industry into a responsible and developed industry. Under environment strategic thrust, CITP aims that sustainable infrastructure in Malaysian construction industry to be a model for the emerging world. CITP also aims to increase productivity by two-and-a-half times, where more than doubling of productivity will be equally matched by higher wages

within the construction industry. The last strategic thrust in CITP is internationalisation, which aims at unlocking the full potential of the global construction market. CIDB realised that there is a critical need to address gaps in domestic capabilities and improve access to financing within the domestic market and overseas market. In ensuring the achievement of CITP’s aim, all appraisal systems from CIDB, namely SCORE, QCLASSIC and SHASSIC need to be appraised in terms of its efficiency for better improvement.

Critical Success Factors (CSFs) towards Efficiency of Contractor’s Performance Appraisal System:

The term critical success factors (CSFs) was first used in construction project management by Rockart²⁷. CSFs can be defined as the criteria that are able to make the organisation successful (Pakseresht et al.²⁶), where if the criteria are not applied, the organisation would fail to reach their goal. Alias et al.¹ and Harison et al.¹² define CSFs as the criteria that help projects management practice to finish project successfully and it is even able to improve project delivery. Therefore, the paper suggests that CSFs in construction industry are defined as criteria that lead to the success of a project and improve project delivery through project management. Table 1 shows the summary of CSFs listed by previous studies.

Table 1: Summary of critical success factors (CSFs) listed by previous studies

No.	Criteria	Authors				Time referred
		Homtong et al. (2016)	Pakseresht et al. (2012)	Omran et al. (2012)	Saqib et al. (2008)	
Cost Performance		/	/	/	/	4
1.	Experience worker	/	/	/	/	4
2.	Effective communication and coordination	/	/	/	/	4
3.	Effective management and supervision at site	/	/	/	/	4
4.	Good availability of sources	/		/		2
5.	Good and enough material and equipment	/		/		2
6.	Less wastage	/		/		2
Time Performance		/	/	/	/	4
7.	Good competency of project participant	/		/		2
8.	Good change order practice	/		/	/	3
9.	Skills worker	/	/	/	/	4

Conted...

11.	Motivation by incentives	/	/		/	3
12.	Clear and realistic object	/	/			2
13.	Rapid decision making	/	/			2
Quality Performance		/	/	/	/	4
14.	Good organisational quality assurance	/		/	/	3
15.	Good monitoring and feedback by participant	/		/		2
16.	Good quality of raw material and equipment	/		/		2
17.	Good availability of competent staff	/	/	/	/	4
18.	High commitment in quality control by management	/	/	/		3
Health and Safety Performance		/	/	/	/	4
20.	Good coordination, control and management practice on health and safety	/	/		/	3
21.	Good personal behaviour by all participants	/	/			2
22.	Good implementation in safety management and practice	/	/			2
23.	Good conduct on-site inspection	/	/			2
Environment Performance		/	/	/	/	4
24.	Proper site layout	/		/	/	3
25.	Use environmental friendly material	/	/			2
26.	Use environmental friendly equipment	/	/			2
Productivity		/	/	/	/	4
27.	Competent manager/supervisor	/	/	/	/	4
28.	Competent skilled worker	/	/	/	/	4
29.	Well schedule and on time inspection	/		/		2
30.	Good change order practice	/	/		/	3
31.	Offer training to workers	/		/		2
32.	Good efficiency equipment	/		/	/	3
33.	Up-to date technology	/		/	/	3
Human Resource		/	/	/	/	4
34.	Good attitude among employees	/		/		2
35.	Enough training for employee	/		/	/	3
36.	Legal requirement	/	/			2
37.	Good support by senior employee/management	/		/		2

Source: Adapted and modified from Homtong et al.²¹, Pakseresht et al.²⁶, Omran et al.²⁵ and Saqib et al.²⁸.

Based on Table 1, the criteria of CSFs are divided into seven main criteria, namely cost performance, time performance, quality performance, health and safety performance, environmental performance, productivity and human resource. Based on the previous studies, all the criteria have been discussed in detail by Homtong et al.²¹, Pakseresht et al.²⁶, Omran et al.²⁵ and Saqib et al.²⁸. Each of the main criteria is explained in next following paragraphs.

As in the first main criterion, cost performance has six CSFs elements: experience worker, effective

communication and coordination, effective management and supervision, good availability of sources, good and enough material as well as equipment and less wastage. The first three are the most important CSFs elements as claimed by Homtong et al.²¹, Pakseresht et al.²⁶, Omran et al.²⁵ and Saqib et al.²⁸.

Time performance is another main criterion of CSFs, where skilled worker is the most important element, followed with good change order practice, motivation by incentive, clear and realistic object as well

as rapid decision making. In quality performance, six elements are referred by previous studies: availability of competent staff, good organisational quality assurance, high commitment in quality control by management, good monitoring and feedback as well as good quality of raw material and equipment.

Health and safety performance is also one of the important criteria, which encompasses good coordination, control and management practice, good personal behaviours by all participants, implementation in safety management and practice and good conduct on-site inspection. In addition, proper layout is the most referred element by previous study under environment performance. This is followed with use of environmental friendly materials and equipment as the important elements of CSFs towards the successful construction project. Under productivity criterion, competent manager or supervisor and skilled worker are the most referred elements, followed with good change order practice, offer training to workers, up-to-date technology, well schedule and on time inspection as well as offer training to workers. Lastly, human resource is also claimed as the main criterion in CSFs towards the success of construction project. Enough training is the most critical element in this criterion, followed with good attitudes among employee, legal requirement and good support by senior employee or management.

METHODOLOGY

Data collection is done via questionnaire survey. Initially, 10 percent of expected sample (15 respondents) was distributed for pilot study following Connelly⁷ before the real questionnaire survey is undertaken. The purpose is to examine the respondents' understanding of the questionnaire apart from determining whether the questionnaire is comprehensive enough in obtaining the information for this paper. This is supported by Scheuren²⁹, who claimed that pilot study is conducted prior to the distribution of actual questionnaire to test the feasibility of intended questionnaire to be undertaken as well as to perfect the questionnaire concepts and wording.

The Cronbach's alpha method is used for this purpose, where a coefficient of minimum 0.6 is expected for the reliability of the questionnaire to avoid correction or elimination of some variables in the contents (Cronbach⁸).

Since the questionnaire of this paper was reliable with overall Cronbach's alpha of 0.98, the actual questionnaire survey was undertaken, where a total of responses from 157 respondents selected from convenience sampling was received via on-site and web-based survey distribution. The analysis undertaken were the mean values (mean) and relative importance index (RII). From the RII, the items for each criterion were then ranked by its importance and validated by seven panels of expert that have experience at least 7 years in construction industry.

FINDING AND DISCUSSION

To fulfil the aim of this paper in proposing critical success factors (CSFs) towards efficiency of the contractor's performance appraisal in Malaysian construction industry, seven criteria are discussed in this sub-section based on the findings. Those criteria are cost performance, time performance, quality performance, health and safety performance, environmental performance, productivity and human resources. Relative Importance Index (RII) for each element in each criterion are calculated, thus each element can be ranked based on their respective criteria.

Table 2 illustrates the appraisal of various performance criteria towards the efficiency of contractor's performance appraisal system. All the elements in this criterion have mean values more than 3, which indicate that all the respondents agreed that each element in all performances are important and should be appraised during the appraisal stage. For cost performance, effective communication and coordination is in the first rank that significantly contributes to cost performance, which is also supported by Olawale et al.²⁴. The second rank is effective management and supervision at site, followed by good and enough material and equipment, good availability of sources, less wastage and experienced worker.

Table 2: Various performance criteria towards the efficiency of contractor's performance appraisal system

Elements		Frequency					Mean	RII (%)	Rank
		5	4	3	2	1			
Cost Performance									
1.	Experienced worker	39	84	34	0	0	4.03	80.89	6
2.	Effective communication and coordination	55	76	26	0	0	4.18	83.69	1

3.	Effective management and supervision at site	49	84	24	0	0	4.16	83.18	2
4.	Good availability of sources	47	80	30	0	0	4.11	82.17	4
5.	Good and enough material and equipment	49	83	25	0	0	4.15	83.06	3
6.	Less wastage	47	77	33	0	0	4.09	81.78	5
Time Performance									
1.	Good competency of project stakeholder	50	73	34	0	0	4.10	82.04	6
2.	Good change order practice	55	73	29	0	0	4.17	83.31	4
3.	Skilled worker	54	72	31	0	0	4.15	82.93	5
4.	Motivation by incentives	58	75	24	0	0	4.22	84.33	2
5.	Clear and realistic object	51	84	22	0	0	4.18	83.57	3
6.	Rapid decision making	60	78	19	0	0	4.26	85.22	1
Quality Performance									
1.	Good organisational quality assurance	45	91	21	0	0	4.15	83.06	2
2.	Good monitoring and feedback by stakeholder	42	77	38	0	0	4.03	80.51	5
3.	Good quality of raw material and equipment	45	88	24	0	0	4.13	82.68	4
4.	Good availability of competent staff	51	88	18	0	0	4.21	84.20	1
5.	High commitment in quality control by management	46	87	24	0	0	4.14	82.80	3
Health and Safety Performance									
1.	Good coordination, control and management practice on health and safety	51	78	28	0	0	4.15	82.93	3
2.	Good personal behaviour by all stakeholder	42	79	36	0	0	4.04	80.76	4
3.	Good implementation in safety management and practice	57	71	29	0	0	4.18	83.57	1
4.	Good conduct on-site inspection	53	77	27	0	0	4.17	83.31	2
Environmental Performance									
1.	Proper site layout	57	72	28	0	0	4.18	83.69	3
2.	Use environmentally friendly material (Gowri, 2004 #161)	60	68	29	0	0	4.20	83.95	2
3.	Use environmental friendly equipment	66	68	23	0	0	4.27	85.48	1
Productivity Performance									
1.	Competent manager/supervisor	60	69	28	0	0	4.20	83.95	3
2.	Competent skilled workers	54	74	29	0	0	4.16	83.18	4
3.	Well schedule and on time inspection	43	81	33	0	0	4.06	81.27	6
4.	Good change order practice	40	67	50	0	0	3.94	78.73	7
5.	Offer training to workers	61	67	29	0	0	4.20	84.20	2
6.	Good efficiency equipment	66	68	23	0	0	4.27	85.61	1
7.	Up-to date technology	55	63	39	0	0	4.10	82.04	5
Human Resource Performance									
1.	Good attitude among employees	67	65	25	0	0	4.27	85.35	1
2.	Enough training for employee	64	65	28	0	0	4.23	84.59	2
3.	Legal requirement	60	72	25	0	0	4.22	84.46	3
4.	Good support by senior employee/management	60	69	28	0	0	4.20	84.08	4

As for time performance, appraisal of rapid decision-making is the most important element, which is also supported by Jarkas et al.¹⁸ who found that rapid decision-making will result in better time performance.

In addition, motivation by incentives is in the second rank, whilst clear and realistic object in the third rank, where clear and realistic objective will allow people to follow with less or no mistake may occur resulting in

good time performance. Good change order practice is in the fourth rank because easy understanding contributes to high possibility of works can be completed on time thus will be benefited to time performance. In the fifth and sixth rank are skilled worker and good competency of project stakeholder, respectively.

Quality performance as discussed by many researchers (Alias et al.¹; Kerzner¹⁹; Mir et al.²¹; Todorović et al.³¹) is important in ensuring the success of the project, where from the findings of this paper, good availability of competent staff is the most important element under this criterion, followed by good organisational quality assurance and high commitment in quality control by management. The fourth and fifth ranks are good quality of raw material and equipment and good monitoring and feedback by stakeholder, respectively. The entire mean for each element under quality performance criteria is 4, which indicates that most of the respondents agreed that these elements are important and should be appraised in the contractor’s performance appraisal system.

As for health and safety performance, good implementation in safety management and practice is the main element that should be appraised. This also indicates that this element is important towards the efficiency of contractor’s performance appraisal system. The second, third, and fourth rank are good conduct on-site inspection, good coordination, control and management practice on health and safety and good personal behaviour by all stakeholder, respectively. In terms of the appraisal of environmental performance, the most important element in this criterion is the use of environmental friendly equipment, followed by the use of environmental friendly material and proper site layout. Gowri¹¹ as mentioned by Kibert²⁰ stated that the use of environmental friendly material benefits the construction in terms of sustainability, thus one of the main criteria should be considered during design, construction and post-construction stage.

For the productivity performance, good efficiency equipment is agreed as the most important element that should be assessed, followed by offer training to workers and competent manager or supervisor element. Ranked number four, five, six and seven are competent skilled workers, up-to date technology, well schedule and on time inspection and good change order practice, respectively. As for human resource performance, the first rank is good attitude among employees, which is

described by Bakker et al.³ as will result good outcome towards the successful construction project. The third, fourth and fifth ranks are enough training for employee, legal requirement and good support by senior employee/management, accordingly.

In addition, Table 3 is produced by calculating the mean of RII value for each criterion and the rank is done based on the RII, where the most important criteria should be appraised during the appraisal stage is human resource performance, followed by environmental performance and quality performance. Dissimilar from the rank based on literature review, the first, second and third ranks are productivity performance, cost performance and quality performance, respectively. Only health performance criterion in the same important rank from both findings in literature review of this paper as in the previous Table 1.

Table 3: Average Relative Importance Index (RII) from each performance criterion towards the efficiency of contractor’s performance appraisal system and its rank

No.	Criteria	RII (%)	Rank	Rank from literature
1.	Cost performance	82.46	7	2
2.	Time performance	83.57	3	4
3.	Quality performance	82.65	5	3
4.	Health and safety performance	82.64	6	6
5.	Environmental performance	84.37	2	5
6.	Productivity performance	82.71	4	1
7.	Human resource performance	84.62	1	6

From all the seven criteria: cost performance; quality performance; quality performance; health and safety performance; environmental performance; productivity performance; and human resource performance, all the elements for each criterion is accepted to be the critical success factors (CSFs) towards the efficiency of contractor’s performance appraisal system. A total number of proposed CSFs are listed in Table 4. Those CSFs have been verified by seven panels of expert that have experience at least 7 years in construction industry. They are from top management from Public Work

Department, Project Management Professional (PMP) registered with Project Management Institute (PMI) of United States of America, academician, local authorities, consultant, developer and contractor. The listed CSFs are recommended to be a part of the elements in appraisal system to ensure the high efficiency of contractor's performance appraisal system in Malaysia.

Table 4: Proposed critical success factor (CSFs) towards the efficiency of contractor's performance appraisal system based on importance

Human Resource Performance	
1.	Good attitude among employees
2.	Enough training for employee
3.	Legal requirement
4.	Good support by senior employee/management
Environmental Performance	
1.	Use environmental friendly equipment
2.	Use environmental friendly material
3.	Proper site layout
Time Performance	
1.	Rapid decision making
2.	Motivation by incentives
3.	Clear and realistic object
4.	Good change order practice
5.	Skilled worker
6.	Good competency of project stakeholder
Productivity Performance	
1.	Good efficiency equipment
2.	Offer training to workers
3.	Competent manager/supervisor
4.	Competent skilled workers
5.	Up-to date technology
6.	Well schedule and on time inspection
7.	Good change order practice
Quality Performance	
1.	Good availability of competent staff
2.	Good organisational quality assurance
3.	High commitment in quality control by management
4.	Good quality of raw material and equipment
5.	Good monitoring and feedback by stakeholder
Health and Safety Performance	
1.	Good implementation in safety management and practice
2.	Good conduct on-site inspection

Conted...

3.	Good coordination, control and management practice on health and safety
4.	Good personal behaviour by all stakeholders
Cost Performance	
1.	Experienced worker
2.	Less wastage
3.	Good availability of sources
4.	Good and enough material and equipment
5.	Effective management and supervision at site
6.	Effective communication and coordination

CONCLUSION AND RECOMMENDATION

The aim of this paper is achieved, where seven criteria are listed, evaluated, analysed, and validated by panel of experts. All criteria have their own elements and they are ranked by this paper orderly by their importance index. Based on this index, the mean values for each criterion are calculated and it is found that human resource performance is the most important criterion that should be appraised to ensure the efficiency of this appraisal system. The ranking is based on the findings and are different from the literature review, except in the sixth rank health and safety performance. These criteria should be considered in the appraisal system established by Construction Industry Development Board (CIDB), namely Contractor's Capability and Capacity (SCORE), Quality Assessment System in Construction (QLASSIC) and Safety and Health Assessment System in Construction (SHASSIC) to ensure the efficiency of the contractor's performance appraisal system in Malaysia.

ACKNOWLEDGMENT

The authors would like to express their sincere gratitude to the Ministry of Education Malaysia, Universiti Teknologi Malaysia (UTM) and the Research Management Centre (RMC) for providing the financial support. This paper is financed by the Grant of Research University Tier 1 under Cost Centre No.Q.J130000.2522.19H54.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Alias Z, Zawawi E, Yusof K, Aris N. Determining critical success factors of project management practice: A conceptual framework. *Procedia-Social and Behavioral Sciences*. 2014; 153: 61-69.
2. Assaf S. A, Al-Hejji S. Causes of delay in large construction projects. *International Journal of project management*. 2006; 24(4): 349-357.
3. Bakker A. B, Demerouti E. Towards a model of work engagement. *Career development international*. 2008; 13(3): 209-223.
4. Benson G. S, Pérez Nordtvedt L, Datta D. K. Managerial characteristics and willingness to send employees on expatriate assignments. *Human Resource Management*. 2009; 48(6): 849-869.
5. CIDB, C. I. D. B. *Construction Industry Transformation Programme 2016–2020*. CIDB Malaysia, Kuala Lumpur. 2015.
6. CIDB, C. I. D. B. *Buletin Statistik Pembinaan Suku Tahunan*. Retrieved from Kuala Lumpur: 2017.
7. Connelly L. M. Pilot studies. *Medsurg Nursing*. 2008; 17(6): 411-413.
8. Cronbach L. J. Coefficient alpha and the internal structure of tests. *Psychometrika*. 1951; 16(3): 297-334.
9. Deepa E, Palaniswamy R, Kuppusamy S. Effect of performance appraisal system in organizational commitment, job satisfaction and productivity. *Journal of Contemporary Management Research*. 2014; 8(1): 72.
10. Gliem J. A, Gliem R. R. Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales. 2003.
11. Gowri K. Green building rating systems: An overview. *ASHRAE journal*. 2004; 46(11): 56.
12. Harison A, Sumi Y, Srivastava V. *Critical Success Factors in Construction Project Implementation and Project Performance with Remedial Measures*. 2015.
13. Heagney J. *Fundamentals of project management: AMACOM Div American Mgmt Assn*. 2016.
14. Hobday M. The project-based organisation: an ideal form for managing complex products and systems? *Research policy*. 2000; 29(7-8): 871-893.
15. Homtong S, Mounnoi W. *Critical Success Factors Influencing Construction Project Performance for Different Objectives: Operation and Maintenance Phase*. Paper presented at the 35th ISERD International Conference, Singapore. 2016.
16. Idris S. M. *Stadium collapse shows worker safety atrocious*. Malaysiakini. 2013.
17. Institute, P. M. I. P. M. *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)-Sixth Edition: Project Management Institute*. 2017.
18. Jarkas A. M, Bitar C. G. Factors affecting construction labor productivity in Kuwait. *Journal of Construction Engineering and Management*. 2011; 138(7): 811-820.
19. Kerzner H. *Project Management Metrics, KPIs, and Dashboards: A Guide to Measuring and Monitoring Project Performance: Wiley*. 2017.
20. Kibert C. J. *Sustainable construction: green building design and delivery: John Wiley & Sons*. 2016.
21. Mir F. A, Pinnington A. H. Exploring the value of project management: linking project management performance and project success. *International Journal of project management*. 2014; 32(2): 202-217.
22. Mok O. *Commission produces 300-page report on Umno building, second bridge ramp mishaps*. Malay Mail Online. 2015.
23. Murad D, Rodzi N. H. *300-tonne concrete span at MRT construction site falls, three workers feared dead*. The Star Online. 2014.
24. Olawale Y. A, Sun M. *Cost and time control of construction projects: inhibiting factors and mitigating measures in practice*. *Construction Management and Economics*. 2010; 28(5): 509-526.
25. Omran A, Abdulbagei M. A, Gebril A. O. *An evaluation of the critical success factors for construction projects in Libya*. *International Journal of Economic Behavior*. 2012; 2: 17-25.
26. Pakseresht A, Asgari G. *Determining the critical success factors in construction projects: AHP approach*. *Interdisciplinary journal of contemporary research in business*. 2012; 4(8), 383-393.

27. Rockart J. F. The changing role of the information systems executive: a critical success factors perspective. 1980.
28. Saqib M, Farooqui R. U, Lodi S. H. Assessment of critical success factors for construction projects in Pakistan. Paper presented at the First Int. Conf. on Construction In Developing Countries, Karachi, Pakistan. 2008.
29. Scheuren F. What is a Survey? : American Statistical Association. 2004.
30. Shehu Z, Endut I. R, Akintoye A, Holt G. D. Cost overrun in the Malaysian construction industry projects: A deeper insight. *International Journal of project management.* 2014; 32(8): 1471-1480.
31. Todorović, M. L, Petrović D. Č, Mihić M. M, Obradović V. L, Bushuyev, S. D. Project success analysis framework: A knowledge-based approach in project management. *International Journal of project management.* 2015; 33(4): 772-783.

Graduating With Your First-Choice Degree: Does It Matter?

Lim Hock-Eam¹, Yip Chee-Yin²

¹*School of Economics, Finance and Banking, Universiti Utara Malaysia;*

²*Faculty of Business and Finance, Universiti Tunku Abdul Rahman*

ABSTRACT

Since the 1990s, Malaysia has achieved remarkable progress in its higher education enrolment. However, this remarkable achievement could be dampened by the gap between student's preferred and enrolled degree. Using a sample of Malaysian public university graduates, this paper measures the gap between preferred and enrolled degree and estimate its impact on the graduate's probability of unemployment. Results reveal that low parental income could lead to graduating with a not first-choice degree, and the first-choice degree is able to reduce the probability of unemployment. Thus, the government's efforts to increase higher education enrolment should also focus on offering degree programs that best match with the choice of students.

Keyword: *Parity index; Preferred degree; Enrolled degree; First-choice degree; Probability of unemployment.*

INTRODUCTION

The liberalization of the higher education sector in Malaysia since the late 1990s has brought a drastic increase in the number of public universities (Lim⁶). Consequently, the enrolment of public university has increased more than fivefold from 91,509 students in 1993 to 540,638 in 2016 (Ministry of Finance Malaysia^{10,11}). The admission rate into Malaysian public universities also increases substantially (Intake for public²). Nevertheless, the offer of admission does not necessarily come with the student's preferred degree.

There is no official statistics pertaining to the number of admission offers that mismatch with the student's preferred degree. However, there are reports that some high achievement students fail to obtain their first-choice degree (Lim⁸; Pak¹⁸). The Malaysia Ministry of Higher Education has pointed out that there are limited seats in public universities and fulfilling the minimum entry requirement does not guarantee a place of one's preferred degree (Lim⁸). The question that follows is: what is the problem of not getting one's first-choice degree?

There are various benefits of studying in one's first-choice degree. The admission into first-choice degree increases a student's probability of completing the degree and reduces the amount of time taken to complete the degree (Heinesen¹). In addition, Ost, Pan and Webber¹⁷ found that students who scored just above the admission cut-off point (first-choice degree) derive higher earnings than students who scored just below (not first-choice degree).

The Malaysian government has achieved remarkable progress in higher education enrolment and istargeting a further increase to 70% by 2025 (Ministry of Education Malaysia¹²). This remarkable achievement and aspiration could be dampened if there is a substantial gap between preferred and enrolled degree. Previous studies have shown that choice of degree is closely related to a student's talent, interest and ability. Murphy, Seneviratne, Cochrane, Davis and Mires¹⁵ found that high achievement students are more likely to choose their own course components. Indeed, the choice of students in their degree studied is driven by different motivations: career, interest, helping, and loafing (Skatova and Ferguson²⁰). For example, choice of medical degree is driven by helping and career motivation. Thus, graduating with a not preferred degree might lead to a low motivated graduate.

Malaysia is facing a persistent graduate unemployment problem since the financial crisis of 1998

Corresponding Author:

Lim Hock-Eam

School of Economics, Finance and Banking,

Universiti Utara Malaysia

Email: l1heam@uum.edu.my

(Lim⁷). Employers have ranked poor attitude a some of the top reasons for graduate unemployment (Jobstreet.com⁴). The poor attitude could be due to the low motivation of graduates. There are extensive studies on graduate unemployment and its determinants are clearly identified, such as English language proficiency, types of degree, academic attainment, ethnic groups, parental income and mismatch of skills(Khattab⁵; Lim and Siew⁹; Morshidi, Rosni, Lim and Mohamed Nasser¹³; Morshidi et al¹³; Pietro and Cutillo¹⁹). Recently, the lack of interest in entrepreneurship and its career choice are also found to be the determinants (Norasmah and Nur Zafirah¹⁶).

Jayasingam, Fujiware and Thurasamy³ found that choosiness could contribute to a graduate's unemployment. Graduates with high level of choosiness are perceived negatively by employers which deteriorates their employability. The not first-choice degree could be a contributing factor in this choosiness because the graduates may wish to choose the careers of their interests, and thus are choosy in their job search. This highlights the importance of first-choice degree to graduate unemployment. Despite the importance of first-choice degree, it appears that the tool to measure the first-choice degree and its impacts is yet to be established. To fill the gaps, this paper aims to measure the first-choice degree and estimate its impact on the probability of unemployment.

DATA AND METHODOLOGY

Data: The targeted population comprised the graduates of Universiti Utara Malaysia (UUM) and Universiti Malaysia Kelantan (UMK). The data were collected using self-administrated questionnaire. There was no sampling design and the graduates were approached at the best effort while they were waiting for their graduation robe. A total of 1,723 respondents were successfully obtained: 169 (UMK) and 1,554 (UUM). The first-choice degree is defined as the graduating degree that matches with the most preferred degree as perceived by the students after completing their studies.

Methodology: First-choice degree Parity Index (FPI) is proposed to measure the ratio between number of students graduated with their first-choice degree (S_j) to number of students graduated with not first-choice degree (S_0). The FPI could be disaggregated by the types of degree or other characteristics(j):

$$FPI = \frac{S_j}{S_0} \quad \text{where } j = 1, 2, \dots, k \quad \dots(1)$$

The value of FPI equals to one indicates a parity between graduates with first-choice degree and graduates with not first-choice degree. The value of FPI more than one indicates a disparity that favours the first-choice degree (more first-choice degree graduates, a good outcome). Values of less than one indicates a disparity that does not favour the first-choice degree (less first-choice degree graduates, not a good outcome).

Assume that there is a latent variable that represents a graduate's underlying tendency to be unemployed. This underlying tendency (latent) is associated with individual employability characteristics (X s) and first-choice degree (z). Let Y^* represents this latent variable and assume Y^* is a linear function of X s and z , the Equation (2) is obtained:

$$Y^* = \beta'X + \delta'z + e \quad \dots(2)$$

where

Y^* = latent variable of tendency to be unemployed

X = variables of individual employability characteristics

z = graduating with one's first-choice degree ($Z=1$) or not ($Z=0$)

β = vector of coefficient for variables in X

δ = coefficient of z (impact of first-choice degree)

e = the error terms

The observed outcome, Y , takes the value of 1 if the graduate is unemployed and 0 if employed. If the error terms are logistically distributed, we obtain a logit model. The maximum likelihood estimation method is used to estimate the probability of being unemployed and the impact of first-choice degree (δ).

RESULTS AND ANALYSIS

Descriptive statistics analysis: Table 1 presents the number of students graduated with their first-choice degree. More than half of the graduates reported that their graduating degree is their first choice (53.88%). The FPI (First-choice degree Parity Index) is found to be 1.168. From Table 2, the entrepreneurship degree is found to have the lowest value of FPI(0.658), i.e., the lowest ratio for first-choice degree; whereas, the professional degrees have the highest disparity (5.306).

Table 1: Graduates with First-choice degree

First-choice degree	Freq.	%	FPI
No	790	46.12	1.168
Yes	923	53.88	

Note: FPI = First-choice degree parity index

Table 2: Graduates with First-choice degree by types of degree

Types of degree	First-choice degree?		FPI
	Yes	No	
Entrepreneur	52	79	0.658
professional	191	36	5.306
Business/eco	501	510	0.982
ICT	67	90	0.744
Islamic	35	25	1.400
Arts	31	18	1.722
Sciences	24	27	0.889

Note: FPI = First-choice degree parity index

Relating to the ethnic groups (Table 3), Indian is found to have the highest disparity for first-choice degree (1.333). It is followed by Malay (1.223) and Chinese (1.016). The FPI is found to be increased over the range of parental income. The highest parental income (above RM5000) has the highest disparity for first-choice degree (3.000); whereas the lowest parental income (RM900 and below) has the lowest (0.897).

Table 3: Graduates with First-choice degree by ethnic groups and parental income

	First-choice degree?		FPI
	Yes	No	
Ethnic groups			
Malay	668	546	1.223
Chinese	194	191	1.016
Indian	40	30	1.333
Others	20	23	0.870
Parental income			
RM900 and below	113	126	0.897
RM901-RM2000	265	273	0.971
RM2001-RM3000	177	141	1.255
RM3001-RM4000	94	58	1.621
RM4001-RM5000	56	33	1.697
Above RM5000	36	12	3.000

Note: FPI = First-choice degree Parity Index

Relating to the employment status (Table 4), 45.18% of the graduates are unemployed and with a good parity between first-choice and not first-choice degree (FPI=1.019). Like unemployed graduates, self-employed (1.72%) and employed with full-time jobs that are not commensurate with qualification (16.96%) have a good parity (1.00 and 1.06 respectively). Graduates who are in full-time employment that commensurate with qualification have the highest disparity (1.405).

Table 4: Graduates with First-choice degree and employment status

Employment outcome	%	First-choice degree?		FPI
		Yes	No	
Unemployed	45.18	371	364	1.019
Further studies	6.58	61	46	1.326
FT employment commensurate with qualification	29.56	281	200	1.405
FT employment not commensurate with qual.	16.96	142	134	1.060
Self employed	1.72	14	14	1.000

Note: FPI = First-choice degree Parity Index; commensurate with qualification refer to full-time (FT) employment that required university degree as entry qualification.

In short, almost half of the Malaysian public university graduates are graduated with degree not of their first choice. The not first-choice degree graduates are more likely to be the non-professional degree, Chinese, low parental incomes, and obtain less favourable employment status.

Econometrics modelling: Table 5 presents the estimated logit models. It is found that students who graduated with their first-choice degree have lower probability of being unemployed than students who graduated with degree not of their first-choice, by 5.33 percent point (see Model 1). However, after controlling the influences of other variables, the impact of first-choice degree reduces and becomes insignificant (see Model 2). To gain further insights, a sub-sample analysis (first-choice and not first-choice degree graduates) is performed.

Table 5: Estimated logit model of being unemployed (full sample)

	Model 1		Model 2	
	M.E.	P-value	M.E.	P-value
First-choice degree	-0.0533	0.031**	-0.0451	0.160
Age	-	-	-0.0209	0.842
Age-squared	-	-	0.0000	0.988
Male	-	-	0.0443	0.177
Malay ²	-	-	0.2513	0.000***
Married ³	-	-	0.0287	0.661
Parental income	-	-	0.0071	0.573
Hh working member	-	-	0.0051	0.441
MUET	-	-	-0.0777	0.000***
CGPA	-	-	-0.0347	0.554
Types of degree: ⁴				
Professional	-	-	-0.2123	0.008***
Entrepreneur	-	-	-0.1928	0.021**
Business/Economics	-	-	-0.2423	0.006***
ICT	-	-	-0.1674	0.055*
Islamic related	-	-	-0.2513	0.001***
Sciences	-	-	-0.2986	0.000***
Overall fit test (p-value)	0.031**		0.000***	
% correctly predicted	54.82		62.76	

Notes:

1. ***, **, and * represent 1%, 5% and 10% significant level respectively; M.E. = marginal effect
2. Malay (comparison group: non-Malay)
3. Married (comparison group: not married)
4. Types of degree (comparison group: arts)

Table 6 presents the estimated logit models for the two sub-samples. In the sub-sample of first-choice degree (Model 3), the types of degree obtained matters. Compared to arts degrees, the other degrees are found to have lower probability of unemployment. In the sub-sample of not first-choice degree (Model 4), the types of degree are found to have no significant influences. This in significant result is also confirmed by a restriction test for types of degree (restricted the dummy variables of types of degree being in significant simultaneously). It is the proficiency in English language that influences the probability of unemployment significantly.

Table 6: Estimated logit model of being unemployed (sub-samples)

	Model 3 (first-choice)		Model 4 (not first-choice)	
	M.E.	P-value	M.E.	P-value
Age	-0.0241	0.829	0.2509	0.701
Age-squared	0.0001	0.974	-0.0060	0.645
Male	0.0514	0.257	0.0273	0.568
Malay ²	0.2476	0.000***	0.2468	0.000***

Married ³	0.0259	0.764	0.0229	0.827
Parental income	0.0108	0.505	0.0046	0.817
Family size	0.0074	0.414	0.0000	1.000
MUET	-0.0481	0.105	-0.1222	0.000***
CGPA	-0.0320	0.686	-0.0658	0.475
Types of degree:⁴				
Professional	-0.2760	0.003***	-0.1271	0.398
Entrepreneur	-0.3044	0.000***	-0.0267	0.862
Business/Economics	-0.2889	0.006***	-0.1538	0.268
ICT	-0.2615	0.002***	-0.0268	0.859
Islamic related	-0.3102	0.000***	-0.0935	0.581
Sciences	-0.3855	0.000***	-0.1434	0.352
Overall fit test (p-value)	0.0000***		0.0000***	
% correctly predicted	61.90		66.14	
Restriction test (degree)	-		0.3797	

Notes:

1. ***, **, and * represent 1%, 5% and 10% significant level respectively; M.E. = marginal effect
2. Malay (comparison group: non-Malay)
3. Married (comparison group: not married)
4. Types of degree (comparison group: arts)

DISCUSSIONS AND CONCLUSION

This paper measures the parity between the number of students graduated with degree of their choice and the number of students who are not and estimates the impact of first-choice degree on probability of being unemployed. Students from poor family are less likely to be graduated with their first-choice degree. This jeopardizes the government's efforts to have upward mobility for the poor in the Malaysian society. The unemployed graduates are more likely to have degrees of not their first-choice. Thus, the importance of being graduated with a degree of one's first-choice is clearly shown. Furthermore, results reveal that if the degree obtained is not the graduates' first-choice, the types of degree obtained do not have significant influences on probability of being unemployed, even for a marketable degree. Thus, a marketable degree would not help to improve their employability. These findings suggest that the achievement of Malaysian government in increasing its public university enrolment is dampened. The Malaysian government should focus on public universities' ability to offer places that best match with the choice of students. It is important to note that the findings are based on a sample of graduates from two public universities, i.e., UUM and UMK. Thus, the findings are exploratory. Future studies are suggested

to use a more representative sample to validate these findings and explore further into the issue of first-choice degree in Malaysia.

ACKNOWLEDGEMENT

We would like to thank the Ministry of Education Malaysia and Universiti Utara Malaysia for providing financial support to this study through its FRGS (Fundamental Research Grant Scheme) research grant (Code S/O: 12912). Thanks are also due to the ICOSIA2018 anonymous referees whose comments have improved this paper substantially.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Heinesen E. Admission to higher education programmes and student educational outcomes and earnings. The rockwool Foundation Research Unit, Study Paper No. 113, Copenhagen. 2016.

- Retrieved from: https://www.rockwoolfonden.dk/app/uploads/2016/10/Study-paper-113_Final_WEB.pdf
2. Intake for public universities. The Star Online, online newspaper, 2016 August 14. Retrieved from: <https://www.thestar.com.my/news/education/2016/08/14/intake-for-public-universities/>
 3. Jayasingam S, Fujiware Y, Thurasamy R. I am competent so I can be choosy” choosiness and its implication on graduate employability. *Studies in Higher Education*. 2016;43(7):1119-1134.
 4. Jobstreet.com. Employers rank soft skills above academics. 2013. Retrieved from: <https://goo.gl/psdfgQ>
 5. Khattab N. Ethnic and regional determinants of unemployment in the Israeli labour market: a multilevel model. *Regional Studies*. 2006;40(1):93-105.
 6. Lim H.E. Studies on graduate unemployment in Malaysia: unemployment duration, labour market outcomes and psychological impact of unemployment. Unpublished PhD Thesis, Monash University, Australia. 2008.
 7. Lim H.E. Overeducation and happiness in the Malaysian graduate labour market. *International Journal of Business and Society*. 2013;14(1):93-110.
 8. Lim R. Lessons in rejection. The Star Online, online newspaper, 2010 April 25. Retrieved from: <https://www.thestar.com.my/news/education/2010/04/25/lessons-in-rejection/>
 9. Lim H.E, Siew G.Y. Are the Malaysian students “unskilled” and “unaware”? *Journal of Advanced Research in Social Sciences and Humanities*. 2017;2(1):27-34
 10. Ministry of Finance Malaysia. Economic Report 1998/99. Kuala Lumpur: PNMB. 1998.
 11. Ministry of Finance Malaysia. Economic Report 2018/19. Putrajaya: PNMB. 2018.
 12. Ministry of Education Malaysia. Malaysia Education Blueprint 2015-2025 (Higher Education). Ministry of Education Malaysia, Putrajaya. 2016. Retrieved from: <https://www.mohe.gov.my/en/download/public/penerbitan/pppm-2015-2025-pt/5-malaysia-education-blueprint-2015-2025-higher-education/file>
 13. Morshidi S, Rosni B, Lim H.E, Mohamed Nasser K. Pencapaian akademik & kebolegunaan tenaga siswazah institusi pengajian tinggi. USM IPPTN Monograf 3/2004, Penang: Penerbit USM. 2004.
 14. Morshidi S, Abd. Aziz B, Abd Majid M.I, Ambigapathy P, Moha Asri A, Mohamed Dahlan I, Mohd Hafflah P, Lee N.N, Munir S, Rosni B, Rujhan M, Shukran A.R, Siti Zubaidah H, See C.M, Wan Ahmad K.M. Masalah pengangguran di kalangan siswazah. USM IPPTN Monograf 2/2004, Penang: Penerbit USM. 2004.
 15. Murphy M.J, Seneviratne R.D, Cochrane L, Davis M.H, Mires G.J. Impact of student choice on academic performance: cross-sectional and longitudinal observations of a student cohort. *BMC Medical Education*. 2013;13-26.
 16. Norasmah O, Nur Zafirah A.R. Public university students’ entrepreneurship interest and their career in Malaysia. *International Journal of Pure and Applied Mathematics*. 2018;119(5):2014-2046.
 17. Ost B, Pan W, Webber D. The returns to college persistence for marginal students: Regression discontinuity evidence from university dismissal policies. IZA Discussion Paper No. 9799, Institute for the Study of Labor (IZA), Bonn, Germany. 2016.
 18. Pak J. Is Malaysia university entry a level playing field? BBC News. 2013 September 2. Retrieved from: <http://www.bbc.com/news/world-asia-23841888>
 19. Pietro G.D, Cutillo, A. University quality and labour market outcomes in Italy. *Labour*. 2006;20(1):37-62.
 20. Skatova A, Ferguson E. Why do different people choose different university degrees? Motivation and the choice of degree. *Frontiers in Psychology*. 2014;5:1-15.

Financial Literacy among Malaysian Households in Managing Income

Noor Afza Amran¹, Norfaiezah Sawandi¹, Hasnah Shaari¹, Ram AlJaffri Saad¹, Abu Sufian Abu Bakar²

¹Tunku PuteriIntan Safinaz School of Accountancy, ²School of Economic, Finance and Banking, Universiti Utara Malaysia, 06010, Kedah, Malaysia

ABSTRACT

This paper examines the level of financial literacy among Malaysian households in terms of financial knowledge in managing their income and debt, financial planning and the elements of financial management. In terms of data collection, questionnaires were distributed to households in Peninsular Malaysia (Kedah, Pulau Pinang, Perak, Selangor, Johor, Kelantan and Terengganu). Findings reveal that around 25% of Malaysians have done financial planning for their daily expenses. About 44% of the decision on spending is done by the breadwinner (man in the family) and 24% is made by both husband and wife. In terms of financial management, it is found that males are wiser in terms of managing the money. The older group has a better understanding of managing their money as compared to the younger generation. The location and level of education also influence the behavior of individuals in managing their money. Thus, relevant authorities, such as Bank Negara Malaysia, need to be more aggressive in educating the public about the importance of financial education and planning.

Keywords: financial literacy, financial management, income, debt, households

INTRODUCTION

The issue of financial literacy and financial management among Malaysians is becoming crucial in today's scenario. The Malaysian Department of Insolvency reported that there were 18,457 individual bankruptcy cases in 2015 (News Straits Times¹⁹). A majority of youth has been found to be living on loans, with 38% relying on personal loans, while 47% on high credit card loans (Asian Institute of Finance, 2015). It has also been found that more than 3,400 youth between the ages of 20 to 30 years sought help from the Credit Counseling and Debt Management Agency in the first eight months of 2017, compared to 3,450 youths for the entire year of 2016.

Whitman Independent Advisors Sdn. Bhd.'s founder and managing director, Yap Ming Hui, said the financial

literacy level of Malaysians today is quite low. For the Generation Y, personal finance is not a priority. Thus, it is vital to educate youngsters on financial matters, especially in terms of investing and its usefulness as a hedge against inflation. They must also be taught how to make their money work for them (The Star Online²³). Thus, based on the unresolved financial issues discussed above, the objective of this study is to measure the level of financial literacy and financial management of Malaysian households.

LITERATURE REVIEW

Financial Literacy: Financial literacy is defined as the people's ability to process the economic information and make informed decisions about financial planning, wealth accumulation, debts and pensions (Mitchell & Lusardi, 2014). An individual is claimed to be financially literate if he or she is competent and able to apply the knowledge (Huston¹³) that is acquired through practical experience and active integration (Idris et al¹⁴). A lack of financial literacy is not only a problem in emerging economies; consumers in developed countries have also failed to demonstrate a strong grasp of financial

Correspondence Author:

Noor Afza Amran

1Tunku PuteriIntanSafinaz School of Accountancy,
Universiti Utara Malaysia, 06010, Kedah, Malaysia

Email: 1afza@uum.edu.my

principles, and have failed to manage financial risks effectively to avoid financial pitfalls. Lusardi and Tufano¹⁸ analyzed the concept of debt literacy and the consideration of taking loans among individuals. There is a significant relationship between debt literacy and both financial experience and debt burden. Individuals with lower levels of debt literacy tend to transact in a high-cost manner, incurring higher fees and using high cost of borrowing. On the other hand, interested groups, such as policymakers, are concerned that consumers lack working knowledge of financial concepts and do not have the tools to make decisions most advantageous to their economic well-being (Braunstein & Welch⁵). These inadequacies are concentrated among particular population sub-groups (those with low income and low education, minority groups and women), where being financially illiterate may render them more vulnerable to economic hardship during retirement (Lusardi & Mitchell¹⁵).

The National Financial Capability Study by the Financial Industry Regulatory Authority has found that only about a third of Americans younger than 40 years of age understand the basic financial concepts of compounding, inflation and risk diversification. In practice, there is widespread financial illiteracy and many households are unfamiliar with the most basic economic concepts needed to make sensible savings and investment decisions. This has serious implications for saving, retirement planning, retirement, mortgage and other decisions (Lusardi & Mitchell¹⁵).

Therefore, the main goal of investor education is to change the 'norms' of saving and investing of ordinary people (Fanto¹⁰). Financial education is knowledge related to any financial affairs in order to gain good financial practices (Hilgert, Hogarth, & Beverly¹²). Oehler and Werner (2003) argued that financial education is the ultimate solution to enhance financial literacy. The Australian Government of Financial Literacy Foundation conducted a study on 7,500 Australians and found that 89% of the sample have high levels of ability to manage their money (Ali et al³). The respondents feel more confident when it comes to everyday money management issues, like dealing with credit, budgeting, saving and managing debt.

Financial Knowledge in Malaysia: Bank Negara Malaysia conducted a Financial Capability and Inclusion Survey in 2015, and found that more than 75% of Malaysians face challenges to raise RM1,000 cash for

an emergency. Only 32% of Malaysians have enough money to cover a week's expenses at most, should they lose their source of income. An ideal situation is to have a financial buffer that is sufficient to cover living expenses of at least three to six months in the event of loss of income. According to the Employees Provident Fund, to live above the poverty line for the next 20 years in Malaysia, individuals need a minimum savings of RM228,000 when they reach 55 years of age. Only 40% of Malaysians consider themselves financially ready for retirement, despite the steadily increasing life expectancy of Malaysians. Many Malaysians are still prone to financial fraud and they also fall victim to financial scams. Statistics from the police have revealed that 1,883 cases related to financial scams were recorded between years 2015 to 2017. The total loss amounted to RM379 million. This suggests that greed and ignorance give way to rational financial decisions for many victims (Ruxyn²²).

According to the New Straits Times¹⁹, young Malaysians still lack of financial knowledge, especially to invest. Opening a savings account seems to be not a good method as inflation and the cost of not investing will decrease the value of savings from year to year. Based on the Personal Wealth Young Investors' Survey 2016 carried out by The Edge, only 7% of the respondents invested more than 30% of their monthly income while 45% only allocate 5% or less of their monthly income for investment.

Thus, initiatives have been taken by Bank Negara Malaysia by developing a five-year national strategy with the aim of elevating financial literacy among Malaysians. The five strategic priorities cover all life stages from nurturing values among young children to inculcating positive behavior for adults and preparing Malaysians to retire comfortably. The vision of Bank Negara Malaysia is to nurture a society characterized by responsible financial behavior, the ability to manage finances well and the achievement of financial security. The implementation of the national strategy is aligned to the longer-term government aspiration under the Finance Cluster initiative of the National Transformation 2050 (TN50). Elevating literacy levels and achieving financial well-being would only remain as hopes and dreams of Malaysians unless "commitment" is made (The Star Online²³).

Factors Influencing Financial Literacy: Many factors may lead to financial literacy, such as age, race, gender, marital status and education level, among others. The following studies relate to the factors mentioned above:

Gender: Most of the studies have found that males are more financially literate compared to females (Al-Tamimi & Al-Anood²; Lusardi & Mitchell¹⁶). Ford and Kent¹¹ revealed that female have lower levels of financial market awareness compared to male. This gap could be due to men normally playing the role as leader, responsible for managing their family’s affairs, including financial matters of their dependents, like wife and children.

Age: Capuano and Ramsay⁸ found that older people over the age of 70 seem to use credit cards more wisely compared to younger people, while young people are easily exposed to and involved in risky financial practices due to lack of financial literacy. On the other hand, Agarwal et al¹ showed financial mistakes are more prevalent among the young and elderly, i.e., those who have the lowest level of financial knowledge.

Marital Status: Married individuals are more financially literate compared to unmarried individuals (Brown & Graf⁶). Men are more knowledgeable about financial markets and instruments; hence they would influence the financial knowledge of their wives (Bashir et al., 2013). Therefore, married women exhibit a better level of financial literacy than single women. Low level of financial literacy in a marriage which can lead to the risk of making bad financial decisions, results in debts and create a rift in the marital relationship (Calamato⁷).

Education Level: Investors with degrees are found to be more knowledgeable than those with high school or college education (Cude⁹; Volpe et al²⁵). An educated, employed male living in an urban area is more financially capable than his peers, especially if his parents are educated (Lusardi et. Al¹⁷). Rooijab et al²⁴ indicated that an increase in financial education leads to wise financial decisions. Bateman et al⁴ found that basic and sophisticated financial competence increases with age, education level and income. Financial mistakes are found to be common among the young and elderly if they exhibit a low level of financial knowledge (Agarwal et al¹).

RESEARCH METHODOLOGY

This study employed a survey method and was carried out in several states of Peninsular Malaysia. Selection of respondents was done using the random sampling technique. The aim of this study is to provide empirical evidence on the level of financial literacy and spending habits among

Malaysian households. This research concentrated on an individual-based analysis. The unit of analysis is households with the age range of 16 years and above. The respondents comprised households from Kedah, Pulau Pinang, Perak, Johor, Selangor, Kelantan and Terengganu with 451 respondents being given questionnaires (as in Table 1). Part of the questions were adapted from Assessing Financial Literacy Organization for Economic Co-operation and Development (OECD) 2015.

Table 1: Breakdown of Sample Respondents by Selected States in Malaysia

States	Sample Household	Percentage (%)
Kedah	50	11
Pulau Pinang	50	11
Perak	50	11
Johor	100	22
Selangor	100	22
Kelantan	50	11
Terengganu	51	11
Total	451	100

RESULTS AND DISCUSSION

Table 2 discusses the result on financial planning. About 163 respondents (25.3%) have their own financial plan in order to achieve their financial goals; while 123 (19.2%) households are cutting down on their expenses in order to achieve their financial goals. Other than that, 97 (15.1%) respondents will do some savings and cash investment to achieve their financial goals. A total of 56 respondents (8.7%) will find a new job or part-time job to fulfill their financial goals; whilst 33 respondents (5.1%) will find another financial loan or refinance their loan to achieve their financial goals. Meanwhile, 20 (3.9%) respondents will increase their savings with the hope that by putting away more savings, they can meet their financial goals more quickly. A total of 149 households (22.7%) do not have any financial planning. This group of people is crucial as they are not aware of the importance of financial planning. This may be due to poor education level, lack of exposure to financial planning among family members or an individual’s behavior. These findings are consistent with a survey done by Bank Negara Malaysia in 2015 that more than 75% of Malaysians face challenge to raise RM1,000 of immediate cash in the event of an emergency (Ruxyn²²).

Table 2: Financial Planning by Malaysian Households

		Frequency (n = 451)	Percent
1.	Prepare financial plan	163	25.3
2.	Reduce spending	123	19.2
3.	Saving or cash investment	97	15.1
4.	Find new job/part time job	56	8.7
5.	Find other financial loans	33	5.1
6.	Increase financial saving	20	3.9
7.	No financial plan	149	22.7

According to Table 3, the results show who is responsible for making household decisions on daily expenses. About 42.1% or 190 respondents make joint husband-wife decisions; whilst 24.8% (112 respondents) mention that household spending decision is done either by the husband or the wife. Also, about 149 respondents

do not know who is responsible for making daily household expenses decisions. Often, it is based on prompt decisions as and when it is needed. These findings support a study done by Whitman Independent Advisors Sdn. Bhd. that financial literacy level of Malaysians is quite low, especially the Generation Y, where personal finance is not a priority for them (The Star Online²³).

Table 3: Households' Daily Spending Decisions

	Frequency (n = 451)	Percent
Decision is made together	190	42.1
Decision is made by the other party	112	24.8
Don't know	149	33.1

Table 4 illustrates the results based on respondents' financial knowledge, financial behavior and debt management. The results reveal the descriptive statistics of 451 respondents from several states in Peninsular Malaysia.

Table 4: Financial Management by Malaysian Households

	N	Time-value of money (%)	Interest on loan (%)	Risk & return (%)	Inflation (%)
Overall	451	49.0	70.1	79.6	84.6
Location					
Urban	290	69.0	71.7	78.8	83.4
Rural	161	47.2	63.1	67.1	72.7
Ethnicity					
Malay	198	49.8	69.4	81.20%	85.4
Chinese	186	51.7	74.6	79.70%	86.4
Indian	53	31.8	66.7	71.10%	82.2
Others	14	23.8	65.9	70.80%	77.8
Gender					
Male	204	47.6	74.5	79.80%	86.2
Female	247	51.2	66.0	79.10%	83.6
Age					
16 – 25 years	125	45.5	73.2	83.60%	80.4
26 - 40 years	141	45.2	65.8	79.5	86.3
41 - 50 years	87	53.20%	83.30%	78.70%	87.00%
51 - 60 years	39	59.00%	90.80%	84.60%	89.70%
more than 60 years	59	60.00%	89.00%	85.00%	95.00%

Conted...

Education Level					
Primary	19	64.30%	87.20%	71.40%	92.90%
Secondary	175	43.20%	65.50%	72.60%	80.50%
Diploma	112	47.10%	84.20%	89.50%	84.20%
Degree	124	69.90%	81.70%	96.20%	94.20%
Master's& above	21	40.00%	70.00%	97.00%	80.00%

Based on Table 4, respondents participated and showed their understanding on the five items asked, with the highest response for inflation (84.6%), risk and return (79.6%) and interest on loan (70.1%); and the lowest for the time-value of money (49%). Based on location, urban households show better understanding of financial knowledge and debt management (69% to 83%) compared to rural households (47% to 72%). It is not surprising since urban society may have a better standard of living, better education and exposure in terms of financial management. Past study by Lusardi and Mitchell (2007) have found that an educated, employed male living in an urban area is more financially capable than his peers, especially if his parents are educated (Lusardi et al.¹⁷).

In terms of ethnicity, there are four main groups. The Chinese show that they have a higher understanding of managing their cash and debt. They scored highest for the items of time-value of money (51.7%), interest on loan (74.6%), risk and return (79.7%) and inflation (86.4%) compared to Malay and Indian groups. This may justify that family upbringing and culture may also influence the behavior of people towards financial literacy.

For gender, 204 males and 247 females participated. Male respondents scored higher than female respondents for the items of inflation (83-86%), risk and return (79%), interest on loan (66-74%) and time-value of money (47-51%). Males are more alert to financial management and debt which could be due to their being the breadwinner in the family and hence, need to plan for the family. Past studies have supported these findings that female have lower levels of financial market awareness compared to male. Men normally play the role as a leader and are responsible for managing their family affairs, including financial matters of their dependents, like their wife and children (Ford & Kent¹¹; Al-Tamimi & Al-Anood²).

The older group (age of 51 and above) show better understanding of managing their money. They scored

high on the items of interest on loan, inflation and risk and return, ranging from 84 to 95%. Older people are more concerned with financial and debt management, have more experience and higher savings from their pension fund. These findings are consistent with Capuano and Ramsay⁸ who found older people (over the age of 70) spend more wisely compared to younger people. Most of the age levels scored a low point for the item of time-value of money. Respondents may not really understand the value of savings at a young age in that it may have a compounded value in the future, especially during retirement.

For the education level, the items of interest on loan (84%), risk and return (97%) and inflation (94%) scored high marks compared to time-value of money (69%) for all education levels. Respondents with diploma, degree and master's and above have better understanding of planning their savings and managing their debt. It is consistent with past studies that investors with degrees are more knowledgeable than those with only high school or college education (Volpe et al.²⁵). It is also evident that respondents at primary and secondary levels of education understand financial management. They may have been exposed to the basic knowledge on financial management and debt at school level, but lack the skills to manage and control their money (Lusardi et al.¹⁷; Cude⁹).

CONCLUSION

This study reveals that households in Peninsular Malaysia are still lacking in financial knowledge in terms of managing their wealth and debt. However, it must not be overlooked that they have already started to do some financial planning for the family in order to enjoy a better living standard and have some savings. The financial planning is done by the husband who is usually the breadwinner together with the family. In terms of knowledge on financial matters, this study found that households are aware about the items, such

as time-value of money, interest on loan, risk and return and inflation. As expected, urban society with higher level of education has better financial planning; whilst older people are found to have better financial literacy compared to the younger group. Males are found to be more financially literate and the Chinese seem to have higher awareness and planning in terms of financial management. Thus, it is timely for the relevant authorities, such as Bank Negara Malaysia, Ministry of Education and the Insolvency Department to be more aggressive in educating the public about the importance of financial education and planning. The limitation of this research is that it only covered Peninsular Malaysia and had a limited timeframe for respondents to answer the questionnaire.

ACKNOWLEDGEMENTS

The authors wish to thank the Ministry of Higher Education Malaysia in funding this study under the Fundamental Research Grant Scheme (FRGS), S/O code 13585, and Research and Innovation Management Centre, Universiti Utara Malaysia, Kedah for the administration of this study.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Agarwal S, Driscoll J. C, Gabaix X, Laibson D. The Age of Reason: Financial Decisions over the Lifecycle with Implications for Regulation. *Brookings Papers on Economic Activity*. 2009;2:51-117.
2. Al-Tamimi H. A. H, Al-Anood K. Financial literacy and investment decisions of UAE investors, *The Journal of Risk Finance*. 2009;10(5):500-516. DOI 10.1108/15265940911001402.
3. Ali P, Anderson M. E, McRae C. H, Ramsay I. The Financial Literacy of Young Australians: An Empirical Study and Implications for Consumer Protection and ASIC's National Financial Literacy Strategy, *Company and Securities Law Journal*. 2014;32(5):334-352.
4. Bateman H, Eckertz C, Geweke J, Louviere J, Satchellkand S, Thorp S. Financial competence and expectations formation: Evidence from Australia. *Blackwell Publishing Asia*. 2012;88(280):39-63. <http://dx.doi.org/10.1111/j.1475-4932.2011.00766.x> T
5. Braunstein S, Welch C. Financial Literacy: An Overview of Practice, Research, and Policy. *Federal Reserve Bulletin*. U.S.A: Federal Reserve Board. 2002.
6. Brown M, Graf R. Financial Literacy and Retirement Planning in Switzerland. *Numeracy Advancing Education in Quantitative Literacy*. 2013;6(2):1-23.
7. Calamato M.P. Learning Financial Literacy in the Family. 2010. Available via internet: http://scholarworks.sjsu.edu/etd_theses/384
8. Capuano A, Ramsay I. What Causes Suboptimal Financial Behaviour? An Exploration of Financial Literacy. *Social Influences and Behavioural Economics*. 2011 March 23. U of Melbourne Legal Studies Research Paper, (540).
9. Cude B.J. Financial Literacy. *The Journal of Consumer Affairs*. 2010;44(2):271-275.
10. Fanto J. A. Comparative Investor Education. *Brooklyn Law Review*. 1998;64:1083-1110.
11. Ford M. W, Kent D. W. Gender Differences in Student Financial Market Attitudes and Awareness: An Exploratory Study. *Journal of Education for Business*. 2010;85(1):7-12.
12. Hilgert M. A, Hogarth J. M, Beverly S. G. Household Financial Management: The Connection between Knowledge and Behavior. *Federal Reserve Bulletin*. U.S.A: Federal Reserve Board. 2003.
13. Huston S.J. Measuring financial literacy. *Journal of Consumer Affairs*. 2010;44(2):296 - 316.
14. Idris F. H, Krishnan K.S. D, Azmi N. Relationship between financial literacy and financial distress among youths in Malaysia: An empirical study. *Malaysian Journal of Society and Space*. 2013;9(4):106-117.
15. Lusardi A, Mitchell O. S. Financial Literacy and Retirement Preparedness: Evidence and Implications for Financial Education. *Business Economics*. 2007;42:35-44.

16. Lusardi A, Mitchell O. S. Financial Literacy and Planning: Implications for Retirement Wellbeing. Philadelphia: (The Wharton School, Univ. of Pennsylvania. 2006.
17. Lusardi A, Mitchell O.S, Curto V. Financial literacy among the young. *Journal of Consumer Affairs*. 2010;44(2):358–380.
18. Lusardi A, Tufano P. Debt literacy, financial experiences and overindebtedness. NBER Working Paper No. 14808. 2009a.
19. New Straits Times. Young Malaysians lacking in financial knowledge, need to start investing. 2018 Februar 26;1-4.
20. OECD. Improving Financial Literacy: Analysis of Issues and Policies. 2005. Retrieved from http://www.oecd.org/document/28/0,3343,en_2649_15251491_35802524_1_1_1_1,00.html
21. Oehler A, Werner C. Saving for Retirement: A Case for Financial Education in Germany and UK? An Economic Perspective. *Journal of Consumer Policy*. 2008;31(3):253-283.
22. Ruxyn T. Bank Negara reveals the 4 biggest mistakes Malaysians make when it comes to money. 2017;1-9. <http://says.com/my/news>
23. The Star Online. Bank Negara working on financial literacy roadmap. 2017 October 4;1-3.
24. Rooijab M, Lusardi A, Alessie R. Financial literacy and stock market participation. *Journal of Financial Economics*. 2011;101(2):449-472. <https://doi.org/10.1016/j.jfineco.2011.03.006>
25. Volpe R. P, Kotel J. E, Chen H. A Survey of Investment Literacy among Online Investors. *Journal of Financial*. 2002.

The Impact of Board of Directors' Characteristics and Remuneration on Companies' Performance in Malaysia

Chua Mei Shan¹, Nazrul Hisyam Ab Razak², Aiwan bin Ismail Ali³

^{1,3}Putra Business School, ²Department of Accounting and Finance, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia

ABSTRACT

This study aims at investigating the impact of board size, board independence, CEO duality, board gender diversity and board remuneration on the performance of public listed firms in Malaysia. Using the fixed effect and random effect models, the result showed that board independence and board remuneration have positively influenced firm performance respectively to ROA and TQ. However, board gender diversity was negatively associated with ROA. These results imply that higher number of board independence and higher amount of board remuneration can enhance firm performance. Though the Malaysian Code of corporate governance, the importance of having more female on board with the quota of 30% has been stressed with the result apparently presented that many female representations on the board may not enhance but deteriorate firm performance. The result of this study supported the notion of board remuneration and board independence that act as effective governance mechanisms to mitigate agency cost. With these results, firms must carefully design the director remuneration and determine appropriate numbers of independent director and female director on the board since they can influence firm performance.

Keywords: Board Independence, Board Gender Diversity, Board Remuneration, Return on Assets, Tobin's Q, Fixed Effects Model, Random Effects Model

INTRODUCTION

Corporate governance is gaining attention worldwide with financial scandals and corporate failures due to mismanagement, fraudulence, corruption and breach of trust. This has raised the issue of governance and its effects on company performance. The corporate scandals such as Enron in 2001, WorldCom and Tyco in 2002, Freddie Mac in 2003, American International Group (AIG) in 2005 and Lehman Brothers in 2008 suggest that even large and strong corporate entities can collapse if they are not well managed and governed. The integrity of corporations, financial institutions and markets is crucial in gaining market confidence as well as protecting shareholders' interests. Since the major corporate scandals have led to the downfall of big corporations, significant changes have been done in the governance, regulation and relationship between managements, boards and shareholders to improve company performance.

Companies with better corporate governance might have better performance than those with poor corporate

governance (Black, Jang, & Kim⁹&Arora & Sharma⁷). In Malaysia, corporate governance has received more attention after the Asian Financial Crisis in 1997. Malaysian securities commission has released the first Malaysian Code of Corporate Governance (MCCG) in 2000 to improve the governance standard in the country. The MCCG has been revised for three times in 2007, 2012 and 2017 to strengthen the framework and address future issues and challenges. The revisions of MCCG in 2007 and 2012 are to be in line with globally recognised best practices and standards, while the MCCG in 2017 has taken a new approach that includes the Comprehend Apply and Report (CARE) approach, shift from "comply or explain" to "apply or explain an alternative" and an introduction to new dimension of "Step Up" practices to urge companies to go further in achieving corporate excellence. All in all, these MCCGs emphasised the importance for having effective board to improve firm performance.

An effective board is often linked with the size of board, greater number of independent directors, separation of CEO-chairman position, board gender diversity and remuneration. Early studies on the

relationship of board characteristics and firm performance have largely concentrated on the developed countries (Horváth & Spirollari²²) while this issue is gaining attention from developing countries only in the recent years. Although studies on board characteristics have been previously carried out in Malaysia, the evidences provided were mixed. This may be due to the failure of ordinary least squares (OLS) in capturing the endogeneity relationship of board structure and firm performance. Furthermore, the use of only one or two board structure variables (Fuji, Halim, & Julizaerma¹⁶; Khan, Hassan, & Marimuthu²⁶; Lee-kuen, Sok-gee, & Zainudin²⁹; Mohd Nor, Shafee, & Samsuddin³⁵) caused the studies to be unable to capture simultaneous relationship of board characteristics and firm performance in a period. What is more, shorter time frame studies (Abdullah¹; Ponnu & Karthigeyan⁴¹; Shukeri, Shin, & Shaari⁴⁷; Yatim⁵³; Shawtari, Salem, Hussain, Alaeddin, & Thabit⁴⁶) may create limitations to draw inferences for another period. Therefore, this study was endeavoured to fill the academic gap by investigating the relationship of board size, board independence, CEO duality, board gender diversity and board remuneration with the performance of 100 public listed firms in Bursa Malaysia for five years period (2012 to 2016). To improve the estimators' efficiency, this study used fixed effect and random effect estimations for robust estimators.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Two main theories were referred in formulating the hypothesis namely Agency Theory (AT) (Jensen & Meckling²⁵) show its relationship to the 'separation and control' issue, investigate the nature of the agency costs generated by the existence of debt and outside equity, demonstrate who bears these costs and why, and investigate the Pareto optimality of their existence. We also provide a new definition of the firm, and show how our analysis of the factors influencing the creation and issuance of debt and equity claims is a special case of the supply side of the completeness of markets problem. The directors of such [joint-stock] companies, however, being the managers rather of other people's money than of their own, it cannot well be expected, that they should watch over it with the same anxious vigilance with which the partners in a private copartnership frequently watch over their own. Like the stewards of a rich man, they are apt to consider attention

to small matters as not for their master's honour, and very easily give themselves a dispensation from having it. Negligence and profusion, therefore, must always prevail, more or less, in the management of the affairs of such a company. Adam Smith. *The Wealth of Nations*, 1776, Cannan Edition (Modern Library, New York, 1937) and Resource Dependency Theory (RDT) (Pfeffer & Salancik³⁹). According to AT, agency conflict occurs due to the different interests between managers (agents) and shareholders (principals). (Jensen & Meckling²⁵) show its relationship to the 'separation and control' issue, investigate the nature of the agency costs generated by the existence of debt and outside equity, demonstrate who bears these costs and why, and investigate the Pareto optimality of their existence. We also provide a new definition of the firm, and show how our analysis of the factors influencing the creation and issuance of debt and equity claims is a special case of the supply side of the completeness of markets problem. The directors of such [joint-stock] companies, however, being the managers rather of other people's money than of their own, it cannot well be expected, that they should watch over it with the same anxious vigilance with which the partners in a private copartnership frequently watch over their own. Like the stewards of a rich man, they are apt to consider attention to small matters as not for their master's honour, and very easily give themselves a dispensation from having it. Negligence and profusion, therefore, must always prevail, more or less, in the management of the affairs of such a company. Adam Smith. *The Wealth of Nations*, 1776, Cannan Edition (Modern Library, New York, 1937). To reduce the agency conflict, the shareholders would appoint the board of directors (BODs) as monitor to oversee the management. Meanwhile, the RDT views the BODs as a resource provider that could bring in unique set of human and social capital resources such as education, expertise, skills, access and an individualised set of contacts that may impact the firms in positive ways. (Krishnan & Amin²⁸).

Board size is one of the board characteristics that have been extensively studied by researchers locally and internationally. Yermack⁵⁴) argued that small board size can enhance firm performance since the consensus among members is easier to achieve, requires shorter time in decision making and less communication conflicts among the members. (Horváth & Spirollari²²; Jensen²⁴; Shukeri et al.⁴⁷) political, regulatory, and economic forces have been changing the worldwide economy in

a fashion comparable to the changes experienced during the nineteenth century Industrial Revolution. As in the nineteenth century, we are experiencing declining costs, increasing average (but decreasing marginal). In contrast, large board size is associated with great depth of intellectual knowledge that helps in decision making process (Arora & Sharma⁷). Researchers such as Arora & Sharma⁷ [India], Afrifa & Tauringana³ [United Kingdom], Shawtari et al.⁴⁶ [Malaysia], Rathnayake & Sun⁴² corporate governance and corporate performance in Asia such as China, India, Singapore, Pakistan, Malaysia and Sri Lanka. In addition, this study examines whether there is an impact of ownership structure and ownership concentration levels on firm's performance. This study considers board size, shareholder's independence and age of the corporation are used as corporate governance measures. Firm performance is measured by the return on assets (ROA [Asian countries] and Singh, Tabassum, Darwish, & Batsakis⁴⁸) [Pakistan] discovered that board size is positively associated with company performance. Meanwhile, Malik & Makhdoom³¹ [Fortune Global 500 companies], Wijethilake, Ekanayake, & Perera⁵¹) [Sri Lanka] and Ujunwa⁴⁹ [Nigeria] concluded that board size is negatively related with company performance. Therefore, this current study postulated that:

H1. There is a positive relationship between board size and company performance

Having outside directors is vital as they can act as “. . . providers of relevant complementary knowledge” to the management (Abdullah¹; Fama & Jensen¹⁴). Board independence can be a proxy for overall good governance (Bhagat & Bolton⁸). High representation of independent directors may help to improve firm performance as they are independent, concerned about own reputation, hold better judgment and more trustworthy to hold fair representation of shareholder interest (Shukeri et al.⁴⁷). Jaffar & Abdul-Shukor²³ [Malaysia], Gaur, Bathula, & Singh¹⁷ [New Zealand] and Ahmadi, Nakaa, & Bouri⁵ [French] found a positive relationship between board independence and firm performance. In contrast, Darko, Aribi, & Uzonwanne¹³ [Ghana], Horváth & Spirollari²² [US] and Shukeri et al.⁴⁷ [Malaysia] demonstrated an inverse relationship between the independent directors and performance. Thus, it was hypothesised that:

H2. There is a positive relationship between board independence and company performance.

According to AT, the separation of CEO and Chairman positions may improve the effectiveness of BODs since it reduces the potential conflict among the BODs (Shukeri et al.⁴⁷; Wijethilake et al.⁵¹). Nevertheless, it has been argued that combination role helps in making decisions because dual roles vested in one person can create deeper understanding and knowledge on the operations of a company (Marashdeh³²). Researchers such as Wijethilake et al.⁵¹ [Sri Lanka] and Gaur et al.¹⁷ discovered a positive relationship between CEO duality and firm performance. Nevertheless, Vu, Phan, & Le⁵⁰ [Vietnam] and Shukeri et al.⁴⁷, Ghazali¹⁸ and Ponnu⁴¹) the weight of opinion is that there is a significant relationship between governance structures and firm performance. The aim of this research is to study the effect, if any, of corporate governance structures, particularly board structure and CEO duality, on the performance of Malaysian public listed companies. The literature on these two governance parameters, board structure and CEO duality on firm performance in the context of Malaysia is lacking. Using samples of large publicly traded Malaysian companies, this research aims to examine the relationship between CEO duality and the proportion of independent directors on firm performance as measured by return on assets (ROA [Malaysia] reported insignificant relationship between CEO duality and firm performance. Hence, the third hypothesis of this study is:

H3. There is a positive relationship between CEO duality and company performance.

In Malaysia, the trend of women holding higher positions in the decision making process in public and private sector has gained its momentum. Aiming at gender equality, the government has introduced a policy that women must comprise no less than 30% on board and senior management positions by 2016 for public and limited liability companies with more than 250 employees.

Female representations on the board may strengthen the board monitoring function and more advantages in obtaining and maintaining important resources (Adams & Ferreira²; Nguyen, Locke, & Reddy³⁷). Adding more women on board may widen human capital and channels of communication of the BODs as they can bring in extra knowledge into firms' strategic issues especially those related to female employees, consumers and business partners (Daily, Certo, & Dalton¹²). However, increasing gender diversity may lead to a greater conflict of interests due to difficulties in reaching monotonous strategy decisions in heterogeneous

group and impair the monitoring functions(Campbell & Mínguez-Vera¹⁰; Goodstein, Gautam, & Boeker¹⁹). Darko et al.¹³) and Khan et al.²⁶ [Malaysia] presented a positive relationship between female directors and firm performance. Conversely, Fauzi & Locke¹⁵ and Ujunwa⁴⁹ reported that female directors are detrimental to firm performance. Meanwhile, Shukeri et al.⁴⁷ and Vu, Phan, & Le⁵⁰demonstrated insignificant relationship. Hypothesis 4 is described as below:

H4. There is a positive relationship between gender diversity and company performance.

From the AT perspective, board remuneration is one of the vital mechanisms to solve agency problem(Hassan, Christopher, & Evans²¹; Ruparelia, Njuguna, & Otten⁴⁴). If the remuneration is sufficiently appealing, the company can acquire ability that can prompt a superior management of the firm and encourage directors to perform better (Miyienda, Oirere, & Miyogo³⁴). However, higher compensation packages may impair the directors’ judgment, giving managers the advantage of pursuing their own interests at the expense of performance (Afrifa & Tauringana³). Aggarwal & Ghosh⁴[Indian] found that board remuneration has positively influenced accounting performance with insignificant relationship with market performance. Likewise, Yatim⁵³ and Razali, Yee, Hwang, Tak, & Kadri⁴³)[Malaysia] and Narwal & Jindal³⁶ [India] found that director remuneration is able to improve firm financial performance. However, Afrifa & Tauringana³ [UK] discovered that high remuneration can be harmful to firm performance. Thus, the Hypothesis 5 was

constructed as follows:

H5. There is a positive relationship between board remuneration and company performance.

Data: This study utilised the panel data of financial and BODs’ data collected from Thompson Reuters Datastream and companies’ annual report, respectively. The sample was 100 public listed firms in Bursa Malaysia that came from three largest industries; 40 industrial product, 30 trading and services and 30 consumer product firms. The study period was from 2012 to 2016. Following Krishnan & Amin²⁸ and Shukeri et al⁴⁷, the companies were randomly selected from each sector so that significant number of companies can well represent each respective sector. All financial and unit trust companies were excluded from the sample because of differences in the regulatory requirements. A total of 500 observations were analysed.

Estimation Model: In this study, the following regression model was estimated:

$$\text{Performance}_{it} = \alpha_0 + \beta_1 \text{BSIZE}_{it} + \beta_2 \text{BIND}_{it} + \beta_3 \text{CEODuality}_{it} + \beta_4 \text{GDIVER}_{it} + \beta_5 \text{BREM}_{it} + \beta_6 \text{LEV}_{it} + \beta_7 \text{SIZE}_{it} + \epsilon_{it} \dots(1)$$

Where firm performance is a function of BODs characteristics and some control variables. Firm performance is measured by return on assets (ROA) and Tobin’s Q (TQ). ϵ_{it} denotes the residual (contains random or fixed effects). i represents the firm and t denotes time. (See Table 1 for the definition of the variables.)

Table 1: Definition of the variables

Variables& Symbols	Measurements
Dependent Variables	
Return on Assets (ROA _{it})	Net income available to common stockholders divided by total assets
Tobin’s Q (TQ _{it})	Market value of equity divided by book value of equity
Independent Variables	
Board Size (BSIZE _{it})	Total number of BODs in the company at the end of financial year.
Board Independence (BIND _{it})	Number of Non-executive directors divided by total directors on the board.
CEO Duality (CEODuality _{it})	Dummy variable equal to 1 for duality, 0 for non-duality.
Board Gender Diversity (GDIVER _{it})	Number of female directors divided by total directors on the board.
Board Remuneration (BREM _{it})	Logarithm of total directors’ remunerations including salary, bonuses, fees and benefit-in-kind.
Control Variables	
Firm size (SIZE _{it})	Logarithm of total assets.
Leverage (LEV _{it})	The ratio of total debt to total assets.

ESTIMATION METHOD

The most common estimation of panel data is the Ordinary Least Squares (OLS) estimator. Unbiased and consistent estimators of OLS rely on several assumptions. This suggests that the corporate governance and control variables should be strictly orthogonal to the errors and that the errors are independently and identically normally distributed with a zero mean and a variance equal to σ^2 (Schultz, Tan, & Walsh⁴⁵) we fit a comprehensive model of performance and governance using a range of econometric techniques. Once a dynamic generalized method of moments (GMM). In other words, the error terms in each time period should be uncorrelated with the explanatory variables in the same time period (Marashdeh³²). However, Wintoki, Linck, & Netter⁵² argued that the corporate governance and performance relation may suffer from endogeneities (simultaneity and unobserved heterogeneities). This endogeneities would be captured by disturbance terms. Thus, the violation of the assumptions causes the OLS estimators to be no longer unbiased and consistent. Consequently, any findings drawn from OLS results lead to wrong inferences (Ochieng³⁸). To deal with this, the fixed effects estimation (FE) and random effects estimation (RE) can be applied. The FE model assumes that the individual effect term is constant, whereas

the RE assumes that the individual effect is a random disturbance drawn from probability distribution.

In identifying the appropriate model, Equation (1) was run with OLS estimators followed by RE estimation. For the selection process between the OLS and RE, Lagrange Multiplier test (LM) was utilised. The null hypothesis is that individual-specific or time-specific error variance components are zero. If the p-value of Chi-square distribution is less than 0.05, the RE is better to control the heterogeneity. To differentiate between FE and RE, Hausman test was used, which is a test for correlation between the x variables and the individual random effect. Under the null hypothesis, RE estimator is the preferred model; for alternate hypothesis, FE estimator is the preferred model. If the p-value of Chi-square distribution is less than 0.05, then one can reject the null hypotheses and conclude that FE method is more appropriate.

FINDINGS & DISCUSSIONS

Table 2 demonstrates the characteristics of the variables for 100 firms. The results showed all the 100 firms with healthy performance due to a positive and high percentage of ROA and TQ. The average ROA was 5.8730 ranging from -59.28 to 212.22. It has a SD value of 12.8531. The average TQ was 1.0463 ranging from 0.0853 to 7.9947. The SD for TQ was 1.1393.

Table 2: Descriptive Statistics

Variables	Obs	Mean	Std. Dev. (SD)	Min	Max
ROA	500	5.8730	12.8531	-59.28	212.22
TQ	500	1.0463	1.1393	0.0853	7.9947
BFSIZE	500	7.666	2.0695	4	15
BIND	500	0.6337	0.1814	0.1	1
CEODuality	500	0.15	0.3574	0	1
GDIVER	500	0.1067	0.1218	0	0.44
BREM	500	14.6301	0.9241	12.0494	18.3664
SIZE	500	20.0242	1.5785	17.1082	25.6126
LEV	500	0.1846	0.1535	0	0.6184

Note: ROA (net income available to common stockholders divided by total assets), TQ (market value of equity divided by book value of equity), BFSIZE (total number of BODs in the company at the end of financial year), BIND (number of Non-executive directors divided by total directors on the board), CEODuality (dummy variable equal to 1 for duality, 0 for non-duality), GDIVER (number of female directors divided by total directors on the board), BREM (logarithm of total directors' remunerations including salary, bonuses, fees and benefit-in-kind), SIZE (logarithm of total assets) and LEV (the ratio of total debt to total assets). This table reports the descriptive statistics for dependent variables, independent variables and control variables. The result of control variables are presented in the table but it is not reported in order to save space.

The number of directors on boards was between 4 and 15 with an average BSIZE of 7.666 directors. Sixty three percent of overall board members were seen as independent directors. Sample of this study indicated that only 15% of the firms practice dual leadership. Over the five-year period, the average number of female directors was 0.1067 ranging from a minimum of 0% to a maximum of 44%. In terms of BREM, the average

number of logarithm remuneration was 14.6301 with a range between 12.0494 and 18.3664.

Table 3 depicts the multicollinearity relationship among the variables. It was initially checked by pairwise correlation followed by variance-inflating factor (VIF) (Gujarati & Porter²⁰). The VIF results showed that the sample data did not suffer from multicollinearity problem.

Table 3: Correlation Coefficients

Variables	ROA	TQ	BSIZE	BIND	CEODuality	GDIVER	BREM	SIZE	LEV	VIF
ROA	1									
TQ	0.4534***	1								
BSIZE	0.0738*	0.1306***	1							1.37
BIND	0.1308***	0.1615***	0.0664	1						1.41
CEODuality	-0.0557	0.0026	-0.1191***	-0.1147**	1					1.04
GDIVER	0.0328	0.0378	0.0647	0.1307***	-0.0144	1				1.04
BREM	0.0949**	0.1428***	0.4336***	-0.1712***	-0.1254***	0.0672	1			1.91
SIZE	0.0744*	0.084*	0.4781***	0.2598***	-0.0793*	0.1347***	0.5663***	1		2.11
LEV	-0.1451***	-0.1989***	0.1758***	-0.2240***	-0.0175	-0.0676	0.3719***	0.3109***	1	1.28

Note: This table reports pair-wise correlation coefficients based 100 firms. The values of variance inflation factors (VIFs) are based on the sample of 500 firm-year observations. The variables are as defined in Table 2. *, **, and *** significant at 10%, 5% and 1%, respectively. VIF results less than 10 showed no multicollinearity problem. The result of control variables are presented in the table but it is not reported in order to save space.

Table 4 examines the relationship between board characteristics and ROA. The Hausman test chi-squared result suggested that the null hypothesis of the test cannot be accepted at any conventional level of significance [chi-sq 24.11; p-value = 0.011]. Therefore, the FE approach was employed to control the time invariant unobserved characteristics across firms.

Table 4: The relationship between board characteristics and ROA

Dependent Variable: Return on Assets (ROA)			
	Pooled Ordinary Least Squares (OLS)	Random Effect Model (REM)	Fixed Effect Model (FEM)
Constant	-31.95622 *** (-3.02)	-27.87661 (-1.88)	5.690533 (0.11)
BSIZE	0.1560039 (0.49)	-0.0206145 (-0.05)	-0.3785018 (-0.52)
BIND	8.505421** (2.32)	10.56792** (2.09)	28.38669*** (2.61)
CEODuality	0.7526426 (-0.47)	-0.6330232 (-0.29)	-0.1106121 (-0.03)
GDIVER	-0.8120147 (-0.17)	-6.195866 (-0.95)	-33.2074** (-2.34)
BREM	2.489683*** (2.97)	1.824314 (1.61)	-4.401609 (-1.95)
SIZE	-0.1050856 (-0.20)	0.2296276 (0.31)	2.966913 (1.13)
LEV	-15.58467*** (-3.77)	-17.99031*** (-3.28)	-34.44534*** (-3.50)
Adjusted R ²	0.0482	0.0548	0.0134
Breusch-Pagan LM test	71.51(0.000)		-
Hausman test	-	24.11 (0.011)	
Observations	500		

Note: This table reports findings from estimating Eq. (1). Column 2 reports the outcomes from the OLS estimator with clustering at the firm level. Column 3 exhibits the results gained from Random Effect estimator. Estimation gained from fixed effect estimator is reported in Column 4. ** and *** significant at 5% and 1%, respectively. The result of control variables are presented in the table but it is not reported in order to save space.

From Table 4, the initial significant coefficients under pooled OLS estimation were seen disappeared after unobserved fixed effect was considered. This implies that the results of OLS were likely to be driven by omitted firm level characteristics. The result from FE estimation showed that the BIND was positive and significant at 1% level of significance ($\beta = 28.28669$, p-value = 0.009). The positive evidence showed that increasing the number of independent directors can lead to a better performance. This is because they are able to hold better judgment, provide resources and act on behalf of shareholders' interest (Abdullah¹; Chaghadari & Chaleshtori¹¹; Shukeri et al.⁴⁷). This study result was parallel with that of Jaffar & Abdul-Shukor²³. Hence, this study supported Hypothesis 2.

Meanwhile, GDIVER was found to be statistically negative at 5% level of significance with ROA ($\beta = -33.2074$, p-value = 0.02). This implies that the greater the number of female directors, the lower is firm performance. This was contradicted with this study's prediction that women on board would strengthen the board monitoring function because their existence seem to cause greater conflict of interests and slow down the decision making, thus weakens the firm performance. The result of this study was consistent with that obtained by Fauzi & Locke¹⁵ and Ujunwa⁴⁹. Though the result was significant, it was out from the proposed prediction; therefore, Hypothesis 4 was rejected.

Moreover, the results showed that BSIZE, CEO Duality and BREM were insignificant with ROA ($\beta = -0.3785018$, p-value=0.602; $\beta = -0.1106121$, p-value=0.979; $\beta = -4.401609$, p-value= 0.052, respectively). Thus, it can be deduced that board size, CEO duality and board remuneration are not the effective governance mechanisms to improve financial performance. Thus, Hypothesis 1, 3 and 5 were rejected.

Table 5: The relationship between board characteristics and Tobin's Q

Dependent Variable: Tobin's Q (TQ)			
	Pooled OLS	Random Effect	Fixed Effect
Constant	-3.662604*** (-4.04)	-4.044881*** (-3.49)	-6.688187*** (-4.09)
BFSIZE	0.0473236 (1.74)	0.0416972 (1.92)	0.0434323 (1.89)
BIND	1.099587*** (3.5)	0.5309547 (1.74)	0.5293542 (1.54)
CEODuality	0.1833827 (1.33)	0.0273499 (0.22)	0.0135249 (0.1)
GDIVER	-0.1480475 (-0.37)	-0.2049343 (-0.51)	-0.3056394 (-0.68)
BREM	0.3476296*** (4.84)	0.167191*** (2.57)	0.142337** (1.99)
SIZE	-0.0548022 (-1.24)	0.1070069 (1.83)	0.2562167*** (3.08)
LEV	-1.900788*** (-5.36)	-0.7363877** (-2.55)	-0.6299959 ** (-2.02)
Adjusted R ²	0.1114	0.0624	0.0329
Breusch-Pagan LM test	798.70 (0.0000)		-
Hausman test	-	13.35 (0.0639)	
Observations	500		

Note: This table reports findings from estimating Eq. (1). Column 2 reports the outcomes from the OLS estimator with clustering at the firm level. Column 3 exhibits the results gained from Random Effect estimator. Estimation gained from fixed effect estimator is reported in Column 4. ** and *** significant at 5% and 1%, respectively. The result of control variables are presented in the table but it is not reported in order to save space.

Table 5 tests the relationship of board characteristics and TQ. The Hausman test result (Chi-sq= 13.35, p-value = 0.0639) suggested RE model as the preferred model.

The result of OLS presents two variables that are statistically positive at 1% level of confidence, which are BIND and BREM. However, under RE model, only BREM ($\beta = 0.167191$) remained significant with TQ. The positive coefficient implied that as board remuneration increases, firm market performance increased. In line with Yatim⁵³ and Razali et al.⁴³ CEO duality, firm size, firm age, and leverage; the regression results show director remuneration has positive relationship with firm performance (measured by ROA and ROE, board remuneration appeared to be an effective monitoring mechanism that can help improving firm performance. Hence, Hypothesis 5 was accepted.

The insignificant coefficient of BSIZE, BIND, CEO Duality and GDIVER deduced that they are not the effective mechanisms to enhance the firms' market performance.

CONCLUSION

This study was conducted to investigate the impact of board size, board independence, CEO duality, board gender diversity and board remuneration on the performance of 100 public listed firms in Malaysia from year 2012 to 2016. Using the appropriate model between the FEM and REM, this study showed that board independence was positively related with ROA, while board gender diversity was negatively associated with ROA and board remuneration was statistically positive with TQ. These implied that board independence and board remuneration work as effective governance mechanisms improving firm performance. Though the MCGG has stressed a quota of 30% female on board, the result apparently showed that having more female directors might deteriorate firm performance. The insignificant result of board size and CEO duality neither in ROA nor TQ suggests that both characteristics may not be effective in solving agency conflicts. Hence, firms must carefully design the director remuneration and balance the numbers of independent and female directors on the board.

RECOMMENDATIONS

The research design of this study has its own limitation. Firstly, the sample size was only limited to 100 firms with the study period of only 5 years. For more accuracy, future studies can increase the sample size and

longer time frame. Secondly, this study has only used ROA and TQ as dependent variables; thus, future studies can consider other measures including ROE or PE ratio since different measures produce different results (Li, Lu, Mittoo, & Zhang³⁰) whereas state-controlled firms have insignificant effects, irrespective of whether they are state or locally controlled. The results are robust to a battery of endogeneity checks and are stronger with market-based (Tobin's Q). Finally, future studies could incorporate variables such as director education, age and board busyness as these characteristics may play roles in improving the corporate governance in Malaysia.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Abdullah S. N. Board structure and ownership in Malaysia: the case of distressed listed companies. *Corporate Governance*. 2006; 6(5): 582–594. <https://doi.org/10.1108/14720700610706072>
2. Adams R. B, Ferreira D. Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics*. 2009; 94(2): 291–309. <https://doi.org/10.1016/j.jfineco.2008.10.007>
3. Afrifa G. A, Tauringana V. Corporate governance and performance of UK listed small and medium enterprises. *Corporate Governance: The International Journal of Business in Society*. 2015; 15(5): 719–733. <https://doi.org/10.1108/CG-03-2015-0029>
3. Aggarwal R, Ghosh A. Director's remuneration and correlation on firm's performance. *International Journal of Law and Management*. 2015; 57(5): 373–399. <https://doi.org/10.1108/IJLMA-08-2011-0006>
4. Ahmadi A, Nakaa N, Bouri A. Chief Executive Officer attributes, board structures, gender diversity and firm performance among French CAC 40 listed firms. *Research in International Business and Finance*. 2018; 44: 218–226. <https://doi.org/10.1016/j.ribaf.2017.07.083>
5. Ameer R, Ramli F, Zakaria H. A new perspective on board composition and firm performance in

- an emerging market. *Corporate Governance: The International Journal of Business in Society*.2010; 10(5): 647–661. <https://doi.org/10.1108/14720701011085607>
6. Arora A, Sharma C. Impact of Firm Performance on Board Characteristics: Empirical Evidence from India. *IIM Kozhikode Society & Management Review*.2015; 4(1): 53–70. <https://doi.org/10.1177/2277975215595559>
 7. Bhagat S, Bolton B. Corporate governance and firm performance. *Journal of Corporate Finance*.2008; 14: 257–273. <https://doi.org/10.1016/j.jcorpfin.2008.03.006>
 8. Black B, Jang H, Kim W. Does Corporate Governance Affect Firm Value? Evidence from Korea. Stanford Law School, Working Paper.2002.
 9. Campbell K, Mínguez-Vera A. Gender diversity in the boardroom and firm financial performance. *Journal of Business Ethics*.2008; 83(3): 435–451. <https://doi.org/10.1007/s10551-007-9630-y>
 10. Chaghadari M. F, Chaleshtori G. N. Corporate Governance and Firm Performance. 2011 International Conference on Sociality and Economics Development.2011; 10: 484–489. <https://doi.org/http://dx.doi.org/10.1016/j.jcorpfin.2008.03.006>
 11. Daily C. M, Certo S. T, Dalton D. R. A decade of corporate women: some progress in the boardroom, none in the executive suite. *Strategic Management Journal*.1999; 20(1): 93–100. [https://doi.org/10.1002/\(SICI\)1097-0266\(199901\)20:1<93::AID-SMJ18>3.0.CO;2-7](https://doi.org/10.1002/(SICI)1097-0266(199901)20:1<93::AID-SMJ18>3.0.CO;2-7)
 12. Darko J, Aribi Z. A, Uzonwanne G. C. Corporate governance: the impact of director and board structure, ownership structure and corporate control on the performance of listed companies on the Ghana stock exchange. *Corporate Governance: The International Journal of Business in Society*.2016; 16(2): 259–277. <https://doi.org/10.1108/CG-11-2014-0133>
 13. Fama E. F, Jensen M. C. Separation of Ownership and Control. *Journal of Laws and Economics*.1983; 26(2): 301–325. <https://doi.org/10.1086/467037>
 14. Fauzi F, Locke S. Board structure, ownership structure and firm performance: A study of New Zealand listed-firms. *Asian Academy of Management Journal of Accounting and Finance*.2012; 8(2): 43–67.
 15. Fuzy S. F. S, Halim S. A. A, Julizaerma M. K. Board Independence and Firm Performance. *Procedia Economics and Finance*.2016; 37(16): 460–465. [https://doi.org/http://dx.doi.org/10.1016/S2212-5671\(16\)30152-6](https://doi.org/http://dx.doi.org/10.1016/S2212-5671(16)30152-6)
 16. Gaur S. S, Bathula H, Singh D. Ownership concentration, board characteristics and firm performance: A contingency framework. *Management Decision*.2015; 53(5): 911–931. <https://doi.org/10.1108/MBE-09-2016-0047>
 17. Ghazali N. A. M. Ownership structure, corporate governance and corporate performance in Malaysia. *International Journal of Commerce and Management*.2010; 20(2): 109–119. <https://doi.org/10.1108/10569211011057245>
 18. Goodstein J, Gautam K, Boeker W. The Effects of Board Size and Diversity on Strategic Change. *Strategic Management Journal*.1994; 15, November 1992: 241–250. <https://doi.org/10.1002/smj.4250150305>
 19. Gujarati D. N, Porter D. C. *Basic Econometrics*. McGraw-Hill.2009.
 20. Hassan S, Christopher T, Evans R. Directors' remuneration and firm performance: Malaysian Evidence. *Malaysian Accounting Review*.2003; 2(I).
 21. Horváth R, Spirollari P. Do the Board of Directors' Characteristics Influence Firm's Performance? The U.S. Evidence. *Prague Economic Papers*.2012; 21(4): 470–486. <https://doi.org/10.18267/j.pep.435>
 22. Jaffar R, Abdul-Shukor Z. The role of monitoring mechanisms towards company's performance. *Journal of Accounting in Emerging Economies*. 2016; 6(4), 408–428. <https://doi.org/10.1108/JAEE-05-2014-0021>
 23. Jensen M. C. The Modern Industrial Revolution, Exit, and the Failure of Internal Control Systems. *Journal of Finance*.1993; 48(3): 831–880. <https://doi.org/10.1111/j.1540-6261.1993.tb04022.x>
 24. Jensen M. C, Meckling W. H. Theory of the Firm: Managerial. *Journal of Financial Economics*.1976;

- 3: 305–360. [https://doi.org/http://dx.doi.org/10.1016/0304-405X\(76\)90026-X](https://doi.org/http://dx.doi.org/10.1016/0304-405X(76)90026-X)
25. Khan H, Hassan R, Marimuthu M. Diversity on Corporate Boards and Firm Performance: An Empirical Evidence from Malaysia. *American Journal of Social Sciences and Humanities*. 2017; 2(1): 1–8. <https://doi.org/10.20448/801.21.1.8>
 26. Kılıç M, Kuzey C. The effect of board gender diversity on firm performance: evidence from Turkey. *Gender in Management: An International Journal*. 2016; 31(7): 434–455. <https://doi.org/10.1108/GM-10-2015-0088>
 27. Krishnan S, Amin A. M. M. Empirical Study of Corporate Governance on Public Listed Companies in Malaysia. *Human Resource Management Research*. 2017; 7(1): 17–27. <https://doi.org/10.5923/j.hrnr.20170701.02>
 28. Lee-kuen I. Y, Sok-gee C, Zainudin R. Gender Diversity and Firms' Financial Performance in Malaysia. *Asian Academy of Management Journal of Accounting & Finance*. 2017; 13(1): 41–62. <https://doi.org/10.21315/aamjaf2017.13.1.2>
 29. Li Lu L, Mittoo U. R, Zhang Z. Board independence, ownership concentration and corporate performance-Chinese evidence. *International Review of Financial Analysis*. 2015; 41: 162–175. <https://doi.org/10.1016/j.irfa.2015.05.024>
 30. Malik M. S, Makhdoom D. D. Does corporate governance beget firm performance in fortune global 500 companies? *The International Journal of Business in Society*. 2012; 16(4): 1–26.
 31. Marashdeh Z. M. S. The Effect of Corporate Governance on Firm Performance in Jordan. 2014; September: 193.
 32. Marimuthu M. Ethnic Diversity on Boards of Directors and Its Implications on Firm Financial Performance. *The Journal Of International Social Research*. 2008; ¼: 431–445.
 33. Miyiinda B, Oirere C. O, Miyogo J. the Relationship Between Director Remuneration and Performance of Firms Listed in the Nairobi Securities Exchange. *The International Journal of Social Sciences*. 2013; 15(1): 1–17.
 34. MohdNor M, Shafee N. B, Samsuddin N. Board Characteristics and Malaysian Firm Performance. *Global Journal of Business Research in Accounting, Auditing and Business Ethics* 2014; 1(3): 139–147.
 35. Narwal K. P, Jindal S. The Impact of Corporate Governance on the Profitability : An Empirical Study of Indian Textile Industry. *International Journal of Research in Management, Science & Teknologi*. 2015; 3(2): 81–85.
 36. Nguyen T, Locke S, Reddy K. Does boardroom gender diversity matter? Evidence from a transitional economy. *International Review of Economics and Finance*. 2015; 37: 184–202. <https://doi.org/10.1016/j.iref.2014.11.022>
 37. Ochieng O. R. The Influence of Corporate Governance on Agency Cost of firms listed in the Nairobi Securities Exchange. 2013.
 38. Pfeffer J, Salancik G. R. *The External Control of Organizations: A Resource Dependence Perspective*. Harper and Row. 1978. <https://doi.org/10.2307/2231527>
 39. Ponnu C. H. Corporate Governance Structures and the Performance of Malaysian Public Listed Companies. *International Review of Business Research Papers*. 2008; 4(2): 217–230.
 40. Ponnu C. H, Karthigeyan R. M. Board independence and corporate performance : Evidence from Malaysia. *Africa Journal of Business Management*. 2010; 4, March, 2000: 858–868.
 41. Rathnayake D. N, Sun G. Corporate Ownership, Governance and Performance: Evidence from Asian Countries. *Research Journal of Finance and Accounting Www.Iiste.Org ISSN*. 2017; 8(15): 28–36. Retrieved from <https://www.researchgate.net/publication/321480044>
 42. Razali M. W. M, Yee N. S, Hwang J. Y. T, Tak, A. H. Bin, Kadri, N. Directors' Remuneration and Firm's Performance: A Study on Malaysian Listed Firm under Consumer Product Industry. *International Business Research*. 2018; 11(5): 102. <https://doi.org/10.5539/ibr.v11n5p102>
 43. Ruparelia R, Njuguna A, Otten J. Relationship between Board Remuneration and Financial

- Performance in the Kenyan Financial Services Industry. *International Journal of Financial Research*.2016; 7(2): 247–255. <https://doi.org/10.5430/ijfr.v7n2p247>
44. Schultz E. L, Tan D. T, Walsh K. D. Endogeneity and the corporate governance - performance relation. *Australian Journal of Management*.2010; 35(2): 145–163. <https://doi.org/10.1177/0312896210370079>
45. Shawtari F. A, Salem M. A, Hussain H. I, Alaeddin O, Thabit O. Bin. Corporate governance characteristics and valuation: Inferences from quantile regression. *Journal of Economics, Finance and Administrative Science*.2016; 21: 81–88. <https://doi.org/10.1016/j.jefas.2016.06.004>
46. Shukeri S. N, Shin O. W, Shaari M. S. Does Board of Director's Characteristics Affect Firm Performance? Evidence from Malaysian Public Listed Companies. *International Business Research*.2012; 5(9): 120–127. <https://doi.org/10.5539/ibr.v5n9p120>
47. Singh S, Tabassum N, Darwish T. K, Batsakis G. Corporate Governance and Tobin's Q as a Measure of Organizational Performance. *British Journal of Management*. 2017; 29(1): 171–190. <https://doi.org/10.1111/1467-8551.12237>
48. Ujunwa A. Board characteristics and the financial performance of Nigerian quoted firms. *Corporate Governance: The International Journal of Business in Society*. 2012; 12(5): 656–674. <https://doi.org/10.1108/14720701211275587>
49. Vu M. C, Phan T. T, Le N. T. Relationship between board ownership structure and firm financial performance in transitional economy: The case of Vietnam. *Research in International Business and Finance*.2018; 45: 512–528. <https://doi.org/10.1016/j.ribaf.2017.09.002>
50. Wijethilake C, Ekanayake A, Perera S. Board involvement in corporate performance: evidence from a developing country. *Journal of Accounting in Emerging Economies*. 2015; 5(3): 250–268.
51. Wintoki M. B, Linck J. S, Netter J. M. Endogeneity and the dynamics of internal corporate governance. *Journal of Financial Economics*. 2012; 105(3): 581–606. <https://doi.org/10.1016/j.jfineco.2012.03.005>
52. Yatim P. Directors' Remuneration and Corporate Governance in Malaysia. *Seventh Asia Pacific Interdisciplinary Research in Accounting Conference*.2013; 1–24. Retrieved from <http://www.apira2013.org/proceedings/pdfs/K253.pdf>
53. Yermack D. Higher market valuation for firms with a small board of directors. *Journal of Financial Economics* 1. 1996; 40(1494): 185–211.

Integrated Research Framework Approaches to the Control of Dengue Diseases for Achieving Sustainable Development Goals in Malaysia

Ahmad Firdhaus Arham¹, Muhammad Rizal Razman², Latifah Amin³, Zurina Mahadi⁴, Lee Khai Ern⁵, Sharifah Zarina Syed Zakaria⁶, Mazlin Mokhtar⁷

^{1,2,5,7}Research Centre for Sustainability Science & Governance (SGK), Institute for Environment & Development (LESTARI); ^{3,4}Pusat Citra Universiti, ⁶Research Centre for Environmental, Economic & Social Sustainability (KASES), Institute for Environment & Development (LESTARI), 43600 UKM Bangi, Selangor, Malaysia

ABSTRACT

Integrated research framework approaches are designed to create smart strategies to control dengue diseases in Malaysia. These approaches combine ecosystem approaches to health, or Eco-health, adaptive management and community participation in decision-making process. The processes may look somewhat complex, but each approach has its strength when it comes to control dengue diseases. A review of the collaboration between the various approaches can improve ecosystem services, encourage socio-cultural empowerment, improve health awareness and foster economic growth with less impact on human beings and the environment. Informative knowledge regarding Eco-health is essential for providing an understanding of the ecosystem from measurement in adaptive management. The adaptive management from all expertise will lead good governance and guaranteed community rights with regard to ensure their participation in decision-making process. Therefore, we carried out a survey on 399 respondents in Klang Valley, Malaysia to evaluate their attitudes by looking their participation on developing their trust in key actors and informed consent in terms of implementation on dengue's control techniques. The justification for this study is that we really need an integrated research approaches to make sure the informative knowledge about dengue diseases, that the correct methods for prevention are well known, that safe products with regard to prevention are ready to apply, that health management with regard to dengue is effective, that good governance exists in terms of policy, and the most important is high level of community participation. Consequently, it is necessary to look at the real situation of dengue cases in Malaysia by giving space to all stakeholders involved to choose the best way to preserve environment without dengue, to ensure healthy lives and to help the nation achieve its sustainable development goals.

Keywords: *integrated research approaches, eco-health, adaptive management, community participation, decision-making process, trust on key actors, informed consent, dengue.*

INTRODUCTION

Dengue is mosquito-borne virus diseases that become a major health problem in Malaysia^{1,2}. According to a report from the Ministry of Health, 2014 until 2016 are a dramatic year for Malaysia when the number of dengue cases have raised more than 100,000. However, in 2017, dengue cases were decreased with 83,849 which resulting 177 deaths. Up to August 2018, the number of dengue cases have also decreased by 42,952 that involving 65 deaths. This shows that Malaysia is one of the countries which is trying to achieve the goal

of a global strategy by the World Health Organization (2012) to reduce mortality by at least 50% and to reduce morbidity by at least 25% in 2020 by using the year 2010 as a baseline. Furthermore, this also shows that Malaysia was committed to achieve Sustainable Development Goals (SDGs) agenda in controlling dengue diseases.

Several principles of SDGs that can be encouraged to preserve the environment in controlling dengue which are i) the 3rd principle to ensure a healthy life among all age and ii) the 11th principle to ensure the city and the community in an inclusive, resilient

and sustainable. Both principles are appropriate to ensure that the public is safe from any vector-borne diseases, especially dengue. There is a link between environmental awareness and sustainability in ensuring sustainable development³ which environment needs to be preserved and protected by humans⁴. The concept of sustainable development is a strategy to protect the environment⁵ to ensure its survival so that the entire world is protected for future generations⁶. The concept of environmental sustainability refers to the process of conserving the ecosystem to maintain ecological and life systems⁷ and not contaminated from any damage that will cause various negative effects⁸. Therefore, process of environment preservation needs to integrate social and economic dimensions⁹.

There are many strategies for preventing dengue in Malaysia that focus on vector control management, surveillance, enforcement, emergency preparedness, vector control research and community participation^{1, 2}. Therefore, this research is carried out to propose innovative framework, which combine integrated approaches to ensure environmental sustainability without dengue. These approaches are an innovation to manage a healthy ecosystem in an adaptive approach. There are also involving participation from the community which influenced by their trust in key actors and the provision of informed consent for the implementation of dengue's control techniques. In other words, healthy ecosystem management through an adaptive approach requires community participation by raising public awareness to sustain our environment. The aims of the approaches are, 1) to solve the dengue problem by identifying the factors that cause the symptoms of dengue in such a way as to see the gaps between environment, social and economic dimensions; 2) to implement an appropriate approach to sustain the ecosystem as it applies to human health by using adaptive management, and by educating communities to participate in decision making process to eliminate dengue diseases.

In discussing aspects of dengue, it is important that we have clear information on the causes and challenges of dengue diseases. Aedes mosquitoes are the main vectors that spread the dengue diseases which commonly found in human habitats, especially in urbanized community areas¹. The main vector of this virus is the Aedes Aegypti mosquito, while the Aedes Albopictus mosquito is the second vector most commonly found in Malaysia¹⁰. There are four serotypes of the virus that are classified as *flavivirus* DENV 1, DENV 2, DENV 3, and DENV 4. The virus spreads through the bite of

female Aedes mosquitos that carry the virus^{11, 12}. After someone has been bitten by the infected mosquito, the virus enters the victim's blood stream, probably leading to sudden fever followed by various symptoms such as severe headache, pain behind the eyes, severe abdominal pain and sometimes a heat rash¹³. Currently, there is no specific treatment in the form of vaccines against dengue infection¹⁴, and only preventive therapy treatment is available to treat it¹⁵.

Human activity is the main factor for dengue becoming a dramatic epidemic globally¹. Rapid development in terms of progress, population growth, urbanization, and climate change, especially in cities, have become the factors leading to the worsening of the dengue problem^{1, 16, 17, 18}. Domestic water used by humans has created an opportunity for the Aedes mosquito to breed¹⁹. Some researchers have identified that buckets, flower pots and used tires are commonly used by Aedes to breed¹⁰. In fact, anything that can hold water can also act as a suitable place for the Aedes mosquito to breed^{1, 10, 21}. Weather changes and climate uncertainties are also a major factor that can cause this epidemic to become rampant because they provide conducive conditions for the transmission of dengue diseases²². In fact, environmental factors such as relative humidity and a high ambient temperature will increasing the number of mosquito breeding spots¹⁰.

A lack of community awareness means less participation can cause dengue problem to increase. Community participation depends on how the community involves itself in ensuring the success of dengue preventative strategy²³. However, the community usually is not willing to participate in dengue's control programmes. The community itself tends to suffer from poor communication which leads to a lack of community involvement, lack of knowledge and limited awareness of dengue. Previous research shows that the Aedes population density depends on human behaviour based on public participation and environmental management strategies²⁴. However, good knowledge and understanding does not mean that there will be a positive attitude towards dengue prevention²⁵.

ECO-HEALTH APPROACH

The ecosystem approach to health or eco-health as it is known, is a popular approach to protect environmental health from the stress syndrome that makes an ecosystem sustainable²⁶. The concept of eco-health relates to determining good ecosystem management strategies to improve the conditions of life and good health in order to maintain the sustainability of the ecosystem²⁷. The eco-

health approach creates interactions between ecological and social systems that shape good environmental health dimensions^{28, 29}. Therefore, we need to identify problems with regard to the relationship of the dimensions.

An eco-health approach should consider several factors that contribute to the dengue problem, and which determines the correlation between the dimensions that cause dengue. The environmental dimensions depend on changes in the environment due to climate change, usage of land, water supply and drainage systems, solid waste management, ecological and biodiversity change, as well as taking into consideration the development and urbanization that influences the reproduction of the dengue virus. In addition, social and economic dimensions have also been factoring that cause dengue virus transmission.

Conflicts in terms of the interaction between the environment and social dimensions can occur when humans do not care about the human-made environment that causes the increase in mosquito breeding sites. The gap between the environment and economic dimension occurs when development and population growth is rapid, disrupting the environment in such a way that it can lead to the rapid spread of the dengue. Such a conflict affects the economy because the treatment costs are high and social problems caused by humans will not be successfully handled without changes in public attitudes. Therefore, it is essential to consider problems associated with the interactions in the environment, social and economic dimensions, in order to analyse the causes of dengue diseases (Fig 1). Then, the gaps between the dimensions can be fixed using adaptive management in order to sustain the environment without dengue diseases. This will be described in the next approach on adaptive management approach.

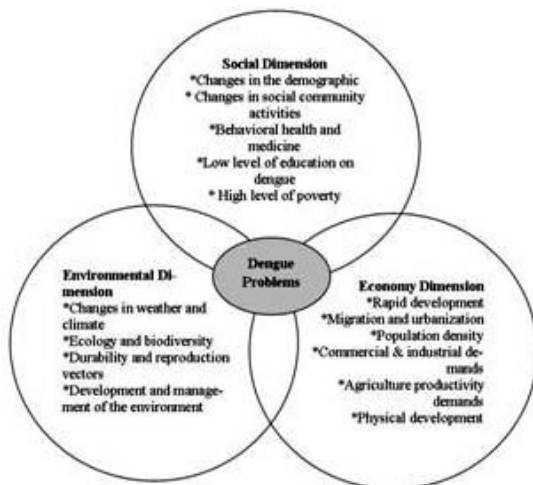


Figure 1: Dengue problems interaction in environment, social and economic dimensions

ADAPTIVE MANAGEMENT APPROACH

Adaptive management approach was initially introduced for the management of forest resources³¹ and was then developed for the management of natural resources³². More research has been carried out using this approach. Adaptive management was used in the early 1990s to understand the interaction between social issues as part of environmental management, by connecting risk factors to human health³³. Adaptive management is a continuous process in terms of the procurement of process data. It involves model development to advance the science and the process of determining the best results when handling any large-scale application³⁴.

Adaptive management is a process aimed at reducing the uncertainties in monitoring the environment effectively without dengue diseases. Previous research has suggested that the purpose of adaptive management is to link the issues related to social and environmental issues and to determine the relationship between environmental risk factors and human health³⁵. Adaptive management is also regularly used to integrate socio-economic factors in order to design a more environmentally-conscious approach, and to use a more sustainable management of natural resources by associating it with issues related to public health and the health of the environment³⁶.

This approach incorporates the involvement of expertise in the fields of biology, ecology, epidemiology and entomology, and on the part of health agencies, stakeholders, national leaders and local community leaders. Through the eco-health framework, we can determine the cause of dengue problems. While adaptive management involves planning development in terms of the ecological system, where management searches for the best solutions to identify dengue vector habitats and for controlling the life cycle of the Aedes mosquito. This approach can also be used to support law enforcement and policy capability with regard to offenders who let mosquitoes breed in their houses or work premises.

Adaptive management can be used to improve the dengue control programme at the national level which needs collaboration on the part of district health officers, vector departments and the Ministry of Health to carry out surveillance by monitoring the situation on a weekly and monthly basis, to provide the efficient and specific data on dengue. The National Public Health Laboratory (NPHL) should improve their services as the national

reference laboratory to coordinate dengue cases. While, services involving 'serologically-confirmed dengue diagnosis' also needs to be available in hospitals and clinics to ensure its effectiveness in accordance with the capabilities when it comes to detecting dengue. Houses or premises inspection in order to identify mosquito breeding sites should be enhanced by imposing a fine on the owners of houses or premises that have allowed the breeding of Aedes. The study of biological data in terms of the geographical distribution of dengue vector habitats, the results of laboratory diagnoses, information on dengue cases, weather data and inspection can improve our ecosystem to sustain healthier environment without dengue.

The Malaysian government has also introduced Clinical Practice Guidelines Management of Dengue Infection (CPG), a Dengue Epidemic Preparedness Plan and Dengue Integrated Vector Management (IVM) to provide clear guidelines to manage dengue diseases that involves the participation of all stakeholders. These methods provide general information about the awareness of dengue on the part of the public, monitoring dengue cases trends, controlling Aedes habitats, handling of dengue prevention, and managing dengue treatment. The implementation of public health policy and the creation of dengue risk mapping can also help reduce the number of dengue cases. The documentation of data in terms of dengue risk mapping needs to be updated in order to address this problem more efficiently. Research on climate change is urgently needed to determine the correlation between rainfall, air humidity and wind speed with this epidemic. The local authorities that deals with urban and rural planning, the management of solid waste flow, and the management of water sources need to work together to reduce the spread of Aedes breeding. The combination of adaptive management through collaborative integration of government, health agencies, scientists, NGOs and medical experts is necessary to fight dengue. With the implementation of surveillance and diagnosis, the extent of mortality can be reduced. Therefore, this adaptive approach is the best management approach when it comes to conducting and controlling dengue in Malaysia.

COMMUNITY PARTICIPATION IN THE DECISION-MAKING PROCESS

The third proposed framework involves a decision-making process which are 1) the administrative authority

and regulatory issues; and 2) the trust in key actors and informed consent from community. Community participation in the decision-making process is very important in order to protect our cities and communities from dengue diseases. The decision-making framework has been suggested in a research study on genetically modified Aedes mosquitoes (GM Aedes). The authors took into consideration the ethical, social and cultural aspects of handling GM Aedes and dengue-related issues³⁷. Another research publication used decision making contexts to understand the link between ecosystems and human welfare to improve ecosystem services³⁸. The decision-making model suggests that there are many factors that influence in the decision-making process such as case factors, organizational factors, external factors and decision maker's factors when it comes to making an appropriate decision before any action is taken³⁹. From this research, it can be concluded that while the policies and existing regulations are important, knowledge and skills in implementing procedures are also needed. Studies evaluating risk are scarce, and the responsibility and support from authorities are a must in order to combat dengue in Malaysia. Through this research, it can be concluded that the law and existing regulations are ambiguous, less attention on implementation procedures, studies of evaluating the risk are limited, while negligence in terms of responsibility and ethical issues in management also occur due to the current political changes.

The ethical management of dengue is essential in order to improve the understanding of public health by increasing knowledge with regard to manage dengue prevention in Malaysia. Therefore, public health education is needed for the local community to have access to more detailed information about Aedes. For this purpose, attention should be paid to strategies that focus on vector control of dengue. Expert authorization is also necessary when handling any process for the dengue prevention. Health information that encourages awareness can help the community to combat dengue. Public opinion and consent must be considered from the outset in terms of the process of the prevention. Their trust in key actors can help to improve the public's awareness of dengue issues. The involvement of the local community is vital when it comes to taking a positive stance as a result of all the campaigns run by the government. For this approach to be successful, ongoing researches should be informed and accepted by the public. Sharing knowledge and a

study of community behaviour must be carried out to find out the community's concerns over dengue cases. The community should also be exposed to information about the risk of dengue-related diseases. As a result, they will be able to inform their consent whether or not the prevention processes performed by the authorities to preserve their lives.

Risk management also a key aspect of vector control programmes. Good bilateral communication and cooperation in the prevention of dengue, such as cleanliness regimes or seminars on dengue are also important to ensure that the number of dengue cases drops to zero. Behavioural improvements can change community behaviour and improve human welfare. Even the government needs to monitor any information in the media to ensure that only the right information is delivered to the public. Interaction with the media is also necessary for successfully disseminating information to the public. Through good media management, by publishing notes and posters on dengue, the government can reduce the impact of dengue and improve people's confidence in the dengue prevention efforts engaged in by the authorities. The information with regard to the Destruction of Disease Bearing Insects Act 1975 must be disclosed thoroughly by the authorities, so that the public can be warned of the dangers of dengue and will observe these laws. Therefore, participation in the decision-making process on the part of communities is a must in order to control dengue in Malaysia.

Nowadays, many dengue prevention techniques have been introduced to combat dengue. However, the extent of public trust in key actors in terms of dengue prevention techniques is still limited, even the extent of agreement upon the implementation of these techniques. Therefore, to conduct effective eco-health and adaptive management, we need to know the Malaysian's attitude towards the dengue prevention techniques by looking at their trust in key actors in terms of their informed consent to these dengue prevention techniques to ensure their participation.

Theoretical Framework on Community Participation: The theoretical framework of Malaysian's attitude towards the dengue's techniques through community participation is adapted, adopted and modified from previous research by Pardo et al.⁴⁰ and Amin and Hashim⁴¹. These studies were based on Fishbein's Attitude Model⁴².

The model begins with the listing of predictor variable factors which refers to community participation. Trust in key actors and informed consent are predictor variable factors that can determine community participation to relate their attitude towards dengue's control techniques. Visschers et al.⁴³ stated that trust in key actors is common factor in the public's acceptance of a technology. While informed consent is always used in ethical aspects involving clinical research or medical practice to channel effective communications about the benefits and risks^{44,45}. To explore the acceptance and involvement of the community in this dengue issue, these two factors are important to assess their attitude towards dengue's control techniques. Therefore, questionnaire instruments are developed based on the listing of predictor variable factors followed by the techniques to be tested on the attitude towards it. The questionnaire was developed in a group among researchers involved with this study and was validated by face and content validity to ensure that the questionnaire was unbiased, easy to understand and could answer the question of study.

RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

The research model of the study as shown in Figure 2 was based on literature related to trust in key actors, informed consent and attitudes to dengue's control techniques. To answer the research's question, the researchers have developed three hypotheses:

- H1: When Malaysian have more trust in key actors, then they will have informed their consent associated with dengue's control techniques.
- H2: When Malaysian have more trust in key actors, then they will have a more positive attitude to dengue's control techniques.
- H3: When Malaysian will have informed their consent associated with dengue's control techniques, then they will have a more positive attitude to dengue's control techniques.

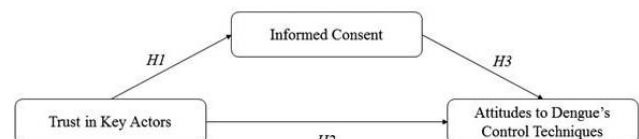


Figure 2: Research Model

To prove the hypotheses and to assess the relevance association between these variables, component-based approach of the PLS-SEM (Partial Least Squares-Structural Equation Modeling) is used with Smart PLS software.

MATERIALS AND METHODS

The research is conducted from September 2016 to September 2017 by survey of 399 respondents (age 18 years old and above). The Klang Valley was chosen as the location of the study because it has recorded as the highest dengue cases in Malaysia. The model requires an instrument measuring to prove what should be measured by performing validity and reliability tests⁴⁶ which include loading factor, composite reliability, convergence and discrimination validity⁴⁷. The loading factor for the variables was accepted because the value

is greater than 0.50 which contributes the total average variance extracted (AVE) exceeds 0.50⁴⁸. The value of composite reliability and cronbach’s alpha for each factor are greater than 0.80. The AVE value score for each variable factor in this study also exceeds 50%⁴⁷. Validity can also be evaluated through Fornell-Larcker Criterion, cross loading and Heterotrait-Monotrait Ratio (HTMT). In the Fornell-Larcker Criterion assessment, each variable factor should have a higher value of square root AVE compared to other variable factors^{49,50}. The study also found that cross loading assessments are in line with the predetermined features which is the loading of each indicator which has a higher value than the loading factor value for other indicators⁵¹. Meanwhile the value of HTMT should not exceed 1 and if the value exceeds 1, it means the indicator for that factor is less than the discriminant factual aspect⁵². Therefore, this study has met the instrument measurement criteria (Table 1).

Table 1: Cronbach’s Alpha (CA), Composite Reliability (CR) and AVE Values, Fornell-Larcker Criterion and HTMT ratio

Factor	CA	CR	AVE	Fornell-Larcker Criterion			Heterotrait-Monotrait Ratio		
				1	2	3	1	2	3
¹ Trust in Key Actors	0.791	0.877	0.703	0.839			1		
² Informed Consent	0.942	0.921	0.632	-0.038	0.795		0.049	1	
³ Attitudes to Dengue’s Control Techniques	0.920	0.935	0.673	0.374	-0.081	0.821	0.420	0.065	1

Finding of Structural Model: Bootstrapping method was used to test structural model. The t-test is conducted to determine the significance coefficient pathways between each factor to answer hypotheses. Based on PLS structural model analysis, the results only showed one significant coefficient pathways to structural prediction modelling for the Malaysian’s attitudes towards the dengue’s control techniques in Table 2.

Table 2: The Relationship Between Trust in Key Actors and Informed Consent that Encourage Malaysian’s Attitude Towards the Dengue’s Control Techniques

Correlation	Coefficient Value	Mean Score	Standard Deviation	T-Values	P-Values	Conclusion
H1: Trust in Key Actors->Informed Consent	-0.038	-0.011	0.080	0.468	0.320	Not Supported
H2: Trust in Key Actors->Attitudes to Dengue’s Control Techniques	0.371	0.376	0.058	6.352	0.000***	Supported
H3: Informed Consent->Attitudes to Dengue’s Control Techniques	-0.067	-0.038	0.080	0.833	0.202	Not Supported

*p < 0.05, **p < 0.01, ***p < 0.001

The analysis of structural model also involves i) testing of co-efficient pathways of determination (R^2), ii) testing the accuracy of the model predictions (Q^2),

and iii) testing of effect size (f^2) on the impact value on attitude towards dengue’s control techniques. The R^2 value of attitude towards dengue’s control techniques

factor is 0.144, suggesting that trust in key actor's factor explain 14.4%. Then, the Q^2 value of attitude towards dengue's control techniques factor is 0.088, which more than 0 to indicates that the exogenous variable (trust in key actors) is appropriate to predict endogenous variable (attitude towards dengue's control techniques)⁵³. The results also showed that trust in key actors ($f^2=0.166$) have medium effect size on attitude towards dengue's control techniques according to the effect size assessment proposed by Cohen⁵⁴.

DISCUSSION AND CONCLUSION

The findings of this study found that the trust in key actors ($\beta=0.371$, $p=0.000$) has been well explained in encouraging positive Malaysian's attitude towards dengue's control techniques. In fact, this study showed consistency with the study of Amin and Hashim⁴¹ when Malaysians have trust in key actors, they will have positive attitude to accept genetically modified mosquitoes to control dengue disease in Malaysia⁴¹. However, the findings also showed that informed consent factors not explaining positive attitude towards dengue's control techniques and trust in key actors no direct association with informed consent.

Therefore, this study gives implications for enriching the literature on the attitudes towards dengue's control techniques based on trust in key actor's factor. The next study may add more predictor factors in assessing the attitude of Malaysian community to the dengue's control techniques. It can even be added with a simplification factor that can identify predictors of factors with their relationship in assessing aspects of attitudes. This model of the research is also seen to be important in improving the quality of health and the environment of the Malaysian community in controlling dengue diseases.

CONCLUSION

The strategy to diminish dengue-related issues should be implemented consistently and closely monitored in terms of its effectiveness and suitability. Dengue vector control should be carried out systematically and law enforcement and police activities should be fine-tuned. Community participation and the support of civil society is indispensable with regard to all shapes and patterns of dengue prevention and control activities, so that this phenomenon ceases to be a major public health

problem in Malaysia. Living freely without the threat of dengue must be implemented through collaborative integration in terms of the framework of the proposal, namely to improve the eco-health by providing a healthy environment, a more efficient adaptive management approach, and higher participation of the community by trusting key actors and by allowing informed consent in terms of making correct decisions in implementing dengue's control techniques is a must.

This is crucial in making the correct decision with regard to dengue-related problems and also the techniques to control it. Thus, an integrated information and education system should be introduced so that the public can act correctly. A healthy living culture should be encouraged and the empowerment of communities in terms of social and economic structures should be used to preserve the environment. As a conclusion, all experiences with regard to controlling dengue prevention in order to ensure healthy living indicate a challenge to maintain sustainable development to ensure sustainable living in Malaysia. Therefore, the integration of these three frameworks and the support of all relevant experts is necessary to provide a greater understanding of the approaches that can be used to ensure healthy living and to promote well-being for all. To do this we must provide new dimensions in dengue management as well as good governance and community rights in terms of decision making with regard to dengue-related issues. This will lead to prevention as part of the effective solutions to dengue control. This will help Malaysia achieve its sustainable development goals in the coming years.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

ACKNOWLEDGMENT

Appreciation goes to Ministry of Education Malaysia under MyBrain15 scholarship, Centre for Research and Instrumentation Management (CRIM-UKM), Research Centre for Sustainability Science & Governance, Institute for Environment & Development (LESTARI-UKM), Pusat Citra Universiti (CITRA UKM) and Hajjah Aisah Md. Nor for their support in carrying out this study.

REFERENCES

1. Ong SQ. Dengue Vector Control in Malaysia: A Review for Current and Alternative Strategies. *Sains Malaysiana*. 2016; 45(5): 777-785.
2. Lee HL, Rohani A, Khadri MS, Nazni WA, Rozilawati H, Nurulhusna AH, Nor Afizah AH, Roziah A Rosilawati R, Teh CH. Dengue Vector Control in Malaysia-Challenges and Recent Advanced. *The International Medical Journal Malaysia*. 2015; 14(1): 11-16.
3. Zakaria SZS, Roslan NAM, Mokhtar M, Hadi AS, Razman MR, Jahi JM & Nordin NH. Environmental management in dealing with dengue fever cases towards urban sustainability: Study on the prevention and control of infectious diseases act 1998 (Act 342). *Social Sciences (Pakistan)*. 2013; 8(4): 295-299.
4. Razman MR, Matsah M, Jahi JM, Arifin K, Aiyub K, Awang A. Pemakaian Undang-Undang Kecuaian dalam Pengurusan Ekologi dan Habitat Manusia di Melaka, Malaysia. *Malaysian Journal of Environmental Management*. 2009; 10(2): 135-155.
5. Sands P. Principles of international environmental law. Cambridge: Cambridge University Press. 2003.
6. Hueting R. Why environmental sustainability can most probably not attained with growing production. *Journals of Cleaner Production*. 2010; 18: 525-530.
7. International Union for Conservation of Nature. International union for conservation of nature (Global change: Reducing uncertainties). Stockholm: Royal Swedish Academy of Sciences. 1980.
8. Markom R, Hassan N. Kelestarian Alam Sekitar Dan Pembiayaan Teknologi Hijau Dari Perspektif Undang-Undang Syariah. *Kanun*. 2014; 26(2): 268-287.
9. Siwar C, Damanhuri NA, Aziz S & Aziz AG. Rancangan pembangunan Malaysia: isu tukar-ganti (trade-off) antara pertumbuhan dengan kelestarian Malaysia development plan: trade-off issues between growth and sustainability. *IJMS*. 2011; 18 (Special Issue): 7-33.
10. Sahani M, Othman H, Mohd. Nor NA, Hod R, Mohd. Ali Z, Mohamad Rasidi MN, Choy EA. Aedes mosquito breeding study in Senawang Negeri Sembilan, Malaysia. *Sains Malaysiana*. 2012; 41(2): 261-269.
11. Chinnakali P, Gurnani N, Prakash RU, Parmar K, Suri TM, Yadav K. High level of awareness but poor practices regarding dengue fever control: a cross sectional study from North India. *North American Journal of Medical Sciences*. 2012; 4(6): 278-282.
12. Wan Rozita WM, Tap BW, Veronica S, Muhammad AK, Lim KH, Sumarni MG. Knowledge, attitude and practice (KAP) survey on dengue fever in an urban malay residential area in Kuala Lumpur. *Malaysia Journal of Public Health Medicine*. 2006; 6(2): 62-67.
13. Lee HL. Aedes: Mosquitoes That Spread Dengue Fever. *Mosquitoes & Mosquitoes-borne Disease: Biology, Surveillance, Control, Personal & Public Protection Measures*. Kuala Lumpur, 2000; 29-30 June 1999.
14. Halstead SB. Dengue vaccine development: a 75% solution? *Lancet*. 2012; 380: 1535-1536.
15. Shuaib F, Todd D, Campbell-Stennett D, Ehiri J, Jolly, PE. Knowledge, attitudes and practices regarding infection in Westmoreland, Jamaica. *West Indian Medical Journal*. 2010; 59(2): 140-146.
16. Murray NEA, Quam MB, Wilder-Smith A. Epidemiology of dengue: past, present and future prospects. *Clinical Epidemiology*. 2013; 5:299-309.
17. McCall PJ, Kittayapong K. Control of dengue vectors: tools and strategies. Report of the Scientific Working Group meeting on Dengue, Geneva. 2007; 110-119.
18. Kumarasamy V. Dengue fever in Malaysia: time for review? *Medical Journal of Malaysia*. 2006; 61(10): 1-3.
19. Mondini A, Neto FC. Socioeconomic variables and dengue transmission. *Revista de Saude Publica*. 2007; 41: 923-993.
20. Nyamah MA, Sulaiman S, Omar B. Categorization of potential breeding sites of dengue vectors in Johor Malaysia. *Tropical Biomedicine*. 2010; 27(1): 33-40.
21. Abu Hassan A, Che Salman MR, Ngumbang J, Ramli A, El-Badri AM. Mosquitoes of urban areas of

- Penang abundance and control in Proceeding of the 5th International Conference on Urban Pests. 2005.
22. Mazrura S, Rozita H, Hidayatulfathi O, Zainudin MA, Mohamad Naim, MR, et al. Community vulnerability on dengue and its association with climate variability in Malaysia: a public health approach. *Malaysian Journal of Public Health*. 2010; 2:25-34.
 23. Sokrin K, Lenore, M. Community participation and social engagement in the prevention and control of dengue fever in rural Cambodia. *Dengue Bulletin*. 2008; Volume 32.
 24. Vanlerberghe V, Toledo ME, Rodriguez M, Gomez D, Baly A, Benitez, JR, Van der Stuyf P. Community Involvement in dengue Vector Control: Cluster Randomised trial. *British Medical Journal*. 2009; 338: b1959.
 25. Hairi F, Ong CH, Suhaimi A, Tsung TW, Anis Ahmad MA, Sundaraj C, Soe MM. A knowledge, attitude and practices (KAP) study on dengue among selected rural communities in the Kuala Lumpur District. *Asia-Pacific Journal of Public Health*. 2003; 15(1):37-43.
 26. Wilcox BA. Ecosystem health in practice: emerging areas of application in environment and human health. *Ecosystem Health*. 2001; 7: 317-325.
 27. Forget G, Lebel J. An ecosystem approach to human health. *International Journal of Occupational and Environmental Health*. 2001; 7(2): 3-36.
 28. Berbes-Blazquez M, Oestreicher JS, Mertens F, Saint-Charles J, Ecohealth and resilience thinking: A dialog from experiences in research and practice. *Ecology and Society*. 2014; 19(2): 24.
 29. Lebel J. Health: an ecosystem approach. International Development Research Centre, Ottawa, Ontario, Canada. 2003.
 30. Charron DF. Ecosystems approaches to health for global sustainability agenda. *Ecohealth*. 2012; 9:256-266.
 31. Holling CS. Adaptive Environmental Assessment and Management. International Series on Applied Systems Analysis. Chichester: Wiley. 1978.
 32. Nicols JD, Michael C, Runge FA, Johnson B, Williams K. Adaptive harvest management of North American waterfowl populations: a brief history and future prospects. *Journal of Ornithology*. 2007; 148:343-349.
 33. Bevilaqua M, Rubio-Palis Y, Medina DA, Cardenas L. Malaria control in Amerindian communities of Venezuela. *Ecohealth*. 2014; 11(4): 449-638.
 34. Comiskey JA, Dallmeier F, Alonso A. Framework for assessment and monitoring of biodiversity. In: *Encyclopedia of Biodiversity*, Levin, S. eds. New York: Academic Press. 1999; 3:63-73.
 35. Corvalan CF, Kjellstrom T, Smith KR. Health environment, and sustainable development: identifying link and indicators to promote action. *Epidemiology*. 1999; 10:656-660.
 36. Yee SH, Bradley P, Fisher WS, Perrault SD, Quackenboss J, Johnson ED, Bousquin J, Murphy PA. Integrating human health and environmental health into the DPSIR framework a tool to identify research opportunities for sustainable and healthy communities. *Ecohealth*. 2012; 9:411-426.
 37. Lavery JV, Harrington LC, Scott TW. Ethical, social, and cultural considerations for site selection for research with genetically modified mosquitoes. *The American Society of Tropical Medicine and Hygiene*. 2008; 79(3):312-318.
 38. Fisher B, Turner RK, Morling P. Defining and classifying ecosystem services for decision making. *Ecological Economics*. 2009; 68:643-653.
 39. Baumann DJ, Dalglish L, Fluke J, Kern H. The Decision-Making Ecology. *American Humane Association*. 2011; 1-13.
 40. Pardo R, Midden C, Muller JD. Attitudes towards biotechnology in the European Union. *Journal of Biotechnology*. 2002; 98: 9-24.
 41. Amin L, Hashim H. Factors factors influencing stakeholder's attitudes toward genetically modified aedes mosquito. *Science and Engineering Ethics*. 2014; 21(3): 655-681.
 42. Fishbein M, Ajzen I. Belief, attitude, intention, and behaviour: An introduction to theory and research. Reading, MA: Addison-Wesley. 1975.
 43. Visschers, VHM, Meertens, RM, Passchier WF, Devries NK. How does the general public evaluate

- risk information? The impact of association with other risks. *Risk Analysis*. 2007; 27:715-727.
44. Purcaru D, Preda A, Popa D, Moga MA, Rogozea L. Informed Consent: How Much Awareness Is There? *PLoS ONE*. 2014; 9(10): e110139. <https://doi.org/10.1371/journal.pone.0110139>
45. Nusbaum L, Douglas B, Damus K, Paasche-Orlow M, Estrella-Luna, N. Communicating risks and benefits in informed consent for research: a qualitative study. *SAGE journals* 4. 2017. <https://doi.org/10.1177/2333393617732017>
46. Creswell JW. *Educational research - planning, conducting, and evaluating quantitative and qualitative research*. 4th Edition. New Jersey: Pearson Merrill Prentice Hall. 2010.
47. Hair JF, Sarstedt M, Hopkins L, Kuppelwieser VG. Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review*. 2014; 26(2): 106-121.
48. Byrne BM. *Structural equation modeling with AMOS: Basic concepts, application, and programming*. Routledge. 2010;
49. Chin WW. How to write up and report pls analyses. In *Modern Methods for Business Research*, Marcoulides (eds). New Jersey: Lawrence Erlbaum Associates. 2010.
50. Fornell C, Larcker D. Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*. 1981; 18(3): 39-50.
51. Gotz O, Liehr-Gobbers K, Krafft M. Evaluation of structural equation models using the partial least squares (PLS) approach. In *Handbook of Partial Least Squares: Concepts, Methods and Applications*, Esposito Vinzi V, Chin WW, Henseler J, Wang H (eds). Berlin: Springer. 2010; 691–711.
52. Henseler J, Ringle CM, Sinkovics RR. The use of partial least squares path modeling in international marketing. *Advances in International Marketing*. 2009; 20(1): 277-31.
53. Fornell C, Cha J. Partial Least Squares. *Advanced Methods of Marketing Research*. 1994; 407: 52-78.
54. Cohen J. *Statistical power analysis for the behavioral sciences*. New Jersey: Lawrence Erlbaum Associates. 1988.

Impacts of Online Social Media on Investment Decision in Malaysia

Shakerin Ismail¹, Radha K. Nair², Rohana Sham³, Siti Norida Wahab⁴

Faculty of Business and Information Science, UCSI University

ABSTRACT

This research aims to study about the investment decision in Malaysia and this study focuses on several impacts of online social media towards the investment decision of investors in Malaysia. The hypotheses are tested through the questionnaires distributed to investors in Malaysia, particularly in Klang Valley area. The collected data are analyzed by using Statistical Package for the Social Sciences (SPSS) Software Version 20. The findings supported all hypotheses as proposed, where the p-value and significance value are all less than 0.05. Therefore, it shows that the independent variables including information in online social media, online community's behaviour in online social media and firm's image in online social media have significant impact on the dependent variable which is investment decision. This research aims to contribute to literature for future research on relevant topic that examines the consequences of social network on movement in capital markets.

Keyword: *Online social media, online community, investment decision*

INTRODUCTION

The early usage of online social media is popular for branding and marketing purpose, where entrepreneurial firm uses online social media as platform to monitor the consumers' conversation and understanding consumer's needs and wants in real-time. Today, communication technology is approaching a foreseen-able singularity. Previously the world used to have various communication method and devices such as telephone, telegram, faxes, printing, post letter and others; but now could be done through a single platform, the Internet. Almost 800 million users of Facebook around the world, 250 million new Tweets by Twitter users each day and 135 million people using LinkedIn to expand their professional social network (Greenfield⁸). According to a research done on Internet Users Survey 2014 published in official portal of Malaysian Communications and Multimedia Commission (MCMC), it shows that 87.1% of internet users are engaged in online social media. These statistical figures proved the extensive use of online social media by people has made online social media an increasing important channel of communication for them to share, connect, and interact with each other about their thoughts, words and decisions. The power of online social media cannot be underestimated and is expected to continue to revolutionize personal and organizational communications and interactions worldwide (Ngai et al.²⁰).

In 2013, few notable events and information attracted the financial community attention in online social media. First, the announcement of the United States Securities and Exchange Commission where companies are allowed to utilize online social media to reveal significant information in compliance with Regulation Fair Disclosure (Regulation FD) as long as investors were aware on which online social media will be used by the companies to disclose the information. Previously, the Regulation FD which applies to company websites is now applies to online social media and other emerging means of communication used by public listed companies. It benefits both the company and its shareholders in the way that the companies can utilize the online social media platform such as Facebook page, Twitter account to selectively make disclosure and provide instant response on what the disclosures are, while the shareholders have the chance to give instant response to the disclosures of the company's post in the online social media account (Hoffman et al., 2013). It shows that both regulators and corporations had taking a step ahead to embrace online social media as a viable channel to disclose significant information (Greenfield⁸).

There are many determinants that influence an investor's decision; whether from economic, political or social. However, there is still a gap in this area of research that explains the impact of online social

media on investor's decisions especially in Malaysia. Online social media has become an important tool that investors use and also rely on to make their investment decisions on the stock market in Malaysia. In this way, the effect of online social media on share costs will undoubtedly turn out to be lesser in the coming years. Besides that, there is an expanding proof that online social media action can support share price. A late study by Arthur O'Connor, an analyst at Pace University stated that the quantity of Twitter adherents, Facebook fans, and YouTube site visits for Nike, Coke, and Starbucks would seem to propose an immediate relationship or connection between these online social media and the share price of those organizations. Another study from Greenwich Associates uncovers that around 80% of institutional investors utilize social media as a major aspect of their normal work process, and roughly 30% of these speculators say data acquired through online social media like Twitter and Facebook has straightforwardly impacted their investment decisions.

As such, this paper examined how the online social media influencing the investment decision made by the investors, especially in Malaysia. The online social media is breaking down into three categories: information, online community behavior and firm's image. This research paper is constructed as follows: we reviewed the literature pertaining to the online social media and investment decision followed by the relationship between online social media and investment decision. Next, we will construct the research framework, describing the methodology to be applied and discussing the research findings.

LITERATURE REVIEW

Investment Decision: Investment is one of the categories in the field of finance. Decision making is crucial in the process of choosing the best option out of all alternatives available that can help individual to achieve their perceived return. According to Jamal¹² suggested in making investment decision, investors often consider the risk-return payoff, which refers to the idea that high risk investment should be compensated with higher expected return. The investment decision is commonly defined as the decision made by investor by measuring the investment subject's financial risk and financial return. Importance of investment decisions towards the economic development can be explained

in two perspectives, micro and macro. In the micro, the firm's investment decision affects the expectation of the investors on the company's future performance. Moving to the macro perspective, the profitability of the aggregate companies will eventually determine a country's economic development.

Information, online community behavior and firm's image: The impact of information on online social media can be broken down into two categories which are consumers and organizations. Information on online social media is utilized by business firms and legislative associations as a specialized device. These substances effectively make utilization of online social media for publicizing, advertising, speaking with clients, building association with clients and branding (Kim¹⁵). In addition, through online social media it is believed to make an advertisement with substantially incurring lesser effort and cost (Kim¹⁵). Online social media can dramatically affect firm in areas, for example, upgrading brand's reputation; improving value, and brand equity; enhance digital advertising and promotion, handling customer service issues, mining innovation ideas and building customer relations (Solis²⁴).

It has a several number of social platforms can be found which are useful in sharing the information. For example, Wikipedia, a free online encyclopaedia, is among the outstanding platform to enable the users to work together on information sharing. Online social media itself definitely play a significant role in providing an information to a wide-ranging people, especially individual investors (Fang, 2009). This suggested that the information gained from online social media such as Twitter and Facebook were useful for investor's trading decisions (Bollen¹⁰).

According to the Gradual-Information- Diffusion model, investors are usually called as news followers who use firm's information on online social media to make economic decisions or traders who use previous changes in stock prices to make investment decisions. This model anticipated that how quickly the changes of stock price in response to new information on online social media. Besides that, a study by Elizabeth Blankespoor⁶ claimed that Twitter, Facebook and other forms of online social media can reducing information asymmetry amongst investors and contribute to higher market liquidity as a result of broad dissemination. Due to that particular reason, it encourages informed traders to seek out

information from online social media in order for them to take an advantage of these opportunities, hence better trading decisions can be made. Moreover, Asheq Rahman¹ has assessed the impact of frequency of online material information on online social media on stock market prices. He demonstrated that the recurrences of announcements are emphatically connected with returns and volumes of securities exchange which will affect investors with the goal for them to make an investment decision.

According to Ridings²², online community should include elements of people who communicating to each other for their own needs or perform special roles by using computer systems in order to support and mediate social interaction and facilitate a sense of togetherness. Online community consists especially of ordinary people who share their opinions, mood or emotions about concrete information. Ngai et al.²⁰ stated that behaviour of online community is crucial for an identification of the social factors in order to stimulate user participation in collective actions in the online social media platforms. Utilizing the social factors that determined from the study of online community behaviour, it can contribute to the strategies development to foster the necessary environments for building and maintaining social communities.

The social factors such as the existing social, psychological and emotional characteristics brought by adolescent into the communication within the online community provide the causal link to the social outcomes of interest. It then shows that the communication behaviours of online community have impact on the social development. Lee et al.¹⁷ mentioned that participation of investors in online community increase the risk in making investment decision. Congenial investors gathered around online communities to educate each other, as well as generate opinions on stock picking, where the less-rational groups of investors are prone to behave according to sentiment (Bukovina⁴). K.Nirmala Devi¹³ found that the sentiment in Twitter, happy and calm by the online community had a high correlation with the stock market prediction. The online social media conversation caused investor's behaviour biased in making investment decision especially during the periods of high volatility in stock market.

Reputation has been characterized as 'a perceptual representation of a firm's past activities and future prospects that depict the firm's general interest to all its key constituents when contrasted with other

driving opponents (Fombrun⁸). According to Spector²⁵, firms create their image by keeping in mind the end goal to impact clients' states of mind towards their items or services. Individuals then again assess these efforts by qualities which more often than not begin from the client's involvement with the company's items or administrations. In this way, firm's picture is a multidimensional idea which relies on the genuine firm picture, its determinants and client assessments (Spector²⁵). There are two main factors which influences a firm's image or reputation on online social media which are consumer perceived value and loyalty. Several studies had proven the relationship between online social media and investment decision. Luo¹⁸ suggested that online social media has significantly affecting a business's value. His research claimed that by having positive online social media posts, investor's confidence and advocacy can be increased, which cause to higher firm value and has an impact on investors trading decision. Naturally, negative online social media posts can contribute to the negative reputations, causing firm's performance to be bad which leads to the firm being unattractive for investments.

Schniederjans²³ examined the linkage between firm's reputation and online social media and found a halfway positive relationship between the utilization of online social media and investment choice, contingent upon the impression management strategy utilized. Negative exposure in online social media specifically can quickly influence investment decisions by investors (Luo, 2013). Brammer³ found that investors make huge returns when they buy stocks of the firms whose reputation has risen tremendously on online social media. This result is an opportunity for firms to invest in their image to create a good reputation for themselves.

RESEARCH METHODOLOGY

This study used questionnaire which adopted from Doan (2011). The questionnaire was structured into three main sections:

- (i) Section I sought to capture the general data about the respondents. For Section I, nominal scales are used to classify objects.
- (ii) Section II was focused with the data on the independent variables that affect investment decisions.

(iii) Section III is the part of investment decision of investors. Under Section II and III, respondents were asked to indicate their degree of how they are influenced by each of the items on 5-points Likert scale. The respondents are required to select their level of agreement within the range of strongly disagree(1), disagree(2), neutral(3), agree(4), and strongly agree(5).

Data analysis method used in this study are descriptive statistics and multiple regression test with the help of Statistical Package for the Social Sciences (SPSS) Software Version 20, which enabled data interpretation and making of statistical inferences. Reliability test was carried out to measure the internal consistency of a set of items of each variable by using Cronbach’s Alpha.

To ensure the normality of data distribution, this study would use the Skewness and Kurtosis results.

Multiple regression test is used to predict the relationship between several independent variables and a dependent variable. A regression equation can then be formed to explain on how the changes in independent variables affect the dependent variable. Significant value which lower than 0.05 ($\text{sig} < 0.05$) is an indication of the existence of significant relationship between independent variable and dependent variable. This study used Multiple R value to measure the strength between the independent variables and dependent variable. Appropriate R value is within the range of -1 and 1 which is similar with the rules of thumb expressed in the correlation test.

RESULTS

Multiple Regression Analysis

Table 1: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimation
1	.821 ^a	0.675	0.665	2.09916

Predictors: (Constant), Information, Online Community’s Behaviour, Firm’s Image

The model indicates that the independent variables explained approximately 67.5% ($R^2 = 0.675$) of the variability of the investment decision. Unfortunately, R^2 tends to overestimate the strength of the association especially if the model has more than one independent variable. R^2 may provide misleading results especially when assessing with small sample size of regression analysis (Matuszewski¹⁹). While the adjusted R-square (adjusted R^2) attempts to give a better estimation of the true population value (Pallant²¹). In addition to this, adjusted R^2 can provide accuracy to the model and give corrected goodness-of-fit measure in regression analysis. Therefore, most of the researchers choose to apply adjusted R^2 rather than R^2 value in the studies. Due to the sample size of this study is small, adjusted R-square has been used in the study.

A coefficient testing is conducted to provide the understanding about the significant level and the degree of impact towards the dependent variable.

Table 2: Results of Coefficient Testing

Coefficients ^a	Unstandardized		Standardized	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.024	1.327		0.77	0.44
Information	0.268	0.09	0.255	2.97	0
Online Community’s Behaviour	0.183	0.081	0.194	2.27	0.03
Firm’s Image	0.479	0.097	0.463	4.92	0

a. Dependent Variable: Investment Decision

The statistical significance of each of the independent variable can be explained by the significant value (Sig.). Generally, those significant values less than 0.05 explains that the independent variables have significant contribution to the dependent variable and vice versa (Pallant²¹). This indicates that all the independent variables in the model have significant impacts on the investment decision.

Other than that, the standardized coefficient Beta value is important to determine and compare the strength of each predictor variable in affecting the dependent variable. Concisely, the variable with a larger Beta value has stronger influence from its contribution to the dependent variable. According to the table, it is found that the variable of firm's image in online social media ($\beta = 0.463$) has the most impact while online community's behaviour in online social media ($\beta = 0.194$) has the least impact among the three predictor variables selected in influencing the investment decision.

DISCUSSION AND CONCLUSION

The significant relationship exists between information in online social media and investment decision. This finding is consistent with the study of Fang (2009) which discussed that online social media play an important role in disseminating information, especially to individual investors. According to the studies by Java¹¹ and Bollen², which explained that the features of online social media which are precise, high volume and real-time, greatly facilitate the diffusion of investing information. Therefore, investors are encouraged to seek out information from online social media in order to take advantage of these opportunities, hence making better investment decisions (Kyle¹⁶).

Besides that, we accepted the second hypothesis which describes that the online community's behaviour in online social media has a significant relationship with the investment decision. This findings is consistent with the study of Lee et al.¹⁷ which mentioned the participation of investors in online community give impact to investors when making investment decision. From the result of the study by K.Nirmala Devi¹³, found that the behaviour in Twitter, happy and calm by the online community had a high correlation with the stock market prediction.

The third hypothesis where the firm's image in online social media significantly affect the investment

decision is accepted. This findings is consistent with the studies by Schniederjans²³ and Luo (2013). Their research discovered that through positive online social media posts, investor's confidence and encouragement can be enhanced which directly affecting to the positive investment decision. Generally, investors make huge returns when they buy stocks of the firms whose reputation has risen tremendously on online social media as according to Brammer³.

Although this research has reached its objectives, there are some unavoidable limitations that had occurred during the research process which may have an effect on the actual findings. The first limitation is the sample size. This study was conducted with a relatively small sample size of only 100 respondents due to the time constraint. Because of this, the sample size that had been selected may not be sufficient enough to represent the entire Malaysian population's perspective on the impact of online social media on investment decision in Malaysia. Hence, the future researchers should increase the sample size by increasing the number of questionnaires distributed to the respective respondents.

In addition, this research paper uses primary data and quantitative method. Due to this, the data collection method used is questionnaire. Hence a 5-point Likert scale is used for all the statements regarding the independent and dependent variables and this has a few limitations whereby the respondents are limited to the Likert Scale and are not able to provide extra information or explanation since it is a close ended questionnaire. So, future researchers also can consider qualitative methods by adding more open-ended questions in the questionnaires so that more accurate opinions and information can be obtain.

This research aims to contribute to literature for future research on relevant topic that examines the consequences of social network on movement in capital markets. Besides, this research can provide some insights to policy maker and standards setter in developing standards in the field of social network and capital market.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Asheq Rahman R. D. Frequency of Corporate Announcements Via Stock Exchange Web Sites and Market Efficiency, *Asia Pacific Journal of Accounting and Economics*, 2005; pp 123-129.
2. Bollen J. M. Twitter mood predicts the stock market. 2010; Retrieved from <http://arxiv.org/abs/1010.3003>.
3. Brammer S. B. Corporate Reputation and Stock Returns: Are Good Firms Good for Investors (Electronic version). *Social Science Research Network (SSRN)*. 2004.
4. Bukovina J. Social media big data and capital markets - An overview. *Journal of Behavioral and Experimental Finance* 1. 2016; pp.18-26.
5. Chen J. X. Moderated online communities and quality of user-generated content. *Journal of Management Information Systems*. 2011; 28, 2: pp. 237-268.
6. Elizabeth Blankespoor G. S. The Role of Dissemination in Market Liquidity: Evidence from Firms' Use of Twitter™. *The Accounting Review*. 2014; Vol. 89, No. 1: pp. 79-112.
7. Fang L. J. P. Media Coverage and the Crosssection of Stock Returns, *The Journal of Finance*. 2009; 64, 5: pp. 2023-2052.
8. Fombrun C. F. Reputation: Realising Value from the Corporate Image. Harvard Business School Press, Greenfield, D. (2014), *Social Media in Finance Market: The Coming of Age*, Gnip. 1996.
9. Hong J. S. A unified theory of underreaction, momentum trading, and overreaction in asset markets., *The Journal of Finance*. 1999; 54, 6: pp. 2143-2184.
10. Bollen, J. H. M. Twitter mood predicts the stock market, *Journal of Computational Science*. 2011; 2, 1: pp. 1-8.
11. Java A. S. Why We Twitter: Understanding Microblogging Usage and Communities. Joint 9th WEBKDD and 1st SNA-KDD Workshop. San Jose, CA. 2007; pp 59- 63.
12. Jamal et al R. P. Decision-Making Style and Investment Success of Retail Investors in Malaysia. *International Journal of Business and Social Science*. 2014; Vol. 5, No. 9(1): pp.311-322.
13. K.Nirmala Devi V. B. Impact of Social Media Sentiments and Economic Indicators in Stock Market Prediction. *International Journal of Computer Science & Engineering Technology (IJCSET)*. 2015; 203-219.
14. Kim A. A. Impacts of Luxury fashion brand's social media marketing on customer relationship and purchase intention. *Journal of Global Fashion Mark*. 2010; 1(3):71-164.
15. Kim A. A. Do social media marketing activities enhance customer equity? An empirical study for luxury fashion brand, *Journal of Business Research*. 2011.
16. Kyle A. Continuous auctions and insider trading. 1985; *Econometrica* 53: pp 1315– 1336.
17. Lee et al A. H. The Role of Social Media in the Capital Market. Evidence from Consumer Product Recalls. 2014.
18. Luo H. C. Customer satisfaction, analyst stock recommendations, and firm value. 2010.
19. Matuszewski J. M. Properties of an R square statistic for fixed effects in the linear mixed model for longitudinal data. 2011.
20. Ngai et al., K.-l. K. Social media models, technologies, and applications: An academic review and case study. *Industrial Management & Data Systems*. 2015; Vol. 115 Iss , pp.769-802.
21. Pallant J. SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS. Sydney, Melbourne, Auckland, London: Allen & Unwin. 2016.
22. Ridings C. β. Virtual community attraction: why people hang out online. *Journal of Computer-Mediated Communication*. 2004; 10, 1: pp. 1-10.
23. Schniederjans D. Enhancing financial performance with social media: An impression management perspective. . *Decision Support Systems*. 2013; 55(4): pp 911-918.
24. Solis B. Engage!. Hoboken, NJ: John Wiley & Sons. 2010; 56-59.
25. Spector A. Basic dimensions of the corporate image. *Journal of Marketing*. 1961; 25: pp 47-51.
26. Trainor K. J. Relating Social Media Technologies to Performance: A Capabilities-Based Perspective. *Journal of Personal Selling & Sales Management*. 2012. Vol. 32 Issue 3, pp 317-331.

The Effects of Perceived Organizational Support, Supervisor Supports and Peer Supports on Transfer of Training

Fadillah Ismail¹, Adibah Abdul Kadir², Fazlulaini Mohd Yunus³, Nur Hayatun Syamila binti Fauzi⁴, Nur Amalina Mohd Rosli⁵

Faculty of Technology Management and Business, Universiti Tun Hussein Onn, 86400 Parit Raja, Johor, Malaysia

ABSTRACT

Organizations have invested a huge amount of time and money into training in order to improve the organizational performance. However, if the training fails, the resources dedicated to it is wasted and the results go unrealized. Thus, the organizational performance can be evaluated by looking on transfer of training that is obtained by employees. The purpose of this study is to determine the effects of dominant factors on the transfer of training. Three factors were proposed by considering the factors of perceived organizational supports (POS), supervisor supports and peer supports. The research was conducted in an organization at Pasir Mas, Kelantan with the population of 90 respondents and the research sample are 82 employees of the organization who had attended Occupational Safety and Health Administration (OSHA) training program. The approach used is quantitative by using survey questionnaire in collecting data 6 months after training program and Statistical Package for the Social Science (SPSS) software to analyze the collected data. The outcome turned out that the level of transfer of training among employees in an organization is very high. Then, peer supports out of other supports has become the most domain factor that affected transfer of training in the organization. Perceived organizational supports, supervisor supports and peer supports are statistically significant correlated with positive relationship towards training transfer.

Keywords: *Transfer of training, Perceived organizational supports, Supervisor, Peer, Supports*

INTRODUCTION

Employees are turning out to be the essential parts that are giving so much functions towards all organizational. Organizations spend significant amounts of time and money into training with the aims of rising the employee performance (Lancaster, Di, Roslyn, Lancaster, & Milia¹¹). The performance of employees can be evaluated by many factors as for one example, the transfer of training that obtained by the employees. Thus, the organizations are focusing on increasing the training transfer in their employees. Transfer of training is an important element in the criteria of training effectiveness, which helps both employees and organizations improve their performance (Bhatti, Battour, Sundram, & Othman, 2013).

The transfer of training can be described as the process of transferring new knowledge, skills and attitude for effective work performance. As the example, considering into the state when there is a disaster taking place, what has been studied in training to get ready for

disasters must to be applied in the workplace or at the location of the rate of the disaster (Lim & Nowell, 2014).

Training transfer can be categorized into the broad areas of trainee characteristics, training design and work environment, yet the study is on the work environment. Work environment can be defined as the character and surrounding of an organization where employees perform their jobs and tasks (Hanaysha⁸). The work environment involve the supports elements that help the organizational to be sustain and improve such as the employer, supervisor, colleagues and subordinates.

TN50 is a long-term development blueprint announced by the Malaysia's 6th Prime Minister, Najib Razak, which is about the process as the product. Najib Razak said TN50 is focusing on development of human capital as a pillar to the national success and thus the excellent human capital can be achieved with the high competency level of people (The Star Online¹⁸). According to New Straits Times¹⁸, the global economic landscape will continue evolving owing

to technological advancement, particularly in the area of digital economy. In the midst of the Fourth Industrial Revolution, raising value-added productivity, alongside innovation, technological advancements and human capital development could unleash further the growth potential of the Malaysian economy. Thus, it shows how important the human capital developments towards TN50.

TN50 has aimed for Malaysia to have sustainable developing organization as one of the issues is Malaysia has lacked of workers who have enough knowledge, skills and attitude (Aun²). According to The Star Online¹⁹, the Malaysia's former Youth and Sports Minister, Khairy Jamaluddin said almost 65% of existing jobs are likely to become redundant or disappear within 30 years or so. These include many construction, manufacturing and administration jobs where robots are replacing manual labor. Malaysia has to make sure the education and training systems are adequate for the jobs of the future. He pointed out that currently Malaysia is "overly dependent" on low-skilled foreign labor and under-invested in the field of automation and robots. He added that the country must grow its productivity level and to move away from labor-intensive sectors (The Star Online¹⁹). Thus, Malaysia surely needs the training systems to be developed well in helping Malaysia to develop human capital, improve the productivity and empowerment in working sector, leading TN50 to be achieved.

PROBLEM STATEMENT

Nowadays, it is so hard to hire employees that are high in their training transfer. The employees that available in the field have low level of training transfer that may affect the performance of organization. Kasim, Omar, Ali & Hashim (2014) stated that there is a majority or mass of the employees who have joined the trainings showed lack of transfer of skills and knowledge. It can clearly being seen in the research study that has been done by Scheineider, Pältz, & Stauche (2014) which noted that there is just 10 percent of the trainings have productively created a positive transfer of learning. Furthermore, Patterson (2009) also in his study have found more than 80 percent of the training outcomes in terms of knowledge, skills and abilities achieved in training programs are not being practiced back into the real workplace.

The money spent on the training transfer program are costly and causing the company and organization to

face losses in their investments for improving employees' performance if their efforts gets into failure. However, in improving their organizational training transfer skills and knowledge, the organizations keep on investing their money onto training program yet, as being stated by Chauhan, Ghosh, & Rai⁵ it has been seen that spending money does not alone help attain the objectives of a training program and the training has to be implemented at the workplace. Otherwise, the return on investment in training is generally considered unsatisfactory.

POS is an important elements to organization as it is functioning in how an employee perceives the degree to which their organization values their contribution to the workplace and cares about their well-being (Rhoades and Eisenberger, 2002). However, the organizational support theory argues that employees pay attention to treatment offered by the organization in an effort to determine the degree of their contributions to the organizations. Supervisor acts the role as ones who are in responsibility in supporting and reminding the subordinates in implementing their skills, they can affect the subordinates to be whether through the positive or negative parts of implementation. Yet, peers also are giving impacts towards the transfer of training as they are acting as the supporters during on the job training and the ones who influence the skills towards employees. Chauhan et al.⁵ during their research, they found out that the influence of peers on transfer is found to be higher than supervisors do. Homklin, Takahashi & Techakanont (2014), have found that different to supervisor support and organizational support, only peer's support is positively being related to transfer.

RESEARCH OBJECTIVES

There are three main objectives to be found out and they were listed as below:

- (i) To determine domain factors that influence the transfer of training on employees at the organization.
- (ii) To identify the relationship between perceived organizational supports, supervisor supports and peer support towards the transfer of training on employees at the organization.

Research Scope: The scope of this study will be as below:

- (i) The research is conducted at an organization at Kelantan.

- (ii) The population of research are 90 employees and the sample are 82 employees of who had attended OSHA training programs organized by organization 6 months after the program.
- (iii) The survey questionnaires about the effects of perceived organizational supports, supervisor supports and peer supports on transfer of training.

Significant of Research: By doing this study of research, we get to know the level of training that have been practiced by the employees in the organization and the factors that leading them towards training transfer. Besides, we also get to know the effect of POS, supervisor supports and peer supports onto the training skills, attitude and knowledge transfer between the employees.

This research is limited in some parts as there are some participants who are not cooperating and not giving the clear answers which causing the surveys to be not reliable and not consistent in result. It is also just includes the ones who had attended the training program that is organized by the company 6 months after the training program. This study also may be one source of reference to who are interested in the field of research to do the further research.

LITERATURE REVIEW

Training and Development: Training can be described as a systematic approach to learning and development to improve individual, team, and organizational effectiveness (Goldstein & Ford 2002). The training program is a strategic function of human capital management, where it focuses on developing overall employee competencies to overcome their daily work problems (Madi & Abdullah¹²). Meanwhile, development refers to activities leading to the acquisition of new knowledge or skills for purposes of personal growth (Aguinis & Kraiger¹). According to Churchill⁶, training is focusing around doing exercises today to develop employees for their present occupations while development is getting employees ready for future parts and obligations.

Training Effectiveness: Training effectiveness can be defined as the study of individual, group, or organizational level factors that influence learning in training and transfer after training (Aguinis & Kraiger¹). According to Kirkpatrick model (1959/1996), training effectiveness can be evaluated using the four levels: reaction, learning, behavioral changes, and results. However, Kirkpatrick argues that the higher the level of training effectiveness

the more difficult, complex, and expensive the measure. This explains why it is very difficult to evaluate all levels of training effectiveness. (Fardaniah & Aziz⁷). Sitzmann & Weinhardt¹⁷ suggest that training effectiveness should be operationalized at the macro, within person, and between-person levels of analysis as well as it affects training effectiveness at each of these levels.

Organizations invest in training because they believe a skilled workforce represents a competitive advantage (Kraiger, Smith-jentsch, Salas & Tannenbaum¹⁰). Skills and knowledge that are learned and adopted from the training programs can produce the employees that are functioning in improving organizational performance.

Evaluation of Training: Evaluation can be defined as the systematic collection and assessment of information for deciding how best to utilize available training resources in order to achieve organizational goals (Topno²⁰). Borate³ states that evaluation ensures whether training has done the expected effect and employees are well capable of implementing the same in their tasks assigned.

One of the most useful models in evaluating training programs is The Kirkpatrick Model. The Kirkpatrick Model has been introduced by Donald Kirk Patrick. It has four levels of evaluation which are results, behavior, learning and reaction.

Yoshikawa et. al.³ state that in order to enable the participants of a training program to effectively practice what they have learn from the training to their work place, it is important to provide a thorough follow-up after the training.

Transfer of Training: Transfer of training can be described as the degree to which trainees apply to their job the knowledge, skills, behavior and attitudes gained in training (Holton et al., 1997), transfer of training is an important element in the criteria of training effectiveness, which helps both employees and organizations improve their performance (Bhatti et al., 2013). According to Goldstein and Ford (2002), transfer of training is a process that occurs after the training is completed and takes place at the employees' workplace.

Meanwhile, Aguinis and Kraiger¹ have described transfer of training as the extent to which new knowledge and skills learned during training are applied on the job. Transfer of training is also being referred as the degree to which trainees regularly apply to their jobs the knowledge, skills, behaviors, and attitudes learned in training (Velada & Caetano²²). An employee is considered

to have transferred the training to his or her workplace when he or she can apply the new learned knowledge, skills and attitudes to their job, and this practice becomes consistent over a period of time (Zumrah, 2015).

However, according to study conducted by Vandergoot et. al.²¹ on their research conducted among healthcare professionals, time since training, was significantly negatively related to training transfer. The result is as it would be expected in that training transfer would be less likely to occur or change the further time passed by.

Perceived Organizational Support: Perceived Organizational Support (POS) can be defined as the extent to which an employee perceives that an organization values their contributions and cares about their well-being (Eisenberger, Huntington, Hutchison, & Sowa, 1986). POS is also can be described as the employees’ general belief that their work organization values their contribution and cares about their well-being (Rhoades and Eisenberger, 2002). POS also refers to how an employee perceives the degree to which their organization values their contribution to the workplace and cares about their well-being (Rhoades and Eisenberger, 2002).

POS can encourage employees to transfer the learning outcomes in the workplace, which, in turn, increase service quality provided to customers (Zumrah, 2015). It can be supported by the research done by Meade & Surface¹³ that states the types of training opportunities offered by an organization are influenced by the organization’s needs and its culture, which, in turn, can influence the effects of training on individual employees.

Hypothesis 1: Perceived organizational supports has a significant impacts on the transfer of training among employees.

Supervisor Supports: Supervisor support can be defined as the extent to which the supervisor behaves in a way that optimizes employees’ use on the job of the knowledge, skills and attitudes gained in training (Nijman, Nijhof, Wognum, & Veldkamp¹⁵). Supervisor support can also be defined as the extent to which supervisor-managers support and reinforce use of learning on the job (Holton, Bates, & Ruona⁹). Chiaburu and Marinova (2005) and Chiaburu and Tekleab (2005) measured supervisor support in terms of “employee development”, “practice new skills” and “constant reminder to apply skills”.

Several authors (e.g. Kontoghiorghes, 1998; Gumuseli and Ergin, 2002; Cromwell and Kolb, 2004) have noted a strong positive correlation between supervisor support and training transfer. Burke and Hutchins (2010) observe that there are studies arguing about strong or moderate relationship between the variables and have also found studies showing mixed results; the authors suggest further research to clarify or to build on the correlation between training transfer and supervisor support.

Hypothesis 2: Supervisor supports has a significant impacts on the transfer of training among employees.

Peer Supports: Peer support has been defined by Holton et al. (1996, p. 183) as the “extent to which peers reinforce and support the use of learning on the job”. Peer supports also can be described as the extent to which peers behave in a way that optimizes the trainees’ use of learning on the job (Nijman et al.¹⁵).

The supports from peers are surely helpful as Hawley and Barnard (2005) has found that peer support behaviors were most influential on transfer networking with peers and sharing ideas about course content helped promote skill transfer 6 months after training. Furthermore, Holton et al. (2007) found that among social support factors, peer support has greater impact on past training behavior and motivation to transfer.

Hypothesis 3: Peer supports has a significant impacts on the transfer of training among employees

Conceptual framework and hypotheses: Based on the literature review discussed, a conceptual framework is formed with the independent variable of perceived organizational supports, supervisor supports and peers. The dependent variable is the transfer of training among employees. In order to answer the research question, the hypotheses are generated.

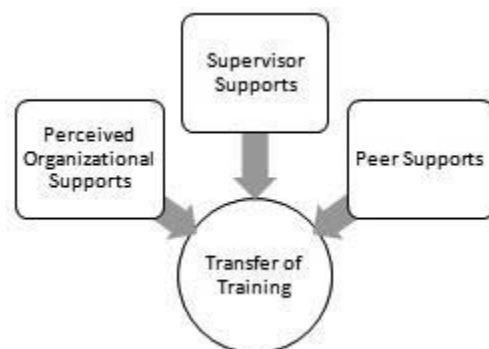


Figure 1: Conceptual framework

Hypothesis 1: Perceived organizational supports has a significant impacts on the transfer of training among employees.

Hypothesis 2: Supervisor supports has a significant impacts on the transfer of training among employees.

Hypothesis 3: Peer supports has a significant impacts on the transfer of training among employees.

METHODOLOGY

Research Design: The research design can be simply defined as the group of methods and procedures that are used in order to collect and to do some measurement on analyzing the variables that have been specified in the research. The descriptive method is used which requires us to do some survey onto the participants to get the results of the population that is being studied. The survey is done by studying the sample from a population by using the questionnaire survey. It is designed to be a quantitative type which is suitable for the questionnaire survey. Quantitative method requires this research to looking up onto objective measurements, statistical, mathematical or numerical analysis of data. The data will be collected through the questionnaire of survey.

In this research, there are few steps of research processes as below:

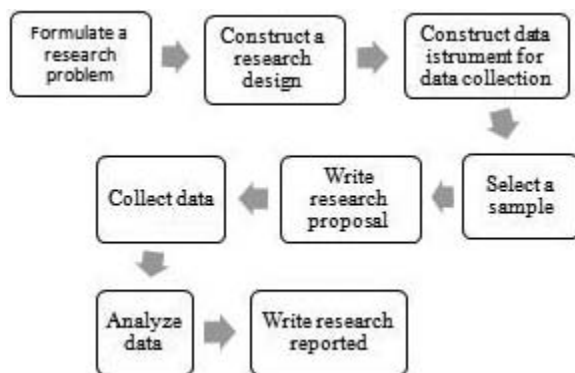


Figure 2: 8-Step Research Process (Kumar, 2005)

For this research study, the location that is chosen is an organization at Kelantan. This organization is functioning in generating, transmitting and distributing electricity in Malaysia. The population of research are 90 employees of that organization. Somehow, it is conducted on 82 samples of respondents who had attended OSHA training programs that was organized by the organization 6 months after the program.

Data Instrument: Research instrument is a tool that is used to collect the data needed for the research. The questionnaire is used to survey the participants. It is divided into various section in order to simplify the data collection and analysis. It is designed in five different sections which are demographic questions, training transfer, perceived organizational support, supervisor supports and peer supports. The 6-point of Likert scale is used.

After data is collected, it is filled and ran into the software package of IBM SPSS. The instrument data is then analyzed according to the objectives of research as below:

Table 1: Data Analysis

Objectives	Data Analysis
(i) To investigate domain factors that influence the transfer of training on employees.	Linear Regression
(ii) To determine the relationship between POS, supervisor supports and peer support towards the transfer of training on employees.	Spearman Correlation

DATA ANALYSIS

Analysis of Demographic Profile: A total of 95 questionnaires had been distributed to the employees in an organization in Pasir Mas and 82 get to be collected and used as sample for research. According to the analysis, male respondents are 73 and female respondents are 9. There are 95.1% of Malay respondents and then followed by Chinese respondents which are 4.9%. Majority are in the age of 30 to 39 years old (41.5%) and the lowest respondents are in the age of 50 years old and above (8.5%). 58.5% of the respondents are married, and the lowest is widowed, 1.2%.

The highest respondents are technician (16 people). Majority of respondents (36.6%) have worked in that organization for 6 to 10 years and the lowest are those with 21 years above (3.7%). All of 82 respondents have attended training programs especially OSHA training.

Reliability Test: Reliability is the degree to which an instrument will get the similar results for the same individuals at the different times.

According to Table of Internal Consistency by Sekaran & Bogie¹⁶, the overall data of Cronbach's Alpha

for this research is 0.933 which its internal consistency is excellent. POS items obtain Cronbach's Alpha of 0.798 which is acceptable and nearly to good result. Item of supervisor supports score 0.747 and it is acceptable. Peer supports items score 0.751 which is acceptable in internal consistency. Transfer of training items has scored 0.837 of Cronbach's Alpha value which is good in internal consistency and it is the highest value scored among all the variables. There is no deleted item in any items of variables of this research.

Regression Analysis: Regression analysis is an analysis that is used to determine which among the independent variables is related to the dependent variable. According to the result, R square is functioning in showing the total percentage of variance explained by perceived organizational support, supervisor supports and peer supports. The value of R square is 0.759, in which means that there is 75.9% of independent variables (perceived organizational supports, supervisor supports and peer supports) have dominated the dependent variables (transfer of training) of the research.

Beta, β is functioning in measuring on how strong independent variables affect the dependent variable. In Table 10, the beta value of peer supports is the highest among other variables. Thus, it means that peer supports is the most domain factors that influence the transfer of training among the employees. Meanwhile, POS scored the lowest as it is the lowest factors in affecting transfer of training.

Normality Analysis: Normality is a test used in determining whether the data of research is normal or not. Kolmogorov-Smirnov is used for respondents not more than 50 and Shapiro-Wilk is used for respondents less than 50. If the P value range more than 0.05, the data is normally distributed and Pearson correlation is used. If it is lower than 0.05, the data is not normally distributed and Spearman correlation is used. Kolmogorov-Smirnov has been used in this study as the respondents are more than 50 as there are total of 82 respondents in the research. By referring to table 11, the data is not normally distributed as each variable have P value that are below than 0.05, thus, Spearman's rho correlation test is needed in order to find the relationship between independent variables and dependent variables in this study.

Bivariate Correlation Analysis: The correlation coefficient can be described as a measure that is used in determining the degree to which two variables'

movement are associated. Based on the result, perceived organizational supports and transfer of training demonstrate a positive relationship between them by correlation of 0.670. Thus, the relationship between POS and TOT is a moderate relationship. The significant value is 0.000 which is less than 0.050, thus, there is statistically significant correlation between these two variables. Hence, H₀ was rejected and H₁ was accepted.

Correlation between Supervisor Support and TOT:

Based on the result, there is positive relationship between supervisor supports and transfer of training with the correlation of 0.660 which means that there is moderate relationship between the two variables. The significant value between these two variables is 0.000 which is lower than 0.050. Thus, there is statistically significant correlation between supervisor supports and TOT. H₀ is rejected, and H₁ was accepted.

Correlation between Peer Supports and TOT: Result of this study shows a positive relationship between peer supports and TOT with correlation of 0.743. Thus, the relationship between these them is a strong relationship. The significant value is 0.000 which is lower than 0.050, thus there is a statistically significant correlation between peer supports and TOT. So, H₀ is rejected and H₁ is accepted.

DISCUSSION

Discussion of first objective: The first objective is to investigate domain factors that influence transfer of training among employees. In Table 17, R square value of transfer of training is 0.759. Thus, there is 75.9% of perceived organizational supports, supervisor supports and peers supports that affect the transfer of training among employees in the organization. Among the factors, peer supports has dominated most of transfer of training as its beta value, 0.410 shows the highest coefficient beta value among other independent variables. Thus, peers supports is the domain factor that affects transfer of training among employees in the organization. Chiaburu (2010) demonstrated that peer support is the most important factor in work environment factors for training transfer by group networking; motivation and encouragement for them to continue apply learned new capability on the job.

Chiaburu et al. (2010) also have established that peer support has more influence on transfer as compared to organizational and supervisor support. Van den Bossche,

Segers & Jansen (2010) had conducted the study that based upon 35 academic employees in the Netherlands discovered co-workers' support, in the form of feedback was indeed important in determining employees' ability to apply what they learned on the job. It is important to note that peer support has its own unique and significant contributions to the transfer of training (Chiaburu, 2010).

Discussion of second objective: The second objective is to identify the relationship between perceived organizational supports, supervisor supports and peer supports towards transfer of training. For POS, the results revealed a positive and moderate relationship with transfer of training. The result of the study turns out to be similar to Zumrah et. al. (2012) which demonstrated that POS has a positive impact on transfer of training. Homklin et al. (2014) also had proposed that organizational support has a positive relationship to transfer of training as organizational supports interacts with learning so that the positive relationship with transfer is stronger for learners with high learning than those learners with low learning. The results indicated that perceived organizational support affect transfer of training among employees in the organization. Thus, POS can encourage employees to transfer the learning outcomes in the workplace, which, in turn, increase service quality provided to customers (Zumrah, 2015).

Supervisor supports was revealed to have a moderate and positive relationship with transfer of training. The result is similar Chiaburu (2010) which demonstrated in his study that the supervisor support has a significantly positive relationship with training transfer. The result of a recent meta-analytic review by Blume, Ford, Baldwin, & Huang (2010) involving 89 studies on training transfer found that supervisory support have strong relationships with transfer of training. It also can be supported by Dermol and Cater (2013) who view that supervisor support is significant for transfer of training as supervisors influence the quality and quantity of training.

Meanwhile, peer supports was found out to have a positive and strong correlation relationship with transfer of training. It can be related to the study by Chiaburu (2010) which demonstrated that support originating from peers has been found to exert a significant influence on employees' ability to apply training in the workplace. It can be related by the study of a recent meta-analytic review by Blume et al. (2010) who found that peer support have strong relationships with transfer

of training. Homklin et. al. (2014) also demonstrated that peer support was significant positively related with training transfer.

RECOMMENDATION

Peer supports turns out to be the domain factor that affects transfer of training among employees the most. Thus, a peer support program should be established as it can helps a lot in improving engagement between employees. POS need to improve by considering employees' goals and values in working environment and help when employees need any help. Organization should show its supports by taking the opinions by employees into consideration Future study can improved by doing the research onto different types of work sectorsso it will compare different types of work sectors by how they handle their transfer of training. Additionally, the future research should be done in a longitudinal study rather than exploratory study in order to assess the consistency of findings with the sufficient resources.

LIMITATION OF STUDY

The research is being done in cross-sectional design which need a lot of time, money and other resources in order to make this research successful and detailed. The results is just based on limited number of population and samples. It is also limited on how the instrument data was collected because some respondents are not answering honestly as they tried not to disclose the negative information about themselves. Thus, the data of the survey may lead the research results in the possible situation of there are some biased information, leading the results to be affected and being in generality.

CONCLUSION

In conclusion, we can see that the level of transfer of training among employees is very high which means that the supports have influenced employees to transfer skills, knowledge and attitude that they get from training program. Thus, it shows the effectiveness of training transfer among employees. Besides, we also can see that peer supports has turned out to be the most domain factors among the others. Thus, it shows that peer has the greatest influence in transferring skills, knowledge and attitude from training program. The relationship between perceived organizational supports, supervisor supports

and peer supports towards transfer of training shows that there are significant correlation relationship between perceived organizational supports, supervisor supports and peer supports towards the transfer of training among employees. Hence, these factors are surely have affected the effectiveness of training among employees, leading them to transfer their training.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Aguinis H, Kraiger K. Benefits of training and development for individuals and teams, organizations, and society. 2009; 451–774. <https://doi.org/10.1146/annurev.psych.60.110707.163505>
2. Aun L. H, Malaysia's transformasi nasional 2050 brings bold new style, but to What End? 2017; (31): 1–7.
3. Borate N. S. The international journal of business & management: A case study approach for evaluation of employee training effectiveness and development program abstract. 2014; 2(6): 201–210.
4. Bryman A, Cramer D. Quantitative Data Analysis with SPSS 12 and 13. Routledge: London. 2005.
5. Chauhan R, Ghosh P, Rai A. The impact of support at workplace on transfer of training: a study of an Indian manufacturing unit. 2016; (August). <https://doi.org/10.1111/ijtd.12083>
6. Churchill R.Q. The Role of Employee Training and Development in Achieving Organisational Objectives: A Study Of Accra Technical University. Society for Science and Education, United Kingdom. 2018; Vol 6, No. 2 (2018). <http://dx.doi.org/10.14738/abr.62.4190>
7. Fardaniah S, Aziz A. Developing general training effectiveness scale for the Malaysian workplace learning. 2015; 6(4), 47–56. <https://doi.org/10.5901/mjss.2015.v6n4s1p47>
8. Hanaysha J. Testing the effects of employee engagement, work environment, and organizational learning on organizational commitment. Procedia - Social and Behavioral Sciences. 2016; 229, 289–297. <https://doi.org/10.1016/j.sbspro.2016.07.139>
9. Holton E. F, Bates R. A, Ruona W. E. A. Development of a generalized learning transfer system inventory. 2000; 11(4).
10. Kraiger K, Smith-jentsch K. A, Salas E, Tannenbaum S. I, Kraiger K. The science of training and development in organizations: What matters in practice. 2012; June: 74–101. <https://doi.org/10.2307/23484697>
11. Lancaster S, Di L, Roslyn M, Lancaster S, Milia L. Di. Supervisor behaviours that facilitate training transfer. 2013; <https://doi.org/10.1108/13665621311288458>
12. Madi M, Abdullah B. Linking supervisor's role in training programs to motivation to learn as an antecedent of job performance. 2010; 6(1): 1–25. <https://doi.org/10.3926/ic.2010.v6n1.p1-25>
13. Meade A. W, Surface E. A, Mullen T. R, Kroustalis C. Assessing change in perceived organizational support due to training. 2006.
14. New Straits Times. Budget 2018 sets the direction for TN50 transformation. 2017; Retrieved from <https://www.nst.com.my/business/2017/10/295947/budget-2018-sets-direction-tn50-transformation>
15. Nijman D. J. M, Nijhof W. J, Wognum A. A. M. (Ida), Veldkamp V. Exploring differential effects of supervisor support on transfer of training. Journal of European Industrial Training. 2002; 30, 529–549. <https://doi.org/10.1108/03090590610704394>
16. Sekaran U, Bougie R.J. Research methods for business: a skill building approach seventh edition. New Jersey: John Wiley & Sons, Inc. 2016.
17. Sitzmann T, Weinhardt J. M. Training engagement theory: A multilevel perspective on the effectiveness of work-related training. Journal of Management. 2018; 44(2): 732–756.
18. The Star Online. Human capital development key to TN50 success. 2017; Retrieved from <http://www.thestar.com.my/news/nation/2017/04/22/human-capital-development-core-to-tn50-success-says-najib-razak/>

19. The Star Online. Preparing for the jobs of the future. 2017; Retrieved from <https://www.thestar.com.my/business/business-news/2017/06/19/preparing-for-jobs-of-the-future/>
20. Topno H. Evaluation of training and development : An analysis of various models. 2012; 5(2), 16–22.
21. Vandergoot S, Sarris A, Kirby N. Factors That Influence the Training Transfer and Maintenance of Conflict Resolution Programs of Healthcare Training and Development Units: A Retrospective Study. *Applied Psychology Readings*. 2018; 103-121. doi:10.1007/978-981-10-8034-0_7
22. Velada R, Caetano A. Training transfer : the mediating role of perception of learning. *Journal of European Industrial Training*. 2009; 31(4), 283–296. <https://doi.org/10.1108/03090590710746441>
23. Yoshikawa E, Yoshikawa T, Takeuchi Y, et. al. 1310 Evaluation of facilitators training in improving the workplace environment using a participatory approach for primary prevention in mental health. *Occup Environ Med* 2018; 75:A569. 2018.
24. Zumrah A. R, Boyle S, Fein E. C. The consequences of transfer of training for service quality and job satisfaction : An empirical study in the Malaysian training for service quality and job satisfaction. 2013; June. <https://doi.org/10.1111/ijtd.12017>.

Measuring Performance of Islamic Banks Using Maqasid Index

Siti Aida Sheikh Hussin¹, Siti FairuzKamaruzaman¹, Zalina Zahid¹, Siti Shaliza Mohd Khairi¹

¹Department of Statistics and Decision Sciences, Faculty of Computer and Mathematical Sciences
Universiti Teknologi MARA, UiTM Shah Alam

ABSTRACT

Banking Industry plays vital role in a country's economic development therefore it is important to evaluate banks' performance. Islamic Banks performances are measured using the same mechanism, which considers only financial ratios that are shareholder oriented. From Shariah point of view it is insufficient. The objectives of this paper are twofolds, firstly, to determine the performance of Islamic banks in Malaysia by using *Maqasid* Index that integrates the Shariah principles with financial ratios by applying Simple Additive Weightage (SAW). Secondly to identify the indicators contributing to the performance using Panel Data Analysis. The scope of this research is nine local Islamic Banks in Malaysia. The study found that Alliance Bank outperformed the other banks based on *Maqasid* Index. The indicators that significantly contribute to the performance of Islamic banks are fair returns, profit ratio, and investment ratio in real sectors.

Keywords: *Islamic banking, performance measurement, Simple Additive Weightage (SAW) Method, Panel Data Analysis*

INTRODUCTION

Bank industry plays a vital role in a country's economic development. Due to increasing competitive market, it is important to evaluate banks' performance to monitor and improve banks' functions.

Most countries offer dual banking systems the conventional banks and Islamic banks. Islamic banking is a banking system that governs by the principles laid down by *Shariah* (Islamic law). The two sources of Islamic Law are the *Quran* and the *Sunnah* (teaching and practices of Prophet Muhammad). The primal fundamental of *Shariah* compliant finance that differentiate them from conventional finance are the prohibition of interest (*riba*), ensure all transactions are clear of uncertainties (*ghirar*), avoidance of any form of gambling (*masyir/qimar*) and no association as well as investment in prohibited industries/organisations. Islamic economics ensure that the motives and objectives driving the Islamic finance industry are beneficial to society. Balance between material pursuits and spiritual needs as well as balancing individual and social need. Islam doesn't restrict economic activities but then introduce responsible activities that benefit human beings, protects the earth, and honors Allah by promoting zakat (a form of tax from wealthy individuals to people in need) and encouraging shared risk

Islamic Banks performances are measured using the same conventional mechanism, the financial ratios that are shareholder inclined without any element of Islamic measurements. The financial ratios are necessary but insufficient. Therefore, Islamic banks requires a shifting paradigm in term of their performance indicators and measurement that include economics, environmental and social indicators as Islamic banking system main activities, must be focused on benefit approach for wider stakeholders (community). The significance of output from this research includes the awareness of consumers toward Islamic bank performances with regards to both *Maqasid* index and performance ratios. In additions Islamic banks will gain better public confidence in ascertaining the conformance to Shariah Law.

LITERATURE REVIEW

Generally, in the practices of company performance measurement including Islamic banking are usually limited to financial ratio such as Data Envelopment Analysis (DEA), Capital, Asset, Management, Earning, Liquidity, Sensitivity of Market Risk (CAMELS) and Economic Value Added (EVA). These performance measurements that use only financial ratio indicators have many weaknesses. Therefore, Islamic banking that is different from conventional banking both in theory and practice aspects, need performance that are not limited to the financial ratios but also one that conforms to Shariah Law (Yuwono, et al., 2004).

The concept of *Maqasid* Index was adapted from the Islamic law or the main crucial objective of *shariah* which is upholding the welfare and benefit values (*Jalb al-Masalih*) also preventing harm (Antonio, Sanrego, & Taufiq³). According to literature, the three ideal concepts of Islamic Bakings are educating individuals (*Tahdzib alFard*), establishing justice (*Al- 'Adl*) and promoting welfare (*Jalb al-Maslahah*).Refer to Sekaran concept (Figure 1)

The three objectives or concepts are transformed into nine dimensions and ten elements. Performance ratio are calculated using the ten elements. Educating the individual in the first *Maqasid* is to gauge the development of knowledge and expertise to individuals in order to heighten individuals' spiritual values. Islamic banks have to contribute to society by providing educational program or training,with the hope to increase knowledge and expertise among employees and stake holders. Banks also need to provide sufficient information to the stakeholders and educate them on how the products offered are Shariah compliant. Ratio in the first *Maqasid* is education grant, research, training, and publicity (promotion) (Mohammed and Taib, 2009). The second *Maqasid* is justice, Islamic banks must assure that all transactions and activities are execute in honesty and fairness. All transactions must be free from injustice elements such *maysir*, *gharar* and *riba*. The third *Maqasid* is *Maslahah* or welfare, where banks should develop investment projects and social services to improve community welfare. It can be seen from the zakat ratio issued by banks and investments in the real sector,

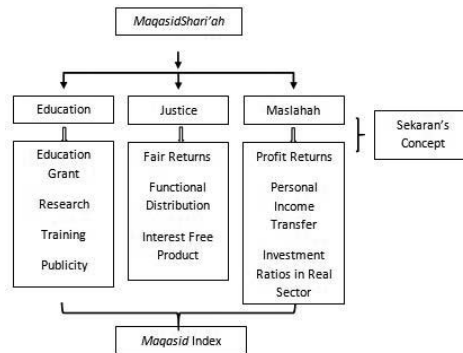


Figure 1: Maqasid Index Framework
Adapted from: Mohammed, Tarique, and Islam⁶

METHODOLOGY

This study covers nine local Islamic banking institutions in Malaysia as listed in table 1. The secondary data are taken from the annual report over period 2012 to 2016 retrieved from the official web site of each bank.

Table 1: List of Local Islamic Banking Institutions in Malaysia

Name
Affin Islamic Bank Berhad
Alliance Islamic Bank Berhad
AmBank Islamic Berhad
Bank Islam Malaysia Berhad
Bank Muamalat Malaysia Berhad
CIMB Islamic Bank Berhad
Hong Leong Islamic Bank Berhad
Public Islamic Berhad
RHB Islamic Bank Berhad

There are two methods used in this study which are Simple Additive Weighting (SAW) and panel data modeling. Simple Additive Weighting (SAW) method is known as a weighted linear combination or scoring method in determining the performance of the banks. The definition and operational variables are as shown in Table 2.

Table 2: Definition and Operational Variables

Concepts	Dimensions	Elements	Performance Ratios	Sources of Data
Education	C1. Advancement of knowledge	D1: Education Grants	E1. Education grant/total income	Annual Report
	C2. Instilling new skills and improvements	D3: Training	E3. Training expense/total expense	Annual Report
	C3. Creating awareness of Islamic banking	D4:Publicity	E4. Publicity expense/total expense	Annual Report
Justice	C4. Fair dealings	D5: Fair Returns	E5. Profit/ total income	Annual Report
	C5. Affordable products and services	D6: Affordable Price	E6. Bad debt/ total investment	Annual Report

Conted...

Welfare	C7. Profitability	D8: Profit Ratios	E8. Net profit/ total asset	Annual Report
	C8. Redistribution of income & wealth	D9: Personal Income	E9. Zakat/net income	Annual Report
	C9. Investment in vital real sector	D10: Investment Ratios in real sector	E10. investment deposit/total deposit	Annual Report

Source: Mohamad5

EVALUATION STEPS OF MAQASID INDEX

In order to evaluate the performance of the banks using Maqasid Index, there are three tests that need to adhere to which are the determination of performance ratio, Islamic banking health level depending on the performance indicators, and Islamic banking health level according to *Maqasid* index (Mohammed et al.⁵). The steps are explained as below:

Determination of Performance Ratio: This research considers eight ratios of the individual performance of Islamic banks. The first three ratios are pertaining to Education or *Tahdzib al-Fard*, the next two ratios are regarding to Justice (*Al-'Adl*) and the last three ratios correspond to the Welfare (*Al-Maslahah*).

Performance Indicators (PI) for all three Shari'ah concepts: The individual Performance Indicator will be evaluated for each Shariah concept/objective. For instance, the Performance Indicator for the first, second and third concept denoted by PI (C1), PI (C2) and PI (C3) respectively are computed mathematically as shown below:

First concept (Education)

$$PI(C1) = (W_1 \times D_1^1 \times E_1^1) + (W_1 \times D_1^3 \times E_1^3) + (W_1 \times E_1^4 \times E_1^4) \dots(1)$$

Where;

C1 denotes as the first concept of Shari'ah (Education)

W_1 denotes the weight assigned of C1

D_1^1 denotes the weight assigned to the first element of C1

D_1^3 denotes the weight assigned to the third element of C1

D_1^4 denotes the weight assigned to the fourth element of C1

E_1^1 denotes the performance ratio corresponding to the first element of C1

E_1^3 denotes the performance ratio corresponding to the third element of C1

E_1^4 denotes the performance ratio corresponding to the fourth element of C1

The benchmark of the best performance indicators is based on the weightage of each indicator mentioned in the Table 3. As the percentage of the performance indicators approach to the defined weightage value, the performance of the bank is considered better.

Table 3: Weighted Average Maqasid Index Variables

Concepts	Average Weight (Out of 100%)	Variables	Average Weight (Out of 100%)
Education	$W_1: 30$	E1: Education Grants/Donations	$E_1^1: 24$
		E2: Research	$E_1^2: 27$
		E3: Training	$E_1^3: 26$
		E4:Publicity	$E_1^4: 23$
		Total	100
Justice	$W_2: 41$	E5: Fair Returns	$E_2^1: 30$
		E6: Fair Price	$E_2^2: 32$
		E7: Interest free product	$E_2^3: 38$
		Total	100
Welfare	$W_3: 29$	E8: Bank's Profit Ratios	$E_3^1: 33$
		E9: Personal Income Transfer	$E_3^2: 30$
		E10: Investment Ratios in real sector	$E_3^3: 37$
Total	100	Total	100

*Maslahah covered bank interest and public interest
Adapted from: (Mohammed et al.⁵)

Islamic Banking Number and Rank Determination:

The *Maqasid* Index (MI) is measured by total up the three performance indicators for each bank.

$$MI = PI (C1) + PI (C2) + PI (C3) \quad \dots(2)$$

The nine banks will be ranked from 1 to 9 according to the MI as the largest total value ranked first and smallest total value ranked last. As it approaches 100%, the better the rank indicates the performance of the bank.

In order to reach the second research objective that is to identify the indicators contributing to the *Maqasid* Index of the banks, the Panel Data Analysis will be utilized. The process of panel data analysis is as shown in Figure 1 and need to satisfy all the assumptions.

The variables used in the panel data analysis are based on the weighted ratios of *Maqasid* Index performance. The measurement of the variables is continuous and value in percentage. There are a total of nine variables which are consisting of one dependent variable and eight independent variables as shows in Table 4.

Table 4: Data Description for Panel Data Analysis

Variable	Description	Measurement
MI	Maqasid Index	Percentage
Education	Weighted education grant performance ratio	Percentage
Training	Weighted training expense performance ratio	Percentage
Publicity	Weighted publicity expense performance ratio	Percentage
Fair returns	Weighted profit performance ratio	Percentage
Affordable price	Weighted bad debt performance ratio	Percentage
Profit ratio	Weighted net profit performance ratio	Percentage
Personal income	Weighted zakat performance ratio	Percentage
Investment ratio	Weighted investment performance ratio	Percentage

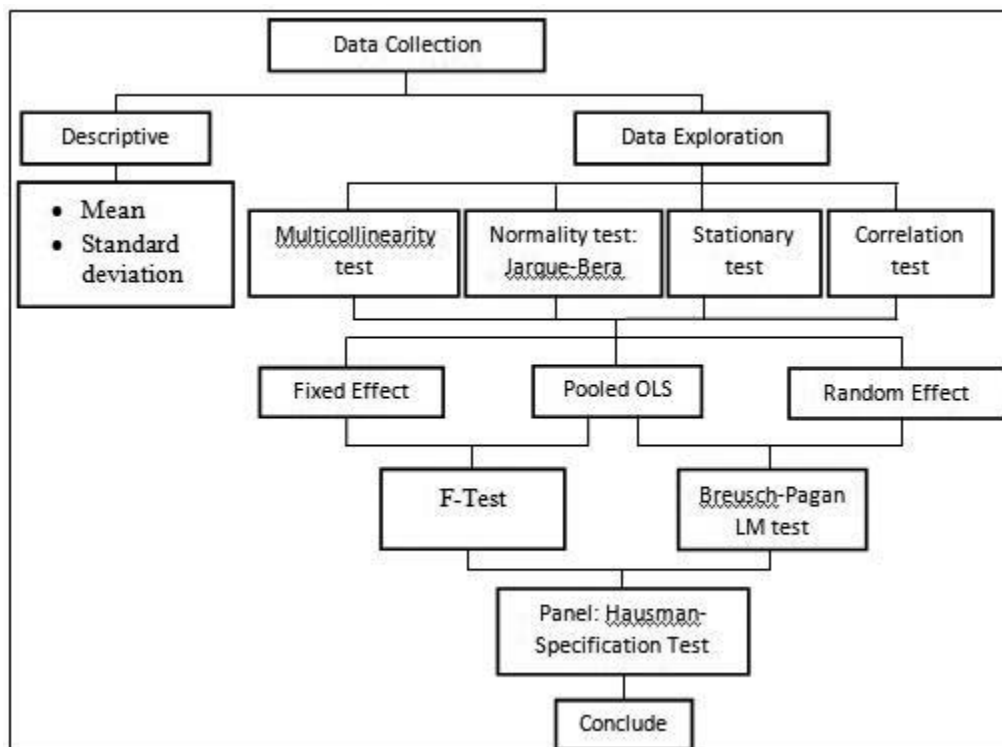


Figure 2: Panel Analysis Research Design

RESULTS AND DISCUSSION

From the results obtained, Alliance Bank is ranked first as the most compliance to Maqasid Index Refer to table 5 to see the rank as well as the percentage of overall index as well as index for each concept. As fo Bank Islam

Malaysia (BIMB) ranked eighth with *Maqasid* Index of 15.53%, the MI is relatively close with the result of the previous research done by Abdul Aziz¹.

Table 5: Islamic Banks based on Maqasid Index (%)

Banks	PI (C1)	PI (C2)	PI (C3)	MI [PI (C1)+ PI (C3)+ PI (C3)]	Ranked
Affin	0.177	6.009	10.260	16.446	5
Alliance	0.378	6.426	12.355	19.158	1
AmBank	0.273	6.505	8.955	15.733	7
BIMB	0.158	5.677	9.699	15.534	8
BMMB	0.326	3.824	11.623	15.773	6
CIMB	0.159	6.554	7.539	14.252	9
Hong Leong	0.184	7.469	8.957	16.610	4
PIB	0.175	8.638	10.095	18.909	2
RHB	0.306	6.998	11.525	18.829	3

Table 9 indicates that all models show that 99% of *Maqasid* Index is explained by the four independent variables which are training, fair returns, profit ratio and investment ratio. The three models which are pooled Ordinary Least Square (OLS) model, random effect model, and fixed effect model have a p-value of F-statistic less than 0.05 which indicates that the models are significant in modeling the *Maqasid* Index with four independent variables. However, the Hausman test results in Table 4.13 concluded that the random effect model is appropriate to be used rather than the fixed effect model.

F-test was used to compare the fixed effect model and pooled OLS model. Based on the result in Table 6, it indicates that the null hypothesis is rejected, and there is at least one dummy parameter (banks) in the dataset that is not equal to zero (F-statistic = 1834.680, p -value = 0.0000 < α = 0.05). Therefore, the fixed effect model is more appropriate compare to pooled OLS model.

Table 6: F-Test for Fixed Effect Model

Test Statistics	Value	Probability
F-statistics	1834.680	0.0000

Breusch-Pagan Lagrange Multiplier (LM) test was used to compare the random effect and the pooled OLS model. The results in Table 7 indicates that the null hypothesis is rejected, and there is at least one specific variance component of the banks or time in the dataset that is not equal to zero (p -value = 0.0002 < α = 0.05). Therefore, the random effect model is more appropriate compare to pooled OLS model.

Table 7: Breusch-Pagan Lagrange Multiplier (LM) Test

Test Statistics	Value	Probability
Breusch-Pagan	13.973	0.0002

Since both hypotheses of the F-test and LM test are rejected, the Hausman-Specification test is conducted to compare which effect models is appropriate for the analysis.

Table 8: Hausman-Specification Test

Chi-Square	p -value
1.3649	0.8503

Based on Table 8, the chi-square shows there is no significant difference in the Hausman test (χ^2 = 1.3649, p -value = 0.8503 < α =0.05). Hence, it can be deduced that Hausman test fail to reject the null hypothesis of random effect model is appropriate. Therefore, the random effect model is observed as

Table 9: Summary of Panel Data Analysis

Variable	OLS	Random Effect	Fixed Effect
Constant	2.2334	2.4749*	2.2627*
	(0.01)	(0.01)	(0.02)
Training	-0.0416	0.6896	1.4435
	(0.94)	(0.41)	(0.20)
Fair returns	0.8897*	0.8963*	0.9159*
	(0.00)	(0.00)	(0.00)

Conted...

Profit ratio	0.8373*	0.7901*	0.7957*
	(0.00)	(0.00)	(0.00)
Investment ratio	1.0231*	1.0193*	1.0188*
	(0.00)	(0.00)	(0.00)
R ²	0.9946	0.9958	0.9975
F-statistic	1834.680	2368.578	1075.890
p-value	0.000	0.000	0.000

The result of random effect model in Table 8 shows that only the independent variable of training does not significant in the model since the p-value is greater than 0.05. Therefore, the final model with the significant independent variables model is as below equation 3.

$$MI = 2.4749 + 0.8963*Fair_returns + 0.7901 + Profit_ratio + 1.0193*Investment_ratio \dots(3)$$

Based on the model 5, the fair returns give an average effect of 0.8963% to the *Maqasid* Index when the fair returns changes across time and between banks by one unit. Also, when profit ratio changes across time and between banks by one unit, the average effect of the profit ratio over the *Maqasid* Index will increase by 0.7901%. Lastly, the *Maqasid* Index will increase by 1.0193% when the investment ratio changes by one unit across the time and between the banks.

CONCLUSION

Consequences from the three aspects of measurement, Alliance Bank rank first in complying to *Maqasid Shariah*, followed by Public Islamic Bank. As for the third to the last rank are RHB Bank, Hong Leong Bank, Affin Bank, Bank Muamalat, AmBank Islamic, Bank Islam Malaysia Berhad, and CIMB Bank, respectively.

The indicators (ratio) that contribute to the *Maqasid* Index performance of Islamic banking in Malaysia are fair returns, profit ratio and investment ratio. Those

indicators give a positive effect on the *Maqasid* Index performance and the investment ratio gives the biggest impact in contributing to *Mqasid* Index performance of the banks.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Abdul Aziz Y. S. Analyzing the Performance of Islamic Banking in Indonesia and Malaysia: *Maqasid* Index Approach. *Jurnal Ekonomi Islam*. 2017.
2. Abdul Razak D, Mohamed M. O, Md Taib F. The performance measures of Islamic banking based on the *Maqasid* framework. 2008.
3. Antonio M. S, Sanrego Y. D, Taufiq M. An Analysis o Islamic Banking Performance: *Maqasid* Index Implementation in Indonesia and Jordania. *Journal of Islamic Finance*. 2012.
4. Melia Y. Multi Attribute Decision Making Using Simple Additive Weighting and Weighted Product in Investment. *International Academic Journal Of Business Management*. 2016; 3(7); 1-15.
5. Mohammed M. O, Dzuljastri A. R, Taib F. M. The Performance of Islamic Banking Based on the *Maqasid* Framework. Paper presented at the IIUM International Accounting Conference (INTAC IV). 2008.
6. Mohammed M. O, Tarique K. M, Islam R. Measuring the performance of Islamic banks using *maqasid*-based model. *Intellectual Discourse*. 2015; 23; 401.
7. Rusydiana A. S, Al Parisi S. The Measurement of Islamic Bank Performance: A Study Using *Maqasid* Index and Profitability. *Global Review of Islamic Economics and Business*. 2016.

Analysis of Critical Success Factors of Startups in Thailand

Sutthikarn Khong-khai¹, Hung-Yi Wu²

¹Branch of Management, Maejo University, No.99, Lamae District, Chumphon Thailand; ²Department of Business Administration, National Chiayi University, No.580, Xinmin Rd., Chiayi City, Taiwan

ABSTRACT

Thailand set up Thailand 4.0 Policy as a guideline on country development in the aspects of economic and social strength. It also focuses on the participation of civil state. Startups are significant tools that the government sector promotes and reinforces as economic weapons for driving Thailand's economic system. Collaborations from all sectors such as government sector, private sector, and educational institution are required in order to encourage startup growth and sustainability. This study, therefore, applied the concept of startup ecosystem creation to search for the critical success factors (CSFs)(i.e., criteria/sub-criteria) affecting the startup in Thailand according to experts' viewpoints. Fuzzy Delphi Method (FDM) was used for data analysis based on experts' consensus. The findings indicated that "Human Capital" was the first priority among the criteria influencing startup success. "Entrepreneur Capability," "Innovation Capability," and "Startup Team" were the top three important sub-criteria influencing startup success and growth, respectively. The results can be provided as reference for planning and determining startup strategies in the future.

Keywords: Thailand 4.0, Startup, Critical success factors (CSFs), Fuzzy Delphi Method (FDM)

INTRODUCTION

In the present day, the politic, economy, and social environments at the international level, the regional level, and the domestic level have changed rapidly, causing the dynamic of change which is a business encounters rivals from around the world and all the time. Furthermore, the change is also a challenge to the countries around the world who receive the impact, for example, the change of demographic structure, globalization, and future market, deprivation of natural resources, the climate change, the change of technology and innovation (NIA²⁷). These changes give rise to each country preparing to respond the impact towards its society, economy, and environment, at the least level. Thailand, therefore, specifies Thailand 4.0 Policy as the plan to support this challenging change with the purpose to liberate people from the trap of poverty. Moreover, the influence of internet of things and technology bring about the building of new business model and opportunity for new entrepreneurs in their starting of creative business. These entrepreneurs are called "Startups" and they are regarded as the new business warriors who will construct a new business foundation in Thai's future. Under "3S" business group which contains Startup, SMEs, Social enterprise that the state gives priority to and aims at promoting its strength (Angsathammarat²). For this reason, the "building of economic weapon" or Startup

promotion is added to build the new startup group for economic force in accordance with Thailand 4.0 Policy.

Startup is a new organization formed to search for a repeatable and scalable business model (Blank⁵). It applies technology and/or innovation to be the heart of the business building. The type of business mostly comes from an idea to solve some problem in daily life or the business opportunity that no one has ever done (Worapongdi³⁶). Silicon Valley is the first original source of Startup of the world. It is capable of building jobs and income to the economy of USA. Several countries try to apply the Silicon Valley model in their own country (Bossup Solution⁸; Kshetri²⁴; Cheah, Ho & Lim⁹; Geibel & Manickam¹⁵). The building of good and appropriate startup ecosystem will increase the chance of success and push the holistic economy. Apart from that, the startup ecosystem depends on the politics and the education (Berger & Kuckertz⁴). A startup ecosystem is formed by people, startups in their various stages and various types of organizations in a location, interacting as a system to create new startup companies. These organizations can be further divided into categories: universities, funding organizations, support organizations, research organizations, service provider organizations, and large corporations (Grow advisors¹⁷). In every country, the main factors lead to the different success (Geibel & Manickam¹⁵).

The startup began to be widely recognized in Thailand since 2013. Thailand must push the startup to be the tool for economic repulsion. This study is aimed to analyze the critical success factors (CSFs) of startups in Thailand. In order to achieve the objective, the researchers adopted the startup ecosystem of Isenberg²¹ to answer the question

“what is the main factor that affects the startup business operation in Thailand?” The data received can be applied for decision-making and planning of startup business promotion in Thailand and building of startup ecosystem. The description and main references of each sub-criterion are summarized in Table 1.

Table 1: Summary of the CSFs of startup in Thailand

Criteria	Sub-criteria	Description	References
1. Government Policy	1.1 Taxes	Tax measures are determined in order to promote startup growth	Cheah et al. (2016)
	1.2 Laws	Revise laws that do not facilitate startup establishment as well as growth	National Startup Committee (2016)
	1.3 Financial support from government	Government agencies offer financial support in the way that startup entrepreneurs can simply access sources of low-interest investment funds in real time.	Geibel&Manickam (2016)
	1.4 Investors	Motivation measures must be created to attract qualified investors at the beginning of startups for taking this opportunity to extend their businesses and startup markets, including fundraising from different sources.	Worapongdi (2017); Cheah et al. (2016)
2. Startup support	2.1 Infrastructure	Places, communities, and facilities are provided as learning sources and meeting centers for idea exchange, with the main purpose to support startups	Worapongdi (2017); Cheah et al. (2016); Fuzi (2015)
	2.2 Professional services	Provide and offer services to assist startup entrepreneurs in particular	Cheah et al. (2016); Teeter & Whelan-Berry (2008)
	2.3 Incubator/ Accelerator	Large businesses or those with efficiency to grow further concentrate on business incubation/acceleration. They are advisors and assistants to entrepreneurs at the beginning of startups for faster growth and for taking opportunities to attract investors from potential firms.	Worapongdi (2017); Krajcik&Formanek (2015) Hoffman &Radojevich-Kelley (2012)
	2.4 Startup activities	Hold meetings, seminars, events, and arrange media related to startups for manipulating them as stages to present businesses, bring inspirations, build networks for any updates, and connect collaborations among national and international startups.	Worapongdi (2017); Geibel&Manickam (2016)
3. Human capital	3.1 Entrepreneurial Capability	Entrepreneurs possess excellent views, skills, and competence in businesses and change management so that they can compete with national and international markets.	Cheah et al. (2016); Geibel&Manickam (2016); Colombo &Grilli (2005)
	3.2 Innovation Capability	Able to apply innovative knowledge to fulfill trade activities or to solve problems for customers. Consequently, products innovations as well as process innovations emerge, along with the development of new creations.	Worapongdi (2017)
	3.3 Startup team	Have great work teams with capabilities, work experiences, skills, and concepts in accordance with those of business founders.	Geibel&Manickam (2016); Altman (2014)
	3.4 Foreign talent	Hire foreign experts for jobs that require specialization (Engineering or IT) for cross-cultural learning and sharing new visions of market extension.	NIA (2017)
4. Marketing	4.1 Product	Have outstanding products or services, adequate inventories; and can satisfy customer needs instantly.	Statistic Brain (2016); Altman (2014)
	4.2 Price	Know how to manage emotional pricing.	Statistic Brain, 2016
	4.3 Scale up	Startups are scalable, with products or services certified by international standards; and can deal with both national and international target markets.	Geibel&Manickam (2016)
	4.4 Exit strategy	Be knowledgeable and prepared for exit strategies and withdrawal in case startups are popular and taken over.	National Startup Committee (2016)

Conted...

5. University	5.1 Instruction	Mainly instruct students to obtain knowledge and skills of entrepreneurship, along with the connection between theories and actual practices. In this regard, universities do not take part in business to compete with the business sector.	Illinois Innovation Index (2016); Boh et al. (2015)
	5.2 Research	The center of research and academic advancement; including knowledge, technological, and innovative transfer to advocate, help, and rectify, and improve startups.	Illinois Innovation Index (2016)
	5.3 Startup ecosystem	Make this happen in universities so that they will become learning centers of entrepreneurship, business trials, inspiration creation, and experiences.	Boh et al. (2015); Ratzinger et al. (2013)
	5.4 Alumni	Form up alumni networks to support universities regarding startup activities.	Galloway & Brown (2002)

METHODOLOGY

Questionnaire Design and Data Collection: This study developed the Fuzzy Delphi method (FDM) questionnaire, which was designed from relevant documents, articles, and research papers related to CSFs of startup. The criteria and sub-criteria used in the FDM questionnaire are adapted from the study of Isenberg²¹. The key factors can be divided into five criteria, containing 20 sub-criteria (Table 1) for experts to evaluate the importance (in a scale of 1 to 10) of each sub-criteria. As presented in Table 2, taking the sub-criterion “1.1 Taxes” as an example, the expert evaluates the importance with a range of 5 to 7.

Table 2: Shows the Max-min score from the experts about the key factors leading to the success of Startup Business

Criteria	Sub-Criteria	Definition	Score
1. Government Policy	1.1 Taxes	Tax measures are determined in order to promote startup growth	1 2 3 4 5
		[For example, Tax privilege/ Tax incentive for startup investor].	6 7 8 9 10

The samples of the questionnaire surveys were focused on experts of educational agencies, government sector, and private sector. The experts were those involving in startups, e.g., startup entrepreneurs, incubators/accelerators, co-working space owners, mentors, financiers, academician, and government officials. The experts selected have at least three years of working experience related to startup. The sample sources were from published documents, academic

seminars, and internet database. The questionnaires were reviewed by five startup experts in order to bring their assessment to improve and correct the questions before being sent out.

The Fuzzy Delphi Method (FDM): The Max-min Fuzzy Delphi method was proposed by Ishikawa et al.²² It has an advantage for collecting the appropriated information on the experts’ opinions. The Max-min FDM is simpler since all the experts’ opinions can be synthesized in one time investigation (Ma et al.²⁵).

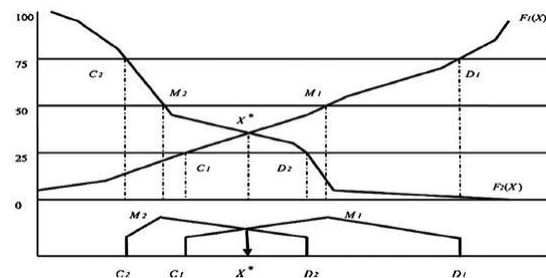


Figure 1: Max-min FDM Forecasting.

Source: Ishikawa et al.²

The analysis process of FDM in a study can be described in the following steps (Ishikawa et al.²²):

In Step 1, the aggregate allocation function $F_1(X)$ for the highest level (i.e., Max. value) of concurrence as well as the aggregate allocation function $F_2(X)$ for the lowest level (i.e., min. value) of concurrence for each evaluation factor (A_i) must be determined.

In Step 2, the corresponding lower quartile, median and upper quartile of both $F_1(X)$ and $F_2(X)$ must be determined. For display of results, symbols C_p , M_p , D_1 and D_2 , M_2 , C_2 are used.

In Step 3, the level of significance for the topic is the aspect of junction between (C_p, M_p, D_1) and (D_2, M_2, C_2) . Typically called the “grey zone”, the intersecting section of both functions is termed target value X^* . Further, the

aggregate allocation function $F_1(X)$ for the highest level of concurrence and the aggregate allocation function $F_2(X)$ for the lowest level of concurrence both show a grey area, as given in Figure 1. The intersecting regions of their lower quartiles, medians, and upper quartiles (C_1, X^*, D_2) comprise the grey areas.

The expected value (X) of the assessment factor A_i can be acquired based on the previous estimation. Afterwards, a maximum value is typically assigned by specialists for assessing the most significant factors.

The assessment factors appropriate for the study will be identified by the threshold value S , i.e.:

If $X_i \geq S$, then A_i will be accepted as the assessment factor.

If $X_i < S$, then A_i will be rejected.

For further better understanding, the sub-criterion “1.1 Taxes” is taken as an illustrative example. The scores(values) of (C_1, M_1, D_1) , (D_2, M_2, C_2) , and X^* calculated by the above steps of FDM analysis are summarized in Table 3.

Table 3: Example of the Max-min FDM analyses of the sub-criterion “1.1 Taxes”

Taxes												
Assessment value	1	2	3	4	5	6	7	8	9	10	First quartile: C_1	7
F_1 :	0	0	0	0	1	5	3	6	7	8	Second quartile: M_1	8.5
The total occurrences of Maximum value	0	0	0	0	1	6	9	15	22	30	Third quartile: D_1	9.75
F_2 :	5	1	1	2	8	5	3	4	1	0	Third quartile: D_2	6.75
The total occurrences of minimum value	30	25	24	23	21	13	8	5	1	0	Second quartile: M_2	5
											First quartile: C_2	4
											X^*	6.88

RESULTS

Experts’ Demographic Profile: There were 45 questionnaires sent out and 30 completed questionnaires were received. The valid response rate is 66.67%. Each sector hasten experts participated in the survey. Most(70%) of the experts are male; 30% of them are females. The respondents’ ages are most between 31-40 years old (46.67%). Most of the experts have master’s degrees(46.67%) and most of the participants have business startup experience for 3-5 years(70.33%).

The CSFs of Startup analyzed by FDM: After the data analysis was done following the formula (steps) of Max-min FDM, the analytical result of the key factors (i.e.,

sub-criteria) leading to the success of Startup Business is shown in Table 4. According to the experts’ evaluation, the scores of all the X^* are ranging from 6.50~8.00. Thus, in this research, the threshold was set to be 7. Five sub-criteria were deleted. Therefore, 15 sub-criteria were selected finally. To clarify, the result was found the experts agree that the most important criterion influencing Thailand’s startup success is “Entrepreneur capability (8.50),” followed by “Innovation capability (8.13),” and “Startup team (8.13)” with the equal scores. When considering the overall factors, “Human capital” is ranked on the top of all the sub-criteria affecting Thailand’s startup success.

Table 4: Summary of the CSFs of Startup analyzed by FDM

Criteria	Sub-criteria	C_1	C_2	D_1	D_2	X^*
1. Government Policy	1.1 Taxes*	7	4	9.75	6.75	6.88
	1.2 Laws*	7	3	10	7	7
	1.3 Financial support from government	8	5	10	8	8
	1.4 Investors	8	5	10	7	7.50
2. Startup Support	2.1 Infrastructure*	7	3.25	10	6	6.50
	2.2 Professional services	8	5	10	8	8
	2.3 Incubator/Accelerator	7	3.25	10	7.75	7.38
	2.4 Startup activities	8	4	10	7	7.50

Conted...

3. Human Capital	3.1 Entrepreneur capability	9	6	10	8	8.50
	3.2 Innovation capability	8.25	5	10	8	8.13
	3.3 Startup team	8.25	5	10	8	8.13
	3.4 Foreign talent*	7	3.25	9	6	6.50
4. Marketing	4.1 Product	8	5	10	8	8
	4.2 Price*	8	4.25	10	6	7
	4.3 Scale up	8	4.25	10	7	7.50
	4.4 Exit strategy	7.25	3.25	9	7	7.13
5. University	5.1 Instruction	8	4	10	8	8
	5.2 Research	7	4.25	10	8	7.50
	5.3 Startup ecosystem	7	4	10	8	7.50
	5.4 Alumni	7.25	4.25	10	7	7.13

Note: * indicates the criteria with $X^* \leq 7.00$, which had been deleted.

DISCUSSION

The study was aimed to explore and analyze which factor(s) influenced Thailand's startup success most so as to apply the obtained data for planning or preparing the development and the promotion of Thailand's startup. Most experts agreed that "Entrepreneur Capability," "Innovation capability," and "Startup team" are the first key factors in leading the Startup Business to success and these three sub-criteria are all under the "Human capital" criteria. Human capital is the firm's collective capability to find the best solution by using specific knowledge (Bontis⁷) and is also a source of innovation as well as strategic renewal. As such, to encourage the Startup Business to be the economic weapon in order to drive Thailand, according to Thailand 4.0 policy, the government should increase the entrepreneurs' potential and entrepreneurship and also encourage the entrepreneurs to bring the innovations into their business as well as create a better quality startup team who shares the same direction with the business founders, which corresponds to the study of Geibel and Manickam¹⁵, which remarked that "Even though the results revealed that the internal factors influencing startup success in USA were co-founder, work culture, and employee because startups in this country highly gave precedence to work teams and capability improvement before business conduct."

In Marketing criteria, most of the experts thought that product is the important factor for the successful startup business. Due to at the beginning of the startup business, whether the business will be successful or not,

it depends on the product or service they provide and proper with customers (Santisteban & Mauricio³⁰). As such, the startup business with capability entrepreneurs and quality startup team will be able to offer competitive products or services. The entrepreneurs need is the specific assistance or support from professional services such as a financial consultant to support the business management succeed (Gnyawali & Fogel¹⁶). There are several ways to do that such as short-term consultancy, long-term support to meet ongoing needs for general business advices and training programs for entrepreneurs (Deakins¹¹). The financial factor also the key factor causing business failure, such as the lack of money to run the early stage business (Erin¹²) such as Singapore's government sectors offered financial support in different forms to startups (Hemmert et al.¹⁸). Thus, it should be offered at the appropriate time (Smith & Miner³¹).

For the University criteria, instruction is important in building entrepreneurship. It was necessary to universities so as to promote students to practice their entrepreneurial experiences through courses as well as activities as interdisciplinary. This conformed with the study of Wandhwani (2012), who stated that instruction and courses were substantial to make students interested in entrepreneurship. According to the research by Timmons and Spinelli (2007), they pointed out that entrepreneurship is a way of thinking, reasoning, and acting which is opportunity obsessed, holistic in approach, and leadership balanced for the purpose of value creation and capture. Besides, the government sector established "Entrepreneurial universities" so that they could develop

entrepreneurial courses and instructor competencies as the archetypes of entrepreneurial instruction management to other universities across the country (STI Office³³). Educational institution (universities) was a key part to help shaping and promoting entrepreneurship to students through instruction process such as Singapore (Cheah et al.⁹). Furthermore, businesses started by alumni are actually much more significant (Roberts & Eesley²⁹; Åsterbro & Bazzazian³).

CONCLUSION

Research Conclusion: In the past two years, the government clearly stated that Thailand would use the startup business as the main strategy to build a sustainable business in order to improve nation's economics and achieve key goals for being sturdy, with prosperity and sustainability. The study found that most of the experts think that the entrepreneur capability, innovation, and startup team are the first important factors for the successful startup business. Moreover, the next factors that both government and related sectors should facilitate are providing financial support from the government, professional service (such as financial consultant), product, and instruction from the educational sector or university to strengthen the business and make it competitive.

Suggestions for Further Research: Further in-depth studies on Thailand's startup groups with growth and competitive abilities at the international level are suggested. Moreover, studies on startup failure factors should also be conducted to produce useful data for new entrepreneurs of markets. Work cultures among entrepreneurs can be explored. In addition, other analytical tools (e.g. analytic hierarchical process (AHP), analytic network process (ANP)) can be used to prioritize the CSFs of startup screened by the current study.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Altman S. How to Start a StartUp. 2014; Retrieved from <http://startupclass.samaltman.com/courses/lec01/> (accessed January 8, 2018).
2. Angsathammarat R. Supporting and developing the Tech-Startup: case study in Singapore. 2017;

- Retrieved from <http://203.113.122.174/ULIBIGP/dublin.php?ID=3720> (accessed January 20, 2018).
3. Åsterbro T, Bazzazian N. Universities, entrepreneurship and local economic development, in M Fritsch (ed.) Handbook of Research on Entrepreneurship and Regional Development, Cheltenham: Edward Elgar. 2011.
4. Berger E. S. Kuckertz A. Female entrepreneurship in startup ecosystems worldwide. Journal of Business Research. 2016; 69(11), 5163-5168.
5. Blank S. What's a Startup? First Principles. 2010; Retrieved from <https://steveblank.com/2010/01/25/whats-a-startup-first-principles/> (accessed January 20, 2018).
6. Boh W. F, De-Haan U, Strom, R. University technology transfer through entrepreneurship: faculty and students in spinoffs. The journal of technology transfer. 2015; 41(4), 661-669.
7. Bontis N. Intellectual Capital: An exploratory study that develops measures and models. Management Decision. 1998; 36(2), 63-76.
8. Bossup Solution. Startup Series Ep.3: Silicon Valley. 2018; Retrieved from <http://www.bossup.co.th/site/startup-series/> (accessed March 22, 2018).
9. Cheah S, Ho Y. P, Lim P. Role of public science in fostering the innovation and startup ecosystem in Singapore. 2016; Retrieved from https://www.researchgate.net/publication/310806678_Role_of_Public_Science_in_Fostering_the_Innovation_and_Startup_Ecosystem_in_Singapore / (accessed January 20, 2018).
10. Colombo M. G, Grilli L. Founders' human capital and the growth of new technology-based firms: A competence-based view. Research Policy. 2005; 34, 795-816.
11. Deakins D. Entrepreneurship and small firms: Sources of finance: overview of issues and debt finance and E-business, the small firm and the knowledge-based economy, 2nd edition, UK, London: Ed. McGraw-Hill. 1999.
12. Erin G. Why startups fail, according to their founders. 2014; Retrieved from <http://fortune.com/2014/09/25/why-startups-fail-according-to-their-founders/> (accessed February 10, 2018).

13. Fuzi A. Co-working spaces for promoting entrepreneurship in sparse regions: the case of South Wales. *Regional Studies, Regional Science*. 2015; 2(1): 462-469.
14. Galloway L, Brown W. Entrepreneurship education at university: a driver in the creation of high growth firms? *Education + Training*. 2002; 44(8/9): 398-405.
15. Geibel R, Manickam M. Comparison of selected startup ecosystems in Germany and in the USA. Explorative analysis of the startup environments. *GSTF Journal on Business Review (GBR)*. 2016; 4(3): 66-71.
16. Gnyawali D. R, Fogel D. S. Environments for entrepreneurship development: key dimensions and research implications. *Entrepreneurship: Theory and Practice*. 1994; 18(4), 43-62.
17. Grow advisors. White paper: An introduction to Startup Ecosystem. 2014; Retrieved from <http://www.growadvisors.com/knowledge-centre.html> (accessed January 20, 2018).
18. Hemmert M, Cheng Y, Kohlbacher F, Kotosaka M, Loh C. T, Waldnberger F. High-tech Startup Ecosystems in East Asian Agglomerations: Are They Different from the West?, Tokyo: German Institute of Japanese Studies. 2016.
19. Hoffman D. L, Radojevich-Kelley N. Analysis of Accelerator Companies: An Exploratory Case Study of Their Programs, Processes, and Early Results. *Small Business Institute Journal*. 2012; 8(2), 54-70.
20. Illinois Innovation Index, Winter. University Entrepreneurship Rising: A detailed look at university startup creation, tech transfer, and local funding trends. 2016; Retrieved from https://illinois.edu/emailer/.../istc_university_entrepreneurship_index.pdf (accessed February 10, 2018).
21. Isenberg D. The Entrepreneurship Ecosystem Strategy as a New Paradigm for Economic Policy: Principles for Cultivating Entrepreneurship. Babson Park, MA: Babson Entrepreneurship Ecosystem Project, Babson College. 2011.
22. Ishikawa I, Amagasa M., Shiga T, Tomizawa G, Tatsuta R, Mieno H. The Max-min Delphi method and fuzzy Delphi method via fuzzy integration. *Fuzzy Sets and Systems*. 1993; 55(2): 241-253.
23. Krajcik V, Formanek I. Regional start-up ecosystem. *European Business and Management*. 2015; 1(2): 14-18.
24. Kshetri N. Fostering Startup Ecosystems in India. *Asian Research Policy*. 2016; 7(1), 94-103.
25. Ma Z, Shao C, Ma S, Ye Z. Constructing roadsafety performance indicators using fuzzy Delphimethod and Grey Delphi method. *Expert Systemswith Applications*. 2011; 38, 1509-14.
26. National Startup Committee. White Paper of Startup to build startup ecosystem in Thailand. 2016; Retrived from <https://www.marketingoops.com/news/tech-update/white-paper-for-startup-ecosystem/> (accessed January 20, 2018).
27. NIA (National Research and Innovation Policy Council). Draft of Strategic Planning of Reseacher and Innovation during 2017-2036. 2017; Retrived from <http://www.nric.or.th/>(accessed January 20, 2018).
28. Ratzinger D, Greenman A, Mosey S. The role of universities as educators in the UK Internet start-up ecosystem: Research opportunities.‘ Third meeting of business creation experts from business incubators and researchers: EDHEC Business School. Lille, France. 2013; April 11: 2013.
29. Roberts E. B, Eesley C. E. Entrepreneurial impact: the role of MIT-an updated report, Foundations and Trends in Entrepreneurship. 2011; 7(1-2): 1-149.
30. Santisteban J, Mauricio D. Systematic literature review of critical success factors of information technology startups. *Academy of Entrepreneurship Journal*. 2017; 23(2): 1-23.
31. Smith N, Miner J. Type of entrepreneur, type of firm, and managerial motivation: Implicationsfor organizational life cycle theory. *Strategic Management Journal*. 1983; 4: 325–340.
32. Statistic Brain. Startup Business Failure Rate By Industry. 2016; Retrived from <http://www.statisticbrain.com/startup-failure-by-industry/> (accessed January 8, 2018).
33. STI Office (National Science Technology and Innovation Policy Office). Meetings, Workshops and Seminars. 2017; Retrived from http://www.sti.or.th/news-detail.php?news_type=1&news_id=192 (accessed February 10, 2018).
34. Teeter R, Whelan-Berry K. My firm versus our firm: The challenge of change in growing the small professional service firm. *Journal of Business Inquiry*. 2008; 32(3), 41-52.
35. Timmons J. A, Spinelli S. New venture creation: entrepreneurship for the 21st century. Boston: McGraw Hill. 2007.
36. Worapongdī N. SET Your Startup Business Guide. Bangkok: The Stock Exchange of Thailand. 2017; Retrived from www.set.or.th/enterprise (accessed January 20, 2018).

Personality as Predictor of Life Satisfaction at Middle-Age Retirement among Army Veterans post-Resettlement Training in Malaysia

Aminatu Zahriah Mohd Ngamal¹, Ruslin Amir², Faridah Mydin Kutty³, Khairul Anwar Mastor⁴, Raja Rizal Iskandar Raja Hisham⁵, Zaizul Ab Rahman⁶, Harisson Harun⁷

^{1,2,3}Faculty of Education, Universiti Kebangsaan Malaysia, 43000 Bangi Selangor, Malaysia;

^{1,2}Adult Education and Professional Development Studies, Faculty of Education, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia; ⁴Center for Liberal Studies (CITRA), Universiti Kebangsaan Malaysia, 43000 Bangi Selangor, Malaysia; ⁵Islamic Business School, Universiti Utara Malaysia, 06010, Sintok, Kedah, Malaysia; ⁶Center of Aqidah and Global Peace, Faculty of Islamic Studies, Universiti Kebangsaan Malaysia, 43000 Bangi Selangor, Malaysia; ⁷Royal Military Air Force Administrative & Management Learning Institute c/o Subang Air Based, 40000 Shah Alam Selangor, Malaysia

ABSTRACT

The study investigates the effect of personality domains, namely, neuroticism, extraversion, openness, agreeableness and Conscientiousness on life satisfaction. The sample was pensionable middle-age other ranks army veterans (n=464). Stratified random sampling technique was employed in sample selection. A cross sectional survey design, was employed for the study. A structural equation modelling using Smart PLS 3.2.5 was employed for the analysis. The results indicate that conscientiousness, extraversion and neuroticism contribute to the life satisfaction of army veterans. Meanwhile, openness and agreeableness do not significantly contribute to life satisfaction. The result assists in providing insights on the type of personality influencing life satisfaction of the Malaysian Armed Forces other ranks army veterans. This understanding can further assist in designing measures to help the retiring army personnel during resettlement program in dealing with their personality profile that influence to their life satisfaction at middle-age retirement.

Keywords: *Personality, Life satisfaction, Army veterans, Malaysia, Structural equation modelling, Partial Least Squares (PLS)*

INTRODUCTION

Increasing life satisfaction at retirement is contingent upon beneficial resources Hobfoll¹⁹ within the veterans. According to Hobfoll¹⁹, resources can be defined as the total capability of an individual to fulfil the required valued needs. Among the personal resources is personality, which is an antecedent Reis & Gold²⁷ and resource Wang, Henkens, & Van Solinge³² to veterans in achieving life satisfaction. Veterans, during their active duty were exposed to the regimented training of armed forces environment Jackson, Thoemmes, Jonkmann, Lütke, & Trautwein²⁰ of high discipline and routine structured duty. Thus, various exposures to the regimented environment is believed to influence the personality type of the retired veterans Jackson, Thoemmes, Jonkmann, Lütke, & Trautwein²⁰, which

eventually could also relate to their satisfaction with life at retirement Reis & Gold²⁷. Bleidorn, Hopwood and Lucas³ also suggest that more fine-grained research examination need to be conducted pertaining to the changes of personality traits as a function of retirement.

PROBLEM STATEMENT

Approximately 6,756 pensionable other-ranks (Ors) army personnel retired mandatorily from the active service from 2010 to 2012 (Dept. of Record and Salary, Ministry of Defense, 2012). Pensionable other-ranks army retire when they completed as minimum as 21 years of service Armed forces Act¹. If he begins his career at the age of 19, therefore the retirement age is 40.

Many veterans who mandatorily retire at middle age experience difficulties in managing life affairs

with mostly lacking the ability to secure a second career after retired (Normah Zakaria, 2013), although job matching and placement are provided (“Veterans Affairs Department of socioeconomic and welfare,” 2018). Most of them have high financial commitment on family matters and children’s educational expenses (Nur Zahidah Hassanuddin, 2015).

Normah Zakaria (2013) found that only 2% of veterans are able to secure their second career after retirement, indicating that veterans may not be satisfied with their retirement without a job while remaining physically fit and healthy at middle age as civilian. Thus, reflecting dissatisfaction of life at retirement. In this regards, studies on comprehending the aspect of personality relating to veterans’ life satisfaction is crucial as each veterans may possess different types of personality that may benefit them as resources Wang, Henkens, & van Solinge³²; Hobfoll¹⁹ in dealing with difficulties and dissatisfaction at their retirement. Investigating personality is of paramount following suggestion by Leszko et al (2016) that would promisingly bring a novelty of understanding on the role of it as a predictor to any outcome variables such as well-being and cognitive functioning. Though McCrae & Costa²⁴ posit that personality is genetically stable at adulthood, the social investment theory (Helson, Kwan, John, & Jones¹⁵; Bleidorn et al⁴; Roberts, Wood & Smith²⁸ argue that personality could change due to the environmental influences, and life event during adulthood. Taking into account the two contrasting views, this study was conducted to address the effect of personality factors as resources of the veterans on life satisfaction.

Research Objective: The objective of the study is to investigate the effect of personality factors on life satisfaction.

Research Questions: What are the significant effects of personality factors of conscientiousness, extraversion, openness, agreeableness and neuroticism on life satisfaction?

LITERATURE REVIEW AND HYPOTHESES

Personality and life satisfaction: McCrae and Costa²⁴ regards personality as individual differences in characteristics that indicate the patterns of behaving, feeling and thinking, which is stable across time. In this study, personality with regards to conscientiousness, extraversion, openness, agreeableness and neuroticism refers to a veteran’s personal resource of his own characteristics patterns of behaving, feeling and thinking

that relate to his life satisfaction at retirement. Although McCrae and Costa²⁴ defined personality as biologically stable across time at adulthood, but social investment theory argue that the environment where one is exposed to might influence the development of his personality. In this conditions, personality of veterans would be influenced by the regimented training (Jackson, Thoemmes, Jonkmann, Lüdtke, & Trautwein²⁰ that a personnel received during his active duty, whereby the traits were carried out within the veterans’ characteristics even after retired.

In this study, veterans’ self-reporting on their life satisfaction was recorded according to their own overall cognitive judgment on experiences during their early stage of retirement. Reis and Gold²⁷ in their model of life satisfaction at retirement suggest that traits components of the big five personality theory may relate directly or indirectly to life satisfaction of the retirees at their retirement. All hypotheses in this study were developed based on the model of Five Factor Personality trait influence on life satisfaction in retirement Reis & Gold²⁷. In the previous study, Robinson, Demetre, and Corney²⁹ found conscientiousness, agreeableness and low neuroticism were the predictors of life satisfaction to those who had already retired. Thus, the first hypothesis is (H1): There is a significant effect of conscientiousness on life satisfaction.

Mroczek and Spiro²⁵ found that extraversion predicted various changes with life satisfaction, those who possess high level of extraversion is associated with a high and a flat life satisfaction trajectory. Therefore, the second hypothesis is (H2): Extraversion significantly affects life satisfaction among army veterans.

Stephan³⁰ reported that openness to experience has an incremental small variance to predict life satisfaction among 235 sample of retired adult with age between 58-85 years old. Therefore, the third hypothesis is (H3): Openness significantly affects life satisfaction.

Henning, Hansson, Berg, Lindwall and Johansson¹⁶, found that agreeableness moderates the well-being after one year retired with Swedish older sample between age 60-66. Those who possess high score in agreeableness, showed an increase in well-being at retirement. Thus, the fourth hypothesis is (H4): There is a significant effect of agreeableness on life satisfaction.

Boyce, Wood, Delaney and Ferguson⁵ found that changes in neuroticism have the strongest relationship with changes in life satisfaction. Lockenhoff, Terracciano and Costa²² reported that those who possess low in neuroticism and high in extraversion showed higher retirement

satisfaction with cross sectional study on (n=144) sample. Therefore, the fifth hypothesis is (H5): There is a significant effect of neuroticism on life satisfaction.

Based on the arguments above, the framework of the study is depicted in Figure 1.

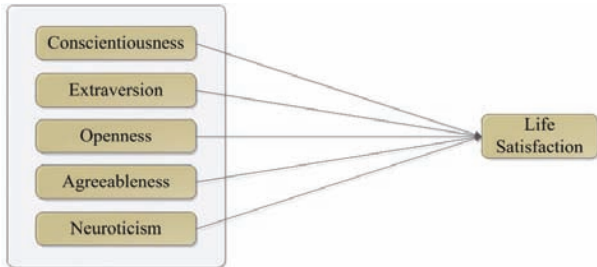


Figure 1: Research framework

METHOD

Design: A cross-sectional mailed survey design was employed for the study.

Sample: 464 respondents out of 6,756 population of pensionable other ranks army veterans, ranging from warrant officer 1 to private, at middle age between 40 to 50 years old and had attended the resettlement training prior to their retirement, responded to the study.

Measures: A 20-item questionnaire was employed to measure personality and life satisfaction constructs. All scales were adopted from the existing measures of Neo Personality AppiKA UKM Fatimah wati Halim et al⁹, to measure personality, and Satisfaction with Life Scale Diener, Emmons, Larsen, & Griffin⁸, to measure life satisfaction (table 1). Analyses were conducted descriptively and quantitatively using SPSS version 22 and Structural Equation Modelling using Partial Least Square (Smart PLS 3.2.5 software) Hair et. al¹².

Table 1: Instruments

Construct	Source of instruments	Number of items
Conscientiousness	NEO AppiKA UKM, Fatimah wati Halim et al (2013)	5
Extraversion		3
Openness		2
Agreeableness		2
Neuroticism		4
Life Satisfaction	Satisfaction with Life Scale, Diener (1985)	4
	Total no. of items	20

Data collection: Four hundred and sixty four out of seven hundred and forty one data were obtained after data cleaning. Sample size was calculated using G-Power statistical analysis, indicating that 464 respondents were sufficient. Researchers had selected the respondents throughout Malaysia using stratified random sampling technique.

RESULTS

Partial least squares structural equation modelling (PLS SEM) was employed to test the research hypotheses due to a reason on exploring the prediction of personality on life satisfaction. Demographically, the respondents comprised of 93.8 percent male and 6.3 percent female counterparts. The majority of respondents were from 40 to 45 years old (72.4%), SPM holders (69.4%) and Sergeant (24.6%) with 2 years length of retirement (33.2%).

Assessment of the Measurement model: Hair et al¹², suggest that the measurement model in SEM-PLS must be evaluated systematically on its convergent validity, discriminant validity and reliability. Hair et al¹³, suggested the approach of using factor loadings, composite reliability (CR) and Average Variance Extracted (AVE) scores Fornell & Larcker¹¹, in assessing convergent validity. Table 2 shows the results of the convergent validity in that the loadings for all items used range from 0.49 to 0.88, with the cut-off value for the loadings being 0.40 Henseler, Ringle, & Sinkovics¹⁷; Fornell & Larcker¹¹ a powerful structural equation modeling technique for research on international marketing. While a significant body of research provides guidance for the use of covariance-based structural equation modeling (CBSEM. Meanwhile, Table 2 shows the Average Variance Extracted (AVE), of all constructs range from 0.520 to 0.760, exceeding the recommended value of at least 0.5 or more than 0.5 Hair et al¹³; Henseler, Ringle, & Sinkovics¹⁷ a powerful structural equation modeling technique for research on international marketing. While a significant body of research provides guidance for the use of covariance-based structural equation modeling (CBSEM. In this regard, the value of AVE shown for this measurement model indicates the sufficient convergent validity.

In this study, the composite reliability values are between 0.772 and 0.881, with cut-off value above 0.7 Henseler, Ringle and Sinkovics¹⁷ a powerful structural equation modeling technique for research on international marketing. While a significant body of research provides guidance for the use of covariance-based structural equation modeling (CBSEM, in that it is satisfactory.

Table 2: The Measurement Model on convergent validity and composite reliability

Construct	Items	Loadings	AVE	CR
Conscientiousness	Bitem9	0.690	0.533	0.851
	Bitem27	0.739		
	Bitem28	0.723		
	Bitem30	0.716		
	Bitem31	0.779		
Extraversion	Bitem14	0.690	0.553	0.787
	Bitem18	0.761		
	Bitem19	0.778		
Openness	Bitem8_1	0.881	0.760	0.864
	Bitem16	0.863		
Agreeableness	Bitem11_1	0.899	0.633	0.772
	Bitem22	0.677		
Neuroticism	Bitem4	0.732	0.520	0.812
	Bitem5	0.694		
	Bitem7_1	0.751		
	Bitem10_1	0.705		
Life satisfaction	GSwls1_1:	0.765	0.651	0.881
	GSwls 2:	0.864		
	GSwls 3:	0.813		
	GSwls4:	0.781		

Note: AVE= Average variance extracted; CR = Composite reliability

Secondly, validity of measurement model requires the assessment of discriminant validity Fornell & Larcker¹¹; Henseler, Ringle, & Sinkovics¹⁷ a powerful structural equation modeling technique for research on international marketing. While a significant body of research provides guidance for the use of covariance-based structural equation modeling (CBSEM. In this study, the square root of the AVE is greater than the correlation with other constructs indicating that discriminant validity is adequate.

Apart from Fornell-Larcker criterion on AVE, the cross loadings also have to be fulfilled for assessing the discriminant validity of the measurement model Henseler, Ringle, & Sinkovics¹⁷; Chin, 1998; Chin, 1998) a powerful structural equation modeling technique for research on international marketing. While a significant body of research provides guidance for the use of covariance-based structural equation modeling (CBSEM. In this study, the loadings of the measurement indicators on their respective latent construct are significantly different from zero. Table 3 shows that the square root of the AVE by each of the latent variables is higher than the correlations between the latent variable, and all the other variables.

Table 3: The Discriminant validity of the constructs

	Mean	SD	Consc	Extrav	Open	Agree	Neurotic	Life satis
Conscientiousness	4.19	.403	0.730					
Extraversion	3.93	.554	0.491	0.744				
Openness	3.37	.687	0.358	0.354	0.872			
Agreeableness	3.39	.766	0.269	0.281	0.169	0.796		
Neuroticism	2.05	.649	-0.237	-0.199	-0.189	-0.129	0.721	
Life Satisfaction	5.32	.923	0.289	0.303	0.153	0.175	-0.257	0.807

Note: Diagonals (in bold) presents the square root of the Average Variance Extracted (AVE) while the other entries represent the correlations.

According to Henseler, Ringle and Sarstedt¹⁸ such as partial least squares, the Fornell-Larcker criterion and the examination of cross-loadings are the dominant approaches for evaluating discriminant validity. By means of a simulation study, we show that these approaches do not reliably detect the lack of discriminant validity in common research situations. We therefore propose an alternative approach, based on the multitrait-multimethod matrix, to assess discriminant validity: the heterotrait-monotrait ratio of correlations. We demonstrate its superior performance by means of a Monte Carlo simulation study, in which we compare the new approach to the Fornell-Larcker criterion and the assessment of (partial, cross loadings and Fornell-Larcker criterion are two examinations that are always used in order to evaluate the discriminant validity of the measurement model, yet these cross loadings and Fornell-Larcker criterion failed to uncover the lack of discriminant validity. In this regard, Henseler, Ringle

and Sarstedt¹⁸ such as partial least squares, the Fornell-Larcker criterion and the examination of cross-loadings are the dominant approaches for evaluating discriminant validity. By means of a simulation study, we show that these approaches do not reliably detect the lack of discriminant validity in common research situations. We therefore propose an alternative approach, based on the multitrait-multimethod matrix, to assess discriminant validity: the heterotrait-monotrait ratio of correlations. We demonstrate its superior performance by means of a Monte Carlo simulation study, in which we compare the new approach to the Fornell-Larcker criterion and the assessment of (partial suggest the Heterotrait-monotrait ratio of correlations (HTMT) as an alternative to assess discriminant validity of the measurement model. It was found that the HTMT for the study in Table 4 is less than 0.85 ratio, which indicates that the discriminant validity for the measurement model has been established.

Table 4: The Heterotrait-Monotrait (HTMT) ratio of correlations for discriminant validity

	Consc	Extrav	Openn	Agreeable	Neurotic	Life satis
Conscientiousness						
Extraversion	0.711					
Openness	0.491	0.567				
Agreeableness	0.480	0.609	0.330			
Neuroticism	0.324	0.311	0.272	0.228		
Life satisfaction	0.340	0.416	0.202	0.267	0.336	

The assessment of structural model will then can be carried out once the measurement model is valid and reliable Nunnally, Bernstein²⁶; Hair et. al¹²; Henseler, Ringle, & Sinkovics¹⁷; Chin, 1998.

Assessment of the Structural Model: A non-parametric bootstrapping with 5000 replications Hair, Ringle, & Sarstedt¹³, was applied to obtain the standard errors of the estimates and the t-statistics to evaluate on the statistical significance of the path coefficients. In this study, the level of significance p value of 0.05 is used, which means 95% level of confidence to accept the hypothesis Hair et. al¹². The observed t value must be

greater than 1.96 in order to conclude that the hypothesis is supported Hair et. al¹².

The findings showed that Conscientiousness ($\beta = 0.142, t = 2.722, p < 0.05$), implying that the hypothesis (H1) is supported. Extraversion ($\beta = 0.182, t = 3.336, p < 0.05$), the hypothesis (H2) is supported. Openness ($\beta = -0.007, t = 0.142, p < 0.05$), the hypothesis (H3) is not supported. Agreeableness ($\beta = 0.064, t = 1.496, p < 0.05$) the hypothesis (H4) is also not supported. Result for Neuroticism ($\beta = -0.180, t = 3.931, p < 0.05$), indicates that the hypothesis (H5) is supported. Table 5 shows the result of path coefficient and the hypotheses testing for the study.

Table 5: The Path Coefficient and Hypotheses Testing

Hypothesis	Construct	Beta	Standard Error	T value	Decision
H1	Conscientiousness→Life satisfaction	0.142	0.052	2.722	Supported
H2	Extraversion→ Life satisfaction	0.182	0.054	3.336	Supported
H3	Openness→Life satisfaction	-0.007	0.052	0.142	Not supported
H4	Agreeableness→Life satisfaction	0.064	0.043	1.496	Not supported
H5	Neuroticism→Life satisfaction	-0.180	0.046	3.931	Supported

Note: Significant at *t-value >1.96 ($p < 0.05$)

The R² for the model was 0.152, indicating that 15.2% of the variance in the life satisfaction variable can be explained by the latent variables of conscientiousness, extraversion, openness, agreeableness and neuroticism. The R² in table 6 refers to the explanatory power of the predictors on the respective construct.

Further, the blindfolding procedure was employed in testing the predictive relevance (Q²) of the model. Hair et. al¹², explain the Q² as a measure on how well the observed values are constructed by the model and its parameter estimates. This model has Q² value of 0.087, which is higher than 0 Fornell and Cha¹⁰, in that cross validated redundancy measure showed the structural model had its predictive relevance.

The effect size (f²) analysis is carried out in order to measure the changes in R square, in that to perceive whether the impact of exogenous latent variables to endogenous variable have a substantive impact or not Hair et. al¹². Table 6 indicated that Conscientiousness, Extraversion and Neuroticism have a small effect on life satisfaction.

Table 6: The effect size

Construct R ²	f ²	Decision
Conscientiousness	0.017	Small
Extraversion	0.027	Small
Openness	0.000	
Agreeableness	0.004	
Neuroticism	0.035	Small
Life satisfaction	0.152	

f² 0.02, small, 0.15 medium, 0.35 large (Cohen, 1988; Henseler et al., 2009; Hair et al., 2014)

DISCUSSION

The study aimed at investigating the effect of Conscientiousness, Extraversion, Openness, Agreeableness and Neuroticism as personal profile and resource of veterans on life satisfaction. Changes in life satisfaction at retirement were considered as the functions of conscientiousness, extraversion and neuroticism. The results showed that veterans with types of personality on conscientiousness were predicted at 0.017 effect size in contributing to the life satisfaction. A conscientious veteran was perceived to be more careful

on his health related behaviour, and would focus more on his retirement preparation Reis & Gold²⁷. An extrovert veteran would tend to possess more warmth and sociable characteristics in dealing with people around him and more energetic to lead the life Reis & Gold²⁷. Extraversion had an effect size of 0.027, indicating a small contribution to life satisfaction.

Result has shown that Neuroticism has a negative significant effect ($\beta = -0.180, t= 3.931, p< 0.05$), on life satisfaction. In this regard, veterans with neurotic personality would tend to have less satisfaction in his life at retirement. The more the veteran is neurotic, the least he would be satisfied with his retirement life. A veteran with neurotic personality type may have a tendency to possess vulnerable, hostile, impulsive, depressed and anxious Reis & Gold²⁷, traits towards his retirement situation.

Although three personality factors on conscientiousness, extraversion and neuroticism were found significantly affected on life satisfaction at retirement, conversely, the other two personality factors on openness and agreeableness were did not significantly affected on life satisfaction among them.

Implications: Theoretically, this study contributed to the body of knowledge by strengthening the empirical understanding that conscientiousness, extraversion and neuroticism factors did contribute to the life satisfaction of army veterans.

Limitations: Finding of the study cannot be generalised to ranks officers army veterans, neither to navy nor to Air force veterans. Besides, cross sectional design is limited to know the process of retirement took place among the veterans.

Directions for future research: Future research should conduct a qualitative study to better understand both positive and negative personal experience of the other ranks army veterans at retirement.

CONCLUSION

In conclusion, conscientiousness, extraversion and neuroticism had found contributed to life satisfaction of other-ranks army veterans, though the effects size were small. The results revealed that the effect of openness to experience and agreeableness on life satisfaction, were not supported respectively.

ACKNOWLEDGEMENT

A special gratitude is extended to Captain Nizam Ibrahim from Imbalanbaik Samudera Sdn. Bhd. in assisting the data collection of the current study.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Armed Forces Act. Law of Malaysia (Act 77). (2016). Percetakan Nasional Malaysia Berhad. 1972.
2. ATM Veterans Act Law of Malaysia (Act 740). (2015) Percetakan Nasional Malaysia Berhad. 2012.
3. Bleidorn W, Hopwood C.J, Lucas, R. E. Life Events and Personality Trait Change. *Journal of personality*. 2018; 86(1); 83-9.<http://doi:10.1111/jopy.12286>
4. Bleidorn W, Klimstra T. A, Denissen J. A, Rentfrow P. J, Potter J, Gosling S. D. Personality Maturation Around the World: A Cross-Cultural Examination of Social- Investment Theory. *Psychological Science*. 2013; <http://doi.org/10.1177/0956797613498396>
5. Boyce C. J, Wood A. M, Delaney L, Ferguson E. How do Personality and Social Structures Interact with Each Other to Predict Important Life Outcomes ? The Importance of Accounting for Personality Change. *European Journal of Personality*, (March). 2017. <http://doi.org/10.1002/per.2099>
6. Cohen J. *Statistical power analysis for the behavioral sciences* (2nd. ed.). Hillsdale, NJ: Erlbaum. 1988.
7. Dept. of Record and Salary, Ministry of Defense, Malaysia. 2012.
8. Diener E, Emmons R. A, Larsen R. J, Griffin S. The Satisfaction With Life Scale. *Journal of Personality Assessment*. 1985; 49(1): 71–75.
9. Fatimah wati Halim, Khairul Anwar @ Johari Mastor, Ahsan Ahmad, Rohany Nasir, Fatimah Omar, Wan Shahrazad Wan Sulaiman. Nur Riza Suradi, Kaseh Abu Bakar, Nor Ba'yah Abdul Kadir, Dzuraidah Abd. Wahab, Norbahiah Misran, Ismanizan Ismail, and R. H. A. Alat Psikometrik Pemilihan Kakitangan UKM APPIKA UKM. Malaysia: Collaborative Inovation Center. 2013.
10. Fornell C, Cha J. Partial Least Squares. In R. P. Bagozzi (Ed.), *Advanced Methods of Marketing Research*. Blackwell. 1994; (pp. 52–78).
11. Fornell C, Larcker D. F. Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*. 1981; 18(1): 39. <http://doi.org/10.2307/3151312>
12. Hair J. F, Hult G. T. M, Ringle C. M, Sarstedt M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (2nd.). California, USA: Sage publication. 2017.
13. Hair J. F, Ringle C. M, Sarstedt M. PLS-SEM: Indeed a Silver Bullet. *The Journal of Marketing Theory and Practice*. 2011; 19(2): 139–152. <http://doi.org/10.2753/MTP1069-6679190202>
14. Hassanuddin N. Z. *Pre-retirement Program for Retired Army in Malaysia*. Universty Utara Malaysia. 2015.
15. Helson R, Kwan V. S. Y, John O. P, Jones C. The growing evidence for personality change in adulthood: Findings from research with personality inventories. *Journal of Rsearch in Personality*. 2002; 36: 287–306.
16. Henning G, Hansson I, Berg A. I, Lindwall M, Johansson B. The role of personality for subjective well-being in the retirement transition – Comparing variable- and person-oriented models. *Personality and Individual Differences*. 2017; 116: 385–392. <http://doi.org/10.1016/j.paid.2017.05.017>
17. Henseler J, Ringle C. M, Sinkovics R. R. Advances in international marketing. *International Journal of Research in Marketing*. 2009; 20: 277–319. [http://doi.org/10.1016/0167-8116\(92\)90003-4](http://doi.org/10.1016/0167-8116(92)90003-4)
18. Henseler J, Ringle C. M, Sarstedt M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*. 2015; 43(1): 115–135. <http://doi.org/10.1007/s11747-014-0403-8>

19. Hobfoll S. E. Social and Psychological Resources and Adaptation. Review of General Psychology. 2002; 6(4): 307–324. <http://doi.org/10.1037//1089-2680.6.4.307>
20. Jackson J. J, Thoemmes F, Jonkmann K, Lütke O, Trautwein U. Military Training and Personality Trait Development: Does the Military Make the Man , or Does the Man Make the Military ? Psychological Science. 2012; 23(3): 270–277. <http://doi.org/10.1177/0956797611423545>
21. Leszko M, Elleman L.G, Bastarache E. D, Graham E. K, Mroczek D. K. Future Directions in the Study of Personality in Adulthood and Older Age. Gerontology. 2015. <http://doi.org/10.1159/000434720>
22. Lockenhoff C. E, Terracciano A, Costa P. T. Five-Factor Model Personality Traits and the Retirement Transition : Longitudinal and Cross-Sectional Associations. 2009; 24(3); 722–728. <http://doi.org/10.1037/a0015121>
23. McCare R. Controlling Neuroticism in the measurement of Stress. Stress Medicine. 1990; 6: 237–241.
24. McCrae R. R, Costa P. T. Personality , coping , and coping effectiveness in an adult sample. Journal of Personality. 1986; 54(2, June): 385–405.
25. Mroczek D. K, Spiro A. Change in Life Satisfaction During Adulthood : Findings From the Veterans Affairs Normative Aging Study. Journal of Personality and Social Psychology. 2005; 88(1): 189–202. <http://doi.org/10.1037/0022-3514.88.1.189>
26. Nunnally J. C, Bernstein I. H. Psychometric theory (3rd ed.). New York NY: McGraw-Hill. 1994.
27. Reis M, Gold D. P. Retirement, Personality, and Life Satisfaction: A Review and Two Models. Journal of Applied Gerontology. 1993; 12(2): 261–282. <http://doi.org/10.1177/073346489301200209>
28. Roberts B. W, Wood D, Smith J. L. Evaluating Five Factor Theory and Social Investment perspectives on Personality Trait Development. Journal of Research in Personality. 2005; 39: 166–184. <http://doi.org/10.1016/j.jrp.2004.08.002>
29. Robinson O. C, Demetre J. D, Corney R. Personality and retirement : Exploring the links between the Big Five personality traits , reasons for retirement and the experience of being retired. Personality and Individual Differences. 2010; 48(7): 792–797. <http://doi.org/10.1016/j.paid.2010.01.014>
30. Stephan Y. Openness to experience and active older adults ' life satisfaction : A trait and facet-level analysis. Personality and Individual Differences. 2009; 47: 637–641. <http://doi.org/10.1016/j.paid.2009.05.025>
31. Wang M, Henkens K, Solinge H. V. Retirement Adjustment. American Psychologist. 2011; 66(3): 204–213. <http://doi.org/10.1037/a0022414>
32. Wang M, Henkens K, van Solinge H. A review of theoretical and empirical advancements. The American Psychologist. 2011; 66(3): 204–213. <http://doi.org/10.1037/a0022414>
33. Zakaria N. Kompetensi mengurus kerjaya dalam kalangan pesara tentera berpangkat rendah. Universiti Putra Malaysia. 2013.
34. Veteran Affairs Mission Vision and Objectives. (2018, March 1). Retrieved from <http://www.jhev.gov.my/en/corprate-info/mission-vision-objective>
35. Veterans Affairs pensionable veteran career socioeconomics & NBOS. (2018, March 1). Retrieved from <http://www.jhev.gov.my/en/our-service/career-socioeconomic-nbos>

The Influence of Electronic Word of Mouth on Theory of Reasoned Action and the Visit Intention to the World Monument Fund Site

Abdul Hafaz Ngah¹, Mohd Rahimi Abdul Halim¹, Norzalita Abd Aziz²

¹Universiti Malaysia Terengganu; ²Universiti Kebangsaan Malaysia

ABSTRACT

The traditional Chinese shop houses in Kampung Cina, Kuala Terengganu have been awarded a grant of USD 50,000 by the World Monument Fund (WMF) to improve and preserve the building structures in this area. In line with the changes, the community and the state administrator have conducted many activities in this area and promoted Kampung Cina which WMF deemed as a major tourist attraction in this area. This study was conducted to understand the electronic word-of-mouth (eWOM) and to close the gap for the lack of literature regarding the intention to visit the WMF site. This exploratory study focused on modelling the influence of eWOM on the attitude, subjective norm, and the visit intention to this world monument site. A survey based on the theory of reasoned action was distributed to 155 tourists at the WMF site, and only 123 responses can be used for the analysis purposes. This study has used a quantitative approach of self-administered questionnaire. The results showed that eWOM has a positive relationship with attitude and subjective norm. Besides that, the study also found that attitude, subjective norm, and benefits have a positive relationship with the visit intention. The findings of this study could help the government and private sector to develop better planning to enhance this WMF site as a major tourist attraction. It is hoped that this study could attract the interest of others to conduct more studies on tourism in Terengganu and also other WMF sites around the world.

Keywords: *Theory of Reasoned Action, Electronic Word-of-Mouth, Second-Order Construct, Intention to Visit, Smart PLS*

INTRODUCTION

As a non-profit organisation (NGO), the World Monuments Fund (WMF) was founded to preserve important artistic treasures worldwide. Currently, WMF has sponsored over 600 conservation projects in 90 countries throughout the world. The preservation activities aimed to identify imperilled cultural heritage sites and provide direct financial and technical support for the conservation activities. As a result, WMF has provided a grant of USD 50,000 to develop a plan to improve the shop structures in Kampung Cina, Kuala Terengganu (<https://www.wmf.org/>). Kampung Cina has been on the watch list in the following years: 1998, 2000, and 2002.

The advancement in networking technology has fostered the development of a new style of changing and sharing information among the world population

especially for tourists. Tourists will look for the information about the destinations, especially from their relatives or friends. However, tourists did not only rely on their relatives and friends but from the worldwide via online, which is known as electronic word of mouth (eWOM). eWOM has become a vital source of meaningful information by the potential customers because it could be either in negative or positive forms (Mayzlin, 2006).

There are many studies that have been conducted to model the intention to visit, however, it is quite impossible to rely on a single model to explain the tourist preferences for different types of destinations Shen et al.²⁶. The intention to visit or travel to certain places can be influenced by various factors. Attitude, subjective norm, and benefits of the visit could be the significant factors that can influence the intention to visit a destination

There are many studies on eWOM have been conducted all over the world such as; on the west Martin & Lueg²¹, Jalilvand et al¹⁸ and Fan et al¹⁰. However, very little research on the topic has been conducted in Malaysia Zainal et al³⁰, especially on the WMF sites.

This study intended to close the gap in the literature by identifying the effect of eWOM on the variables in the theory of reasoned action (TRA) and the theory towards the intention to visit the WMF Site in Kampung Cina, Terengganu. Most of the studies in tourism focused on world heritage sites.

LITERATURE REVIEW

Electronic Word of Mouth: Word of mouth (WOM) has been claimed to have an important function in forming the consumers' attitude and behavioural intentions Xia & Bechwati²⁸. According to Smith et al²⁷, eWOM has become a significant source of information for the consumers to decide on their purchase. The impact of eWOM should be stronger than the traditional WOM Abu Bakar and Ilkan¹. Fakharyan et al. (2013) found that eWOM has a positive relationship with the tourists' attitude towards the Islamic destination choice. It was discovered that eWOM has a positive relationship with attitude and subjective norm Jalilvand & Samiei¹⁸. Hence, the hypotheses are formulated as follows:

H1. eWOM has a positive relationship with the attitude to visit World Monument Funded site.

H2. eWOM has a positive relationship with the subjective norm to visit World Monument Funded site.

Benefits: Tourists will gain certain benefits for their visits to each destination. One of the factors that influence the intention to visit is benefits because each tourist will gain different benefits. This study adopted the benefit factor that was used by Nowacki²³. According to Nowacki²³, benefits can be measured by three dimensions which are recreational, educational, and social. Those three dimensions act as a first-order construct to measure the overall benefits as a second-order construct. Becker et al⁵ proposed that the second-order construct should be in a formative form. Nowacki²³ found that the overall benefits can be positively related to the intention to visit the destination. Hence, the hypothesis is as follows:

H3. Benefits has a positive relationship with the intention to visit the World Monument Funded site.

Theory of Reasoned Action (TRA): Theory of reasoned action (TRA) was developed by Fishbein and Ajzen³ to predict the customers' behaviour. According to Guo et al⁴, TRA used attitude and subjective norm to express the impacts of cognitive components for the individual decision-making process. Even though TRA was formed in year 1975, the theory is still being used to predict the individual's behaviour in many areas of study, including health adoption Xiaofei et al²⁹; social media Kim et al¹⁹; and green purchasing Paul et al²⁴.

Attitude: Attitudes has been classified as an important psychological construct that can influence and predict many behaviours Huh et al¹⁷. According to Ajzen and Fishbein³, attitude refers to the evaluation of the performances of a behaviour. Jalilvand et al¹⁸ found that attitude has a positive relationship with the visiting intention to Isfahan. Han et al¹⁶ also found that attitude is positively related to intention. As a result, we hypothesised the following:

H4. Attitude has a positive relationship with the intention to visit the World Monument Funded site.

Subjective Norm: Ajzen² defined subjective norm as perceived pressure from an important person in someone's life whether to perform or not perform the behaviour. Subjective norm is positively related to the intention to visit Isfahan Jalilvand et al¹⁸. In a recent study, Han et al¹⁶ found that subjective norm is positively related to intention. Thus, we hypothesised the following:

H5. Subjective norm has a positive relationship with the intention to visit the World Monument Funded site.

Intention to visit: Referring to TRA, the two variables that can explain the behaviour are attitude and subjective norm. According to Ajzen², the behavioural intention will explain the individual's intention whether to perform or not perform a specific behaviour. In tourism study, the intention to visit refers to the willingness of a potential visitor to visit the destination (Chen et al. 2014). It is believed that the intention will lead them to the real intention.

METHODOLOGY

Using purposive sampling method, with self-administered approach, data were collected from international tourists during the mid of March until the mid of April 2017. Out of the 155 tourists, only 123 of them were willing to participate in this study. After

sorting the questionnaires, only 117 questionnaires can be used for the data analysis purposes. The unit of analysis for the study is at an individual level. Based on G*power 3.1 software Faul et al¹¹, with four predictors, medium effect size, and power were set at 80% Gefen et al¹², the minimum sample size required to test this model was 85. The 117 responses are adequate to test the research model by referring to the requirement of G*power. All the items in the variables were adopted from Jalilvand and Samiei¹⁸ except for the benefits as the second-order variable which was adopted from Nowacki²³.

This study used partial least squares (PLS) technique using Smart PLS 3.2.6 software (Ringle, Wende, & Becker²⁵ to test the hypotheses in the research model. Anderson and Gerbing⁴ proposed a two-stage analytical procedure that tested the measurement model and the structural model. The structural model tested the hypothesised relationships using the bootstrapping procedure with 500 resamples as proposed by Chin⁷.

Sample Profile: The majority of the respondents are from a European country with the percentage of 53.8%. Overall, 53% of them were female, 58.1% of them aged between 20 to 29 years old, and the majority of them have a degree or above for their education level.

ANALYSIS AND RESULTS

The multivariate skewness and kurtosis were tested by the software available at: <https://webpower.psychstat.org/models/kurtosis/results.php?url=e9bb3e5270e63dd2feb659f8b9c6d168> as proposed by Hair et al¹⁵. The Mardia’s multivariate skewness with $\beta = 7.374$, $p < 0.01$ and Mardia’s multivariate Kurtosis ($\beta = 46.201, p < 0.01$) showed that the data were not normal multivariate. Thus, it is confirmed that the data suited perfectly with the Smart PLS which is a nonparametric analysis software.

Measurement Model: Two types of validity will be examined to confirm the measurement model which are convergent validity and the discriminant validity.

Convergent Validity: The convergent validity is used to confirm that the multiple items measure the same concept in agreement Hair et al¹⁵, Ngah et al²² by evaluating the factor loadings, composite reliability (CR), and the average variance extracted (AVE). The loadings and the AVE should exceed 0.5, and the CR should be greater

than 0.7 Hair et al¹⁵, to establish the convergent validity. Table 1 shows all the constructs achieve the minimum threshold value to meet the requirement to establish the convergent validity.

Table 1: Measurement Model of First Order Construct (Reflective)

Construct	Item	Loadings	CR	AVE
Attitude	ATT1	0.909	0.948	0.858
	ATT2	0.932		
	ATT3	0.937		
Electronic Word of Mouth	EWOM1	0.827	0.907	0.621
	EWOM2	0.871		
	EWOM3	0.788		
	EWOM4	0.798		
	EWOM5	0.649		
	EWOM6	0.777		
Intention	INT1	0.904	0.910	0.719
	INT2	0.736		
	INT3	0.862		
	INT4	0.879		
Educational Benefits	EB1	0.776	0.866	0.683
	EB2	0.845		
	EB3	0.856		
Recreational Benefits	RB1	0.936	0.915	0.844
	RB2	0.900		
Social Benefits	SB1	0.910	0.901	0.820
	SB2	0.901		
Subjective Norm	SN1	0.903	0.925	0.803
	SN2	0.877		
	SN3	0.908		

Table 2: Measurement Model for Second Order Construct (Formative)

Construct	Weight (Beta value)	VIF	T-value
Educational Benefit	0.598	1.537	14.522**
Social Benefits	0.427	1.424	9.491**
Recreational Benefits	0.271	1.096	3.049**

**p < 0.01

The overall benefit was measured using the formative second-order construct; Hair et al¹⁵ proposed that the measurement should focus on weights, t value, and collinearity. Diamntopoupus and Siguaw⁸ claimed that if the variance inflator factor (VIF) values are higher

than 3.33, it is a sign of a multicollinearity problem which does not occur in this study. The weights and associated t-values which assess the level of each item's contribution to the overall factors were good. These results confirmed that the measurement model for the second-order construct is not a problematic issue for this study. Table 2 illustrated the result for the measurement model for second order construct.

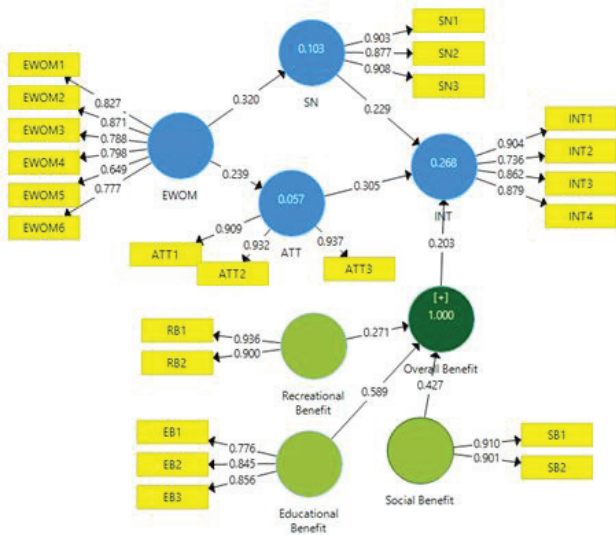


Figure 1: Measurement model

Discriminant Validity: The discriminant validity is the extent to which a construct can truly distinct from the other construct and to measure how much indicators represent only a single construct Gholami et al¹³. Table 4 shows the results of the discriminant validity based on the HTMT ratio. If the HTMT value is greater than HTMT_{0.85} Kline²⁰, it indicates that there is a serious issue in the discriminant validity. Table 3 shows that the discriminant validity was established as all values for HTMT were lower than the cut-off value mentioned by Kline²⁰.

Table 3: HTMT Criterion

	1	2	3	4	5
1. Attitude					
2. EWOM	0.258				
3. Intention	0.498	0.253			
Overall Benefit	0.201	0.286	0.295		
SN	0.493	0.345	0.405	0.155	

Note: HTMT established at 0.85

Structural Model Analysis: It is vital to confirm that there is no collinearity issue before assessing the structural model. Table 4 shows the results of the collinearity test. Since the VIF values were lower than 3.3 Diamantopoulos & Sigua⁸, it is confirmed that collinearity is not an issue for this study.

Table 4: Collinearity Assessment

Construct	INT	SN	ATT
ATT	1.327		
Overall Benefit	1.049		
SN	1.291		
EWOM		1.000	1.000

Table 5 illustrates the results of the hypothesis testing based on the hypotheses in the research model. All of the proposed model were found significant with three of them were significant at 99% confidence interval (EWOM → SN, β = 0.320, t = 2.793, ATT → INT, β = 0.305, t = 2.706. Benefits → INT. β = 0.203, t = 2.652). Other were statically significant at 95% (EWOM → ATT, β = 0.238, t = 2.108, SN → INT, β = 0.229, t = 2.309). The results confirmed that all of the exogenous constructs have a positive relationship with the endogenous constructs.

Table 5: Path Coefficient Assessment

Hypothesis	Relationship	Beta	Se	T-Value	LL	UL	Decision
H1	EWOM -> ATT	0.238	0.113	2.108*	0.020	0.443	Supported
H2	EWOM -> SN	0.320	0.115	2.793**	0.078	0.527	Supported
H3	ATT -> INT	0.305	0.113	2.706**	0.065	0.522	Supported
H4	SN -> INT	0.229	0.099	2.309*	0.036	0.427	Supported
H5	Benefits -> INT	0.203	0.077	2.652**	0.060	0.352	Supported

Note: * p < 0.05, ** p < 0.01., LL = Lower Level, UL = Upper Level

DISCUSSION AND CONTRIBUTION

This study found that all of the hypotheses were supported; thus, indicating that the TRA and the

variables representing the benefits factor is useful in understanding the intention to visit the WMF site which is Kampung Cina in Kuala Terengganu. The results

were similar to Jalilvand and Samiei¹⁸ and Han et al¹⁶ that attitude and the subjective norm were significantly related to the intention to visit Isfahan. The government or organisation which promoted this site should be aware that attitude and subjective norm are important to attract more tourists to visit this site. The promotion should be broader and also ensure that it will reach not only for specific potential individuals but also the important person in their life.

On top of that, eWOM has also been found to have a positive relationship with the attitude and the subjective norm. Hence, eWOM is capable of explaining the attitude and subjective norm among tourists who visited the world monument funded site. This result is similar to Jalilvand and Samiei¹⁸ who found that eWOM has a positive relationship with the attitude and subjective norm of the tourists who visited Isfahan. This study also confirmed the capability of the eWOM to influence the attitude and the subjective norm of the potential visitors to Kampung Cina. Since online information is easily accessed nowadays, the promoters should include more online information through blogs, Facebook, or any other social media channels. The community of Kampung Cina should also provide more online information to the potential visitors since they know the place more than others.

Benefits also has a positive relationship with the intention to visit this area. This result supported the findings by Nowacki²³ who found that benefits was positively related to the intention to visit. Hence, the local body such as Terengganu State Tourism should promote the benefits of visiting this site. Besides promotion, the obligation bodies for this area should create many events to increase the attractiveness and offer a meaningful moment for the potential visitors.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Abubakar A.M, Ilkan M. More Adverts or More eWOM's. *Journal of Business & Financial Affairs*. 2013; 2:129.
2. Ajzen I. The theory of planned behavior. *Organizational Behavior and Human Decision Processes*. 1991; 50(2): 179-211.
3. Ajzen I, Fishbein M, *Understanding Attitudes and Predicting Social Behavior*. NJ: Prentice-Hall, Englewood Cliffs. 1980.
4. Anderson J. C, Gerbing D. W. *Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach*. *Psychological Bulletin*. 1988; 103 (May): 411 -423.
5. Becker J.M, Klein K, Wetzels M. Hierarchical latent variable model in PLS-SEM: Guidelines for using reflective-formative type models. *Long Range Planning*. 2012; 45: 359-394.
6. Chen Y, Shang R, Li M. The effects of perceived relevance of travel blogs' content on the behavioral intention to visit a tourist destination. *Computers in Human Behavior*. 2014; 30: 787-799.
7. Chin W.W. The Partial Least Squares Approach to Structural Equation Modeling, in Marcoulides, G.A. (Ed.), *Modern Methods for Business Research*, London. 1998; pp. 295-336.
8. Diamantopoulos A, Siguaw J.A. Formative versus reflective indicators in organizational measure development. A comparison and empirical illustration. *British Journal of Management*. 2006; 17(4): 263 -282.
9. Fakharyan M, Jalilv, M.R, Elyasi M, Mohammadi M. The influence of online word of mouth communications on tourists' attitudes toward Islamic destinations and travel intention: Evidence from Iran. *African Journal of Business Management*. 2012; 6 (38): 10381-10388.
10. Fan Y.-W, Miao Y.-F, Fang Y.-H, Lin R.-Y. Establishing the adoption of electronic word-of-mouth through consumers' perceived credibility. *International Business Research*. 2013; 6(3): 58-65
11. Faul F, Erdfelder E, Buchner A, Lang A.-G. Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*. 2009; 41: 1149-1160.
12. Gefen D, Rigdon E. E, Straub D. An Update and Extension to SEM Guidelines for Administrative and Social Science Research. *MIS Quarterly*. 2011; 35(2): iii-A7.
13. Gholami R, Sulaiman A, Ramayah T, Molla A. Senior managers' perception on green

- information systems (IS) adoption and environmental performance: results from a field survey. *Information and Management*. 2013; 50(7): 431-438.
14. Guo Q, Johnson C.A, Unger J.B, Lee L, Xie B, Chou C.P, Palmer P.H, Sun P, Gallaher P, Pentz M.A. Utility of the theory of reasoned action and theory of planned behavior for predicting Chinese adolescent smoking. *Addict. Behav.* 2007; 32 (5): 1066–1081.
 15. Hair J. F, Thomas G, Hult M, Ringle C. M, Sarstedt M. *A Primer on Partial Least Squares Structural Equation Modeling (2nd ed.)*. Thousand Oakes, CA: Sage. 2017.
 16. Han, H, Meng B, Kim W. Emerging bicycle tourism and the theory of planned behavior, *Journal of Sustainable Tourism*. 2017; 25:2, 292-309, DOI: 10.1080/09669582.2016.1202955.
 17. Huh Tae, Han Min, Kim Y. Gender differences of risk-taking decisions in sexual behaviors: Condom use and theory of planned behavior. *The Korean Psychological Association*. 2004; 9(3): 69–87.
 18. Jalilvand M, Samiei N. The Effect of electronic word of mouth on brand image and purchase intention: An empirical study in the automobile industry in Iran. *Journal of marketing Intelligence & Planning*. 2012; 30(4): 460-476.
 19. Kim s, Lee J, Doyle Yoon. Norms in Social Media: The Application of Theory of Reasoned Action and Personal Norms in Predicting Interactions With Facebook Page Like Ads. *Communication Research Reports*. 2015; 32: 4, 322-331, DOI: 10.1080/08824096.2015.1089851.
 20. Kline R. B. *Principles and practice of structural equation modeling*. New York: Guilford Press. 2011.
 21. Martin W. C, Lueg J. E. Modeling word-of-mouth usage. *Journal of Business Research*. 2011; 1-8
 22. Ngah A.H, Zainuddin Y, Thurasamy T. Applying the TOE framework in the Halal warehouse adoption study. *Journal of Islamic Accounting and Business Research*. 2017; 8(2): 161-181.
 23. Nowacki M. The quality of attractions and the satisfaction, benefits and behavioral intention of visitors: Verification of a model. 2010. DOI 10.2478/v10106-010-0004-y
 24. Paul J, Modi A , Patel J. Predicting green product consumption using theory of planned behavior and reasoned action. *Journal of Retailing and Consumer Services*. 2016; 29: 123–134.
 25. Ringle C.M, Wende S, Becker J.-M. *SmartPLS 3*, www.smartpls.com. 2015.
 26. Shen s, Schüttemeyer A, Braun B. Visitors' intention to visit world cultural heritage sites: an empirical study of suzhou, china. *Journal of Travel & Tourism Marketing*. 2009; 26(7): 722-734
 27. Smith D, Menon S, Sivakumar K. Online peer and editorial recommendations, trust, and choice in virtual markets. *Journal of Interactive Marketing*. 2005; 19 (3): 15-37.
 28. Xia L, Bechwati N.N. Word of mouth: the role of cognitive personalization in online consumer reviews. *Journal of Interactive Advertising*. 2008; 9 (1): 108-28
 29. Xiaofei Z, Xitong G, Kee-hung L, Feng G, Chenlei Li B. Understanding Gender Differences in m-Health Adoption: A Modified Theory of Reasoned Action Model. *Telemedicine and e-Health*. 2014; 20(1): 39-46. doi:10.1089/tmj.2013.0092.
 30. Zainal N.T.A, Harun A, Lily J, Examining the mediating effect of attitude towards electronic words-of mouth (eWOM) on the relation between the trust in eWOM source and intention to follow eWOM among Malaysian travellers. *Asia Pacific Management Review*. 2017; 22: 35-44

Using Expectation and Confirmation Theory to Determine Customer Loyalty among Postpaid Users

Syukrina Alini Mat Ali¹, Wan Jamaliah Wan Jusoh², Abideen Adeyemi Adawale³

¹Faculty of Business Management, Universiti Teknologi MARA; ²Assoc. Prof. Kulliyah of Economics and Management Sciences, ³Assoc. Prof. Institute of Islamic Banking and Finance, International Islamic University Malaysia

ABSTRACT

In developing countries, the rate of mobile network subscription is slowing down due to market saturation. Thus, acquiring new customers is a challenge for the service provider. Hence, it is vital to raise customer loyalty in mobile service providers for the purpose of maintaining customers. This paper aims to determine the factors which explain customer loyalty and satisfaction among users of mobile postpaid services. Building from the expectations and confirmation theory using the survey method of positivist research, data was collected from 338 subscribers of Digi, Maxis and Celcom located in Klang Valley, Malaysia. The data was analysed using SEM_PLS Version 3 and the result has generally revealed the significant relationship between all variables. Further analysis revealed that service expectation and performance, for example network quality (i.e. first time dial, no cut on line, etc.) were significant customer expectations when subscribing to a service provider. The finding provides further input and understanding for service providers to offer better services to their subscribers in order to satisfy and retain customers longer.

Keywords: customer expectation, service performance, customer satisfaction, customer loyalty, telecommunication industry

INTRODUCTION

Maintaining customer satisfaction is vital for the mobile service industry as the competition is getting intense. Many researchers agree on the importance of customer satisfaction in retaining customers longer (Arokiasamy & Abdullah²; Kunupakan²⁵; Loke, Taiwo, Salim, & Downe³⁰). For example, the loyal customer will engage with word of mouth advertising by promoting the product and services to family and friends, which can subsequently reduce marketing cost and increase profit (Kursunluoglu²⁶). Many organizations concentrate on their resources to enhance their services in order to attract their customers longer. The literature has identified various determinants of customer loyalty, for instance satisfaction, trust, and service quality (Ahmad, Hussain, & Rajput¹; Mosahab, Mahamad, & Ramayah³⁵; Srivastava & Kaul⁵⁴).

A study on consumer satisfaction based on the Consumer Satisfaction Index (CSI) was conducted by Malaysia Communication and Multimedia Commission (MCMC) in 2015. The study involved five mobile service providers, which were Maxis, Digi, Celcom,

Umobile, and Tunetalk. The result showed an increased rate of consumer satisfaction index from 2006 to 2015. However, Maxis and Celcom lost a significant number of their customers to other service providers in the same year. This leads to the question why even though customers are satisfied with their service providers, they still turn away to other competitors. The present study is thus duly motivated to understand this phenomenon and to identify ways in which companies can retain their customers longer in the current market.

Previous studies in Malaysia's telecommunication industry mostly concentrated on prepaid users as target group (Haque, Khatibi, Raquib, & Al Mahmed²⁰; Moneruzzaman³³; Nikbin, Tabavar, & Jalalkamali³⁸; Shamsudin⁵¹). In addition, most of the consumer behaviour frameworks used were those developed in western countries. Therefore, this paper focuses on postpaid users' expectation and perceived service performance in the Malaysian setting. Maxis, Celcom, and Digi were selected as these service providers recorded the highest number of users in Malaysia. The purpose of this paper is to bridge the gap in the literature by examining the roles of expectation and confirmation towards customer satisfaction and loyalty.

LITERATURE REVIEW

Many service providers expend their resources to improve services in order to achieve their goal of lengthier customer retention. Past studies have disclosed various factors that contribute towards customer loyalty such as satisfaction, switching cost, trust, and service quality. It is pertinent to highlight that even though studies on customer loyalty have been an interest for the past decade, it is nevertheless still a challenge to understand the context of customer loyalty in the service industry due to the significant changes in measurement (Ladhari, Souiden, & Ladhari²⁷). Defining customer loyalty is a particularly difficult task as to date, consensus on the meaning of the concept has yet to exist (Bennett & Rundle-Thiele⁵; Bowen, Chen, & Duffy⁷; Dickinson¹⁴; Gecti & Gumus¹⁸; Khan²³; McMullan & Gilmore³²; Ogba & Tan³⁹; Pan, Sheng, & Xie⁴²; Reichheld & Sasser⁴⁷; Saleem, Zahrah, Ahmad, & Hina⁵⁰; Wymer & Rundle-Thiele⁵⁸). The present study conceptualizes 'loyalty' in terms of customer behavior and attitude related to the service or the company, for example the likelihood of future renewal of service contracts, how likely it is that the customer changes patronage, how likely the customer is to provide positive word-of-mouth, and the likelihood of customers providing voice.

Expectation and Confirmation Theory: This study applies the expectation confirmation theory (ECT) by Oliver⁴⁰ which is commonly used to define and predict satisfaction. This theory posits three variables, namely service expectation, service performance, and confirmation, which are measured towards satisfaction and loyalty (Figure 1). According to Oliver, satisfaction is based on previous experience. He further elaborated that satisfaction is acquired from confirmation which is obtained from expectation towards the services or products (Oliver⁴⁰). Confirmation is defined as the differences between two ideas, respectively referring to the differences between a pre-purchase expectation and the actual performance received (Spreng & Page⁵³). Usually, customers will develop expectations toward the product and services before they engage in the buying process. Customers will explore the use of the product or service and develop perceptions about its performance after the buying process. Expectation refers to the "customer's anticipations about performance of products and services" (Churchill & Surprenant¹²). ECT has the ability to define multiple manners of customers in the

purchase process (Elkhani & Bakri¹⁷). The framework is extended by adding perceived performance as a predictor of satisfaction, and further views that both expectation and perceived performance have an influence on confirmation (Churchill & Surprenant¹²). The services literature considers expectations to be reference points of comparison in the service evaluation process (Parasuraman et al⁴³).

Previous Research on ECT: Previous studies have examined the relationship between service expectation and service confirmation in various industries (Baharum & Jaafar⁴; Bhattacharjee⁶; Chang et al⁹; Lin et al²⁹). A research conducted among the students in a beauty salon measured service expectation in pre-purchase setting. The result revealed the relationship between service expectation and service confirmation (Lin et al²⁹). Service expectation links to satisfaction as it roles an anchor in the satisfaction evaluation process (Oliver⁴⁰). Past literatures have examined the association between service expectation and satisfaction in various industries (Baharum & Jaafar⁴; Bhattacharjee⁶; Chang et al⁹; Nasser, Md. Salleh, & Gelaidan³⁷). A review of past literature suggests that customers may consume multiple types of expectation in the evaluation process of satisfaction (Tse & Wilton⁵⁵). These expectations are frequently used as standards of service against which the judgement of satisfaction is made (Churchill & Surprenant¹²). An early study conducted by Helson (1964) in adaptation level theory discovered the association between service expectation and satisfaction. Bhattacharjee's⁶ study supports this hypothesis, revealing a significant relationship between expectation and satisfaction when the customers' expectation was lesser. Furthermore, a study conducted to seek mobile users post-adaptation behaviour emphasizes that meeting users' expectation is a main way to enhance their satisfaction (Zhou⁶⁰).

Performance can influence satisfaction both directly and through confirmation. The relation between performance and disconfirmation is predicted to be positive (Lankton & McKnight²⁸). Tse and Wilton⁵⁵ found that performance had a significant direct effect on satisfaction as well as an indirect effect through confirmation. A more recent study conducted in the service industry also confirms the relationship between perceived service performance and service confirmation (Lin et al²⁹). Moreover, Tse and Wilton⁵⁵ found that performance had a significant direct effect on satisfaction. This discovery was made when the

role of perceived performance in customer satisfaction formation was examined with a tape recorder. In addition, another research in service industry in the UK supports the relationship between service performance and satisfaction (Johnson, Nader, & Fornell²²). The result is in line with the study conducted by Burton et al⁸ in vehicles transport market by measuring the damage rate and vehicle delivery time in Australia. When performance and expectation are equal, confirmation occurs. Both performance and confirmation have been found at times to be significant predictors of customer satisfaction (Churchill & Surprenant¹²; Tse & Wilton⁵⁵).

The research conducted by Bhattacharjee⁶ shows that a higher level of positive confirmation means higher satisfaction. Spreng and Page⁵³ developed a modified satisfaction composition model with the help of ECT model. Their model indicates that confirmation has a significant influence upon property satisfaction or information satisfaction, and upon overall satisfaction. Bhattacharjee also points out that there is a positive correlation between confirmation and satisfaction. In addition, another study using online on internet self-efficacy found that confirmation has a significant influence upon product satisfaction and information satisfaction, as well as overall satisfaction (Chen, Huang, Huang, & Sung¹¹). Based on the discussion, six hypotheses were formulated, as listed below:

H₁: There is a positive relationship between service expectation and service confirmation.

H₂: There is a positive relationship between service expectation and satisfaction.

H₃: There is a positive relationship between perceived service performance and service confirmation

H₄: There is a positive relationship between perceived service performance and satisfaction.

H₅: Service confirmation has a positive effect on satisfaction.

H₆: Satisfaction has a positive effect on loyalty.



Figure 1: Expectation Confirmation Theory

METHOD

The research was conducted based on the quantitative method to examine the relationship between satisfaction and loyalty and to determine the factors that influence customer satisfaction and loyalty. In this study, multiple items were adapted and modified accordingly. Items for service expectation and service performance were adapted from Shamsudin⁵¹, Sirapraha and Tocquer⁵², and Zhang and Feng⁵⁹; items for service confirmation from Bhattacharjee⁶, Lin, Wu, and Tsai (2005), Liu (2012), and Oghuma et al. (2015); customer satisfaction from Quoquab, Abdullah, and Mohammad⁴⁴, Shamsudin⁵¹, and Valvi and West⁵⁶; and customer loyalty from Dimitriades¹⁵, Ruyter and Wetzels⁴⁸, and Shamsudin⁵¹. A reliability test was conducted prior to the actual data collection to ensure consistency of measure. Based on the pilot test of 30 respondents, the internal consistency value for all constructs met the minimum requirement of 0.700. To determine the minimum sample, G*Power software was employed. Based on the effect size set at 0.15, alpha level of 0.05, and four predictors, a sample of 143 respondents was considered appropriate. However, taking into consideration Hair, Black, Babin and Anderson's (2014) suggestion that a larger sample improves precision and reliability of PLS-SEM results, the total number of 400 questionnaires were distributed to Maxis, Digi and Celcom postpaid subscribers at the respective service centers in Klang Valley. Using purposive sampling, the survey return rate was 344 (86%). However, six of the questionnaires were excluded due to missing value exceeding more than 15% and therefore, only 338 (84%) were useable. The Statistical Package for Social Science (SPSS) was used for data cleaning and preliminary analysis, followed by the Partial Least Square-Structural Equation Modelling (PLS-SEM) for analysis since the result failed to meet the normality test procedure.

RESULTS

A total of 338 useful data was used in this study. The respondents' profiles are depicted in Table 1. The data shows a majority of the respondents were female (n=180, 53.3%) and aged between 19 to 30 years old (n=150, 44.4%). More than half of the respondents were Malay (n=186, 55%) with an income level of RM 2001 to RM 4000 (n=144, 42.6%). Almost half of the respondents were subscribers of the RM 101 to RM200 postpaid plans (49.7% n=168). In terms of service

provider subscription, majority of the respondents were Celcom users (n=135, 39.9% and had subscribed to the service provider for almost 1-5 years (n=139, 41.1%). The final data of the study were examined for common method variance. Accordingly, Harman's single test was performed by entering all the measurement items

into SPSS and the results revealed the absence of any common factor loading on all measures, in which the total variance for a single factor was 33.09% which was less than the suggested cut off point of 50% (Podsakoff & Organ, 1986). Therefore, it can be concluded that common method bias was not a threat in this research.

Table 1: Demographic Profiles

Variable	Frequency	%	Variable	Frequency	%
Gender			Income		
Male	158	46.7	Below RM2000	63	18.6
Female	180	53.3	RM2001-RM4000	144	42.6
Age			RM4001-RM6000	98	29.0
18 years old and below	19	5.6	RM6001-RM 8000	30	8.9
19 to 30 years old	150	44.4	RM8001 and above	3	0.9
31 to 40 years old	136	40.4	Monthly Bill		
41 to 50 years old	30	8.9	Below RM 100	116	34.3
51 years old and above	3	0.9	RM 101-200	168	49.7
Race			RM 201-300	41	12.1
Malay	186	55.0	RM 301-400	8	2.4
Chinese	86	25.4	RM 401 and above	5	1.5
Indian	59	17.5	Years of using		
Others	7	2.1	Less than 1 year	52	15.4
Main service provider			Between 1-5 years	139	41.1
Maxis	92	27.2	Between 6-10 years	102	30.2
Digi	111	32.8	Between 11-15 years	33	9.8
Celcom	135	39.9	16 years and above	12	3.6

Measurement Model: Next, the conceptual model was analyzed using PLS-SEM version 3.0. The analysis was divided into two parts which were the measurement model and the structural model. In assessing the measurement model, three criteria were examined. They were the internal consistent reliability; convergence validity, and discriminant validity. Service expectations and service performance were further divided into second order item for each technical and functional constructs in order to reduce the number of indicators in the structural model. Such allows a more parsimonious and easier to grasp analysis (Asyraf & Afthanorhan³). The results are presented in Table 2.

Table 2: Internal Consistency and Convergent Validity

Construct		Loading	AVE	CR
Service Expectation			0.738	0.942
Service Expectation (Technical)			0.672	0.910
SET1	I expect that I can rely on my current service provider to serve me well.	0.769		
SET2	I expect that the network coverage is good in terms of line clarity.	0.866		
SET3	I expect that originated calls can be completed without experiencing premature calls termination (e.g. dropped calls or line got cut).	0.837		
SET4	I expect that my service provider provides customers with good network quality in terms of line clarity, e.g. no disruption, noises or cross lines.	0.837		
SET5	I expect that the service provider will provide good geographical coverage including in-street and in-building.	0.784		

Conted...

Service Expectation (Functional)			0.738	0.942
SEF8	I expect that the service provider will communicate the latest information in a way that is easy to understand, e.g., special offers, rates, discount, helpline numbers, etc. through their websites, brochures, bills and advertisements.	0.709	0.591	0.905
SEF9	I expect that the service packages will give me many choices of postpaid plan.	0.686		
SEF12	I expect that the service provider will offer a very attractive promotion.	0.717		
SEF13	I expect that this service provider will take effective ways to help me know its pricing policies of products and services.	0.806		
SEF14	I expect that this service provider will be offering flexible pricing for various services that meet my needs.	0.838		
SEF15	I expect that the call rate offered by this service provider will be reasonable.	0.795		
SEF16	I expect that the pricing policies of product and services from this service provider will be attractive.	0.817		
Service Performance			0.778	0.913
Service Performance (Technical)			0.672	0.908
S_per1-T	I can rely on my current service provider to serve me well.	0.768		
S_per2-T	The network coverage is good in terms of line clarity.	0.848		
S_per3-T	Originated calls could be completed without experiencing premature call termination (e.g. dropped calls or line got cut).	0.749		
S_per4-T	Provides customers with good network quality in terms of line clarity e.g. no disruption, noises or crosslines.	0.847		
S_per5-T	The service provider provides good geographical coverage including in street and in-building.	0.856		
Service Performance (Functional)			0.569	0.902
S_per8	The service provider provides easy to understand communication of latest information e.g., special offers, rates, discount, helpline numbers, etc. through their websites, brochures, bills and advertisements.	0.706		
S_per9	The service packages offered by this service provider give me many choices of postpaid plan.	0.746		
S_per12	The service provider offers a very attractive promotion.	0.704		
S_per13	This service provider takes effective ways to help me know its pricing policies of products and services. [SEP]	0.754		
S_per14	The pricing policies of products and services from this service provider are attractive.	0.812		
S_per15	The call rate offered by this service provider is reasonable.	0.775		
S_per16	I expect that the service provider is offering flexible pricing for various services that meet my needs.	0.775		
Service Confirmation			0.838	0.939
Con1	My experiences of using the services are better than I expected.	0.913		
Con2	The service level provided by service provider is better than I expected.	0.915		
Con3	Overall, most of my expectations from using this service provider are confirmed.	0.918		

Conted...

Satisfaction			0.702	0.942
CS1	My decision to use this service provider is a wise one.	0.870		
CS2	At times, when I have experienced unforeseen or critical situations, my service provider managed these situations in a satisfactory manner. I think I did the right thing by using this service provider.	0.690		
CS3	My service provider meets my purchase expectations.	0.856		
CS4	I am happy with the effort my service provider is making towards regular consumers like me.	0.761		
CS5	I think I did the right thing by choosing this service provider.	0.881		
CS6	Using this service provider has been a good experience.	0.883		
CS7	Overall, I am satisfied with this service provider.	0.903		
Loyalty			0.677	0.924
CL1	I would definitely recommend my current service provider to someone who seeks my advice.	0.899		
CL2	I encourage relatives and friends to use the services offered by my current service provider.	0.889		
CL3	I intend to use more services offered by my current service provider for the next few years.	0.824		
CL4	I say positive things about my current service provider to others.	0.871		
CL5	I consider my current service provider as my first choice to use the services that I need.	0.891		
CL7	I would pay more than what other competitors charge with the benefits I currently receive.	0.484		

The results provide evidences for composite reliability which meet the minimum requirement of 0.7 and above to achieve internal consistency reliability (see Ramayah, Cheah, Chua, Ting, & Memon⁴⁵). Moreover, all indicator loadings adequately reached the minimum requirement of 0.4 with the average variance extracted (AVE) established more than 0.5 to accomplish the convergence validity requirement. Next, a discriminant validity procedure was conducted to observe how a particular construct was different from the other construct in the study (see Lowry & Gaskin³¹). Using the heterotrait-monotrait ratio (HTMT) techniques, the results shown in Table 3 indicate all values fulfilled the criterion of HTMT_{0.85} as suggested by Kline²⁴ which established discriminant validity. Furthermore, the result of HTMT inference also revealed that the confidence interval did not show a value of 1 on any of the construct, which further confirmed discriminant validity (see Henseler, Ringle, & Sarstedt²¹; Ramayah et al⁴⁵). In addition, based on the Confident Interval Bias value, the columns labeled 2.5% and 97.5% showed that the lower and upper bounds of the 95% (bias-corrected and accelerated) confidence interval did not include the value of 1. In conclusion, the measurement model has established its discriminant validity. Prior to the structural model development, a procedure to address the issue of collinearity was conducted, as the existence of multicollinearity does not contribute to a good regression model.

Table 3: HTMT Criterion

	1	2	3	4	5	VIF
1. Confirmation						1.000
2. Customer Loyalty	0.693 CI.85(0.613, 0.751)					-
3. Satisfaction	0.822 CI.85(0.788, 0.85)	0.792 CI.85(0.713, 0.843)				1.951
4. Service Expectation	0.191 CI.85(0.101, 0.277)	0.042 CI.85(0.002, 0.116)	0.102 CI.85(0.018, 0.193)			1.031
5. Service Performance	0.744 CI.85(0.698, 0.781)	0.663 CI.85(0.567, 0.733)	0.756 CI.85(0.707, 0.8)	0.143 CI.85(0.06, 0.227)		1.031

Next, the structural model analysis was performed through a number of steps. Prior to the hypothesis testing, there was the issue of multicollinearity which needed to be addressed in order to avoid a problematic regression model, requiring below 5.0 variance inflation indicator (VIF). As illustrated in Table 3, values for all constructs met the requirement of VIF which was below 5.00 (see Hair, Hult, Ringle, & Sarstedt¹⁹; Wong⁵⁷), thus confirming the absence of multicollinearity. This was proceeded with the structural model and followed by PLS algorithm which was used to test the hypotheses. In order to ensure the accuracy of PLS estimates, bootstrapping technique with 5000 subsamples was performed and the results are presented in Table 4.

Table 4: Path Coefficient Assessment and Determination of Coefficient (R2)

Relationship	R ²	Path Coefficient	SE	LL	UL	T value	Decision
H1: SE -> Con	0.560	0.087	0.055	0.024	0.147	2.276	supported
H3: SP -> Con		0.731	0.026	0.68	0.772	26.265	supported
H2: SE -> Sat	0.726	-0.058	0.054	-0.109	-0.109	1.899	not supported
H4: SP -> Sat		0.324	0.029	0.517	0.68	7.117	supported
H5: Con->Sat		0.592	0.019	0.517	0.66	13.907	supported
H6: Sat-> Loyalty	0.627	0.792	0.039	0.708	0.842	19.809	supported

t > 1.645 *(p < 0.05), t > 2.33** (< 0.01)

Based on the results, with the exception of the relationship between service expectation and satisfaction, all path coefficients were found to be significant at 99% confidence interval (Service Expectation -> Confirmation $\beta = 0.087$, $p < 0.011$; Service Expectation -> Satisfaction $\beta = -0.058$, $p < 0.029$; Service Performance -> Confirmation $\beta = 0.731$, $p < 0.000$; Service Performance -> Satisfaction, $\beta = 0.324$, $p < 0.000$; Confirmation -> Satisfaction $\beta = 0.592$, $p < 0.000$; Satisfaction -> Customer Loyalty $\beta = 0.792$, $p < 0.000$). Thus, it can be concluded that the five hypothesized relationships in this study are supported in which there is no zero between the Lower Limit (LL) and Upper Limit (UL) confidence interval which relies on bootstrapping standard error (see Hair et al., 2014). The R² value of 0.560 suggests that service expectation and service performance explain 56.0% of variances in confirmation, 0.726 or 72.6% for customer satisfaction, and 0.627 or 62.7% for loyalty. Therefore, R² in this study is acceptable as R² value of 0.20 is considered high in consumer-related studies (see Hair et al¹⁹).

The blindfolding procedure was conducted next to obtain the predictive capability of the model by using Q² (Hair et al¹⁹). According to Hair et al¹⁹ and Ramayah, Cheah, Chuah, Ting, and Memon⁴⁶, if the Q² value is more than 0, the model has predictive relevance for a certain endogenous construct. Based on Table 5, the Q² for Confirmation was 0.564, Satisfaction was 0.704 and loyalty was 0.634, which suggests that the exogenous

constructs possess predictive relevance as they are above zero as outlined by Hair et al¹⁹. The f² values represent the effect size of a specific exogenous construct on the endogenous construct (Hair et al¹⁹). The effect size of SE-Con, SE-Sat, SP-Con, SP-Sat, Con-Sat, Sat-Loyalty were 0.017 (small), 0.012 (small), 1.190 (large), 0.171 (medium) and 0.562 (large), 1.678 (large) respectively based on the guidelines provided by Cohen (1988).

Table 5: Effect Size (f²) and Predictive Relevance Q²

Relationship	Q ²	f ²	Size of effect
H1: SE -> Con	0.564	0.017	small
H3: SP -> Con		1.190	Large
H2: SE -> Sat	0.704	0.012	small
H4: SP -> Sat		0.171	Medium
H5: Con->Sat		0.562	Large
H6: Sat-> Loyalty	0.635	1.678	Large

DISCUSSION

This study was conducted to determine the relationship between customer satisfaction and customer loyalty and to determine the factors that explain for customer satisfaction. Based on the finding, it can be concluded that satisfaction plays an important role towards customer loyalty. This finding supports the previous study conducted by Morgan and Govender³⁴ which emphasized the importance for

service providers to pay a closer attention on activities aimed at increasing satisfaction in order to retain loyal customers longer. As the telecommunication industry is getting saturated, it is important for service providers to meet the customers' expectation, which can lead to satisfaction. In addition, another empirical finding also revealed that postpaid subscribers had high expectation towards their service providers, especially in terms of technicality such as network quality (i.e. first time dial, no cut on line, and others). This particular finding of the study is consistent with the outcome of a previous study conducted by Duzevic, Delic, and Knezevic¹⁶ which found that the functionality of services was one of the important elements in satisfaction. This study has revealed that the current service performance is not at par as to what customers expect. Therefore, it is vital for service providers to meet customers' expectation by showing a good service performance. The result also revealed that the higher the expectation, the lesser the satisfaction. Hence, service providers should avoid making unrealistic and overarching promises, especially during promotional events or advertising to avoid high level of expectation. Moreover, observed was the minimal impact of the relationship between satisfaction and loyalty among subscribers.

The application of ECT in this research extends the knowledge on satisfaction in the context of service expectation and service performance especially since previous studies had mainly focused more on the factors of service quality (Chen & Cheng¹⁰; Muturi, Wadawi, & Owino³⁶; Özer, Argan, & Argan⁴¹; Sagib & Zapan⁴⁹). The use of ECT has allowed this study to incorporate the variable of loyalty in order to strengthen the existing ECT model. This is essentially crucial in light that the telecommunication industry is facing a serious issue of customer retention at present. This model conceptually distinguishes the different impacts of expectation and service performance in the telecommunication industry, as it makes a sharper distinction between how satisfaction is determined.

CONCLUSION

The present study has shed light on the expectation of postpaid subscribers in Klang Valley, Malaysia. This study has further provided a deeper understanding of customer satisfaction and loyalty among mobile postpaid users. Since this study has employed the ECT theory,

it will be an advantage for future research on customer loyalty to conduct a longitudinal study in which a greater comparison can be achieved in terms of pre- and post-subscription, likely after a few months of subscription. Such study may help validate the conclusion of this study and overcome the issue of single period data collection. In this competitive and saturated market, gaining new customers and maintaining old ones is quite a challenging task. Thus, future researchers can explore more on the value of added services, bundle packages, and the ideal mobile network plan to suit customer preferences. This can at the end be used as part of the strategies to retain and develop loyalty among customers.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Ahmad J, Hussain M, Rajput, A. Customer loyalty framework of telecommunication service market. *International Journal of Managing Value and Supply Chains*. 2015;6(1):69–78. <https://doi.org/10.5121/ijmvsc.2015.6106>
2. Arokiasamy A. R. A, Abdullah A. G. K. Service quality and customer satisfaction in the cellular telecommunication service provider in Malaysia. *Journal of Arts, Sciences & Commerce*. 2013;4(2):1–9.
3. Asyraf W. M, Afthanorhan B. W. Hierarchical component using reflective - formative measurement model in partial least square structural equation modeling (Pls - Sem). *International Journal of Mathematics and Statistics Invention*. 2014;2(2):55–71.
4. Baharum A, Jaafar A. User interface design : a study of expectation - confirmation theory. 5th International Conference on Computing and Informatics. 2015;(064):17–24.
5. Bennett R, Rundle-Thiele S. A comparison of attitudinal loyalty measurement approaches. *Journal of Brand Management*. 2002;9(3):193. <https://doi.org/10.1057/palgrave.bm.2540069>
6. Bhattacharjee A. Understanding information systems continuance: an expectation-confirmation model. *MIS Quarterly*. 2001;25(3):351–370. Retrieved from

- <http://www.jstor.org/stable/3250921>
www.jstor.org/page/info/about/policies/terms.jsp
<http://www.jstor.org>
7. Bowen J. T, Chen S.-L, Duffy D. L. The relationship between customer loyalty and customer satisfaction. *International Journal of Contemporary Hospitality Management*. 2001;13(10):213–217. Retrieved from <http://dx.doi.org/10.1108/09596110110395893>
<http://dx.doi.org/10.1108/09564239810199923>
<http://dx.doi.org/10.1108/02634500710722425>
 8. Burton S, Sheather S, Roberts J. Reality or perception? The effect of actual and perceived performance on satisfaction and behavioral intention. *MGS Working Papers in Management*. Australia. 2003.
 9. Chang K. K.-L, Hsu P.-S, Lin C.-P. A qualitative integration of self-determination theory and expectation-confirmation theory using physical education as an example. *Quality & Quantity*. 2008;43(6):977–981. <https://doi.org/10.1007/s11135-008-9166-y>
 10. Chen C.-F, Cheng L.-T. A study on mobile phone service loyalty in Taiwan. *Total Quality Management & Business Excellence*. 2012 Nov;807–819. <https://doi.org/10.1080/14783363.2012.661129>
 11. Chen Y. Y, Huang W. N, Huang H. L, Sung S. F, Hsu Y. C, Tseng H. C, Sung S. F. Confirmation of expectations and satisfaction with an on-line service: the role of internet self-efficacy. *Computer and Information Science*. 2010;3(3):880–885. <https://doi.org/10.1109/NISS.2009.60>
 12. Churchill G. A, Surprenant C. An investigation into the determinants of customer satisfaction. *Journal of Marketing Research*. 1982;19:491.
 13. Cohen J. *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates. 1988. <https://doi.org/10.1234/12345678>
 14. Dickinson J. B. Customer loyalty : a multi-attribute approach. *Research in Business and Economic Journal*. 2013;9(1):1–18.
 15. Dimitriadis Z. S. Customer satisfaction, loyalty and commitment in service organizations: Some evidence from Greece. *Management Research News*. 2006;29(12):782–800. <https://doi.org/10.1108/01409170610717817>
 16. Duzevic, I., Delic, M., & Knezevic, B. Customer satisfaction and loyalty factors of mobile commerce among young retail customers in Croatia. *Revista Eletrônica Gestão & Sociedade*. 2016;10(27). <https://doi.org/10.21171/ges.v10i27.2129>
 17. Elkhani N, Bakri A. Review on “expectancy disconfirmation theory” (EDT) model in B2C e-commerce. *Journal of Information Systems Research and Innovation*. 2012;95–102.
 18. Gecti F, Gumus N. Investigating the Facebook applications and their impact on customer loyalty in the Turkish mobile telecommunication industry. *International Journal of Business and Management*. 2014;9(5):195–207. <https://doi.org/10.5539/ijbm.v9n5p195>
 19. Hair J. F. J, Hult G. T. M, Ringle C. M, Sarstedt M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (2nd ed.). Los Angeles: SAGE Publication. 2016. <https://doi.org/10.1016/j.lrp.2013.01.002>
 20. Haque A, Khatibi A, Raquib A, Al Mahmed S. Consumer perception and its choice mobile telecom service provider in Malaysia . *Journal of International Business and Economics*. 2007;7(2).
 21. Henseler J, Ringle C. M, Sarstedt M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*. 2015;43:115–135. <https://doi.org/10.1007/s11747-014-0403-8>
 22. Johnson M. D, Nader G, Fornell, C. Expectations, perceived performance, and customer satisfaction for a complex service: The case of bank loans. *Journal of Economic Psychology*. 1996;17(2):163–182. [https://doi.org/10.1016/0167-4870\(96\)00002-5](https://doi.org/10.1016/0167-4870(96)00002-5)
 23. Khan M. T. Customers loyalty: Concept and definition (a review). *International Journal of Information, Business and Management*. 2013;5(3):168–191. Retrieved from <http://search.proquest.com/docview/1511381965?accountid>

- = 14495%5 Cnhttp:// diana.uca.es:4550/ resserv?
genre= article & issn = 20769202 & title =
International + Journal + of + Information, +
Business + and+ Management & volume =
5 & issue = 3 & date = 2013-08-01 & a title =
Customers + Loyalty: + Conc
24. Kline R. B. Principles and Practice of Structural Equation Modeling. New York: The Guilford Press. 2015.
 25. Kunupakan K. Customer's Satisfaction with Online Customer Service on Internet Banking. National Chengchi University. 2007. <https://doi.org/10.1073/pnas.0703993104>
 26. Kursunluoglu E. Shopping centre customer service: creating customer satisfaction and loyalty. *Marketing Intelligence & Planning*. 2014;32(4):528–548. <https://doi.org/10.1108/MIP-11-2012-0134>
 27. Ladhari R, Souiden N, Ladhari I. Determinants of loyalty and recommendation: the role of perceived service quality, emotional satisfaction and image. *Journal of Financial Services Marketing*. 2011;16(2):111–124. <https://doi.org/10.1057/fsm.2011.10>
 28. Lankton N, McKnight D. H. Using Expectation Disconfirmation Theory to Predict Technology Trust and Usage Continuance Intentions (unpublished manuscript). 2007.
 29. Lin C.-P, Tsai Y. H, Chiu C.-K. Modeling customer loyalty from an integrative perspective of self-determination theory and expectation–confirmation theory. *Journal of Business and Psychology*. 2009;24(3):315–326. <https://doi.org/10.1007/s10869-009-9110-8>
 30. Loke S.-P, Taiwo A. A, Salim H. M, Downe A. G. Service quality and customer satisfaction in a telecommunication service provider. 2011 International Conference on Financial Management and Economics. 2011;11:24–29.
 31. Lowry P. B, Gaskin J. Partial least squares (PLS) structural equation modeling (SEM) for building and testing behavioral causal theory: When to choose it and how to use it. *IEEE Transactions on Professional Communication*. 2014;57(2):123–146. <https://doi.org/10.1109/TPC.2014.2312452>
 32. McMullan R, Gilmore A. The conceptual development of customer loyalty measurement: a proposed scale. *Journal of Targeting, Measurement and Analysis for Marketing*. 2003;11:230–243. <https://doi.org/10.1057/palgrave.jt.5740080>
 33. Moneruzzaman M. Is Malaysian Telecom Market Shrinking? 2015. | Md. Moneruzzaman | LinkedIn. Retrieved January 29, 2016, from <https://www.linkedin.com/pulse/malaysian-telecom-market-shrinking-md-moneruzzaman?trk=prof-post>
 34. Morgan S, Govender K. Exploring customer loyalty in the South African mobile telecommunications sector. *Cogent Business & Management*. 2017;4(1). <https://doi.org/10.1080/23311975.2016.1273816>
 35. Mosahab R, Mahamad O, Ramayah T. Service quality, customer satisfaction and loyalty: a test of mediation. *International Business Research*. 2010;3(4):72–80.
 36. Muturi F. M, Wadawi J. K, Owino E. O. Antecedents of customer perceived value: Evidence of mobile phone customers in Kenya. *International Journal of Business and Social Science*. 2014;5(4):318–327.
 37. Nasser M, H. A., Md Salleh, S., Gelaidan H. M. Factors affecting customer satisfaction of mobile services in Yemen. *American Journal of Economics*. 2012;2(7):171–184. <https://doi.org/10.5923/j.economics.20120207.03>
 38. Nikbin D, Tabavar A. A, Jalalkamali M. Service recovery in marketing education: Evidence from a developing country. *Elixir Marketing Management*. 2012;42:6250–6256.
 39. Ogba I.-E, Tan Z. Exploring the impact of brand image on customer loyalty and commitment in China. *Journal of Technology Management in China*. 2009;4(2):132–144. <https://doi.org/10.1108/17468770910964993>
 40. Oliver R. L. A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of Marketing Research*. 1980;17:460–470. <https://doi.org/10.2307/3150499>
 41. Özer A, Argan M. T, Argan M. The effect of mobile service quality dimensions on customer satisfaction. *Procedia - Social and Behavioral Sciences*. 2013;99:428–438. <https://doi.org/10.1016/j.sbspro.2013.10.511>

42. Pan Y, Sheng S, Xie F. T. Antecedents of customer loyalty: an empirical synthesis and reexamination. *Journal of Retailing and Consumer Services*. 2012;19(1):150–158. <https://doi.org/10.1016/j.jretconser.2011.11.004>
43. Parasuraman A, Zeithaml V. A, Berry L. L. A conceptual model of service quality and its implications for future. *Journal of Marketing*. 1985;49(4):41–50.
44. Quoquab F, Abdullah N. L, Mohammad J. Investigating the effects of consumer innovativeness, service quality and service switching costs on service loyalty in the mobile phone service context. *Gadjah Mada International Journal of Business*. 2016;18(1):21–53.
45. Ramayah T, Cheah J, Chuah F, Ting H, Memon M. A. Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 3.0: An Updated and Practical Guide to Statistical Analysis. *Handbook of Market Research (2nd ed.)*. Kuala Lumpur: Pearson Malaysia Sdn Bhd. 2016.
46. Ramayah T, Cheah J, Chuah F, Ting H, Memon M. A. Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 3.0: An Updated and Practical Guide to Statistical Analysis. *Handbook of Market Research (2nd ed.)*. Kuala Lumpur: Pearson Malaysia Sdn Bhd. 2018.
47. Reichheld F. F, Sasser W. E. Zero defections: Quality comes to services AT. *Harvard Business Review*. 1990. Retrieved from <https://hbr.org/1990/09/zero-defections-quality-comes-to-services>
48. Ruyter K. de, Wetzels M. On the relationship between perceived service quality, service loyalty and switching costs. *International Journal of Service Industry Management*. 1998;9(5):436–453.
49. Sagib G. K, Zapan B. Bangladeshi mobile banking service quality and customer satisfaction and loyalty. *Management and Marketing Challenges for the Knowledge Society*. 2014;9(3):17.
50. Saleem M. A, Zahrah S, Ahmad R, Hina I. Predictors of customer loyalty in the Pakistani banking industry: a moderated-mediation study. *International Journal of Bank Marketing*. 2016;34(3):564–578. <https://doi.org/10.1108/02656710210415703>
51. Shamsudin M. F. Determinants of Customer Loyalty towards Prepaid Mobile Cellular Services in Malaysia. University Utara Malaysia. 2012.
52. Sirapracha J, Tocquer G. Customer experience, brand image and customer loyalty in telecommunication services. *International Conference on Economics Business and Marketing Management*. 2012;29:112–117.
53. Spreng R. A, Page T. J. A test of alternative measures of disconfirmation. *Decision Sciences*. 2003;34(1):31–62. <https://doi.org/10.1111/1540-5915.02214>
54. Srivastava, M., & Kaul, D. (2016). Exploring the link between customer experience–loyalty–consumer spend. *Journal of Retailing and Consumer Services*, 31, 277–286. <https://doi.org/10.1016/j.jretconser.2016.04.009>
55. Tse D. K, Wilton P. C. Models of consumer satisfaction formation: an extension. *Journal of Marketing*. 1988 May 25;204–212. <https://doi.org/10.2307/3172652>
56. Valvi A. C, West D. C. E-loyalty is not all about trust, price also matters: Extending expectation-confirmation theory in bookselling websites. *Journal of Electronic Commerce Research*. 2013;14(1):99–123.
57. Wong K. K. Partial least squares structural equation modeling (PLS-SEM) techniques using SmartPLS. *Marketing Bulletin*. 2013;24:1–32. <https://doi.org/10.1108/EBR-10-2013-0128>
58. Wymer W, Rundle-Thiele S. Supporter loyalty: Conceptualization, measurement, and outcomes. *Nonprofit and Voluntary Sector Quarterly*. 2016;45(1):172–191. <https://doi.org/10.1177/0899764014564579>
59. Zhang X, Feng Y. The impact of customer relationship marketing tactics on customer loyalty. *Marketing*. Halmstad University. 2009. Retrieved from <http://hh.diva-portal.org/smash/get/diva2:239882/FULLTEXT01>
60. Zhou T. An empirical examination of users' post-adoption behaviour of mobile services. *Behaviour & Information Technology*. 2011;30(2):241–250. <https://doi.org/10.1080/0144929X.2010.543702>

The Role of E-Management in Achieving Sustainable Competitive Advantage: Field Study of Zain Telecom in Iraq

Khaled Abdulaah Ibrahim¹, Shatha Aboud Shaker², Waleed Khalid Abduljabbar³

^{1,3}Department of Public Administration, College of Administration and Economy, University of Fallujah, Al-Anbar, Fallujah, Iraq; ²Yemen Secondary School for Boys, Baghdad, Iraq

ABSTRACT

This study aims at the role of the electronic administration in achieving the competitive advantage of Zain Company in Iraq and the extent of the contribution of the administration in reducing the time of completion of tasks and the cost of performance and by contributing to the achievement of financial savings through (minimum cost and time of completion of tasks) The study relied on taking the views of the same staff (40) people were excluded (5) questionnaires for lack of validity for statistical analysis to remain (35) questionnaire and the most prominent findings of the study is the existence of a relationship of statistical significance between the application of electronic management and achieve a sustainable competitive advantage of The most important of the study's findings is the adoption of a more sophisticated and modern approach to qualify the organization in providing distinguished services to customers and achieving a sustainable competitive advantage.

Keywords: *Competitive advantage, Kaizen, accounting, Information technology, Electronic management*

INTRODUCTION

The electronic administration is a means of developing and developing the performance of the employees of the organization in question. The electronic administration is considered the main component of the sustainable competitive advantage after the emergence and development of the Internet and information technology and the conversion of administrative, marketing, accounting and other operations to electronic work by converting the papers into electronic files. All operations are carried out through networks and the Internet. Increase and develop the relationship between government, organization, employees and customers. Electronic management is efficient, fast and able to solve the problem of traditional management.

Research Problem: The problem of research is to clarify the role of electronic management in achieving sustainable competitive advantage through the use of modern and sophisticated means and the problem of research by answering the following questions:

1. What is the role of electronic management in developing the performance of employees and speed of completion of transactions for customers?

2. What is the role of electronic administration in developing the skills of employees in the company being investigated?
3. Does electronic management affect the quality and quality of the services provided by the employees of the company?
4. What is the impact of electronic management on achieving quality in governmental and private organizations?

The increasing interest of the organizations in Iraq in general and Zain Telecom in particular in electronic management due to the evolution and change in the business environment with the role of electronic management in improving the efficiency of the performance of the employees and the need of these organizations for such new administrative methods so that the organization can achieve competitive advantage and compete with other companies and access to markets Global.

RESEARCH OBJECTIVES

To draw attention to the role of electronic management in achieving the competitive advantage of sustainable, which is one of the most important factors

that help in achieving customer satisfaction by satisfying their desires and achieve their goals and achieve and improve their competitive position in the market and provide services of high quality and ability of employees to achieve the spirit of cooperation among them. And speed in the completion of transactions resulting from electronic transactions and move from the use of paper and eliminate the routine through electronic dealing.

Method and sources of information collection:

The researchers adopted the methods of collecting information and data that help in the implementation of the research objectives and access to the results that were adopted by the researchers on the following sources and methods:

(i) **Theoretical side:** The researchers used the theoretical side of what is available in some theoretical books in addition to Arabic and foreign books, books, periodicals and university letters.

(ii) **The practical aspect:** Adopted the questionnaire method as a key tool to collect the required data, which included the first section/the first section personal information, the second section includes the questions of the questionnaire and measured the dimensions of the independent variable (electronic management) through (5) paragraphs and dimensions of the variable adopted (sustainable competitive advantage) Through (5) paragraph

Community and research sample: The study population consists of Zain Telecommunications Company, where the sample of the study was determined by the employees of the company. The questionnaire was distributed to 35 items of the questionnaire. The researchers adopted the Likert scale of the five-order order as follows:

Disagree Completely (1), Disagree (2), Somewhat Agree (3), OK (4), Totally OK (5).

Statistical means: The study was based on the analytical descriptive approach. An applied study was applied to Zain Telecom in Iraq, where the statistical averages and standard deviations were used as well as the explanatory analysis according to the statistical method through the SPSS program.

LITERATURE REVIEW

The two researchers reviewed previous studies that dealt with the subject of electronic management did not address any of the previous studies to the subject of the role of electronic management in achieving competitive advantage sustainable.

The study aims at identifying the contribution of electronic management in improving the management of technical colleges in Saudi Arabia and uncovering the differences between the views of the technical colleges in Saudi Arabia. The members of the educational and training body and the extent of the application of electronic management to detect these differences. One of the main findings of this study is that the technical colleges apply electronic management to a moderate degree and this contributes to improving the performance of the technical colleges

Creativity must therefore be challenged by change, achievement, customer focus, new ideas, and culture. The key to innovation is trust and respect between management and public in¹⁰.

Market resilience: Due to changes in the environment, it is necessary to adapt to environmental changes easily².

Quality refers to identifying customers, analyzing their needs and knowing the quality of services with other competitors, through which we will reach quality targets that will achieve a sustainable competitive advantage¹.

The results of this study showed that there are no differences between the point of view of administrators and faculty members regarding the application of electronic administration in all fields. The study found that there are differences between the diploma, bachelor and graduate studies in the fields of planning, control, evaluation and electronic implementation.

Study¹² (Effect of Adopting the Total Quality Strategy in Improving Competitive Position: A Field Study for Jordanian Pharmaceutical Industry Companies. This study aimed at determining the effect of adopting the comprehensive quality strategy in improving the competitive position of the Jordanian pharmaceutical companies. The study reached the following results:

- (a) A relationship between the overall quality strategy, the competitive position and the ability to access external markets

- (b) B - Quality and continuous improvement of the strongest elements of total quality.

Electronic administration and its role in achieving competitive advantage in industrial organizations This study was conducted in the battery manufacturing plant in Babylon (1) and Babylon (2)⁸. This study dealt with electronic management and its role in achieving competitive advantage. The results of this study were:

- (a) Achieving respiratory advantage by reducing the time to complete tasks and reduce costs
- (b) B - clarity in the strategic vision of the application of electronic management in the senior management in the battery industry.
- (c) The electronic management of the battery manufacturing plant is in its early stages switching from traditional management to electronic management, so there is a need for a legal system to protect the electronic organizations

Charag & Ahmad¹¹, this study dealt with the gap between the citizens and the government through the establishment of an electronic service capable of providing information in a timely manner and that the delivery of services is quick with a motivation to develop the system, which meets the requirements of customers efficiently through electronic information exchange and the study to provide common services to stakeholders

The Concept of Electronic Management:

E-management is a newly emerged term that plays a key role in improving organizations' performance and quality and shortening the time in providing their services to customers. Electronic management is the integration of information and data in guiding the procedures and methods of the organization to achieve its objectives by responding to internal and external variables⁵.

Yunus⁶, defines it as a group of administrative processes through which it can use the electronic means and apply them with high efficiency, thus improving the performance of the electronic devices and enhancing the effectiveness of information exchange to achieve the desired goals.

From the point of view of the researchers, the electronic administration is the technology of data and information and the development of administrative methods using management in the organization of electronic devices to achieve the goals and desires of the customer and this achieves competitive advantage sustainable.

Importance of electronic management: The idea of electronic management goes far beyond the mechanization concept of labor administrations within the organization. To the concept of data and information integration between different departments and the use of such data and information in guiding the actions and policies of the organization to achieve its objectives and provide the necessary flexibility to respond to external or internal variables⁴, where the importance of electronic management through its ability to keep pace with quantitative and qualitative developments in the field Information technology, the so-called ICT revolution, represents a strong response to the challenges of the 21st century, as well as its efficient and effective interaction with the variables of the present⁷. The Company shall be permitted to plan for the scheduling and timely submission of services⁹.

The electronic administration achieves administrative flexibility in delegation and administrative empowerment and thus will have a greater role in achieving the objectives of the organization. Planning, direction, supervision and organization will remain the new functions of electronic management³.

The research community: Zain Telecommunications Company, located in Baghdad Governorate, has been chosen as a field field to test the hypotheses of the research, as it clearly highlights the variables related to the subject, especially the variables (quality, time, cost, creativity and flexibility) and its impact on the use of electronic management among employees of Zain Telecom, And cultural for the employees in this company and its impact on the absorption of the vocabulary of the answer and the accuracy of the answer to them.

Description of the research sample: The research sample, which included the employees of Zain, was identified. A questionnaire was distributed to the employees of this company in the form of direct delivery and receipt. On this basis, the total number of questionnaires analyzed was 30. After analyzing the results, 69.4% of males and 30.6% of females were female. The results showed that 23.2% were aged 30-25 years and 58.1% were between the ages of 35-30. (17.7%) were between 40-35 years of age and 1% were aged 40 years or older, while 74.2% of them had bachelor's degrees while 25.8% The results showed that 50% of those with years of service ranged from (10-1) years, while 50% had years of service (20-11 years). The results of the analysis That n (74.2%) had three or more courses, and 12.9% had two courses and 12.9% had only one training course. Knowledge and knowledge of electronic management.

Test the search resolution: To test the questionnaire, the researcher used the following statistical tests:

1. Instrument Validation (Instrument Validity):

The questionnaire was prepared in final form by conducting a comprehensive review of the most important studies, researches and references related to the subject of the study, through which the first draft of the questionnaire was reached, and the first draft of the questionnaire was presented to a number of arbitrators who made their observations and suggestions.

2. Instrument reliability test: In order to verify the stability of the tool, Cronbach Alpha was extracted in order to reach the stability coefficient of the questionnaire to make sure that the measuring instrument did not receive the wrong data if it was re-studied and using the same instrument and in the same conditions for the first time and using the statistical program (SPSS) The stability coefficient for the variable was 0.983 and the stability coefficient was 0.984. The stability coefficient for the variable was creativity and elasticity (0.985). The results showed that all variables had a stability coefficient of more than 60% To prove the study tool

Description of the results of the search sample variables: Descriptive statistics (mean arithmetic, standard deviation) have been used as an appropriate means to analyse search variables. (3.33 and above) to determine the relative importance of respondents' perceptions of the study questions based on the five-dimensional Likert scale. Table (1) shows the arithmetical averages and standard deviations of the search variables

Table 1: Level of the quality variables

s.t	SMA	Paragraph	Paragraph number
0.731	3.26	the quality	1
0.791	1.92	Time	2
0.693	3.13	Cost	3
0.919	3.22	creativity	4
0.659	2.08	Flexibility	5
0.714	3.17	Electronic management	6

The results of Table (1) indicate that the level of the quality variable is medium, which is confirmed by the general mean of this variable of (3.26) and by standard deviation (0.731). While the mean variable of

the variable was 3.13, which showed that the level of the variable cost was average and with a standard deviation (0.693) The results showed that the elasticity variable achieved an average of 2.08, indicating that the elastic variable level was low and with a standard deviation (0.659). Finally, the electronic administration variable achieved an arithmetic mean of (3.17) and this indicates that the level E was average and reached the standard deviation (0.714).

CONCLUSIONS

This study deals with the main results of the test of hypotheses and conclusions and then the recommendations reached through the data of the research results

There is a significant statistical correlation between quality and electronic management among the employees of Zain Telecommunications Company in Iraq.

Table 2: Correlation coefficient of quality and the use of electronic management

Use of electronic management	the quality	
0.942**	1	the quality
1	0.942**	Use of electronic management

Table (2) shows that there is a positive correlation between the quality variable and the electronic administration, with correlation coefficient (0.942). This means that the more quality is available, the greater the level of use of electronic of Zain Telecom. The hypothesis of the study can therefore be accepted management in the employees

There is a relationship of statistical significance between the time and the use of electronic management among employees of Zain in Iraq.

(0.958 **) with statistical significance between the time variable on the one hand and the use of electronic management, indicating that the greater the time, the more the use of electronic management among employees and therefore can accept the hypothesis of the study. As shown in Table (3)

Table 3: correlation coefficient of time and use of electronic management

Use of electronic management	Time	
0.958**	1	Time
1	0.958**	Use of electronic management

There is a relationship of statistical significance between the cost and the use of electronic management among employees of Zain in Iraq. The correlation between the variable cost and the use of electronic administration shows that the higher the cost, the greater the use of electronic management among the employees. Therefore, the hypothesis of the study can be accepted. As shown in Table (4)

Table 4: Correlation coefficient of cost and use of electronic management

Use of electronic management	Cost	
0.970**	1	Cost
1	0.970**	Use of electronic management

There is a relationship of statistical significance between the creativity and the use of electronic management among the employees of Zain in Iraq.

(0.951 **) with statistical significance between the variable of creativity on the one hand and the use of electronic management. This indicates that the greater the creativity, the greater the use of electronic management among employees and therefore the hypothesis of the study can be accepted. As shown in Table (5)

Table 5: Correlation coefficient of creativity and the use of electronic management

Use of electronic management	Creativity	
0.951**	1	creativity
1	0.951**	Use of electronic management

There is a statistically significant correlation between flexibility and the use of electronic management among Zain employees in Iraq. The correlation between the elasticity variable and the use of electronic management

is statistically significant. This indicates that the more flexible the use of electronic management among workers, the more likely the hypothesis of the study will be accepted. As shown in Table (6)

Table 6: Correlation coefficient of elasticity and the use of electronic management

Use of electronic management	Flexibility	
0.961**	1	Flexibility
1	0.961**	Use of electronic management

There is a significant statistical impact between the quality and the use of electronic management among employees of Zain Telecommunications in Iraq.

(R²) indicates that the quality variable has an effect on the use of electronic management not less than (98%). This means that the percentage indicates that (98%) of the total differences in The use of electronic management is determined by the interest of the employees of Zain for the quality of the company and the remaining (2%) represents the percentage of contribution variables not included in this research, which cannot be controlled. While the value of (F) (244.98), a value of significant statistical significance at the level of indication (sig = 0.460), indicating that the regression curve is not good in interpreting the relationship between quality in the use of electronic management. The value of the estimated effect of quality on the use of electronic management is 0.095 (= β). This effect is statistically significant according to the value of t = 0.751 at the level of sig = 0.460. Accordingly

There is a significant statistical impact between the time and the use of electronic management among employees of Zain Telecommunications in Iraq.

(R²) indicates that the time variable has an effect on the use of electronic management not less than (98%). This means that the percentage indicates that (98%) of the total differences in The use of electronic management is determined by the interest of the employees of Zain for the time it owns and the remaining (2%) represents the percentage of contribution variables not included in this research, which cannot be controlled. While the value of (F) (244.98), a value of significant statistical significance at the level of indication (sig = 0.002) indicating that the

regression curve is good in interpreting the relationship between time in the use of electronic management. The value of the estimated time effect on the use of electronic administration is 0.451 (β). This effect is statistically significant by the value of ($t = 3.531$) at the level of sig (0.002)

There is a statistically significant impact between flexibility and the use of electronic management among employees of Zain Telecommunications in Iraq.

(R^2) indicates that the elasticity variable has an effect on the use of electronic management not less than (98%). This means that the ratio indicates that (98%) of

the total differences in The use of electronic management is determined by the interest of the employees of Zain for the time it owns and the remaining (2%) represents the percentage of contribution variables not included in this research, which cannot be controlled. While the value of (F) (244.98), a value of significant statistical significance at the level of indication (sig = 0.751), indicating that the regression curve is not good in explaining the relationship between flexibility in the use of electronic management. The estimated effect of elasticity on the use of electronic management is 0.044 (β). This effect is statistically significant by the value of ($t = 0.321$) at the level of sig = 0.751.

Table 7: Results of the effect of independent variables on the use of electronic manage

Regression coefficient					DF	F	R ²	R	Dependent variable
Sig**	T	SD	B	Independent variable					
0.460	0.751	0.124	0.095	the quality	14.770	244.98	0.980	0.990	Use of electronic management
0.002	3.531	0.115	0.451	Time					
0.001	3.672	0.164	0.584	Cost					
0.306	1.045	0.118	0.158	creativity					
0.751	0.321	0.147	0.044	Flexibility					

The correlation between the independent variables (quality, time, cost, creativity and flexibility) and the dependent variable (use of electronic management) from the point of view of the research sample was significant and real, reflecting the reality in Zain’s environment in Iraq Some results have been achieved and some have not been achieved.

ACKNOWLEDGMENT

I would also like to thank my friends who helped me a lot in finalizing this paper within the limited period.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Kotler p, Keller K.L. Marketing management, (12th ed.). New JERSEY: Upper saddle River. 2006.
2. Awwad A, Khattab, A. Anchor. Competitive priorities and competitive advantage in Jordanian

Manufacturing: journal of service science management. 2013; 14(2).

3. Masaoud, Khalifa bin Saleh. (human and material requirements for the application of electronic administration in public schools), Master Thesis published, Department of Educational Administration and Planning, Faculty of Education, Umm Al Qura University, Makkah. 2008.
4. Radwan, Raafat. (electronic administration, management and new global variables, the second administrative forum of the Saudi Society of Management. 2004.
5. Radwan, Raafat. electronic administration, the second administrative forum of the Saudi Society of Management, Cairo: Information and Decision Support Center. 2007.
6. Younis Magdy. Transformation towards electronic administration, Conference of the development of the system of pre-university education, visions and projects, Egypt, Egypt. 2016.
7. Al-Bakri, Thamer. Conceptual Framework for Sustainability and Sustainable Competitiveness,

- HP's Simulation of Sustainability Strategy, Academy of Social Humanities, University of Applied Special Sciences, Faculty of Economics, Jordan. 2013.
8. Al-Bayati, Amira Shakroli. (electronic administration and its role in achieving competitive advantage in industrial organizations - exploratory study in the General Company for the manufacture of cars and equipment, lab 1 and 2), Journal of Human Development University. 2016; vol.2.
 9. Kajewki lee, Ritzman larry. Operation Management strategy and analysis, 7th ed, Newjersy, pearson prentice Hall Inc. 2005.
 10. Okpara F, the value of creativity and innovation in entrepreneurship: journal of Asia entrepreneurship and sustainability. 2007; 111 (2).
 11. charag O, Ahmed M. Optimizing service Delivery magnitude by Usage of Electronic service Delivery Mechanism of E-Governance - International Journal of Applied Services Marketing perspectives. 2013; 2 (2), 236-429.
 12. The judges, Mohamed Ali. (following the adoption of the overall quality strategy in improving the competitive position: field study of the Jordanian pharmaceutical companies), unpublished doctoral thesis, Amman Arab University, Amman, Jordan. 2006.

Work Family Conflict among Teachers: Evaluating Measurement Model Fit

R Zirwatul Aida R Ibrahim¹, Siti Nazilah Mat Ali¹, Azlina Abu Bakar², Mazidah Mohd Dagang¹,
Khatijah Omar³, Siti Sarawati Johar⁴

¹School of Social and Economic Development, Universiti Malaysia Terengganu; ²Faculty of Human Development, Universiti Perguruan Sultan Idris; ³Institute of Tropical Biodiversity & Sustainable Development, Universiti Malaysia Terengganu; ⁴Centre for General Studies and Cocurricular, Universiti Tun Hussein Onn, Malaysia

ABSTRACT

Work family conflict issue has received increasing attention by researchers involving the psychometric properties of measurement scale and its factor structures. Thus, the present study evaluated the psychometric properties and confirmed the factor structure of the work family conflict. A survey design using self-administered questionnaire was conducted to collect the data from 487 teachers in East Coast of Malaysia (Kelantan, Terengganu and Pahang) through multistage-random sampling technique. Results of exploratory factor analysis performed using Principal Component Analysis (PCA) yielded two factor structures with the cut off value of loading factor (λ_x) is 0.50 with rotated solution is Varimax. Further, the confirmatory factor analysis (CFA) also confirmed the scale as a two model factor with good fit indices of $p < 0.01$, $\chi^2/df = 2.41$, RMSEA = 0.05, CFI = 0.99, PCFI = 0.63. All items also yielded acceptable factor loading (λ_x) ranging from 0.72 to 0.94. Thus, the work family conflict scale is a valid and reliable instrument among Malay speaking teachers in the East Coast of Malaysia and proved as a two factor models (e.g. work conflict and family conflict) as the best model fit. Benefits of the measure and uses are discussed.

Keyword: *Work Family Conflict, Exploratory Factor, Confirmatory Factor, and Psychometric Measurement Instrument.*

INTRODUCTION

The 10th Malaysia Plan achievement (2010-2015) reported an increase in the number of female labor force from 46.8 per cent in 2010 to 55.0 per cent by 2015 (Department of Statistics Malaysia⁵). Among the impact of career women is the desire to build a family and at the same time want to stay in the career. As Malaysia's workforce encompasses 62.4 per cent of workers who have married 44.0 per cent are from the dual-income group (Department of Statistics Malaysia⁵), the issue of work conflicts as a result of competing claims between homework and employment is inevitable. While working, they are still obliged to fulfill other responsibilities as husbands, wives, fathers, mothers and boys and girls. Concerns about the adverse impact of work family conflict on individual and family wellbeing along with societal impacts have gained increasing attention among researchers in the east and

west as changing demographic patterns and economic globalization have led to increasing numbers of women into the workforce. Work family conflict according to Greenhaus and Beutell⁸ is a form of inter-role conflict which mutually incompatible leading to role pressures. Work family conflict distinguished by two conflict directions namely work to family conflict (WFC) (e.g. entertaining clients' call during family time) and family to work conflict (FWC) (e.g. cancel a meeting due to unavailability of babysitter). Dobreva-Martinova, Villeneuve, Strickland and Matheson⁴ revisited role theory (Davis³; Kahn et al.¹⁴) as a useful framework for understanding how holding different roles affects the wellbeing of individuals and organisational effectiveness.

The current study attempts to validate Netemeyer, Boles and McMurrian¹⁶ work family scale, one of the most cited instruments and measuring both dimensions of WFC and FWC eventhough with lesser number of

items compared to Kelloway, Gottlieb and Barham¹⁵ as well as Carlson, Kacmar & Williams² (Jain & Nair¹²; Shaffer, Janice & Hsu²⁰). In Malaysia, a few studies of work family conflict scale met the psychometric quality (Ismail & Nordin¹¹; R Zirwatul Aida¹⁷), however, none of these studies used the combination of both EFA and CFA to prove the validation of Netemeyer et al.¹⁶ scale. For example, Ismail and Nordin's¹¹ study mainly conducted CFA involving married female teachers which constraints the validation in that particular study, while, the study by R Zirwatul Aida¹⁷ assessed the factor structure underlying work family conflict scale through EFA. Thus, the objective of the study is to evaluate the measurement model fit of work family conflict scale among teachers in East Coast of Malaysia expands the respondents' demography profiles including both genders and all marital status.

The current study expands previous study by conducting EFA and CFA in an attempting to explore and confirm the factor structure of Netemeyer et al.¹⁶ work family conflict scale. Specifically, the main objectives are:

1. to explore the factor structure and psychometric properties of work family conflict scale among school teachers in East Coast of Malaysia.
2. to confirm the reliability and validity of work family conflict scale.
3. to examine the relevancy of work family conflict scale in Malaysian context.

METHODOLOGY

Sample: 487 secondary school teachers from three-state in Malaysia i.e. Terengganu, Kelantan and Pahang were participated representing 22.79% (111) males and 77.21% (376) females and collected using multistage – random sampling techniques. In the initial stage of data collection, the questionnaires were distributed to 600 teachers, however, due to incomplete and missing data, the number has been reduced to 487 (81.17% response rate).

Research Instrument: Netemeyer et.al¹⁶ work family conflict scale was translated from English to Malay language using back to back translation. Example of items for WFC (e.g. “My job produces strain that makes it difficult to fulfill family duties”) and FWC (e.g. “Family-related strain interferes my ability to perform job-related duties”). Ranging from 1 (*strongly*

disagree) to 7 (*strongly agree*) with the reliability $\alpha = 0.93$ and $= 0.94$ respectively. CFA confirmed the scale as a two model factor with good fit indices of $p < 0.001$, $\chi^2/df = 2.41$, RMSEA = 0.05, CFI = 0.99, PCFI = 0.63. All items also yielded acceptable factor loading ranging from 0.72 to 0.94.

Data Analysis: The data were analyzed by using the statistical software namely SPSS -23 and AMOS – 23. Using SPSS 23, we conducted the data screening process, descriptive statistics analysis (percentage and frequency) and principal component analysis utilized to extract the factor structure of the scale. The CFA was tested using few indicators or indices. Overall measurement fit depends on the smaller value of chi-square (χ^2), Goodness of Fit Index (GFI) and Comparative Fit Index (CFI) are greater than 0.90 and Root Mean Square Error of Approximation (RMSEA) is lower than 0.80.

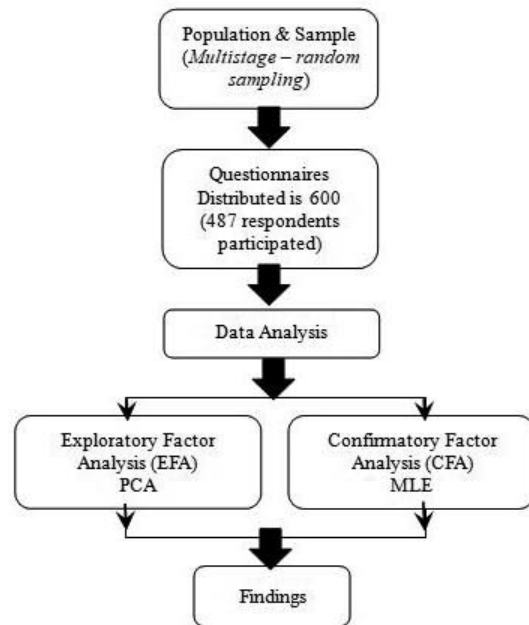


Figure 1: Data analysis flow chart

RESULTS

Demographic Profiling of the Respondents: From a total of 487 respondents, 111 (22.79%) were male and 376 (77.21%) were female. The range of age groups was from 30 years and below (n= 19, 3.9%), 31 to 40 years (n=148, 30.39%), 41 to 50 years (n= 212, 43.53%) and 51 years and above (n=108, 22.18%). Majority of the respondents were ethnic Malay (N= 462, 94.87%), followed by Chinese (n=20, 4.11%) and Indian (n= 5, 1.03%). For marital status, 450 respondents (92.40%) were married, 24 respondents (4.93%) were single, 6 respondents (1.23%)

were divorced and the remainder 7 respondents (1.44%) were widowed. About 158 respondents (32.44%) reported the maximum five children and above, 97 respondents (19.92%) have four children, 86 respondents (17.66%) have three children, 57 respondents (11.70%) have two children and 39 respondents (8.01%) have one child. The remainder of the respondents reported not having any children (n=50, 10.27%).

Exploratory Factor Analysis (EFA): Netemeyer et al.¹⁶ work family scale was examined for its factorability. All the criterion achieved the recommendation values

including; all 10 items inter-correlated items at least 0.30 coefficients, the KMO value of 0.90, the Bartlett’s test of sphericity reached statistical significance, $\chi^2 (45) = 9093.82, p < .001$ as well as the diagonals of the anti-image correlation matrix (over .50). Two distinct factors underlies work family conflict scale after undergoing Varimax rotation, namely WFC (eigenvalue = 5.90) and FWC (eigenvalue = 1.73). All items loaded in a simple structure (WFC: between 0.78 and 0.89; FWC: between 0.73 and 0.88). Both factors explain 76.36% of the variance as shown in Table 1.

Table 1: Factor Structure of WFC Scale

Items	Factors	1	2
WFC items	Q1. The demands of my work interfere with my home and family life.	0.78	
	Q2. The amount of time my job takes up makes it difficult to fulfill my family responsibilities.	0.89	
	Q3. Things I want to do at home do not get done because of the demands my job puts on me.	0.88	
	Q4. My job produces strain that makes it difficult to fulfill family duties.	0.86	
	Q5. Due to work related-duties, I have to make changes to my plans for my family activities.	0.78	
FWC items	Q6. The demands of my family or spouse/partner interfere with work-related activities.	0.73	
	Q7. I have to put off doing things at work because of demands on my time at home.	0.84	
	Q8. Things I want to do at work don’t get done because of the demands of my family or spouse/partner.	0.88	
	Q9. My home life interferes with my responsibilities at work such as getting to work on time, accomplishing daily tasks, and working overtime.	0.85	
	Q10. Family-related strain interferes with my ability to perform job-related duties.	0.86	
Eigenvalue		5.90	1.73
% Variance		59.03	17.36
% Cumulative Variance		76.36	

Fitting–Measurement Model

Confirmatory Factor Analysis (CFA): The value of loading (λ) expresses the relationship of each item to the underlying construct. Thus, using the result of analysis, this study found that the items of Work Conflicts (WC_1 to WC_5) had strongest association to their underlying construct (Work Conflicts) and the items of Family Conflicts (FC_1 to FC_5) had strongest association to their underlying construct (Family Conflicts) with the value of loading factors are greater than 0.60 (Hair et al., 2013).

The values of the Average Variance Extrated (AVE) for both construct namely Work-Family Conflict are 0.70 and above are considered good (Hair et al.⁹). It indicates that the level of variance captured by a construct versus the level due to measurement error is categorized as very good (Fornell-Larcker⁶). Further, the value of composite reliability(CR) is 0.70 and above which means the variance of indicator is not accounted by measurement error or it is commonly represented by the square standardized multiple correlation which range 0 to 1 (Bollen¹; Joreskog & Sorbom¹³).

Table 2: The Value of Loading Factor, Construct Validity, and Reliability

Item		Construct	Estimate (Loading)	AVE	CR
WC 1	<---	Work Conflict	0.786	0.701	0.921
WC 2	<---	Work Conflict	0.879		
WC 3	<---	Work Conflict	0.900		
WC 4	<---	Work Conflict	0.887		
WC 5	<---	Work Conflict	0.718		

Cont'd...

FC_2	<---	Family Conflict	0.876	0.749	0.923
FC_3	<---	Family Conflict	0.941		
FC_4	<---	Family Conflict	0.839		
FC_5	<---	Family Conflict	0.800		

This study obtained that the critical values (C.R) are greater than 1.96 and 2.57 (0.05 & 0.01 - two tail) or all indicators have significant reflecting for each of constructs (Refer Table 3).

Table 3: The Work and Family Conflicts

Item		Construct	Estimate	S.E.	C.R.	P	Label
WC_1	<---	Work Conflict	1.000				
WC_2	<---	Work Conflict	1.110	0.043	25.634	***	par_1
WC_3	<---	Work Conflict	1.127	0.051	22.064	***	par_2
WC_4	<---	Work Conflict	1.117	0.051	21.724	***	par_3
WC_5	<---	Work Conflict	0.852	0.048	17.902	***	par_4
FC_2	<---	Family Conflict	1.000				
FC_3	<---	Family Conflict	1.016	0.035	29.336	***	par_5
FC_4	<---	Family Conflict	0.922	0.038	24.482	***	par_6
FC_5	<---	Family Conflict	0.842	0.038	22.436	***	par_7

Using the result of analysis, we found that all-covariance matrix is significant relationship with each other (Refer Table 4).

Table 4: Covariance Test

Item		Construct	Estimate	S. E.	C. R.	P	Label
Work Conflict	<-->	Family Conflict	0.965	0.11	8.772	***	par_8
e9	<-->	e10	0.334	0.047	7.161	***	par_9
e1	<-->	e2	0.256	0.055	4.697	***	par_10
e1	<-->	e5	0.149	0.057	2.614	0.009	par_11

Table 5: Fit Indices CFA - 2 Factors

Category	Index	Threshold	First-Modification	Second-Modification
Absolute Fit Indices	Chi-Square/df	< 3.00	4.214	2.411
	RMSEA	< 0.08	0.081	0.054
	GFI	> 0.95	0.954	0.976
	PCLOSE	> 0.05	0.000	0.337
Incremental Fit Indices	AGFI	> 0.80	0.915	0.954
	CFI	> 0.95	0.977	0.991
	TLI	> 0.90	0.965	0.986
	NFI	> 0.90	0.970	0.985
Parsimonious Fit Indices	PNFI	> 0.50	0.647	0.629
	PCFI	> 0.50	0.651	0.633

Sources: Hair et al., 2010

As shown in Table 5, the First-Modification refers to the measurement model has been fitting and some thresholds are not achieved. For instance, the value of Chi-Square/df should be less than 3.00 and the empirical result is 4.214. Further, PCLOSE is 0.000 or significant at the level 1 percent as absolute fit indices. By removing item FC_1 (the Second –Modification), results achieved all the threshold achieved recommended by Hu and Bentler¹⁰ (eg. Chi-Sq/df= 2.411 and PCLOSE =0.337).

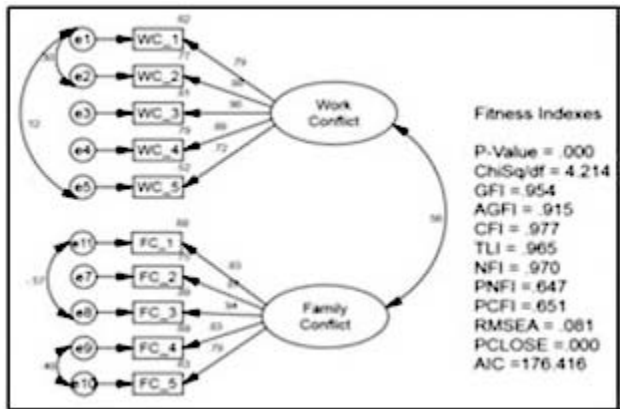


Figure 2: First-Modification (Fitting)

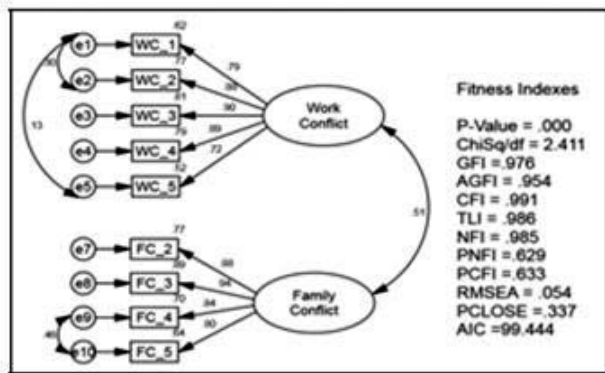


Figure 3: Second-Modification (Fitting)

CONCLUSION

This study evaluated the factor structure and psychometric properties of Netemeyer et al.¹⁶ work family conflict scale. The two extracted factors from EFA found in this study consistent with previous studies by Gudmundson⁷, Netemeyer et al.¹⁶ and Razak, Omar and Yunus (2010). The two factors of 10 items of work family conflict had 76.36 of total variance explained. CFA also confirmed that this scale is a reliable and valid scale explained by two underlying factors measuring dual conflict namely work conflict and family conflict. In other words, the CFA supported the 10-item 2-factor model of Netemeyer et al.’s scale rotated through

varimax rotation of principle component analysis (EFA). This finding was consistent with previous studies in East and Western countries (Jain & Nair¹²; Scott, et al.¹⁹).

This is among a few studies that validate work family conflict scale in the teaching profession focusing all genders and marital status demographic characteristics. The major strength of this study it expanded previous study (Ismail & Nordin¹¹) by including the use of EFA and CFA involving teachers especially in the context of the East Coast of Malaysia. It can be concluded that this study can contribute to a better understanding on work family conflict scale (Netemeyer, et al.¹⁶) in the context of Malaysian study, Malay speaking samples especially among school teachers. This scale appears to be a psychometrically robust measure of work family conflict which can be applied in various industrial and organizational fields and benefitted to the academicians as well to practioner. Most importantly, the current study supports the psychometric property of western adopted work family conflict scale being used among Malaysian respondents that represent different socio cultural background.

Ethical Clearance: Taken from the committee

FUNDING & ACKNOWLEDGMENTS

This study was funded by the Ministry of Higher Education (MOHE) of Malaysia. The authors would like to thank Universiti Malaysia Terengganu for supporting this work. We also thanks all teachers for their voluntary participation in this study.

Conflict of Interest: NIL

REFERENCES

1. Bollen K. A. A new incremental fit index for general structural equation models. *Sociological Methods & Research*. 1989; 17(3): 303-316.
2. Carlson D.S, Kacmar K.M, Williams L.J. Construction and initial validation of a multidimensional measure of work family conflict, *Journal of Vocational Behavior*. 2000; 56: 249-276
3. Davis L. V. Role theory and social work treatment. In F. J. Turner (Ed.), *Social work treatment: Interlocking theoretical approaches*. 1996; pp. 581-600. New York: The Free Press.

4. Dobрева-Martinoва T, Villeneuve M, Strickland L, Matheson, K. Occupational role stress in the Canadian forces: Its association with individual and organizational well-being. *Canadian Journal of Behavioural Science*. 2002; 34: 111-121.
5. DSM. Labor Force Survey Report, Malaysia, 2015. Department of Statistics Malaysia. 2016; Retrieved from https://www.dosm.gov.my/v1/index.php?r=column/cthemebycat&cat=429&bul_id=K0dpZG1Ra1NEa2ZPSUg2SzBJSTR0dz09&menu_id=U3VPM1doYUxzVzFaYmNkWXZteGduZz09
6. Fornell C, Larcker, D. F. Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of marketing research*. 1981; 382-388.
7. Gudmundson, A. J. Balancing work and family: Perspectives of Australian dual-earner parents. (Doctoral dissertation, The Griffith University, Brisbane, Australia). 2003; Retrieved from: <http://www4.gu.edu.au:8080/adt-root/uploads/approved/adt-QGU20040512.164321/public/02Whole.pdf>.
8. Greenhaus J. H, Beutell N. J. Sources of conflict between work and family roles. *Academy of Management Review*. 1985; 10: 76-88.
9. Hair J.F, Sarstedt M. J, Hopkins L, G. Kuppelwieser V. Partial least squares structural equation modeling (PLS-SEM) An emerging tool in business research. *European Business Review*. 2014; 26(2): 106-121.
10. Hu L. T, Bentler P. M. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal*. 1999; 6(1): 1-55.
11. Ismail Z, Nordin MS. Teachers' Work-Family Conflict in Malaysia: Scale Validation. *International Journal of Business and Social Research*. 2012; 2(5): 122-31.
12. Jain S, Nair, S.K. Work-family conflict in India: Construct Validation and Current Status, Asia –Pacific Journal of Management Research and Innovation. 2016; 12(1): 31-45
13. Jöreskog, K. G, & Sörbom, D. LISREL 8: Structural equation modeling with the SIMPLIS command language. Scientific Software International. 1993.
14. Kahn R. L, Wolfe D. M, Quinn R. P, Snoek J. D, Rosenthal, R. A. *Organisational Stress: Studies in Role Conflict and Ambiguity*. New York: Wiley. 1964.
15. Kelloway EK, Gottlieb HB, Barham L. The source, nature, and direction of work and family conflict: A longitudinal investigation. *J Occup Health Psych*. 1999; 4(4): 337. doi: 10.1037/1076-8998.4.4.337.[PubMed]
16. Netemeyer R. G, Boles J. S, McMurrian R. Development and validation of work-family conflict and family-work conflict scales. *Journal of Applied Psychology*. 1996; 81, 400-410.
17. R Zirwatul Aida R Ibrahim. Psychosocial Work Environment, Organisational Justice and Work Family Conflict as Predictors of Malaysian Worker Wellbeing, (Doctoral dissertation, Victoria University, Melbourne). 2012.
18. Razak, A. Z. A. A., Omar, C. M. Z. C., & Yunus, J. N. Family issues and work-family conflict among medical officers in Malaysian public hospitals. *International Journal of Business and Social Science*. 2010; 1: 26-36.
19. Scott L. Boyar, Charles M. Carson, Donald C. Mosley Jr, Carl P. Maertz Jr, Allison W. Pearson. "Assessment of the validity of Netemeyer et al.'s (1996) WFC and FWC scales", *International Journal of Conflict Management*. 2006; Vol. 17 Issue: 1: pp.34-44. <https://doi.org/10.1108/10444060610734163> Permanent link to this document: <https://doi.org/10.1108/104440606107341>
20. Shaffer M. A, Janice R. W. J, Hasu, Y. Expanding the boundaries of work-family conflict research: A review and agenda for future research, *International Journal of Cross Cultural Management*. 2011; 11 (2): 221-268

Organ Donation Intention: The Influence of Attitude, Altruism and Spiritual Belief in Malaysia

Noor'ain Mohamad Yunus¹, Dilla Syadia Ab Latiff¹, SyukrinaAlini Mat Ali¹, Noor Azzah Said¹, Sri Fatiany Abdul Kader Jailani¹

¹Faculty of Business Management, Universiti Teknologi MARA, Shah Alam Selangor. Malaysia

ABSTRACT

Organ shortage is widely discussed in many countries despite the growing acceptance of organ transplantation procedure worldwide. In Malaysia itself, only 420,601 pledgers which only represent 1.3 percent of the total population of Malaysia. This is not sufficient to meet the demand from patients in the organ waiting list. Literature reported that the level of awareness in Malaysia is still low with respects to organ donation. Malaysia as a multi-cultural nation, organ donation becomes very complex due to personal belief, emotions, rituals and practices. Religious views are thought to be one of the major barriers to organ transplantation. Though, no major religion strictly prohibits it, although there are differences in opinion within some religions. Therefore, the primary focus of this study is to identify the factors that influence the society towards organ donation intention. A quantitative approach was used to explore the relationship among the variables. A survey was conducted among 200 respondents using validated questionnaire. The data was analysed using Partial Least Square Structural Equation Modelling (PLS-SEM) approach. The result revealed that spiritual belief and altruism significantly influenced intention regarding organ donations. The outcome of this study aims to inform future health campaigns as there will be a better insight on the role that these elements play in the population's decision to be an organ donor. It is suggested that future studies should look into the possibility of positioning education level as moderator to affect the relationship between the factors that influence the society to pledge for organ donation and organ donation intention. Future studies should also look into the possibility investigating the effect of gender, age and religion on the relationship between factors that influence society to donate dimensions and organ donation intention dimensions.

Keywords: *Organ donation; attitude; altruism; spiritual belief; intention*

INTRODUCTION

Transplantation has become a possible treatment for patients with end-stage organ failure Siminoff et al⁴⁶. In 1954 when the first kidney transplant was successfully performed, the demand for organs has escalated Ehrle¹¹. Hyde²¹ stated that the rising demand for organ donation is due to increase awareness of the benefits from this procedure such as improvement in quality of life. Nevertheless, with 60 years of progress in organ transplantation, the supply of donor organs is still insufficient. This has than lead to the waiting lists getting longer and the figure is alarming all over the world.

The scarcity of organ is an unresolved global problem although various methods have been introduced worldwide to combat this Jingwei, Yu-Hung & Ching²⁴. World Health Organization⁵² reported that

most developing countries are left behind in number of potential donors in per million populations (p.m.p). Statistics by International Registry on Organ Donation and Transplant IRODAT²² revealed that potential deceased organ donors who have pledge in developing countries like Philippines and Malaysia with only 0.2 and 0.7 p.m.p respectively. These figures are among the lowest in developing countries and it is worst compared to the highest donation rate country, Spain (35.1 p.m.p.) Malaysia National Transplant³² & IRODAT²².

Low organ donation rates have been linked to a lack of public awareness and knowledge about organ donation in general Siminoff & Mercer⁴⁶, misleading interpretation of religious fatwas in relation to organ donation Wakefield et al⁵¹, cultural concerns about how dead body is treated Ashkenazi et al¹, and mistrust of the healthcare system (Anwar Naqvi et al., 2014). There

are many reasons why Malaysians are less likely to agree to organ donations and both social and religious issues play an important role and this reflects a multi-ethnic, multicultural, and multireligious community like Malaysia Robson, Razack & Dublin⁴¹. A consistent finding from studies investigating barriers to increasing the number of organs available for transplantation is the rejection of the option to donate organs by the potential donors' next of kin. The shortage of organs for transplantation makes it important to understand why majority of Malaysians do not accept organ donation. Therefore, this quantitative research focused toward examining the factors associated with intention to become an organ donor in Malaysia.

Organ Donation and Transplant in Malaysia: Organ donation and transplantation in Malaysia started in 1970's where the first kidney transplant was carried out in December 1975 and the first deceased donation in 1977 Kassim²⁵. Since then, the Ministry of Health (MOH) has taken number of initiatives to improve the organ donation and transplantation issues in Malaysia. In 2007, the government has strengthened its existing transplantation policy by introducing the National Organ Tissue and Cell Transplantation Policy which serve as a guideline for the future expansion and development of transplantation services.

National Transplant Resource Centre (NTRC) was set in 1997 up to monitor the progress of the organ, tissue and cell transplantation programme in the country. NTRC is responsible to conduct campaign to improve awareness of the importance of organ donation to the public. In 1999, Organ Donor Card was launched as an indication of a person's registration as an organ donor. In an attempt to boost the organ donation rate, NTRC has started the Organ Donation Awareness Week since 2014 which is held throughout the country.

There are various activities run by NTRC such as campaign, talk, organ donation run to make people aware of the importance of organ donation. Most of the talk were conducted in government agencies, universities and events. Currently NTRC is active in promoting organ donation through 'Organ Donation Drive' which is being held in malls and mosque throughout Klang Valley. Despite the number of activities provided, the number of current pledgers in Malaysia are 420, 610 representing only 1.3 per cent of the population. This is considered low compared to the total population of Malaysia.

LITERATURE REVIEW

Organ donation is defined as a surgical procedure for the removal of organs from a donor for the purpose of transplantation with the intention to save and improves lives Malaysia National Transplant³². Up to February 2018, there were only 2023 organ and tissue donations took place in Malaysia (NTRC, 2018). Malaysia National Transplant identified two types of organ donation;(i) deceased organ donation – the donor is someone who has died where an organ is removed after death and (ii) living organ donation – the donor is still alive and chooses to donate one of their kidney or part of their live.

Determinants of Intention towards Organ Donation

Attitude towards Organ Donation: Regardless of race or ethnicity, individuals appear to support organ donation due to positive attitudes toward donation (Morgan & Miller & Arasaratnam, 2003). According to the Institute of Medicine of the National Academies (2006), individual's attitudes towards organ donation depends on awareness and knowledge, which suggest educating people and providing the right information could shape positive attitude towards organ donation. Empirical research found that a favourable attitude toward organ donation especially from health professionals can positively influence a potential donor Schaeffner, Windisch, Freidel, Breitenfeldt, & Winkelmayr⁴⁵. Therefore, the following hypothesis was formulated:

H₁: Individuals who have positive attitude are more likely to have a positive intention regarding organ donation.

Altruism towards Organ Donation: Altruistic deeds were most influenced by the desire to voluntarily saves life and help to improve organ donation intention (Hyde & White, 2011). Altruism is one of behaviour that have been successful in identifying certain psychological variables that appear to be associated with organ donor willingness Morgan & Miller³⁶. Sanner⁴⁴ found that altruism influenced non-donors to change their intention towards organ donation. However, Kopfman and Smith's²⁸, found in their studies, that those who have already registered as a donor are knowledgeable and altruistic. Thus, the following hypothesis was offered.

H₂: An altruistic individual is more likely to have a positive intention regarding organ donation.

Spiritual Belief: Spirituality is defined as the broad personal search for meaning, purpose, and value in life Baumsteiger, Chenneville, & McGuire⁴; Ellor & McGregor¹². Spiritual beliefs relate to perspective on life, death, and the nature of reality Holland, Kash, Passik, Gronert, Sison, Lederberg, & Fox¹⁸. Spirituality span a wide range, and one of the components is religion Hill & Pargament¹⁷ though the use of the term's religion and spirituality as synonymous Gorsuch & Walker¹⁴. Furthermore, the sense of purpose is linking to the importance of volunteer activity to a person's well-being Thoits⁴⁷. Therefore, the following hypothesis was formulated:

H₃: The spiritual belief of an individual influence the intention regarding organ donation.

The development of the conceptual model of this study was guided by A Model of Willingness to Become a Potential Organ Donor developed by Horton and Horton¹⁹ and review of previous literature related to organ donation and transplantation. The conceptual model is illustrated in the conceptual model in Figure 1.

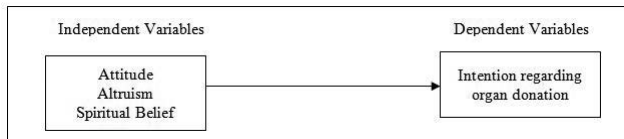


Figure 1: Conceptual model

METHODOLOGY

This study employed quantitative approach and convenience sampling technique was utilised to select respondents who can provide the desired information. A survey was conducted among adults aged 18 years old and above. G*Power software was employed to calculate the sample size and it suggested 79 samples. However, researchers decided to distribute 200 questionnaires as the precision and reliability of PLS-SEM results can be increased with larger sample size Hair et al¹⁶. However, 149 questionnaires were returned, yielding 74.5% of the response rate.

The respondents were asked to respond to a five-point Likert scales that gauge their perception towards the organ donation. The questionnaire was divided into two sections; (i) Section A relates to demographic background, and (ii) Section B enquires about the factors that influence the respondents' intention to donate organ. The study adapted measurement items from several

studies; (i) a total of four items from Kopfman and Smith²⁸ and five items from Rumsey, Hurford and Cole (2003) to operationalize attitude, (ii) five items from Kopfman and Smith²⁸ and to operationalize altruism (iii) five items from Kopfman and Smith²⁸ to operationalize organ donation intention. PLS-SEM 3.0 was used to evaluate the outcome of the study.

RESULTS AND FINDINGS

Harman's single-factor test (Podsakoff & Organ, 1986) in which all items are loaded into one common factor was employed to address the issue of common method bias. An exploratory factor analysis (EFA) was conducted and the result revealed that there was no common factor loading on all measures, where the total variance for a single factor was 27.13% which is less than the suggested cut off point of 50% (Podsakoff & Organ, 1986). Therefore, common method bias was not a threat in this research. A descriptive analysis was conducted to describe the demographic profile of the respondents. Based on the analysis, most of the respondents were female aged between 25-34 years old and Islam.

Measurement Model: Smart PLS 3.0 was used to empirically analyse the conceptual model. In order to confirm the validity and reliability of the data in the study, the assessment of measurement model needs to be conducted. Table 1 shows the outer loadings, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) examine the measurement model reflectively. All the loadings exceeded the minimum threshold value of 0.60 for the exploratory study (Ramayah, Cheah, Franchis Chua, Hiram Ting, & Memon, 2016). The measurement of internal consistency reliability of the Cronbach's Alpha also exceeded the minimum threshold level of 0.70. Based on the CR values, all the constructs possessed high levels of internal consistency reliability. Furthermore, the AVE values (convergent validity) were greater than the recommendations value of 0.50 and above; hence, they constituted convergent validity for all constructs. Due to low loading and to increase the AVE value respectively, items A1, A2, A4, SB 1, SB 3, SB 5 were deleted. All constructs comprising altruism, attitude, spiritual belief and organ donation intention met the minimum value of the threshold requirement by which after the deletion process, the CR < 0.7 and AVEs were greater than 0.5 Hair¹⁶.

Table 1: Internal Consistency and Convergent Validity

Construct	Items	Outer Loading	Cronbach's alpha	AVE	CR
Altruism	If I could help save somebody's life, I would do everything possible.	0.758	0.790	0.539	0.854
	I enjoy doing small favours every day for the people I care about.	0.680			
	I think helping others are one of the most important aspects of life.	0.757			
	I enjoy working for the welfare of others.	0.729			
	My family and I tend to do what we can, to help those less fortunate than ourselves.	0.743			
Attitude	I support the idea of organ donation for transplantation purposes.	0.846	0.808	0.636	0.874
	I believe that organ donation is an act of compassion.	0.816			
	I believe that organ donation is an unselfish act.	0.733			
	I view organ donation as a benefit to humanity.	0.790			
Spiritual Belief	I don't have religious objections to organ donation.	0.642	0.840	0.559	0.883
	I think that organ donation is safe and effective practice.	0.725			
	I trust that doctors and hospitals use donated organ as they are intended to be used.	0.714			
	I think that doctors would try just as hard to save my life whether I plan to be an organ donor.	0.735			
	In general, I think organ donation is a good thing.	0.789			
	Organ donation is consistent with my moral values and beliefs.	0.864			
Organ donation intention	I will register as an organ donor in the future.	0.917	0.942	0.813	0.956
	I will give my organ to a person who needs it.	0.921			
	I will donate my organ to another person after my death.	0.925			
	I will donate my organ to my next of kin after my death.	0.882			
	I would donate my bone marrow to a stranger who needs it.	0.862			

Discriminant validity was conducted to discover the difference between a particular construct and the other construct in the study Lowry & Gaskin³⁰, which resulted from the adoption of different theories in this study Hair¹⁶. HTMT result reveals that all values met the criterion of HTMT, which denoted that discriminant validity has been established. In sum, the sufficiency of both convergent and discriminant validity exists as suggested through the evaluation of the measurement model; hence, the researchers found it appropriate to proceed with the evaluation of the structural model.

Structural Model: Structural model measurement was conducted after all the requirement of measurement model was fulfilled. It is important to address collinearity issue as the existence of multicollinearity does not contribute to a good regression model Pallant³⁸. By using PLS algorithm,

the value of all the construct meet the requirement (Variance inflation factor not more than 5), ranging from 1.244 to 1.425. Therefore, it can be concluded that there is no issue of multicollinearity in this study.

Hypothesis testing was conducted using bootstrapping resampling technique with 1000 sub-samples were used to ensure the accuracy of the PLS estimates Hair et al¹⁶. The result was revealed in the Table 2 which are two construct which are altruism and spiritual belief were found to be significant at 99% confidence interval (Altruism → Organ donation intention $\beta = 0.253$, $p < 0.001$; Attitude → Organ donation intention, $\beta = 0.126$, $p < 0.238$; spiritual belief → Organ donation intention, $\beta = 0.467$, $p < 0.000$;). Thus, it can be concluded that only two hypothesized relationships in this study are supported.

Table 2: Path Coefficient Assessment

	Relationship	Path Coefficient	Std error	LL	UL	T value	Decision
H ₁	Altruism -> Intention	0.253	0.079	0.076	0.401	3.209**	Supported
H ₂	Attitude -> Intention	0.126	0.106	-0.075	0.321	1.182	Not supported
H ₃	Spiritual belief -> Intention	0.476	0.08	0.309	0.626	5.923**	Supported

**p < 0.01, *p < 0.05

After disclosing the significant relationship between independent and dependents variable, the result for the values of coefficient of determination (R²), predictive relevance (Q²), and effect size (f²) were revealed and presented in Table 3. The R²-values showed the amount of variance in the endogenous (organ donation intention) construct that can be explained by all the exogenous constructs (altruism, attitude and spiritual belief) linking to it Astrachan, Patel, & Wanzenried² such as family harmony or family cohesion. Its capability to evaluate complex measurement models and structural paths involving a multitude of variables and levels of constructs has enabled family business researchers to investigate complex and intricate relationships that previously could not be easily untangled and examined. In many cases, however, researchers struggle to meet some of the challenging requirements of covariance-based SEM (CB-

SEM. Therefore, the result of the R²-values of 0.518 suggest that the exogenous constructs in this study moderately explain 51.8% of variances in organ donation intention as recommended by Chin, Peterson, and Brown⁹ Then, the blindfolding procedure was conducted to obtain the predictive capability of the model by using Q²Hair, Hult, Ringle, & Sarstedt¹⁵. Based on the results, the Q²-values for organ donation intention was 0.387. Thus, it can be concluded that the altruism, attitude and spiritual belief possess predictive relevance over the organ donation intention as the Q²-values were all above zero as outlined by Hair et al¹⁵. The f² values represent the effect size of altruism, attitude and spiritual belief on organ donation intention. According to the results in Table 4, the effect size of altruism, attitude, and spiritual belief were 0.101 (small), 0.016 (small) and 0.244 (medium) respectively based on the guidelines provided by Cohen (1988).

Table 3: Determination of Coefficient (R²), Predictive relevance (Q²) and Effect Size (f²)

Construct	R ²	Q ²	f ²	Size of effect	VIF
Altruism	0.518	0.387	0.101	Small	1.316
Attitude			0.016	Small	2.047
Spiritual Belief			0.244	Medium	1.922

DISCUSSION, LIMITATIONS AND CONCLUSIONS

The overall aim of this study was to investigate the factors predicting organ donation intention. The findings revealed that attitude, altruism and spiritual belief accounting for a significant 50.8% of the variance in the intention to register. Spiritual belief and altruism emerged as significant predictors of intention. Looking at the relative importance of the exogenous constructs in predicting intention regarding organ donation, it is evident that spiritual belief is the most important predictors followed by altruism. The result of this study is in line with those of previous studies which found that spiritual belief is the key factor influencing organ donation intention Lam & McCullough²⁹; Bresnahan, Guan, Smith,

Wang & Edmundson⁷; Bortz, Ashkenazi & Melnikov⁶; Hvidt, Mayr, Paal, Frick, Forsberg & Büssing²⁰. As majority of the respondents were Malay, thus their religious belief would be the driver towards intention. Religious belief is closely related to spiritual belief Hill & Pargament¹⁷; Gorsuch & Walker¹⁴ it is not surprising that spiritual belief significantly influenced their organ donation intention. Spiritual belief is closely related on an individual perspective on life Holland, Kash, Passik, Gronert, Sison, Lederberg, & Fox¹⁸ and sense of purpose of life Thoits⁴⁷ and this was found to be a key mechanism linking the importance of helping others. However, this driver is only one part of individual belief system.

There is another key driver to organ donation intention as the findings of this study discloses that there

is a significant relationship between altruism and organ donation intention. This finding is supported by results from previous studies on organ donation Richardson & Hurwitz⁴⁰; Kopfman & Smith²⁸; Morgan & Miller³⁶; Bolt, et al.⁵; Nuffield Council on Bioethics³⁷; Moorlock, Ives, & Draper³⁵. This can be explained by the fact that the majority of the respondents of this study were women, and based on previous literature, women are more empathetic and altruistic than men Chaplin & Aldao⁸; Auyeung, Allison, Wheelwright, & Baron-Cohen³; Christov-Moore, Simpson, Coudé, Grigaityte, Iacoboni, & Ferrari¹⁰ and women express a greater willingness and a more favourable attitude toward organ donation Thomson, Robinson & Kenny, 2002; Sanil⁴³; UNOS⁵⁰. Moreover, it can be explained by the fact that individuals are urged to donate partly to fulfil their motivation to help others and they believed that this will promote the kind of community where others would do the same for them. This is due to the increased feelings of empathy experienced by altruistic individuals.

The present study has several limitations. One of the limitations of the study is the lack of generalizability of most of the respondents were female and Muslim. Another limitation is that, the constructs, namely altruism, attitude and spiritual belief only took account of about 50.8% variation in intention regarding organ donation. Possibly there are other factors that could influence the organ donation intention among Malaysians. Further research should be conducted to identify other variables influencing intention regarding organ donation such as the gender, education level, religious view, knowledge and subjective norms.

In summary, the findings suggest for the development of the content for future campaign and programs in to induce awareness and persuade individuals to register as an organ donor. The results may provide insight into how organ donation registration rate may be improved. The healthcare providers and policy makers must be aware on the significant influence of spiritual beliefs on the intention regarding organ donation. They must acknowledge and respect the beliefs and values of our multicultural society and recognizing our diverse spiritual beliefs. Therefore, involvement of spiritual leaders and the medical community is imperative to increase the organ donation rate. Re-evaluation and enhancement of the current national program and policies on organ donation are crucial to enhance public awareness and acceptance towards organ donation to address the problem of organ shortage in Malaysia.

ACKNOWLEDGMENT

The authors would like to acknowledge Universiti Teknologi MARA (UiTM) and Faculty of Business and Management for supporting the research work.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Ashkenazi T, Lavee J, Mor E. Organ donation in Israel—achievements and challenges. *Transplantation*. 2015; 99(2), 265-266.
2. Astrachan, C. B., Patel, V. K., & Wanzenried, G. A comparative study of CB-SEM and PLS-SEM for theory development in family firm research. *Journal of Family Business Strategy*. 2014; 5(1): 116–128.
3. Auyeung B, Allison C, Wheelwright S, Baron-Cohen S. Brief report: development of the adolescent empathy and systemizing quotients. *Journal of autism and developmental disorders*. 2012; 42(10): 2225-2235.
4. Baumsteiger R, Chenneville T, McGuire J. F. The roles of religiosity and spirituality in moral reasoning. *Ethics & Behavior*. 2013; 23(4), 266–277.
5. Bolt S, Eisinga R, Venbrux E, Kuks J. B. M, Gerrits P. O. Personality and motivation for body donation. *Annals of Anatomy*. 2011; 193: 112-117.
6. Bortz A. P, Ashkenazi T, Melnikov S. Spirituality as a predictive factor for signing an organ donor card. *Journal of Nursing Scholarship*. 2015; 47(1): 25-33.
7. Bresnahan M. J, Guan X, Smith S. W, Wang X, Edmundson J. Z. Cultures of the soul: Spiritual beliefs about organ donation in China and the United States. *Chinese Journal of Communication*. 2010; 3(2): 133-146. doi:10.1080/17544751003740334.
8. Chaplin T. M., Aldao A. Gender differences in emotion expression in children: A meta-analytic review. *Psychological bulletin*. 2013; 139(4), 735.
9. Chin W. W, Peterson R. A, Brown S. P. Structural Equation Modeling in Marketing: Some Practical Reminders. *The Journal of Marketing Theory and Practice*. 2008; 16(4): 287–298.

10. Christov-Moore L, Simpson E. A, Coudé G, Grigaityte K, Iacoboni M, Ferrari P. F. Empathy: gender effects in brain and behavior. *Neuroscience & Biobehavioral Reviews*. 2014; 46: 604-627.
11. Ehrle R. Timely referral of potential organ donors. *Critical care nurse*. 2006; 26(2): 88-93.
12. Ellor J. W, McGregor J. A. Reflections on the words “religion,” “spiritual well-being,” and “spirituality.” *Journal of Religion, Spirituality & Aging*. 2011; 23(4): 275–278.
13. Fisher J. W. Investigating Australian education students’ views about spiritual well-being, as compared with teachers in schools. *International Journal of Children’s Spirituality*. 2009; 14(2): 151–167.
14. Gorsuch R. L, Walker D. Measurement and research design in studying spiritual development. In E. C. Roehlkepartain, P. E. King, L. M. Wagener, & P. L. Benson (Eds.), *The handbook of spiritual development in childhood and adolescence*. Thousand Oaks, CA: Sage Publications. 2006; pp. 92–103.
15. Hair J. F, Hult G. T. M, Ringle C. M, Sarstedt M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM) (2nd ed.)*. Los Angeles: SAGE Publication. 2016.
16. Hair J. F, Black W. C, Babin B. J, Anderson R. E. *Multivariate data analysis*. Harlow: Pearson Education Limited. 2014.
17. Hill P. C, Pargament K. I. Advances in the conceptualization and measurement of religion and spirituality. Implications for physical and mental health research [Review]. *American Psychologist*. 2003; 58(1): 64–74.
18. Holland J. C, Kash K. M, Passik S, Gronert M. K, Sison A, Lederberg M, Fox B. A brief spiritual beliefs inventory for use in quality of life research in life-threatening illness. *Psycho-Oncology: Journal of the Psychological, Social and Behavioral Dimensions of Cancer*. 1998; 7(6), 460-469.
19. Horton R. L, Horton P. J. A model of willingness to become a potential organ donor. *Social science & medicine*. 1991; 33(9): 1037-1051.
20. Hvidt N. C, Mayr B, Paal P, Frick E, Forsberg A, Büssing A. For and against organ donation and transplantation: intricate facilitators and barriers in organ donation perceived by German nurses and doctors. *Journal of transplantation*, 2016. 2016.
21. Hyde M. K, White K. M. To be a donor or not to be? Applying an extended theory of planned behavior to predict posthumous organ donation intentions. *Journal of Applied Social Psychology*. 2009; 39(4): 880-900.
22. International Registry on Organ Donation and Transplant (IRODAT). Database. 2013; Retrieved from <http://www.irodat.org/?p=database> on 20th October 2013.
23. Institute of Medicine of the National Academies. *Organ donation: Opportunities for action*. Washington, DC: National Academies Press. 2006.
24. Jingwei A. H, Yu-Hung A. L, Ching L. Living organ transplantation policy transition in Asia: towards adaptive policy changes. *Global health governance*. 2010; 3.
25. Kassim P. N. J. Organ transplantation in Malaysia: a need for a comprehensive legal regime. *Med. & L.* 2005; 24: 173.
26. Kevern P. Who can give spiritual care? The management of spiritually sensitive interactions between nurses and patients. *Journal of Nursing Management*. 2012; 20: 981–989.
27. Kline R. B. *Principles and Practice of Structural Equation Modeling*. New York: The Guilford Press. 2015.
28. Kopfman J.E, Smith S.W. Understanding the audiences of a health communication campaign: A discriminant analysis of potential organ donors based on intent to donate. *Journal of Applied Communication*. 1996; 24: 22-49.
29. Lam W. A, McCullough L. B. Influence of religious and spiritual values on the willingness of Chinese–Americans to donate organs for transplantation. *Clinical transplantation*. 2000; 14(5): 449-456.
30. Lowry P. B, Gaskin J. Partial Least Squares (PLS) Structural Equation Modeling (SEM) for Building and Testing Behavioral Causal Theory : When to Choose It and How to Use It. *IEEE Transactions on Professional Communication*. 2014; 57(2).

31. Macaulay J, Berkowitz L. (Eds.). Altruism and helping behavior. New York: Academic Press. 1970.
32. Malaysia National Transplant Resource Center (NTRC), Kuala Lumpur. 2012.
33. Ministry of Health. National Organ Tissue and Cell Transplantation Policy: Kuala Lumpur. 2007.
34. Molzahn A. E, Starzomski R, McDonald M, O'Loughlin C. Chinese Canadian beliefs toward organ donation. *Qualitative Health Research*. 2005; 15(1), 82-98.
35. Moorlock G, Ives J, Draper H. Altruism in organ donation: an unnecessary requirement?. *Journal of medical ethics, medethics-2012*. 2013.
36. Morgan S, Miller J. Communicating about gifts of life: The effect of knowledge, attitudes, and altruism on behavior and behavioral intentions regarding organ donation. *Journal of Applied Communication Research*. 2002; 30(2), 163-178.
37. Nuffield Council on Bioethics. Human bodies: donation for medicine and research. London: Nuffield Council on Bioethics, 2011.
38. Pallant J. *For the SPSS Survival Manual: A step by Step Guide to Data Analysis using IBM SPSS (6th ed)*. New York: Mc Graw Hill Education. 2011.
39. Ramayah T, Cheah J, Franchis Chua Hiram Ting, Memon M. A. *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using Smart PLS 3.0: An updated and Practical Guide to Statistical Analysis*. Kuala Lumpur: Pearson Malaysia Sdn Bhd. 2018.
40. Richardson R, Hurwitz B. Donors' attitudes towards body donation for dissection. *The Lancet*. 1995; 346: 277-279.
41. Robson N. Z. M. H, Razack A. H, Dublin N. Organ transplants: ethical, social, and religious issues in a multicultural society. *Asia Pacific Journal of Public Health*. 2010; 22(3), 271-278.
42. Rodrigue J. R, Cornell D. L, Howard R. J. Organ donation decision: comparison of donor and nondonor families. *American Journal of Transplantation*. 2006; 6(1): 190-198.
43. Sanil N, Thompson T. L, Cusella L. P. Persuasive effectiveness of organ donation message strategies: A comparative analysis of positive affect vs. fear appeal messages. Paper presented at the meeting of the Speech Communication Association, Chicago, IL. 1997.
44. Sanner, M. Attitudes toward organ donation and transplantation. *Social Science and Medicine*. 1994; 38: 1141-1152.
45. Schaeffner E. S, Windisch W, Freidel K, Breitenfeldt K, Winkelmayr W. C. Knowledge and attitude regarding organ donation among medical students and physicians. *Transplantation*. 2004; 77(11), 1714-1718.
46. Siminoff L. A, Gordon N, Hewlett J, Arnold R. M. Factors influencing families' consent for donation of solid organs for transplantation. *JAMA*. 2001; 286(1), 71-77.
47. Thoits P. A. Role-identity salience, purpose and meaning in life, and well-being among volunteers. *Social Psychology Quarterly*. 2012; 75(4): 360-384.
48. Thompson T. L, Robinson J. D, Kenny R. W. Gender differences in family communication about organ donation. *Sex Roles*. 2003; 49(11-12), 587-596.
49. Tumin M, Noh A, Ariffin R, Noriza R, Mohd Satar N, Yong S. L, Ng K. Low organ donation rate in Malaysia: A survey. 2014.
50. United Network for Organ Sharing. Transplant patient data source. 2002; Retrieved July 5, 2002, from the World Wide Web: <http://207.239.150.13/tpd/>.
51. Wakefield C. E, Watts K. J, Homewood J, Meiser B, Siminoff L. A. Attitudes toward organ donation and donor behavior: a review of the international literature. *Progress in Transplantation*. 2010. 20(4), 380-391.
52. World Health Organization, Transplantation. 2013; Retrieved from <http://www.who.int/topics/transplantation>.

Measuring the Effectiveness of Hydroponics Technology Knowledge Transfer Program from Universiti Utara Malaysia-Coconut Island Resources on Rural Community: A Case Study in Jitra, Kedah

Shri-Dewi Applanaidu¹, Roslina Kamaruddin¹, Rozana Samah¹

¹*Department of Economics & Agribusiness, School of Economics, Finance and Banking, Universiti Utara Malaysia, 06010 Sintok, Kedah*

ABSTRACT

Transfer of knowledge about innovation in agriculture is essential in improving the living standard of the rural community. This study focus on the collaboration of Universiti Utara Malaysia-Coconut Island Resources (UUM-CIR) hydroponics knowledge transfer to local communities of four villages namely Kampung Pulau Nyior, Kampung Alor Batu, Kampung Gelong, and Kampung Bemban, Jitra in the district of Kubang Pasu, Kedah. The objective of the study is to measure the effectiveness of the hydroponics technology knowledge transfer program by UUM-CIR to Mukim Gelong villagers. A total of 40 respondents was selected from the four villages and have been exposed to the hydroponics technology. The findings showed about 42.5% of the respondents were above 40 years old. In terms of gender, 57.5% of the respondents were female. Majority (70%) of the respondents are aware of hydroponics technology while most (32.5%) of them heard through the media such as newspaper, television and radio. More than half (55%) of the respondents have knowledge about hydroponics technology while 77.5% of respondents never used hydroponics technology. However, 37.5% of the respondents do not know how to set up the hydroponics kit before the workshop. Interestingly, after the workshop almost all (97.5%) the respondents could set up the hydroponics kit on their own and enjoyed using hydroponics technology. Based on this, knowledge transfer of hydroponics technology workshop was found to be effective to the local community with the collaboration of university and industry. The willingness to adapt the hydroponics technology will lead to reduction in household spending on purchase of vegetables, enhance food security and increase their intake of nutritious food which will create a healthy community.

Keywords: *Effectiveness, Hydroponics technology, Knowledge transfer, Rural community.*

INTRODUCTION

The important tool for sustainable growth, poverty alleviation and ensuring food security in developing countries is through agriculture. In agriculture, hydroponics technology is probably the most intensive method for food production which involves less capital and increase profit realised by the farmers' (Jensen¹⁴; Obisesan et al²⁰). According to Sinsinwar and Teja²⁸, hydroponics is the technology of growing plants without the use of soil but through nutrient solution. Similarly, Beibel⁴ stated that hydroponics was derived from Greek words hydro meaning water and ponos meaning work.

Hydroponics technology has been used for several years in United States of America (U.S) and Australia while

Latin America just adopting its use (Kartasi¹⁷). The U.S. Army used hydroponics for vegetable production during world war for civilians and soldiers (Jones¹⁵; Sawas²⁶). Equally, Hussain et al¹³. studies show the successful use of hydroponic technology for vegetable production for passengers in Wake Island. For decade, hydroponics methods have been used to assess development and growth of fruits, vegetables and flowers. Likewise in Asia, there has been high interest in the use of hydroponics to appraise development and growth of crops such as rice and wheat. This system makes it easier for proper monitoring of nutrient uptake, physiological growth status, morphology of the root and yield (Onanuga²¹).

Hydroponics technology can be used to solve the problem of food insecurity due to its cost effectiveness

and contains all the nutrients required for plant growth (Buwalda et al⁷). Hydroponics technology can also be used where arable land is limited and in tropical countries with plentiful land. It also offers products of high quality, high level of production, reduce use of pesticides and free from soil conditions (Corrêa et al⁹). According to Fahey¹¹, hydroponics technique has been used in the urban areas to enhance fresh food accessibility and reduce poverty level in the area. In New York and Montreal, advanced entrepreneurs have applied hydroponics to grow produce on urban rooftops. The hydroponic industry is anticipated to grow more rapidly as soil state becomes difficult. This system should be adopted to increase the quality and yield of produce in order to ensure food security (Ayele et al²).

Food security occurs when people have access to sufficient and nutritious food that meets their dietary needs for a healthy life and it is measured through four scopes which include accessibility, availability, sustainability and utilization. The quality of life and well-being of people plays an important role in a country (Osseweijer et al²³). However, food prices are one of the major factors contributing to food insecurity. High cost of food can lead to food insecurity as a result of low ability of people to manage with high food costs. In Malaysia, there is significant increase in the cost of living due to increase in the price which effects the quality of life of people especially the low income households (Gustafson¹²). The major factors influencing food security household is their monthly income. Hence, these households switch to cheaper food or forgoing some important food items which is important for their health especially vegetables. High prices in vegetables are due to uncertain climate and increase in other inputs such as land, labour, chemicals, fertilizers and machinery. Hence, this contributes to shortage of fresh vegetables and created a situation of supply less than demand. Eventually, the prices of vegetables increase. In order to improve the standard of living of low income households and to ensure food security, hydroponics technology can be introduced to these households. Hence, UUM with collaboration of CIR has conducted hydroponics technology transfer workshop. Four lecturers and 12 facilitators (UUM Agribusiness Management students) and two staffs from CIR were involved in this workshop. The objective of this workshop is to transfer the hydroponics technology knowledge to selected villagers to encourage them to grow their own vegetables using the transferred technology.

Knowledge about hydroponics technology can help in improving production, reduce production costs, increase households' profits and reduce expenses for vegetable expenditure among the local community. The main objective of the study is to measure the effectiveness of the hydroponics technology knowledge transfer program by UUM facilitators and Coconut Island Resources company to the rural communities namely villagers from Mukim Gelong, Jitra, Kedah. The specific objectives of the study are: (i) to profile the demographic information of the respondents, (ii) to examine the awareness level towards hydroponics technology, and (iii) to assess the effectiveness of the knowledge transfer workshop.

THEORETICAL AND EMPIRICAL REVIEW

Hydroponics technology has helped the growers to reduce their cost of operation by setting up under safeguarded structure such as use of plastics or green house (Bradley & Marulanda⁶). This technique does not make vegetables vulnerable to weeds, insects and diseases but reduces costs for planting and harvesting of crops (Banez & Manipon³). This study used the theoretical approach drawn from diffusion on innovation (DOI) by Rogers²⁴. According to Rogers²⁵, adoption decision is a procedure that does not take place suddenly but happens gradually. The farmer needs to try different technologies in order to identify a suitable one that works perfectly well on their farm with resources available before deciding to incorporate the technology into practice. Process of decision on innovation involves seeking and processing of information activity, where an individual is inspired to lessen in decision about an innovation. Individual have to pass through five steps of decision innovation process before adoption of technology which involves knowledge, persuasion, decision, implementation and confirmation. Straub²⁹ opine that understanding of adoption was based on behavioural change. This indicates that adoption occurs gradually and after acceptance it can be used and integrated into the farmer's system. Adoption level of hydroponics technology is based on farmer's choice. According to Bhattarai⁵, various factors determine decision of adoption such as demographic characteristics, awareness, features of technology and policy. Benefit to be derived from the use of hydroponics technology inspires farmer's level of adoption. Meanwhile, Rogers²⁴ opine that early adopters of theory of diffusion of innovation have more

educational years than late adopters. This implies that formal education and training will have positive impact on level of adoption of innovations.

Hydroponics method reduces pesticides application, other agrochemicals, limit cost of production and increases profitability (Sawas²⁶). However, due to economic crises in the country like Thailand, expansion of hydroponics technology has taken place throughout the country and has increased number of hydroponics farmers rapidly for commercial purpose (Mortri & Wattanapreechanon¹⁹; Department of Agriculture¹⁰). Likewise, Sheikh²⁷ opine that hydroponics system has been used for only 40 years on commercial basis and it is a technique that can be used for agriculture sustainability, rural development, poverty alleviation and safeguard food security. The hydroponics technology reduces production cost and increase income level. Farmers were encouraged to embrace the use of hydroponics technology which involves less stress and good yield of produce (Orsini et al²²; Wattanapreechanon & Sukprasert³²)

Reviewed literatures revealed that demographic characteristics are one of the factors that determine decision level towards adoption of hydroponics technology (Bhattarai⁵; Kartasi¹⁷; Awotide et al¹). It is expected that young people will adapt new technology compared to older people who are likely to show unwillingness attitude towards adapting new technology. Similarly, individuals with high level of education are expected to embrace the use of hydroponics technology compared to people with low level of education specifically below secondary education. Educated people are more exposed and have high flexibility level to adoption of technology. Based on gender level, females participate in farming activities more than the males and the possibility to adapt hydroponics technology is higher among the females. Also, income level determines level of technology adoption. People who earn more will have the capacity to meet with the expenses of materials to be used for setting up of the hydroponics kit (Kartasi¹⁷; Velandia et al³⁰; Joy¹⁶). Furthermore, Joy¹⁶ revealed that cost of technology reduced level at which people adapt hydroponics technology.

Moreover, level of awareness is another major factor that create acceptance of new technology. Studies from Kartasi¹⁷ indicated that dissemination of information regarding benefit attached to hydroponics technology, knowledge and trained expertise on the

use of hydroponics technology are limited and has contributed to low level of awareness of hydroponics technology. People with knowledge of hydroponics technology have high possibility to adapt hydroponics technology. Moreover, Velandia et al³⁰ opine that knowledge derived from extension services and other sources of information plays significant role towards adoption of technology. Information of hydroponics technology provides adequate knowledge, costs and benefits to be derived from the use of the technology. Access to information on hydroponics technology is very essential and increase adoption level (Awotide et al¹; Kibiti & Gitnga¹⁸). Technology awareness is very important because it makes people to embrace and adopt it. It can be practiced at the backyard with little stress, disease free, no soil and less water for culture. Similarly, it can be used to provide intensive food production in a limited space in developing countries and could serve as source of livelihood through vegetable production on a limited scale in a given local environment (Mortri & Wattanapreechanon¹⁹). In order to ensure that hydroponics technology is successful, research effort should concentrate on the production aspect and adequate knowledge to operate the system effectively is required by the farmers (Buwalda et al⁷; Wattanapreechanon & Sukprasert³²; Kibiti & Gitonga¹⁸). Adoption level of hydroponics technology can be enhanced through design of suitable policy and capacity development (Joy¹⁶).

Based on our limited readings, there are no studies that measure the impact of hydroponics technology knowledge transfer program involving the collaboration of public university and industry to rural community. Hence, this study will measure the effectiveness of knowledge transfer of hydroponics technology program to selected community with the help of UUM-Coconut Island Resources towards development of rural community.

METHODOLOGY

The objective of the study is to measure the effectiveness of hydroponics technology knowledge transfer program which was carried out by UUM-CIR to four villages namely; Kampung Pulau Nyior, Kampung Alor Batu, Kampung Gelong, and Kampung Bemban, Jitra, in the district of Kubang Pasu, Kedah. The villages were chosen because of the location near to the CIR (the industry partner with UUM). Majority of the respondents were chosen based on their interest in agriculture. Non-probability sampling technique was used to select 10

people per village based on their interest in agriculture and this gives a total of 40 participants for this study. The workshop was carried out by UUM facilitators and CIR in implementing the knowledge transfer in which the company carried out its social responsibility by providing training, equipment and venue for the project.

Structured questionnaires were used for data collection from the respondents and administered with the help of trained research assistants. The design of the questionnaire was based on perceptions towards the hydroponic technology among the villagers. The questionnaire was divided into four parts; demographic factors, awareness towards hydroponic technology, behaviour before adapting hydroponics technology and behaviour after adapting hydroponics technology. The questionnaire and interview were administered using *Bahasa Melayu*. After training, the respondents were given a questionnaire to gauge the effectiveness of this workshop (post testing). The time period between pre-testing and post-testing was within a day; before the start of the workshop and after the end of the workshop which took a day (two sessions).

The effectiveness of knowledge transfer during the one day workshop among the people involved can be seen through their ability to perform their own hydroponics kit set up by their own. Data were analyzed using descriptive statistics (frequency, percentage, mean, standard deviation), mean value for 4-point likert scale and cross tabulation analysis. Mean is simply the average score and the formula is: $\mu = (\sum x_i) / n$ where μ stands for the sample mean, \sum means summation, x_i represents all of the x -values and n means the number of items in the sample. Standard deviation is a measure of variability (spreads out) around the mean. The formula of standard deviation is: $\sigma = \sqrt{\sum (x - \mu)^2 / (n-1)}$ where σ means standard deviation, \sum means summation, x represents individual values in the data set, μ stands for the sample mean and n means the number of items in the sample. Cross tabulation is a two-dimensional table that shows the relationship between two variables in a row and column.

RESULTS

Demographic factors of respondents: The results indicate that almost half (45%) of the respondents were above 40 years old, 22.5% were between 21–30 years old, 17.5% were less than and equal to 20 years while 15% were between 31–40 years old respectively.

Majority (57.5%) of the respondents were females while 42.5% were males respectively. Based on occupation level, most (35%) of the respondents were students followed by retirees (17.5%) and housewife (15%) respectively. Fifty five percent (55%) of the respondents have within 6–10 people as their total family members while about 43% have within 1–5 people in their family members respectively. Majority (57.5%) of the respondents were married while 42.5% were single. In terms of educational level, findings showed that 47.5% of respondents had *Sijil Pelajaran Malaysia* (SPM) qualification, 30% diploma, 7.5% *Sijil Tinggi Pelajaran Malaysia* (STPM) qualification, 5.0% Degree, 2.5% Master while 7.5% had other educational level such as certificates and *Penilaian Menengah Rendah* (PMR). Findings revealed that most (40.0%) of the respondents earned less than RM 1000, 27.5% earned between RM 1001 to RM 2000 as their monthly salary, 12.5% of the respondents earned more than RM 2001 while 20% of the respondents do not have income. Basically, all of the respondents were considered as low income group.

Awareness towards hydroponics technology: In terms of awareness towards hydroponics technology, majority (70%) of the respondents have heard about hydroponics technology while 30% of them have never heard about it. The sources of information on hydroponics technology shows that about 32.5% of the respondents received information through media such as newspaper, television and radio; 17.5% from family and friends, 12.5% from government and non-governmental organization, 5.0% through their agriculture teacher while 2.5% from other source. More than half (55%) of the respondents have same knowledge about hydroponics technology while 45% of them do not have any knowledge about hydroponics technology. In terms of usage, 22.5% of the respondents revealed that they have used hydroponic kit before. Meanwhile 12.5% of them have used it for a period of more than 1 year, 7.5% of the respondents have used it for a period of less than 3 months while 2.5% have used it for a period of 3 to 6 months respectively. Most (20%) of the respondents adapted hydroponics technology because it is a simple method while 2.5% adopted because of its worthy results.

Behaviour before and after the workshop on transfer of knowledge on adapting hydroponics technology

Descriptive statistics behaviour of respondents before the workshop shows majority (62.5%) of the

respondent does not know how to set up hydroponics kit but after the workshop about 97.5% know how to set up hydroponics kit. Around 72.5% of the respondents think cost of applying hydroponics kit between RM150 – RM200 per set worth it before the workshop while after the workshop 100% of the respondents think cost of applying hydroponics kit worth it. Furthermore, about 85% of the respondents enjoyed using hydroponics kit before the workshop while 100% of the respondents enjoyed using hydroponics kit after the workshop respectively. This implies that after the workshop, more respondents enjoyed using hydroponics kit for vegetable cultivation. More than half (60%) of the respondents were willing to carry out hydroponics activities at their home if the cost is borne by their party while after the workshop 87.5% of respondents showed willingness to carry out hydroponic activities at their home if the cost is borne by their party.

Out of all the respondents, 60% of them are willing to pay for the cost of the hydroponic equipment before the workshop. However, after the workshop, all of the respondents (100%) were willing to pay for the cost of the hydroponic equipment. Meanwhile, majority (97.5%) of the respondents were willing to pay between RM150 – RM200 for the cost of the equipment while 2.5% were willing to pay between RM201-RM250 respectively. About 87.5% of the respondents showed willingness to join hydroponics workshop before attending this workshop. However, after attending this workshop, the percentage increased to 92.5%. Moreover, about 92.5% of the respondents showed interest in conducting vegetable farming using hydroponic kit well after workshop respectively. Based on these results, it is revealed that hydroponics technology knowledge transfer one day program by UUM-CIR was found to be effective.

Perception and rating of respondents regarding the hydroponics technology after the workshop: The extent to which respondents agree or disagree regarding the use of hydroponics technology in the agriculture based on the 4-point likert scale shows the mean values (3.73, 3.62, 3.58, 3.65). This has indicated that use of hydroponic technology will help respondents to learn new things, generate income, increase their skills and they believe it is an effective technology respectively while respondents disagree with some statements based on the mean values (1.80, 1.85, 2.20) which says they will avoid using hydroponics technology, technology used too much time and too costly in terms of resources, time

and effort respectively. Descriptive statistics of rating the hydroponics technology after the workshop based on the 4-point likert scale used to rate the hydroponics technology after the workshop, the mean value (3.85) shows that majority of the respondents rated the project a good and excellent one.

DISCUSSIONS

Hydroponics technology is a method which does not require huge land but small parcel of land and a few employees for execution. Results showed that females were more aware of the hydroponics technology compared to males in the study area. Out of 57.5% of the female respondents, 50% of them had positive behaviour towards adapting hydroponic technology after the workshop. According to Kartasi¹⁷, female are involved in farming activities and are more likely to adapt new technology but their decision is highly affected by male being the household heads. Almost half (45%) of the respondents are above 40 years of age which is in accordance with Joy¹⁶ findings. According to Velandia et al³⁰ and Walton³¹ studies, it was revealed that age influenced level of adoption of technology among farmers. From the study, more than half (57.5%) of the respondents have SPM educational level while 30% had diploma respectively. Study by Caswell⁸ shows that education affects the adoption level of technology and increase productivity levels. It was stated further that level of education creates a mental attitude psychologically towards efficient and effective acceptance of new technologies. Results indicated that most (37.5%) of the respondents income falls within RM1000 – RM2000 and this implies that people that earn higher income level will be able to afford the production cost and set up expenses of the hydroponic kit.

Results showed that a larger percentage of respondents have heard about hydroponics technology before. The major source of information on hydroponics technology is through media such as newspaper, television and radio followed by family, friends and government/ non-governmental organization. Findings are in line with Awotide¹ which stated that access to adequate information about agricultural technologies was essential to increase adoption level. Adoption of technology in a local community depends on the willingness of the people. Results showed that more than half (60%) of the respondents are willing to carry

out hydroponic activities at their home if the cost is borne by their party. Also, 60% of them were willing to pay for the cost of the hydroponic equipment. However, majority (92.5%) of the respondents showed interest in cultivating vegetables using hydroponics methods after the workshop. The effectiveness of hydroponics technology knowledge transfer workshop was measured through the pre and post-testing of the workshop and findings showed that almost all (97.5%) the respondents were able to set up the hydroponic kit, harvest vegetables well and enjoy using hydroponic technology after the workshop. Furthermore, findings showed that knowledge transfer of hydroponic vegetable cultivation methods was effective because the number of respondents towards positive behaviour to adapt the hydroponics technology increased after the workshop. Kartasi¹⁷ opine that inadequate dissemination of information on the benefits attached to the use of the technology has made hydroponics technology not to be widely known in the local communities and encounters faced in locating experts with adequate knowledge of hydroponic technology. Furthermore, Kartasi¹⁷ observed that hydroponics will go a long way in improving food security due to its lower cost of production.

CONCLUSIONS AND POLICY RECOMMENDATIONS

Adoption of hydroponics technology by the local community has to do with awareness, adequate knowledge and effective training on good management practices to ensure continuity of the technology. Innovations of technology will help to improve production, reduce production costs, increase farmers' profits, reduce household expenses for vegetable food component among the local community and enhance food security. Findings revealed that 32.5% of the respondents above the age of 40 years old were aware of hydroponics technology. Awareness level was high among the female respondents (37.5%) compared to male respondents (32.5%). Likewise, 40% of the married respondents were more aware of hydroponics technology when compared with 30% of the single respondents that were aware respectively. Results from pre and post-testing of the knowledge transfer of hydroponics technology indicated that after the one day workshop, about 97.5% of the respondents could set up the hydroponic kit, harvest vegetable well, were willing to pay for the cost of the equipment, think cost of applying hydroponic worth it and enjoyed using hydroponics technology respectively.

The results also showed that, 92.5% of the respondents were willing to join hydroponic knowledge transfer project and were interested in conducting vegetable farming using hydroponic methods after the workshop respectively. Meanwhile, 87.5% of the respondents were willing to carry out hydroponics activities at their home after the workshop. At the end of the workshop, respondents rated it has a good one while most of them participated in order to get more knowledge, due to interest in vegetables and simple method. However, economic prospects of adoption of hydroponics technology will improve if public policies support subsidies for production systems is designed by the governments.

This study recommends that knowledge transfer of hydroponics technology should not only concentrate on the older people but also encourage young people to participate in the local community. Similarly, females should be trained on the use of hydroponics technology irrespective of their marital status and educational level. In addition, local community should be enlightened more about the benefit attached to the usage of hydroponics technology and proper training should be given to them.

ACKNOWLEDGEMENTS

The authors wish to thank Universiti Utara Malaysia in funding this study under the Social Innovation Grant Scheme (SIGS), S/O code 13972, Research and Innovation Management Centre and Innovation & Commercialization Centre Universiti Utara Malaysia, Kedah for the administration of this study.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Awotide B, Diagne A, Wiredu A, Ojehomon V. Wealth status and agricultural technology adoption among smallholder rice farmers in Nigeria. *International Journal Sustainable Development*. 2012;5(2):97-114.
2. Ayele S, Duncan A, Larbi A, Khanh T. T. Enhancing innovation in livestock value chains through networks: Lessons from fodder innovation case studies in developing countries. 2012.

3. Bañez B. P, Manipon F. R. Crop production under greenhouse and soil-less media culture (Los Baños conditions). Paper presented at the Workshop on the Packaging of Hydroponics R&D Program for High Value Crop Production in the Philippines. PCARRD, Los Baños, Laguna. 2000.
4. Beibel J. P. Hydroponics-The Science of Growing Crops Without Soil. Florida Department of Agric. Bull, 180. 1960.
5. Bhattarai M. Understanding Technology Pathways among Vegetable Farmers: A Theoretical Framework and Research Agenda. The World Vegetable Centre. 2009.
6. Bradley P, Marulanda C. Simplified hydroponics to reduce global hunger. In World Congress on Soilless Culture: Agriculture in the Coming Millennium. 2000 May;554:289-296.
7. Buwalda F, van Os E. A, Giacomelli G, Samperio Ruiz G, Vermeulen T, van Weel P. A, Ruijs M. N. A. Hydroponic systems: hype or new perspective. In International Symposium on Growing Media and Soilless Cultivation. 2013;1034:201-207).
8. Caswell M, Fuglie K, Ingram C, Jans S, Kascak C. Adoption of agricultural production practices: lessons learned from the US Department of Agriculture Area Studies Project. (Agricultural Economic Report, No. 792). Washington, DC: US Department of Agriculture, Economic Research Service. 2001.
9. Corrêa R. M, do Carmo Pinto S. I, Reis É. S, de Carvalho V. A. M. Hydroponic Production of Fruit Tree Seedlings in Brazil. In Hydroponics-A standard methodology for plant biological researches. InTech. 2012.
10. Department of Agriculture. GAP DOA. (online). 2016 April 11. Available: <http://gap.doa.go.th/searchgap>.
11. Fahey C. Rooftop Hydroponic Agriculture. 2012.
12. Gustafson D. J. (2013). Rising food costs & global food security: key issues & relevance for India. The Indian journal of medical research. 2013;138(3):398.
13. Hussain A, Iqbal K, Aziem S, Mahato P, Negi A. K. A review on the science of growing crops without soil (soilless culture)-a novel alternative for growing crops. International Journal of Agriculture and Crop Sciences. 2014;7(11):833.
14. Jensen M. H. Hydroponic culture for the tropics: opportunities and alternatives. Asian and Pacific Council. Food Technology Center. 1991.
15. Jones Jr J. B. Hydroponics: its history and use in plant nutrition studies. Journal of plant Nutrition. 1982;5(8):1003-1030.
16. Joy A. Effect of Decision Making Stage on Adoption of Hydroponic Technology in Dairy Farming Projects in Kenya. International Journal of Current Research. 2017;9(11):61735-61740.
17. Kartasi F. M. Analysis of the viability of using hydroponics in growth of barley as a fodder crop among rural small-scale farmers in Kiambu County (Doctoral dissertation, UNIVERSITY OF NAIROBI). 2010.
18. Kibiti J. G, Gitonga A. K. Factors influencing adoption of urban hydroponic farming: A case of Meru town, Meru county, Kenya. International Academic Journal of Information Sciences and Project Management. 2017;2(1):541-557
19. Mortri N, E. Wattanapreechanon. Soilless culture in Thailand. In: XXVIII International Horticultural Congress 2006, COEX convention Center, Seoul, Korea. 2006 Aug 13-19;187-193.
20. Obisesan A. A, Omonona B. T, Yusuf S. A, Oni, O. A. Adoption of RTEP Production Technology Among Cassava-based Farming Households in Southwest Nigeria. New York Science Journal. 2013;6(2):62-65.
21. Onanuga A. A Hydroponic Approach to Evaluate Responses to Nutrients and Phytohormones in Cotton Plants (*Gossypium Hirsutum* L.) Growth and Development. 2013.
22. Orsini F, Fecondini M, Mezzetti M, Michelon N, Gianquinto G. Simplified hydroponic floating systems for vegetable production in Trujillo, Peru. In II International Conference on Landscape and Urban Horticulture. 2009 June;88:157-161).
23. Osseweijer P, Watson H. K, Johnson F. X, Batistella M, Lynd L. R, Kaffka S. R, Woods J. Bioenergy and food security. Bioenergy & Sustainability:

- Bridging the Gaps (eds Souza GM, Victoria R, Joly C, Verdade L)(Chapter 4). 2015;72:779.
24. Rogers E. M. Diffusion of Innovations fourth edition The Free Press. New York. 1995.
25. Rogers E. M. Elements of diffusion. Diffusion of innovations. 2003;5(1.38).
26. Sawas D. Hydroponics: A modern technology supporting the application of integrated crop management in greenhouse. Journal of Food Agriculture and Environment. 2003;1:80-86.
27. Sheikh B. A. Hydroponics: key to sustain agriculture in water stressed and urban environment. Pak. J. Agric., Agril. Eng., Vet. Sci. 2006;22:53-57.
28. Sinsinwar and Teja C. Development of a cost effective, energy sustainable hydroponic fodder production device. 2012. Available at: <http://elitepdf.com/development-of-a-cost-effective-energy-sustainable.html>. Accessed on: 16th May, 2015.
29. Straub E. T. Understanding technology adoption: Theory and future directions for informal learning. Review of educational research. 2009;79(2):625-649.
30. Velandia M, Lambert D. M, Jenkins A, Roberts R. K, Larson J. A, English B. C, Martin S. W. Precision farming information sources used by cotton farmers and implications for extension. Journal of extension. 2010;48(5):1-7.
31. Walton J. C, Roberts R. K, Lambert D. M, Larson J. A, English B. C, Larkin S. L, Reeves J. M. Grid soil sampling adoption and abandonment in cotton production. Precision Agriculture. 2010;11(2):135-147.
32. Wattanapreechanon E, Sukprasert P. Hydroponic vegetable cultivation development for extension at LukPhraDabos Agricultural Training and Development Center, SamutPrakan province. RMUTSB Academic Journal. 2016;4(2):106-119.

Tax Evasion, Tax Burden and Economic Development in Asean-5 Economies: A Mimic Model Analysis

Badariah Haji Din¹, Muzafar Shah Habibullah², A. H. Baharom³

¹College of Law, Government and International Studies, Universiti Utara Malaysia, 06010 UUM Sintok, Kedah, Malaysia; ²Financial Economics Research Center & Faculty of Economics and Management, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia; ³INCEIF, LorongUniversiti A, off Jalan Universiti, 59100 Kuala Lumpur, Malaysia

ABSTRACT

Tax evasion is a crime. Recent estimates registered the loss of tax revenue amounting to USD3.1 trillion or 5.1% of world's GDP. Tax revenue losses have negative consequences to the government ability to fuelled economic growth by providing enough public infrastructure and other services. In this study we have estimated the share of shadow economy to the official economy for five ASEAN economies, namely; Indonesia, Malaysia, the Philippines, Singapore and Thailand for the period 1980-2013 using the MIMIC model. The indexes of the shadow economy from the MIMIC model were then used to calculate the loss in tax revenue as a result of the presence of the shadow economy. We then test the hypothesis that the level of economic development and tax burden play an important role in mitigating tax evasion. Our results indicate that increasing economic development and tax burden in all five ASEAN economies Malaysia increased tax evasion for the period 1980 to 2013.

Keywords: Tax evasion; Shadow economy; MIMIC model; ASEAN

Jel Classification: G21, H26, O17

INTRODUCTION

One of the most common and persistent problem for any nations is tax evasion. Cerqueti and Coppier¹⁰ argue that the tax revenue loss has serious economic consequences to the government. By evading taxes the government are deprived from providing adequate public financing and investment, which results in fewer jobs, hospitals, schools, less infrastructure, and ultimately less development, as well as other facilities that would benefit the society (Johnson et al.³³). Furthermore, large tax evasion signifies that the country having large shadow economy compared to the developed world (Fuest and Riedel²²). Franzoni²¹ asserts that the loss of tax revenue may result in slow economic growth, upsetting the proper functioning of the government as the ability to finance its basic expenses is threatened. Thus, fighting tax evasion should be an important agenda for any government.

The Tax Justice Network⁵³ has reported that the estimated total tax evasion is in the excess of USD3.1 trillion or about 5.1% of world's GDP. Europe experienced tax losses of USD1.5 trillion, followed by

Asia USD666 billion, North America USD453 billion, South America USD376 billion, Africa USD79 billion while the Oceania USD46 billion. Among the ASEAN-5 economies Malaysia ranked fourth with total tax evaded of USD11.2 billion; after Thailand USD25.8 billion, Indonesia USD17.8 billion and the Philippines USD11.7 billion. On the other hand, Singapore experience tax losses of USD4.1 billion.

The report further point out that the loss from tax evading activity occurs as a result of shadow economic activities existed in all economies. Nevertheless, tax evasion can also due to tax haven activity, trade mispricing and trade misinvoicing. Tax haven countries are those countries characterize of having low or non-existent tax rates on some types of income, lack of transparency, bank secrecy, lack of information sharing, and requiring no economic activity for an entity to obtain legal status (Gravelle²⁶). Zucman⁵⁶ estimates that bank deposits in Switzerland constitute about one third of the global stock of household offshore wealth and it is believed that a fraction of this wealth escapes home country taxation

(offshore tax evasion). Johannesen³² reports that most of this wealth is owned by the very richest households and that it is largely escapes taxation. In tax haven countries with strict bank secrecy rules, banks do not generally report the investment income earned by their clients to the tax authorities, and therefore escape paying taxes. Henry³⁰ reports that it is estimated that the accumulated offshore wealth stock owned by developing country residents was worth at least USD6.2 trillion by 2007. This implies that developing countries might be losing as much as USD120-160 billion per year in lost tax revenue on the interest and other income generated by all this unreported anonymous wealth. Henry³⁰: p.20 further contends that “developing countries as a whole didn’t really face a “debt” problem, but huge “offshore tax evasion” problem”.

On one hand, trade misinvoicing occurs when trading partners write their own trade documents through export under-invoicing and import over-invoicing. Corrupt government officials, criminals and commercial tax evaders are able to easily move assets out of the countries and into tax havens, anonymous companies, and secret bank accounts (Kar and Spanjers³⁶). In 2012, the Asian region recorded the highest among the developing countries experiencing trade misinvoicing outflows accounted for USD354 billion of funds “flight” out of the country. Among the ASEAN-5 economies, Malaysia ranked 1st with fund outflows of USD39 billion, followed by Thailand USD28 billion, Indonesia USD20 billion and the Philippines USD5 billion. On the other hand, trade mispricing due to activities through which profits of companies (MNCs) are shifted from developing countries to developed country banks and tax havens. Trade mispricing can occur when the underlying trade involves transactions between related parties, such as trade transactions between international subsidiaries of a large parent corporation (Hollingshead³¹). It is reported that as a result of trade mispricing, the yearly average tax revenue loss incurred by Malaysia, average 2002-2006 is about USD4.9 billion, followed by the Philippines USD4.3 billion, Indonesia USD3.1 billion and Thailand USD1.4 billion.

Interestingly, Martinez-Vazquez⁴¹ found that a significant feature of the tax system in Asia is that tax burdens at the regional scale are among the lowest in the world. The average tax-GDP ratio in Asia has been approximately half that of the European Union, and it is also below the ratio for Africa and the Middle East,

and for the Americas. However, there are disparities among the ASEAN-5 countries in the tax-GDP ratio with Thailand being the highest (16.3%), followed by Malaysia (15.8%), Singapore (14.1%), the Philippines (13.8%) and Indonesia (13.6%). Nevertheless, the daunting question that is relevant to tax evasion is: why people evade tax? According to Hanousek and Palda²⁸, people did not just evade taxes in order to enrich themselves but as a means of signalling their discontent with the quality of government services they received. Their study on the transition economies found some evidence that when people believe the quality of government services to be poor, they will evade taxes in response.

In fact, earlier Feige¹⁹ contends that a rising public dissatisfaction with the performance of government and/or a growing public distrust and resentment may potentially contribute to the size of the shadow economy, and economic activities in the shadow economy will be tax evading (Tax Justice Network⁵³). In another study, Torgler⁵⁴ analyses tax morale in seven Asian countries and found that tax morale is very low in the Philippines and relatively high in Japan, China and Bangladesh. Further analyses assert that Philippines having the lowest tax morale among the evaluated Asian countries are also having the biggest size of the shadow economy; while countries like Japan and China having higher tax morale but also having a lower size of shadow economy. Generally, the study suggests that trust in the government and the legal systems have a positive effect on tax morale.

The purpose of the present paper is to determine factors affecting tax evasion in the ASEAN-5 economies. According to Schneider⁴⁹ activities in the shadow economy in most cases imply the evasion of direct or indirect taxes, such that the factors affecting tax evasion will most certainly also affect the shadow economy. In this study we employ the MIMIC model to estimate the index of the shadow economy for each of the ASEAN-5 country. From this index we can calculate the amount of tax evasion and thereafter, we employ the cointegration approach to determine the long-run relationship between tax evasion and its determinants – tax burden and economic development.

The paper is organized as follows. In the next section we discuss the MIMIC model used to estimate shadow economy; section 3 presents the tax evasion model; and in section 4 we discuss the estimated tax evasion model. The last section contains our conclusion.

ESTIMATING THE SIZE OF SHADOW ECONOMY

To estimate the revenue from tax losses it is imperative to estimate the extent of the shadow economy. In this study we follow the approach popularize by Schneider and his associates (Schneider and Enste^{50,51}; Schneider⁴⁷; Bajada and Schneider⁴⁷; Dell’Anno et al.¹⁴; Buehn⁵) by using the multiple indicators multiple causes (MIMIC) method to estimate the shadow economy which is consider a latent variable (unobservable). In our study the causal variables (in logarithm) are government consumption (), inflation rate (), tax burden (), and unemployment rate (). It is expected that increase government consumption in the official economy will instigate crowding-out effect and also introduces distortions to competition in the market, and encourage individual and firm towards shadow economy. Similarly higher tax burden will push people to participate in the shadow economy and evade taxes. Unemployment and inflation indicate peoples’ misery as a result of recession or economic downturn. In such condition individual or firm will move towards shadow economy to find alternative source of income and cheaper goods and services. For the indicators variables we used currency to money supply (M1) ratio, (), and real GDP per capita, (). The increase in the official GDP as well as currency will indicate increasing in the shadow economy. The data for currency, money supply M1, tax burden, inflation, unemployment rate and real GDP per capita were collected from World Development Indicators at the World Bank database. The data used in the study span from 1980 to 2013.

The MIMIC model used in the study is formulated as follows:

$$y_t = \lambda \eta_t + \varepsilon_t \quad \dots(1)$$

$$\eta_t = \gamma' x_t + \xi_t \quad \dots(2)$$

where η_t is an unobserved latent variable, shadow economy;

$y' = (y_1, y_2) = (\lgdppc_t, \text{lcurrency}_t)$ is a vector of indicators for the latent variable η_t ; and $x' = (x_1, x_2, \dots, x_4) = (\lgovtconsp_t, \text{linflation}_t, \text{ltaxburden}_t, \text{luemployment}_t)$ is the vector of the causes of η_t ; λ and γ are $(p \times 1)$ and (4×1) vectors of parameters; and ε and ξ are $(p \times 1)$ and are scalar

random errors. Giles²⁴ shows that Equations (1) and (2) can be viewed as a multivariate regression model,

$$y_t = \Pi x_t + z_t \quad \dots(3)$$

where $\Pi = \lambda \gamma'$ and $z_t = \lambda \xi_t + \varepsilon_t$.

Equation (1) is the measurement model while Equation (2) is the structural model. The consistent and asymptotically efficient estimates for the parameters λ and γ (the elements of Π) can be obtained using the restricted maximum likelihood estimation method. However, the estimation of Equations (1) and (2) requires a normalization of Equation (1), which is generally achieved by constraining one element of λ to a pre-assigned value (e.g. $\lambda_1 = +1$ or -1). Once the estimate for γ is obtained, the latent variable η_t can be predicted at each observed sample point x_t , and the size of the shadow economy can be evaluated. Figure 1 shows the path diagram where potential causes of the shadow economy are shown on the left and the indicators on the right.

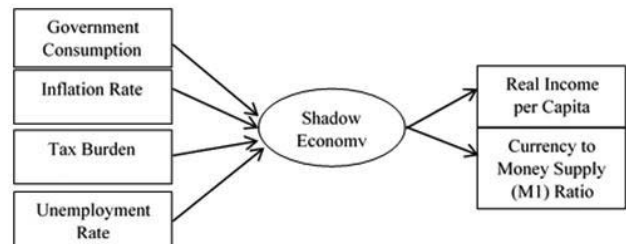


Figure 1: MIMIC Model

To make estimation feasible we set the coefficient of one of the measurement model’s indicator variables to non-zero. In this study we fix the coefficient of the variable real GDP per capita, \lgdppc_t , equal to +1, and Table 1 present the results of the estimated MIMIC model for each of the ASEAN-5 country. The result of the MIMIC models is quite encouraging as some of the variables are significant and show correct signs. The shadow economy show positive relationship with real GDP per capita and negative relationship with currency holdings. The result implies that the increase in real GDP per capita (income) increases shadow economy, while the increase in currency holdings in the shadow economy suggest a reduction in the used of currency holdings in the official economy. For the causal variables majority of the variables are statistically significant at least at the 10% level.

Table 1: Results of the MIMIC models

Causes and Indicators	Indonesia	Malaysia	Philippines	Singapore	Thailand
Causes					
lgovtconsp _t	0.193	0.245*	0.018	-0.858***	0.146
	(1.076)	(1.693)	(0.450)	(2.894)	(0.430)
linflation _t	-0.202	-0.067**	-0.179	-7.360***	-5.461***
	(0.885)	(2.533)	(0.707)	(4.031)	(4.333)
ltaxburden _t	-0.424***	-1.241***	-0.016	-1.636***	1.348***
	(3.087)	(8.521)	(0.411)	(4.888)	(3.151)
luemployment _t	0.421***	-0.783***	0.049	-0.337***	-0.428***
	(7.812)	(12.000)	(0.693)	(3.107)	(5.375)
Indicators					
lcurrency _t	-0.232***	-0.904***	-3.774	-0.467***	0.057**
	(3.843)	(26.673)	(1.147)	(4.745)	(2.005)
lgdppc _t	1.000	1.000	1.000	1.000	1.000
Test-statistics					
χ ² [non-significant]	67.419	65.362	44.867	70.407	48.243
Df	9	9	9	9	9
p-value	0.000	0.000	0.000	0.000	0.000
χ ² /df [≤ 3.0]	7.491	7.262	4.985	7.823	5.360
GFI [≥ 0.90]	0.604	0.694	0.716	0.633	0.782
AGFI [≥ 0.80]	0.076	0.286	0.338	0.143	0.491
RMSEA [≤ 0.08]	0.444	0.436	0.348	0.455	0.363
RMR [≤ 0.08]	0.027	0.023	0.006	0.016	0.007

Notes: Asterisks (***), (**), (*) denote statistically significant at 1%, 5% and 10% level respectively. The source for the criteria for the test statistics for the MIMIC model are from Joreskog and Sorbom³⁴ for chi-square; Chau and Hu¹¹ for GFI and AGFI; Browne and Cudek (1999) for RMSEA and RMR. Figures in square brackets are favourable test statistics for good fit.

As for the overall goodness of fit of the MIMIC model, we report the chi-square (χ²) with degree of freedom (df), normed chi-square (χ²/df), goodness of fit index (GFI), adjusted goodness of fit (AGFI), root mean squared error of approximation (RMSEA), and root mean square residual (RMR). Generally the results for the goodness of fit of the MIMIC models are not encouraging. This is not surprising as the data do not fit the model well is attributed to the time series and the small sample size used in the analysis (see Klaric³⁸; Dell’Anno et al., 2007). Further Dell’Anno et al.¹⁴ note that the reliability of the MIMIC estimates is a controversial matter and the scientific debate is in progress. Nevertheless, our main purpose estimating the

MIMIC model is to compute the index of the shadow economy. The ordinal shadow economy (SE) index is calculated from Table 1 as follows,

$$\text{Indonesia: } \hat{\eta}_{Ind,t} = 0.193* \text{lgovtconsp}_t - 1.202* \text{linflation}_t - 0.424* \text{ltaxburden} + 0.421* \text{luemployment}_t$$

$$\text{Malaysia: } \hat{\eta}_{Mal,t} = 0.245* \text{lgovtconsp}_t - 1.067* \text{linflation}_t - 1.241* \text{ltaxburden} - 0.783* \text{luemployment}_t$$

$$\text{Philippine: } \hat{\eta}_{Phi,t} = 0.018* \text{lgovtconsp}_t - 1.179* \text{linflation}_t - 0.016* \text{ltaxburden} + 0.049* \text{luemployment}_t$$

$$\text{Singapore: } \hat{\eta}_{Sin,t} = -0.858* \text{lgovtconsp}_t - 7.360* \text{linflation}_t - 1.636* \text{ltaxburden} - 0.337* \text{luemployment}_t$$

$$\text{Thailand: } \hat{\eta}_{Tha,t} = 0.146* \text{lgovtconsp}_t - 5.461* \text{linflation}_t + 1.348* \text{ltaxburden} - 0.428* \text{luemployment}_t$$

These indexes, $\hat{\eta}_{j,t}$ (j=Indonesia, Malaysia, Philippines, Singapore, Thailand) are then transformed into a cardinal series using the benchmark estimates for each country from Schneider⁴⁸ which is 19.4% of official GDP in

2000 for Indonesia; 31.1% for Malaysia, 43.3% for the Philippines, 52.6% for Thailand, and 12.7% for Singapore from Elgin and Oztunali¹⁶. Accordingly, following the steps in Dell'Anno and Schneider¹⁵ and Buehn and Schneider⁶ we compute the ratio of shadow economy to the official GDP (%) equals $(\hat{\eta}_{j,t} / \hat{\eta}_{j,2000}) \tilde{\eta}_{j,2000}$ with $\hat{\eta}_t$ notes the value of the MIMIC index at time, t according to Equation (2), $\hat{\eta}_{2000}$ is the value of this index in the base year 2000, and $\tilde{\eta}_{2000}$ is the exogenous estimate (benchmark) of the shadow economy in 2000. For example, for the case of Indonesia, shadow economy, SE equals $[(\hat{\eta}_{Ind,t} / \hat{\eta}_{Ind,2000}) * 19.4\%]$. In this study we plot our estimates of the shadow economy for each of the ASEAN-5 country with three other estimates by Alm and Embaye¹, Elgin and Oztunali¹⁶ and Schneider⁴⁸, as presented in Figure 2. Generally our estimates of the shadow economy showing similar declining trend, however, our estimates seem to be averaging the other three estimates.

9

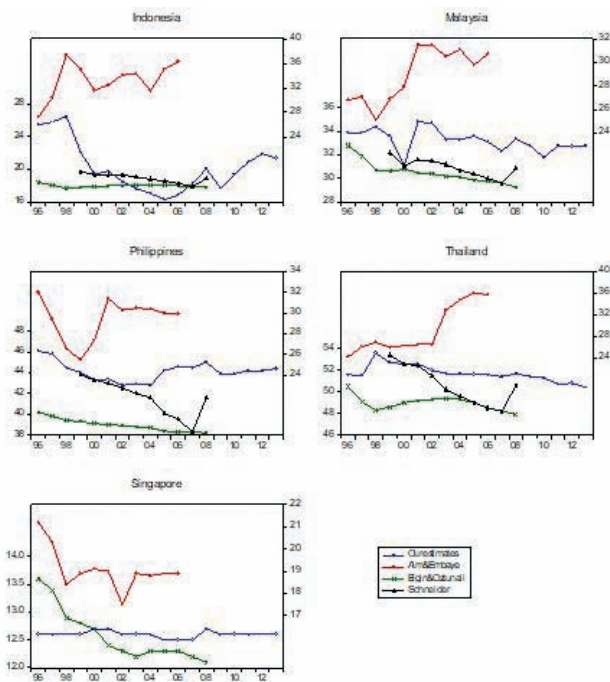


Figure 2: Ratio of shadow economy to GDP in ASEAN-5 economies, 1996-2013

Estimating Tax Evasion: The estimates of the tax evasion are calculated as tax revenue multiply with the ratio of shadow economy to the official GDP. Figure 3 clearly demonstrates that the share of tax evasion to GDP has been on a declining trend for all five ASEAN economies.

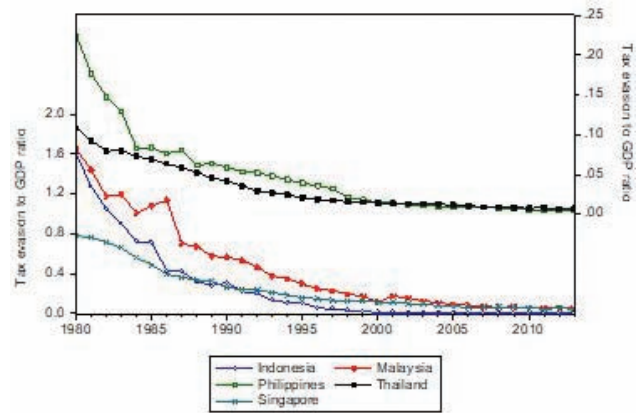


Figure 3: Tax evasion to GDP ratio in ASEAN-5 economies

Next we specify the determinants of tax evasion for the ASEAN-5 economies. Numerous studies have indicated that among others, age structure, income, education, financial development can affect people to evade taxes. For example, a cross-country study by Richardson⁴⁶, posit that age, education, employment in the services sector, fairness and tax morale affect tax evasion in 45 countries investigated. Study by Crane and Nourzad¹² revealed that inflation, marginal tax rate, probability of detection, penalty rate, proportion of wages to income and real income influence tax evading behavior in the U.S. The role of inflation in stimulating tax evasion is further supported by Caballe and Panades⁷.

In two studies on tax evasion in Switzerland, Feld and Frey²⁰ and Kirchgassner³⁷, contend that the probability of detection, penalty rate, marginal tax rate, tax procedures, democracy, income, age distribution, type of employment, language, and population are important determinants of tax compliance. For the OECD countries, Kafkalas et al.³⁵, found that apart from income and tax rate, government effectiveness (quality of government) and tax monitoring expenses influence tax evasion. On the other hand, studies by Cebula⁸ and Cebula and Foley⁹ indicate that income tax rate, unemployment, interest rate, audit and penalty rate affect tax compliance in the U.S.

On another strand of study, researchers have investigated the role of financial sector as determinant of tax evasion. According to Bose et al.³, in developed economies characterized by high level of financial development, individual or firm have easy access to the credit market. However, borrowers have to declare their income and/or assets and this can be used as collateral

or to gauge their creditworthiness but in doing so they will subject to tax liability. Since the value provided by the financial intermediation is considerable (Gordon and Li²⁵), there is less incentive to evade tax and the need to participate in the shadow economy is minimal.

On the contrary, for developing economies with low level of financial development, there is limited access to the credit market due to shortage of loanable funds, asymmetric information and high cost of borrowings; borrowers have less incentive to declare income and/or assets. In such environment, tax evasion is substantial and shadow economy is also larger. Their cross-sectional and panel analyses indicate that improvement in the development of the banking sector as well as the depth and the efficiency of the banking sector contribute to smaller shadow economy. The contention that more tax compliance is associated with more access to the credit market is also supported by the finding in Gatti and Honorati²³.

However, in this study we specify the determinants of tax evasion as follows,

$$Itaxevasion_t = \theta_0 + \theta_1 Itaxburden_t + \theta_2 lgdppc_t + \theta_3 lgdppc_t^2 + \omega_t \dots(4)$$

where $Itaxevasion_t$ is measured by the ratio of tax evasion to GDP, $Itaxburden_t$ is the ratio of tax revenue to GDP, and $lgdppc_t$ is real GDP per capita to the measure economic development or income. All data except tax evasion were collected from the World Development Indicators published and accessible at the World Bank database. It is expected that $\theta_1 > 0$ and $\theta_2, \theta_3 > \text{or} < 0$. l denotes variables in logarithm. The expected sign for θ_2 and θ_3 is ambiguous. However, as Figure 4 suggest, we would expect that there is a non-linear relationship between tax evasion and economic development. This relationship implies that at lower stages of economic development tax evasion are low while at higher level of economic development tax evasion tends to increase.

To estimate Equation (4) we first test the order of integration of all variables in the equation. The unit root test results using ADF-GLS proposed by Elliot et al.¹⁷ which is more robust to both the augmented Dickey-Fuller and Phillips-Perron tests are presented in Table 2. Results in Table 2 clearly indicate that all variables are I(1), that is the series achieved stationarity after first-differencing. These results clearly suggest that all variables are non-stationary in levels. Thus, estimating Equation (4) using OLS is subject to spurious regression results unless the variables are cointegrated. A cointegrating regression implies a long-run model.

Table 2: Results of unit root tests

Series	Deterministic terms	Indonesia	Malaysia	Philippines	Singapore	Thailand
Panel A: Series in Levels						
$Itaxevasion_t$	Constant	-0.233 (5)	-0.825 (1)	-0.438 (1)	0.667 (4)	-1.100 (3)
	Constant + trend	-1.693 (5)	-1.345 (0)	-0.842 (1)	-1.087 (0)	-2.093 (3)
$Itaxburden_t$	Constant	-1.935 (0)	-1.851 (0)	-1.750 (1)	-1.456 (0)	-1.498 (0)
	Constant + trend	-2.429 (0)	-2.879 (0)	-2.352 (1)	-1.818 (0)	-1.751 (0)
$lgdppc_t$	Constant	-0.048 (1)	-0.066 (1)	0.349 (1)	-0.410 (3)	-0.332 (1)
	Constant + trend	-2.194 (1)	-2.476 (0)	-1.047 (1)	-2.371 (0)	-1.775 (1)
$lgdppc_t^2$	Constant	0.012 (1)	-0.031 (1)	0.390 (1)	-0.370 (3)	-0.269 (1)
	Constant + trend	-2.159 (1)	-2.502 (0)	-0.979 (1)	-2.480 (0)	-1.829 (1)
Panel B: Series in First-differences						
$\Delta Itaxevasion_t$	Constant	-3.266***(1)	-3.445***(0)	-2.784***(0)	-3.409***(0)	-2.396**(0)
	Constant + trend	-4.895***(1)	-5.848***(0)	-4.116***(0)	-6.326***(0)	-3.095*(0)
$\Delta Itaxburden_t$	Constant	-4.633***(0)	-5.359***(0)	-3.085***(0)	-3.563***(0)	-3.262***(0)
	Constant + trend	-6.261***(0)	-5.325***(0)	-3.279**(0)	-4.312***(0)	-4.035***(0)
$\Delta lgdppc_t$	Constant	-3.584***(0)	-4.345***(0)	-3.401***(0)	-4.331***(0)	-3.461***(0)
	Constant + trend	-3.595**(0)	-4.725***(0)	-4.581***(0)	-5.840***(1)	-3.715**(0)
$\Delta lgdppc_t^2$	Constant	-3.614***(0)	-4.463***(0)	-3.355***(0)	-5.201***(1)	-3.618***(0)
	Constant + trend	-3.614***(0)	-4.770***(0)	-4.631***(0)	-5.858***(1)	-3.821***(0)

Notes: Asterisks (***) , (**), (*) denote statistically significant at 1%, 5% and 10% level, respectively. The calculated statistics are those computed in MacKinnon⁴⁰. The optimal lag length in round brackets was chosen based on SC criterion throughout the analysis.

Since all variables are of the same order of integration we can proceed to test for cointegration. The conventional method to test for cointegration is the Engle and Granger¹⁸ two-step procedure (*E-G*). However, this method has been criticized for the low power of using the ADF unit root test. The problems associated with the OLS approach have led to the development of alternative procedures which is more recent and more robust, particularly in small samples. To test for cointegration in small sample, Pesaran et al.⁴⁴ suggest using the bounds *F*-test by estimating the following equation. For ARDL(1,1,1,1) we can estimate the following ARDL-UECM (unrestricted error-correction) model using OLS,

$$\Delta \text{taxevasion}_t = \varphi_0 + \varphi_1 \Delta \text{taxburden}_t + \varphi_2 \Delta \text{lgdppc}_t + \varphi_3 \Delta \text{lgdppc}_t^2 + \varphi_1 \text{taxevasion}_{t-1} + \varphi_2 \text{taxburden}_{t-1} + \varphi_3 \text{lgdppc}_{t-1} + \varphi_4 \text{lgdppc}_{t-1}^2 + \epsilon_t \quad \dots(5)$$

where φ_0 is a constant term and ϵ_t is the disturbance term. According to Pesaran et al.⁴⁴, an *F*-test for the joint significance of the coefficients of the lagged levels in the above Equation (5), that is the null hypothesis for no cointegration amongst variables in the equation, is $H_0 : \phi_1 = \phi_2 = \phi_3 = \phi_4 = 0$ against the alternative $H_a : \phi_1 \neq \phi_2 \neq \phi_3 \neq \phi_4 \neq 0$; are employed to bounds test for cointegration or the existence of a long-run relationship between tax evasion and its determinants. Rejection of the null hypothesis suggests cointegration between tax evasion and its determinants. The asymptotic distribution of critical values is obtained for cases in which all regressors are purely *I*(1) as well as when the regressors are purely *I*(0) or mutually cointegrated. Because the critical value of the test depends on the order of integration of the variables, *I*(*d*), where $0 \leq d \leq 1$, the test utilizes a critical range such that values exceeding the range are evidence of rejection, values less than the range are evidence of non-rejection, and values within the range are inconclusive. In other words, if the *F*-statistics exceed their respective upper critical values; we can conclude that a long-run relationship exists, without a need to know the order of integration of the regressors. If the *F*-statistics fall below the lower critical values, we cannot reject the null hypothesis of no cointegration and estimation can continue assuming no

long-run relationship. If the *F*-statistics falls between the two bounds, the result is inconclusive. As such one needs to know the order of the integration of the underlying variables to proceed further. For small sample size as in our case we used the critical values tabulated by Narayan⁴².

Once cointegration is established, next we can proceed to estimate the long-run model for tax evasion - Equation (4). Using the ARDL method, assuming ARDL (1, 1, 1, 1) we can specify the following model,

$$\text{taxevasion}_t = \alpha_0 + \beta_1 \text{taxburden}_t + \beta_2 \text{taxburden}_{t-1} + \beta_3 \text{lgdppc}_t + \beta_4 \text{lgdppc}_{t-1} + \beta_5 \text{lgdppc}_t^2 + \beta_6 \text{lgdppc}_{t-1}^2 + \beta_7 \text{taxevasion}_{t-1} + \epsilon_t \quad \dots(6)$$

In the long-run, from Equation (6) we can derive the long-run tax evasion model as specify in Equation (4): $\text{taxevasion}_t = \theta_0 + \theta_1 \text{taxburden}_t + \theta_2 \text{lgdppc}_t + \theta_3 \text{lgdppc}_t^2 + \omega_t$ where $\theta_0 = \alpha_0 / (1 - \beta_7)$, $\theta_1 = (\beta_1 + \beta_2) / (1 - \beta_7)$, $\theta_2 = (\beta_3 + \beta_4) / (1 - \beta_7)$, $\theta_3 = (\beta_5 + \beta_6) / (1 - \beta_7)$.

For estimating the long-run model and besides using ARDL, other procedures for small sample include Dynamic OLS (DOLS), Fully Modified OLS (FMOLS), and canonical cointegrating regression (CCR). Stock and Watson⁵² propose the dynamic OLS; Park⁴³ introduces the canonical cointegrating regression); while Phillips and Hansen⁴⁵ suggest the fully-modified OLS. DOLS procedure corrects for possible simultaneity bias and small sample bias amongst the regressors by regressing one of the *I*(1) variables on other *I*(1) variables, the *I*(0) variables, and lags and leads of the first difference of the variables. Incorporating the first difference variables and the associated lags and leads will eliminate simultaneity bias and small sample bias inherent among regressors. On the other hand, the FMOLS procedure correct for endogeneity and serial correlation effects as well as eliminates the small sample bias. The CCR is closely related to FMOLS, but instead employs stationary transformation of the time series data to obtain least squares estimates to remove the long-run dependence between the cointegrating equation and stochastic regressors innovations. Park⁴³ shows that the CCR transformations asymptotically eliminate the endogeneity caused by the long-run correlation of the cointegrating equation errors and stochastic regressors innovations, and simultaneously correct for asymptotic bias resulting from the contemporaneous correlation between the regression and stochastic regressor errors.

RESULTS OF THE LONG-RUN MODELS

In Tables 3 to 7, we present the results of the cointegration tests as well the estimated long-run models for Indonesia, Malaysia, the Philippines, Singapore and Thailand, respectively. For OLS we used the conventional Engle and Granger two-step procedure for testing the null hypothesis of non-cointegration or the present of unit root on the residuals. On the other hand, we also report both the L_c - and χ^2 -statistics, the test for the null hypothesis of cointegration for FMOLS, DOLS and CCR; while the bounds F -test using ARDL that tests the null hypothesis of non-cointegration.

Table 3: Results of long-run tax evasion model estimates for Indonesia

Estimators	Constant	Itaxburden _t	lgdppc _t	lgdppc _t ²
ARDL(2,0,2,2)	25.445***	0.075**	-7.228***	0.509***
	(7.664)	(2.123)	(8.021)	(8.184)
	<i>Bound F-test: 15.298***</i>		R ² = 0.991	LM χ^2 (4) = [0.076]
OLS	25.175***	0.188***	-6.993***	0.476***
	(10.910)	(6.382)	(10.738)	(10.397)
	<i>E-G test: -3.449***</i>		R ² = 0.958	LM χ^2 (4) = [0.309]
FMOLS	44.618***	0.148***	-12.466***	0.863***
	(18.978)	(7.341)	(18.915)	(18.575)
	$L_c = 11.145$ [<0.01]		R ² = 0.886	Q(4) = [0.091]
DOLS	32.425***	0.085***	-9.011***	0.622***
{lead=1, lag=1}	(15.073)	(3.552)	(16.234)	(17.283)
	$L_c = 0.131$ [>0.20]		R ² = 0.996	Q(4) = [0.096]
CCR	25.225***	0.209***	-7.026***	0.479***
	(31.223)	(9.606)	(36.316)	(43.635)
	$L_c = 1.202$ [<0.01]		R ² = 0.955	Q(4) = [0.506]

Notes: Asterisks (***), (**) and (*) denote statistically significant at 1%, 5% and 10% level respectively. For the long-run model, figures in round brackets are t -statistics. For the cointegration tests; the $E-G$ test denotes the DF t -statistic on the cointegrating regression’s residual. Critical values at 5% level for bound test (F -statistics) are $I(0) = 3.272$ and $I(1) = 4.306$ for $k = 3$ are taken from Narayan⁴². Breusch-Godfrey LM χ^2 (4) and Ljung-Box Q(4) are the tests for non-serial correlation. L_c -statistic measures Hansen²⁹ parameter instability test for cointegration. The Bound tests and $E-G$ tests with null hypothesis of no cointegration while the Hansen test the null hypothesis of cointegration.

Table 4: Results of long-run tax evasion model estimates for Malaysia

Estimators	Constant	Itaxburden _t	lgdppc _t	lgdppc _t ²
ARDL(1,1,0,0)	35.217***	0.207***	-8.016***	0.449***
	(6.948)	(4.949)	(6.770)	(6.489)
	<i>Bound F-test: 10.306***</i>		R ² = 0.997	LM χ^2 (4) = [0.304]
OLS	40.203***	0.244***	-9.164***	0.514***
	(9.482)	(7.253)	(9.327)	(8.921)
	<i>E-G test: -3.028***</i>		R ² = 0.989	LM χ^2 (4) = [0.190]
FMOLS	40.133***	0.261***	-9.169***	0.515***
	(7.805)	(7.198)	(7.645)	(7.330)
	$L_c = 0.613$ [0.137]		R ² = 0.989	Q(4) = [0.505]

Conted...

DOLS	36.954***	0.219***	-8.471***	0.478***
{lead=1, lag=1}	(6.786)	(3.943)	(6.729)	(6.583)
	$L_c = 0.053 [>0.20]$		$R^2 = 0.997$	$Q(4) = [0.257]$
CCR	41.035***	0.258***	-9.378***	0.527***
	(9.789)	(6.890)	(9.437)	(8.947)
	$L_c = 0.358 [>0.20]$		$R^2 = 0.989$	$Q(4) = [0.497]$

Notes: Asterisks (***), (**) and (*) denote statistically significant at 1%, 5% and 10% level respectively. For the long-run model, figures in round brackets are *t*-statistics. For the cointegration tests; the *E-G* test denotes the DF *t*-statistic on the cointegrating regression’s residual. Critical values at 5% level for bound test (*F*-statistics) are $I(0) = 3.272$ and $I(1) = 4.306$ for $k = 3$ are taken from Narayan⁴². Breusch-Godfrey $LM\chi^2(4)$ and Ljung-Box $Q(4)$ are the tests for non-serial correlation. L_c -statistic measures Hansen (1996) parameter instability test for cointegration. The Bound tests and *E-G* tests with null hypothesis of no cointegration while the Hansen test the null hypothesis of cointegration.

Table 5: Results of long-run tax evasion model estimates for Philippines

Estimators	Constant	$ltaxburden_t$	$lgdppc_t$	$lgdppc_t^2$
ARDL(1,2,2,1)	5.089	-0.078	-1.513	0.116
	(0.359)	(0.504)	(0.384)	(0.427)
	<i>Bound F-test:</i> 10.997***		$R^2 = 0.997$	$LM\chi^2(4) = [0.001]$
OLS	10.905***	0.048***	-3.050***	0.210***
	(3.891)	(7.652)	(3.879)	(3.817)
	<i>E-G test:</i> -2.104**		$R^2 = 0.941$	$LM\chi^2(4) = [0.043]$
FMOLS	13.941***	0.048***	-3.911***	0.272***
	(3.472)	(2.911)	(3.485)	(3.450)
	$L_c = 0.737 [0.076]$		$R^2 = 0.930$	$Q(4) = [0.122]$
DOLS	11.950**	0.042**	-3.388**	0.238**
{lead=1, lag=1}	(2.320)	(2.756)	(2.329)	(2.306)
	$L_c = 0.054 [>0.20]$		$R^2 = 0.984$	$Q(4) = [0.022]$
CCR	10.842***	0.058***	-3.057***	0.212***
	(6.183)	(4.292)	(6.284)	(6.260)
	$L_c = 0.503 [>0.20]$		$R^2 = 0.908$	$Q(4) = [0.097]$

Notes: Asterisks (***), (**) and (*) denote statistically significant at 1%, 5% and 10% level respectively. For the long-run model, figures in round brackets are *t*-statistics. For the cointegration tests; the *E-G* test denotes the DF *t*-statistic on the cointegrating regression’s residual. Critical values at 5% level for bound test (*F*-statistics) are $I(0) = 3.272$ and $I(1) = 4.306$ for $k = 3$ are taken from Narayan⁴². Breusch-Godfrey $LM\chi^2(4)$ and Ljung-Box $Q(4)$ are the tests for non-serial correlation. L_c -statistic measures Hansen (1996) parameter instability test for cointegration. The Bound tests and *E-G* tests with null hypothesis of no cointegration while the Hansen test the null hypothesis of cointegration.

Table 6: Results of long-run tax evasion model estimates for Singapore

Estimators	Constant	$ltaxburden_t$	$lgdppc_t$	$lgdppc_t^2$
ARDL(1,1,0,0)	17.524***	0.028*	-3.238***	0.149***
	(8.716)	(1.807)	(8.031)	(7.452)
	<i>Bound F-test:</i> 18.811***		$R^2 = 0.998$	$LM\chi^2(4) = [0.228]$

Conted...

OLS	24.659***	0.064***	-4.662***	0.219***
	(12.929)	(3.764)	(12.236)	(11.616)
	<i>E-G test</i> : -2.858***		R ² = 0.992	LMχ ² (4) = [0.313]
FMOLS	25.206***	0.036*	-4.746***	0.222***
	(11.778)	(1.791)	(11.044)	(10.405)
	L _C = 0.705 [0.089]		R ² = 0.991	Q(4) = [0.495]
DOLS	21.133***	0.036***	-3.954***	0.184***
{lead=1, lag=1}	(14.026)	(3.464)	(13.443)	(12.869)
	L _C = 0.062 [>0.20]		R ² = 0.999	Q(4) = [0.823]
CCR	23.687***	0.039*	-4.446***	0.208***
	(9.512)	(1.809)	(8.790)	(8.220)
	L _C = 0.271 [>0.20]		R ² = 0.991	Q(4) = [0.546]

Notes: Asterisks (***), (**) and (*) denote statistically significant at 1%, 5% and 10% level respectively. For the long-run model, figures in round brackets are *t*-statistics. For the cointegration tests; the *E-G* test denotes the DF *t*-statistic on the cointegrating regression’s residual. Critical values at 5% level for bound test (*F*-statistics) are I(0) = 3.272 and I(1) = 4.306 for *k* = 3 are taken from Narayan⁴². Breusch-Godfrey LMχ²(4) and Ljung-Box Q(4) are the tests for non-serial correlation. L_C-statistic measures Hansen (1996) parameter instability test for cointegration. The Bound tests and *E-G* tests with null hypothesis of no cointegration while the Hansen test the null hypothesis of cointegration.

Table 7: Results of long-run tax evasion model estimates for Thailand

Estimators	Constant	ltaxburden _{<i>t</i>}	lgdppc _{<i>t</i>}	lgdppc _{<i>t</i>} ²
ARDL(1,1,1,1)	2.137***	0.016*	-0.524***	0.031***
	(12.591)	(1.811)	(11.435)	(10.732)
	<i>Bound F-test</i> : 6.417***		R ² = 0.999	LMχ ² (4) = [0.030]
OLS	2.203***	0.030***	-0.545***	0.032***
	(24.941)	(15.345)	(22.712)	(20.432)
	<i>E-G test</i> : -4.901***		R ² = 0.997	LMχ ² (4) = [0.074]
FMOLS	2.284***	0.029***	-0.566***	0.033***
	(32.400)	(17.375)	(30.262)	(27.435)
	L _C = 1.592 [<0.01]		R ² = 0.997	Q(4) = [0.196]
DOLS	2.360***	0.028***	-0.585***	0.035***
{lead=1, lag=1}	(34.603)	(9.090)	(32.951)	(29.668)
	L _C = 0.101 [>0.20]		R ² = 0.999	Q(4) = [0.070]
CCR	2.209***	0.031***	-0.547***	0.032***
	(35.270)	(19.579)	(31.906)	(28.249)
	L _C = 0.486 [>0.20]		R ² = 0.997	Q(4) = [0.113]

Notes: Asterisks (***), (**) and (*) denote statistically significant at 1%, 5% and 10% level respectively.

For the long-run model, figures in round brackets are *t*-statistics. For the cointegration tests; the *E-G* test denotes the DF *t*-statistic on the cointegrating regression’s residual. Critical values at 5% level for bound test (*F*-statistics) are I(0) = 3.272 and I(1) = 4.306 for *k* = 3 are taken from Narayan⁴². Breusch-Godfrey LMχ²(4) and Ljung-Box Q(4) are the tests for non-serial correlation. L_C-statistic measures Hansen (1996) parameter instability test for cointegration. The Bound tests and *E-G* tests with null hypothesis of no cointegration while the Hansen test the null hypothesis of cointegration.

Generally, cointegration is detected for all ASEAN countries. For Indonesia cointegration is detected from using ARDL, OLS and DOLS; Malaysia and Singapore from all estimators; while for Thailand cointegration is shown using OLS, DOLS and CCR. All the long-run models associated with the cointegration tests pass the no-serial correlation tests at the 5% significant level. Moreover, all variables are significant and show correct sign. The results suggest that tax burden increases tax evasion by at least 0.3% for every 10% increases in tax rates in Singapore and Thailand. The highest response to tax burden is Malaysia where for every 10% increase in tax burden, tax evasion will increase by 26%.

An interesting result emerge from this study is the non-linear relationship shown between tax evasion and economic development for all ASEAN-5 country. The *U*-shape curves suggest that as economic development progress in all ASEAN-5 economies from low to higher level, tax evasion at first decreases and then tax evasion increases. It is observe that the decrease in tax evasion is more responsive than the increase in tax evasion when economic development increases. For example in Malaysia, a 10% increase in economic development will lead to a fall in tax evasion by 9% and then an increase in tax evasion by 0.5%.

The *U*-shape relationship between tax evasion and economic development can be explained according to the public choice argument. Studies by Hanousek and Palda^{27,28}, D'Hernoncourt and Meon¹³, Lassen³⁹, and Torgler⁵⁵ posit that trust and tax evasion is negatively related. At low level of economic development there is high level of trust – trust between economic agents as well as trust to the government. Trust is related to tax morale. Torgler⁵⁵ argue that people will be more prone to pay taxes if they trust their fellow tax-payers to do the same, and if they trust the government to use tax revenues to finance public goods. In this situation high level of trust lead to high tax morale and consequently tax evasion will be low. However, as income increases and economic development progress further, the level of trust eroded and tax morale deteriorate among the society. This situation becomes more complex when an economy consisted of various ethnicity and heterogeneity. Lassen³⁹ point out those countries with more heterogenous society, the trust level is low and therefore tax compliance will be lower too.

CONCLUSION

Revenue from taxation is important for the elected government of all nations. The supply of adequate

government services to the society will be met if the government able to collect enough finances to finance the required expenses – public infrastructures and services. However, it is recognized that the universal problem faced by any nation is the leakage or loss of tax revenue through tax evasion. Tax evasion is a crime – crime to the society as well as to a country; and since tax loss may result in slow economic growth, upsetting the proper functioning of the government as the ability to finance its basic expenses is threatened; therefore, fighting tax evasion should be an important agenda for any government.

The purpose of the present study is to relate tax evasion with tax burden and economic development for five ASEAN countries. In this study using time series data for the period 1980 to 2013, we have estimated the fraction of shadow economy to the official economy for all ASEAN-5 countries using the MIMIC model. Based on this estimate we have computed the amount of tax losses for the period 1980 to 2013. Our estimated long-run models suggest that tax burden and the level economic development are important determinants influencing peoples' behavior to evade tax in all five ASEAN economies. The relationship between tax evasion and economic development is *U*-shape: tax evasion is low at lower level of economic development but as economic development increases, tax evasion also increase. In relation to this non-linear relationship we offer an explanation that at low level of economic development when trust to the government is stronger, there will be less people to evade tax, but as economy grows, government effectiveness become questionable, and when people believe that government is dishonest and the quality of services to the public is poor; the states' misled the peoples' trust and people will evade taxes in response.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Alm J, Embaye A. Using dynamic panel methods to estimate shadow economies around the world. 1984-2006. *Public Finance Review*. 2013; 41(5): 510-543.
2. Bajada C, Schneider F. The shadow economies of the Asia-Pacific. *Pacific Economic Review*. 2005; 10(3): 379-401.

3. Bose N, Capasso S, Wurm M.A. The impact of banking development on the size of shadow economies. *Journal of Economic Studies*. 2012; 39(6): 620-638.
4. Browne M.W, Cudek R. Alternative ways of assessing model fit. In K.A. Bollen (Ed.). *Testing structural equation models*. Newbury Park, CA, Sage. 1993.
5. Buehn A. The shadow economy in German regions: An empirical assessment. *German Economic Review*. 2011; 13(3): 275-290.
6. Buehn A, Schneider F. Shadow economies around the world: Novel insights, accepted knowledge and new estimates. *International Tax and Public Finance*. 2012; 19: 139-171.
7. Caballe J, Panades J. Inflation, tax evasion and the distribution of consumption. *Journal of Macroeconomics*. 2004; 26: 567-595.
8. Cebula R.J. Determinants of aggregate income-tax-evasion behavior: The case of the US. *BNL Quarterly Review*. 1998; 206: 273-290.
9. Cebula R, Foley M. Personal income tax evasion determinants revisited: An exploratory study using newly available data. *Academy of Economics and Finance Journal*. 2010; 2: 17-24.
10. Cerqueti R, Coppier R. Economic growth, corruption and tax evasion. *Economic Modelling*. 2011; 28: 489-500.
11. Chau P.Y.K, Hu P.J.H. Information technology acceptance by individual professionals: A model comparison approach. *Decision Sciences*. 2001; 32(4): 699-719.
12. Crane S.E, Nourzad F. Inflation and tax evasion: An empirical analysis. *The Review of Economics and Statistics*. 1986; 68(2): 217-223.
13. D'Hernoncourt J, Meon P.G. The not so dark side of trust: Does trust increase the size of the shadow economy? *Journal of Economic Behavior & Organization*. 2012; 81: 97-121.
14. Dell'Anno R, Gomez-Antonio M, Pardo A. The shadow economy in three Mediterranean countries: France, Spain and Greece. A MIMIC approach. *Empirical Economics*. 2007; 33: 51-84.
15. Dell'Anno R, Schneider F. A complex approach to estimate shadow economy: The structural equation modeling. In M. Faggini and T. Lux (Eds.). *Coping with the complexity of economics*. Italy, Springer-Verlag. 2009.
16. Elgin C, Oztunali O. Shadow economies around the world: Model based estimates. Working Papers 2012-05. Bogazici University, Istanbul, Turkey. 2012.
17. Elliott G, Rothenberg T.J, Stock J.H. Efficient tests for an autoregressive unit root. *Econometrica*. 1996; 64(4): 813-836.
18. Engle R.F, Granger C.W.J. Co-integration and error correction: Representation, estimation and testing. *Econometrica*. 1987; 55: 251-276.
19. Fiege E.L. The underground economy and the currency enigma. *Public Finance*. 1994; 49(4): 119-136.
20. Feld L.P, Frey B.S. Tax evasion in Switzerland: The roles of deterrence and tax morale. Working Paper Series No.284. Institute for Empirical Research in Economics, University of Zurich, Switzerland. 2006.
21. Franzoni L.A. Tax evasion and tax compliance. Working Paper Series, University of Bologna, Italy. 1998.
22. Fuest C, Riedel N. Tax evasion, tax avoidance and tax expenditures in developing countries: A review of the literature. Report prepared for the UK Department for International Development (DFID), Oxford University Centre for Business Taxation, Oxford, U.K. 2009.
23. Gatti R, Honorati M. Informality among formal firms: Firm-level, cross-country evidence on tax compliance and access to credit. Policy Research Working Paper 4476, The World Bank, New York. 2008.
24. Giles D.E.A. Measuring the hidden economy and the tax-gap in New Zealand. *Empirical Economics*. 1999; 24: 621-640.
25. Gordon R, Li W. Tax structures in developing countries: Many puzzles and a possible explanation. *Journal of Public Economics*. 2009; 93: 855-866.

26. Gravelle J.G. Tax havens: International tax avoidance and evasion. Congressional Research Service 7-5700. CRS Report Prepared for Members and Committees of Congress. 2015.
27. Hanousek J, Palda F. Quality of government services and the civic duty to pay taxes in the Czech and Slovak Republics, and other transition countries. *Kyklos*. 2004; 57: 237-252.
28. Hanousek J, Palda F. The evasional Kuznets curve: A possible shadow economy dynamics during the transition. *Japanese Journal of Comparative Economics*. 2015; 52(1): 1-17.
29. Hansen B.E. Tests for parameter instability in regressions with I(1) processes. *Journal of Business & Economic Statistics*. 1992; 10(3): 321-335.
30. Hendry J.S. The price of offshore revisited. The Tax Justice Network. 2012.
31. Hollingshead A. The implied tax revenue loss from trade mispricing. Global Financial Integrity, Washington, USA. 2010.
32. Johannesen N. Tax evasion and Swiss bank deposits. *Journal of Public Economics*. 2014; 111: 46-62.
33. Johnson S, Kaufman D, McMillan J, Woodruff C. Why do firm hide? Bribes and unofficial activity after communism. *Journal of Public Economics*. 2000; 76: 495-520.
34. Joreskog K.G, Sorbom D. LISREL 8: Structural equation modeling with the SIMPLIS command language. Chicago, Scientific Software International. 1993.
35. Kafkalas S, Kalaitzidakis P, Tzouvelekas V. Tax evasion and public expenditures on tax revenue services in an endogenous growth model. *European Economic Review*. 2014; 70: 438-453.
36. Kar D, Spanjers J. Illicit financial flows from developing countries: 2003-2012. Global Financial Integrity, Washington, USA. 2014.
37. Kirchgassner G. Tax morale, tax evasion and the shadow economy. Discussion Paper No.2010-17. Department of Economics, University of St. Gallen, Switzerland. 2010.
38. Klaric V. Estimating the size of non-observed economy in Croatia using the MIMIC approach. *Financial Theory and Practice*. 2010; 35(1): 59-96.
39. Lassen D.D. Ethnic division, trust and the size of the informal sector. *Journal of Economic Behavior and Organization*. 2007; 63: 423-438.
40. MacKinnon J.G. Numerical distribution functions for unit root and cointegration tests. *Journal of Applied Econometrics*. 1996; 11: 601-618.
41. Martinez-Vazquez J. Taxation in Asia. Asian Development Bank, Philippines. 2011.
42. Narayan P.K. The saving and investment nexus for China: Evidence from cointegration tests. *Applied Economics*. 2005; 37: 1979-1990.
43. Park J.Y. Canonical cointegrating regressions. *Econometrica*. 1992; 60: 119-143.
44. Pesaran M.H, Shin Y, Smith R.J. Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*. 2001; 16: 289-326.
45. Phillips P.C.B, Hansen B.E. Statistical inference in instrumental variables regression with I(1) processes. *Review of Economic Studies*. 1990; 57: 99-125.
46. Richardson G. Determinants of tax evasion: A cross-country investigation. *Journal of International Accounting, Auditing and Taxation*. 2006; 15: 150-169.
47. Schneider F. Shadow economies around the world: What do we really know? *European Journal of Political Economy*. 2005; 21: 598-642.
48. Schneider F. Shadow economies all over the world: New estimates for 162 countries from 1999 to 2007. Policy Research Working Paper 5356, The World Bank, New York. 2010.
49. Schneider F. Tax evasion in Europe. *CESifo Forum*. 2012; 2: 3-12.
50. Schneider F, Enste D.H. Shadow economies: Size, causes and consequences. *Journal of Economic Literature*. 2000; 38: 77-114.
51. Schneider F, Enste D.H. The shadow economy: An international survey. Cambridge, Cambridge University Press. 2002.

52. Stock J.H, Watson M. A simple estimator of cointegrating vectors in higher order integrated systems. *Econometrica*. 1993; 61: 783-820.
53. The Tax Justice Network. The cost of tax abuse: A briefing paper on the cost of tax evasion worldwide. The Tax Justice Network. 2011.
54. Torgler B. Tax morale in Asian countries. Working Paper No.2004-02.Center for Research in Economics, Management and Arts, CREMA, University of Basel, Switzerland. 2004.
55. Torgler B. Tax morale in Latin America. *Public Choice*. 2005; 122: 137-157.
56. Zucman G. The missing wealth of nations: Are Europe and the U.S. net debtors or net creditors? *Quarterly Journal of Economics*. 2013; 128(3): 1321-1364.

Identifying Critical Crime Contribute Factors towards Improving University Facilities

NurFaiza Hussin¹, Radzi Ismail², Mohd Nizam Mohd Yusof³, Salman Riazi Mehdi Riazi⁴

^{1,2,4}*School of Housing, Building and Planning, Universiti Sains Malaysia, 11800, Penang;* ³*Faculty of Economic and Management, University College Bestari, 22100, Setiu, Terengganu, Malaysia;*

⁴*School of Technology Management and Logistics, Universiti Utara Malaysia, 06000, Sintok, Kedah*

ABSTRACT

Campus crime is a serious issue and the first anxiety of the entire campus community as a whole. This criminal activity that occurs on campus not only affects the quality of the learning process but also gives a sense of fear and discomfort to using university facilities. This paper intends to determine the critical contribute factors of crime incidents on the university facilities. This research employs a quantitative method as methods to gather data. This study involved 173 respondents from students of Universiti Sains Malaysia, Pulau Pinang, Malaysia. The analysis of this study used descriptive analysis. The findings have shown that five factors contribute to crime, the first factor is security that contributed to the incident on campus, the second factor is an environment, the third factor is student behaviour, the fourth factor is activity and lifestyle, and the last element design. Entirely the crime contributes factors need to be envisaged in university policies towards reducing the offence incidence on the university facilities.

Keywords: *campus crime, crime contribute factors, and crime incidence*

INTRODUCTION

University campus is an environment that placed thousands number of students to fulfil academic activities. According to Castaldi¹⁰, the organised learning environment is crucial to consider as most of the institutions of higher education places their students live on campus. Besides, a campus doesn't only consist of students, but it also accommodates various parties such as staff, visitors, temporary workers and so on. Therefore, a safe, peaceful, harmonious and free from crime must be created so that all the activities on campus can be conducted without any interruption. The ambience of peace and harmony in the campus can affect the lives of male and female students who are in college. If the campus is in a safe environment, students can gain knowledge through comfortably, but otherwise, the learning process will be interrupted. Its can be linked to the issue of security on the campus.

Crime on campus turned out to be a problem of concern. If the offence often occurs on a campus, it does not immediately raise issues about the safety of the students who are on campus. The question of security is not a new problem, but it is the primary concern of parents when their

children attend college and university. In a study about the goal of parents to students, "health and safety" have higher frequencies than "preparation for citizenship," "improve social skills" or "explore the values and beliefs" Turrentine et al⁴³. Although safety on campus entrusted to the Security Department, in reality, is a collective responsibility of all citizens of the campus either staff or students. Individuals who have an attitude of indifference to the things that could jeopardise safety is part of the primary threats to security. Therefore, close cooperation and mutual understanding of each that will determine the assurance of peace and happiness in this campus.

The crime caused losses arising from damage to the property, resulting in increased property insurance claims, high-value employment compensation, life and health insurance claims were high and also involve the loss to the victim because the need to bear the cost to move to another place Soh³⁹. Reducing or preventing crime to occur is necessary to provide safety and comfort to the people and surroundings. Place-based crime prevention method aims to prevent or reduce crime before they occur. The design of the physical environment plays an important role in preventing crimes from occurring by reducing the opportunities or facilities for their criminal

activities Hedayati et al²¹. It promotes people the ability to feel safe and comfortable outdoors. This different method of approach in deterring crime focus on using structural and environmental design in crime prevention.

Support activity encompasses any activity that increases the presence of community activities in public space and concurrently will reduce potential crime. All the activities that encourage communities to involved in certain areas will provide natural surveillance and a sense of ownership. For example, a futsal court may provide the youngster with a recreational space for them for this sport while on the other hand making strangers to be visible to be identified. This paper attempt to determine the crime contribute factors in university campus.

LITERATURE REVIEW

Issues in University Campus: Nowadays people believe that a university prioritises their image, rather than the safety of students. The argument regarding a crime report will give impact on the money generated by the registrar and alumni donations Burd⁹. This opinion can be viewed on the situation prevailing today, where only minor crime report will be disseminated to the public as is the case of theft. While there are certain cases that confidentiality and the closed case with the reasons to protect the image of the university and avoid students' anxiety.

There are various types of studies have been carried out to safety and campus crime. For example, Gordon¹⁹ has studied the variation between technology and campus safety. Wickes et al⁴⁵, has conducted research on ethnic diversity and campus security. It turns out researchers concerned the issue of campus safety crime aspects, although statistics show that university studies have not experienced crime critical Rund³⁵. The awareness of students regarding factors that lead to crime events can be known. Besides, through this study, campus security weaknesses or deficiencies can be identified based on the views of the students, as well as steps that can be done to improve campus safety and reduce crime.

What are Crimes?: According to Andresen and Jenion (2008), defined crime as a complex phenomenon and can give the cumulative effects of the financial, psychological aspects through the loss of property, insurance, litigation, victimisation and safety. Crime consist of individual or group of people acts become threats to society and that action is an offence in the lawful (Alise, 1990). Crimes

can threaten the safety of individuals and society if it is not kerbed (Bloch and Geis, 1962). Crime is seen to resemble the other crimes carefully, it may be different from the angle of incentives or in the process of etiological. In reality, crime is an acts that will threats the society and influences the life of the community.

THEORY OF CRIMES

Rational choice theory: This theory believes that people are naturally egoistic nature and the law educate people through punishment to ensure individual fear to breaking the legal Devine¹⁴. Besides, the theory also argues that to protected offenders, the punishment should be proportional to the fault Siegel³⁷. There are two concepts in this theory. First theory is an offence particular and the second theory is offenders specific crime. According to Philip and Votey³³, before the criminal commit to do the crime, they will measure the opportunity, space, security exist and they also study the value and risk will expected if they under arrest. Whereas, offenders-specific crime is the criminal commit the crime based on the motive. Temporal, the criminal will think their ability to commit crimes, the intention of doing, they also study about the security of placed. The criminal law is definitely capable of causing a feeling of trepidation to criminals, and it might also cause offenders to cancel their intention.

The theory of rational choice has found there are some criteria cause of crime. According to Siegel³⁷, the causes of crime from economic issues, experience and know-how to commit a crime. In the financial aspect, the criminal is viewed from the point of returns earned from the act of having committed an offence. According to Siegel³⁷, a criminal act will be more interesting if it allows the offenders to earn a second profit within overnight. However, criminals will stop committing the same offence in the future if they find that the benefits they received of the crime are decreasing Pezzin³². In summary, the theory of rational choice considers that opportunity from an economic point is also a contributor to the occurrence of the crime problem. Also, the rational choice approach stated that the skills and knowledge of the offence also plays a significant role in the process of influencing a person commits a crime.

Routines activities theory: In this theory, criminals will see victim's action in their daily lives, which influence the crime to occur. It's the key criteria for the crime happen because of their act Anastasia and John¹. According to Mannon²⁸ in the reality the crimes happened because of

two main things, there are; the criminal will evaluate the risk. In this type of crime, the criminal already understands the characteristics of their target victim and the time constraint during the crime was considered. The criminal understand very well their victim daily activities and also know how to commit without arrest by police. The criminals know very well the environment and behaved the inhabitants of target area

The list of factors that influence success of criminal behaviour Sue⁴⁰:

- (a) The existence of appropriate targets such as houses that have valuable belongings
- (b) The absence of a capable guardian such as the police, homeowner, neighbour, friends and relatives.
- (c) Offenders who acted as criminals as a group of teenagers who do not work, the unemployed and the population of drug addicts.

All these factors will influence the crime exist in certain area and gives tremendous opening of criminals to act Jensen and Anderson²². This theory emphasises on characteristics of the target and any opportunity occur of crime exist will be avoid by guardian of friends, relatives, neighbours and so on.

Trait theory: Trait theory was introduced by Lambroso, where the physical characteristics of criminals as one of the factors that cause crime. This theory was published by observation of the physical characteristics of prisoners and compare them with the physical features of the Italy's armies at that time. At the end of the remark, Lambroso found that there are different physical characteristics between the prisoners and the troops and this lead Lambroso concluded that biological factors as causes of criminal behaviour Siegel³⁷.

Trait theory also described the physical characteristics of the body that can classify a person as a criminal. Among the physical characteristics is the unusual shape of the face or head, large ears, thick lips, broad chin, long arms, wrinkled skin and extraordinary finger's length. A man will be labelled as a criminal if he has five characteristics as mentioned above, whereas for women only have three features of the above, it will be labelled as criminals McCrae and Costa²⁹.

Labelling theory: Kendell²³ found that the Labeling theory states that behaviours are begun with deviant

labelling by social control agents against a small number of individuals involved in acts deviant. Graven and Lerman²⁰ agreed that formal social agencies such as court, police, mental health treatment centres, and prisons are the cause of the terms, labelling as a "madman", "sick people", and "prisoners" existed among the community. Terms and names make the individual charged with the call have a bad record in the eyes of the society. Bad record given by the community to them will cause them to feel alienated. This segregation cause they are motivated to return to their world of crimes.

Contribute Factors: In crimes have many contribute factors that influence the crime occurred. Under this part will discuss that crime contributes elements based on university campus. In this paper will focus on five crime contribute factors as below:

Building Design: According to Clarke¹¹, the opportunities that exist based on the design of a building and the physical environment of an area could invite crime events to occur. A building may encourage crime when it provides an opportunity for criminals to enter into it quickly. Most of the crimes that took place in an area are driven by the availability of possibilities in implementing it. For example, crime is easier to happen when there is an opportunity for the offenders from getting caught or seen by the public such as a building with many routes can help an offender to escape. The building space that does not encourage good neighbouring can cause crime events like the burglary because the residents do not know each other. Through perception of residents, neighbourhoods are those who live next door or those who live near to us Taylor and Harrel⁴¹.

Activity and Lifestyle: The lifestyle and daily campus routine activities require the student to travels to and from the campus, walking to the library at night, parking in public lots, and socialised inside and outside campus area create opportunities to be a victim of criminalization. These lifestyle exposed students to criminal behaviour. Crimes are ignited by mainly three factors that present simultaneously at the same time. Those factors are the victim, the person that is motivated to commit the offence, and open opportunities to carry out crime. The daily student routine would able to provide the victim, and opportunities factor for a crime to happen.

Studies of crime in the campus stating that student has lower percentage compare to non-student within the same age to be crime victimisation, including overall

level of violence Becker et al⁴. Another study shows that thievery related to student properties has been the most famous crime that occurs in campus life Clarke¹¹. As victims know these offenders, many of them had not taken any precaution steps as they trust the offenders to watch and cares of their properties.

Environment: Many researchers have examined how and why crime occurs, especially as it relates to the physical environment. Medieval and classical cities found refuge in defensible space, long before the term was even coined, which can be observed in the way they walked their communities and places few entry gates. Cities in 18th and 19th century modified their built surroundings as part of major crime control efforts Dhiman¹⁵. In London and Paris, street lighting was introduced to reduce crime on the streets Brangtiham and Brangtiham⁷.

Adequate lighting in an area plays an important role; this is because proper lighting enables the environment clearly visible and can also help individuals to detect a crime happens more easily. Also, the researcher has proved that lighting has a close link with the fear of crime, this is due to poor lighting does not offer adequate lighting to allow conditions or hazardous environments such as being attacked by criminals detected earlier before the offence occurred. Poor lighting in some areas such as parking areas is more prone to crime to occur due to parking areas usually located away from the crowd, and the fear of crime is higher than in public places such as sidewalk where the lighting is poor Brownlow⁸.

Most findings showed consistent results where low light intensity level caused heightened fear. According to Kirk²⁴, there are two factors chosen by most of the respondents that expressed the environment was not safe when an area is dark (poor lighting), and there are also places that allow an attacker to hide. Also, there is also a study made by Loewen et al²⁷, where the study asked students to list the characteristics of the environment that they think are safe, that can avoid becoming a victim of criminals. Most listed features to ensure a safe environment is light followed by open spaces as well as access to real protection.

Security: Installation of CCTV system is intended to prevent crime and disorder where it can prevent crime through surveillance. According to Bennett and Gelsthorpe⁵, CCTV can give assurance to the people about their safety while in public areas and reduce the fear of crime and at the same time can increase the use

of public space. Through an evaluation program that has been made about the effectiveness of CCTV installations in particular areas such as residential areas, parking, elevators, shopping malls and other results obtained is crime rates decreasing compared with areas without CCTV installation.

Security also can be enhanced by placing a security guard in the student hostel. According to Fischer et al¹⁸, the placement of safety guard nearby to the student hostel can reduce crime where offenders or the students themselves are afraid to commit crime or immorality as they worried their actions being seen and the risk of being caught is high. Furthermore, the offences in student dormitories such as burglary, fights, bring in an outsider, property theft and so on are easier to known and can be resolved fast when there are security guards in charge or control near the hostel Brownlow⁸.

Security checks should be enhanced at the female hostel due to female students are more likely to become victims of crime Schreck and Miller³⁶. Usually, offenders prefer their victims to commit crimes are women compared to men, it is because women are weak and they are unable to defend their self to fight criminals. Women who are victims of crime usually prefer to remain silent or concealing the crimes on them instead of reporting to the police Weiss⁴⁴.

Resident's Behaviour: The behaviour of the population is among the contributing factors of crime on campus. According to Narawian and Syawal³¹, students are subjected to the Universities Act and University College Act, so students should know what can they do and what they cannot do on campus. It is an offence to be in the lecture hall after class time and is prohibited together with a partner (couple) in the dark area.

Students should think wisely before taking any actions or decisions. They should be more sensitive to the Universities Act and University College Act so that cases like theft and aggression can be overcome. To prevent crime and avoid becoming a victim, students must be more vigilant and careful with the environment and do not go out alone at night.

Table 1 present crime contribute factors based on the previous research. Most of the researcher discuss five crime contribute factors namely design, activity and lifestyle, environment, security and resident's behaviour. This finding will be used in the study of real crime factors in the university campus.

Table 1: Crime Contribute Factors

Variable \ Author	Design	Activity and Lifestyle	Environment	Security	Resident's Behaviour
Anastasia and John (2007)		√	√	√	√
Clarke (2000)					
Cobanoglu and Demicco (2007)				√	
Davison and Smith (2003)	√		√		√
Dhiman (2006)			√	√	
Dowdall 2008)		√			
Eck and Weisburd (2015)		√			√
Fischer et al. (2012)		√		√	
Landman and Lieberman (2005)	√		√		√
Mustaine and Tewsbury (2000)		√			
Sloan and Fisher (2014)		√		√	
Tewksbury and Mustaine (2003)		√			
Weiss (2010)				√	√

METHODOLOGY

This study applied a quantitative method. Therefore, a set of the questionnaire had been developed as a research instrument. The question has been designed based on the literature findings. In developing the survey, the question that is made must be straightforward, short, simple, easy to understand and avoid any sensitive issues. The most important thing is, the question that had been developed must not take a much time for respondents to answer. A total population of student Universiti Sains Malaysia is about 30 000 and the sample size is about 390 students. The sample size based on the determination of sample size by Krejcie and Morgan²⁵. After the data collection and data cleansing, the whole data that were used in this research is 173. Besides, this study used probability sampling. According to Archer et al³, probability sampling is a sampling technique in which every member of the population has a chance to be selected as respondent. Therefore, its reason this study used this kind of technique sampling.

RESULTS AND DISCUSSION

Based on the descriptive analysis that has been carried out, Table 2 shows the factors that contribute to crime incidents in USM Main Campus in descending order. From studies carried out, its indicate that the security factor as the key element to the crime incidents with the highest mean value (m=4.2890, std=0.47709).

The weak security controls induced the crime due to the opportunities obtained by the criminals to carry out their activities. Lack of patrols by security guards at night, especially in areas that are quiet, located far from the public, may cause it to become the target of criminals. This finding clearly shows that its equivalent with finding by Brownlow⁸ which the placement of security guard nearby to the student hostel can reduce crime where offenders or the students themselves are afraid to commit crime or immorality as they worried their actions being seen and the risk of being caught is high.

Followed by the environment factor as the second critical factor lead to crime occurrence with the mean value (m=4.0684, std=0.51462). This factor becomes main factor during at night which people difficult to control after their eye. Before the crime is carried out, the criminals will evaluate first the potential risks and rewards they get by performing illegal activities. This finding in link with Day (1994) and Sloan et al.(2000).

The third factor could encourage to crime incidents is resident's behaviour with the mean value (m=4.0048, std=0.60185). While, the fourth factor is activity lifestyle with the mean value (m=3.8116, std=0.55099). The last factor that is believed only contributes a small percentage to crimes is design element with the mean value (m=3. 6262, std=0.60705).

All the crime contribute factors namely security, environment, resident's behaviour, activity lifestyle and

design should be the main agenda in making of crime policy in the university campus. Its will support the system of education because the students will develop their life without prejudice with safety system in the university.

Table 2: Crime Contribute Factors in Campus of Universiti Sains Malaysia

Factors	N	Mean	Standard Deviation
Security	173	4.2890	0.47709
Environment	173	4.0684	0.51462
Resident’s Behavior	173	4.0048	0.60185
Activity and Lifestyle	173	3.8116	0.55099
Design	173	3.6262	0.60705

CONCLUSION

The crime contributes factors will influence students in choosing the right university for their four years study life. In this found that five crime contribute factors namely security, environment, resident’s behaviour, activity and lifestyle and design. The first factor based on this research finding is security, this factor related with the system that implements in university to take care of students in their campus. The university should rethink about their security system because it become the important elements in providing the first class education environment. This finding also related to the university policy, how they plan to make their student live in comfortable and feel safe. This finding could aid universities to improve their facilities towards students safety.

Ethical Clearance: Taken from the committee

ACKNOWLEDGMENT

This research was funded by UniversitiSains Malaysia under bridging grant.

Conflict of Interest: NIL

REFERENCES

1. Anastasia L. S, John E. E. Crime prevention and active living. *American Journal of Health Promotion.* 2007; 21(4s): 380-389.
2. Andresen M. A, Jenion G. W. Crime prevention and the science of where people are. *Criminal Justice Policy Review.* 2008; 19(2): 164-180.

3. Archer E, Hand G. A, Blair, S. N. Validity of US nutritional surveillance: National Health and Nutrition Examination Survey caloric energy intake data, 1971–2010. *PloS one.* 2013; 8(10): e76632.
4. Becker J. V, Cunningham-Rathner J, Kaplan M. S. Adolescent sexual offenders: Demographics, criminal and sexual histories, and recommendations for reducing future offenses. *Journal of Interpersonal Violence.* 1986; 1(4): 431-445.
5. Bennett T, Gelsthorpe L. Public Attitudes towards CCTV in Public Places. *Studies on Crime and Crime Prevention.* 1996; 5(1): 72-90.
6. Bloch H. A, Geis G. *Man, crime, and society.* New York: Random House. 1970; (pp. 221-222).
7. Brangtiham P. J, Brangtiham P. L. *Patterns in Crime.* New York: Macmillan. 1994.
8. Brownlow A. *A Geography of Men’s Fear.* Geoforum. 2015; 36(5): 581-592.
9. Burd S. US Proposes Regulations on Disclosure of Graduation Rates and Campus Crime Data. *Chronicle of Higher Education.* 1992; 38(46).
10. Castaldi B. *Educational facilities: Planning, remodeling, and management.* Allyn and Bacon. 1977.
11. Clarke R. V. *Situational Prevention, Criminology, and Social Value. Ethical and Social Perspectives on Situational Crime Prevention,* Oxford: Hart. 2000; 97-112.
12. Cobanoglu C, Demicco F. J. To be secure or not to be: Isn’t this the question? A critical look at hotel’s network security. *International journal of hospitality & tourism administration.* 2007; 8(1): 43-59.
13. Davison E, Smith W. Exploring accessibility versus opportunity crime factors. *Sociation Today: The Journal of The North Carolina Sociological Association.* 2003; 1(1).
14. Devine F. E. *Cesare Beccaria and the Theoretical Foundation of Modern Penal Jurisprudence.* New Eng. J. on Prison L. 1981; 7, 8.
15. Dhiman D. *Identifying the relationship between crime and street layout using space syntax technology (Doctoral dissertation, University of Cincinnati).* 2006.
16. Dowdall G. W. *College Drinking: Reframing a Social Problem: Reframing a Social Problem.* ABC-CLIO. 2008.

17. Eck J. E, Weisburd D. L. Crime places in crime theory. 2015.
18. Fischer R, Halibozek E. P, Walters D. Introduction to security. Butterworth-Heinemann. 2012.
19. Gordon A. F. Ghostly matters: Haunting and the sociological imagination. U of Minnesota Press. 2008.
20. Graven M, Lerman S, Wenger E. Communities of practice: Learning, meaning and identity. *Journal of Mathematics Teacher Education*. 2003; 1998; 6(2): 185-194.
21. Hedayati A. An analysis of identity theft: Motives, related frauds, techniques and prevention. *Journal of Law and Conflict Resolution*. 2012; 4(1): 1-12.
22. Jensen J, Anderson J. Crime Prevention Through Environmental Design Criminology 420-Term Paper. 2004.
23. Kendall D. *Sociology in our times*. Cengage Learning. 2012.
24. Kirk N. L. Factors Affecting Perceptios of Safety in a Campus Environment. EDRA: Environmental Design Research Association. 1988.
25. Krejcie R. V, Morgan D. W. Determining Sample Size for Research Activities. *Education Psychol Meas*. 1970.
26. Landman K, Liebermann S. Planning against crime: preventing crime with people not barriers. 2005.
27. Loewen L. J, Steel G, Suedfeld P. Perceived Safety from Crime in the Urban Environment. *Journal of Environmental Psychology*. 1993; 13(4): 323-331.
28. Mannon J. M. Domestic and intimate violence: An application of routine activities theory. *Aggression and Violent Behavior*. 1997; 2(1), 9-24.
29. McCrae R. R, Costa, P. T. Personality in adulthood: A five-factor theory perspective. Guilford Press. 2003.
30. Mustaine E. E, Tewksbury R. Comparing the lifestyles of victims, offenders, and victim-offenders: A routine activity theory assessment of similarities and differences for criminal incident participants. *Sociological Focus*. 2000; 33(3): 339-362.
31. Narawi S, Syawal M. Adaptasiunsuralamdanunsur fauna dalam kata panggilanadat: pen didi kanuntuk kele starian budayaetnikKelabit. 2015.
32. Pezzin L. E. Earnings prospects, matching effects, and the decision to terminate a criminal career. *Journal of quantitative criminology*. 1995; 11(1), 29-50.
33. Phillips H, Votey H. L. Rational choice models of crimes by youth. *The Review of Black Political Economy*. 1987; 16(1): 129-187.
34. Popkin S. J. *The hidden war: Crime and the tragedy of public housing in Chicago*. Rutgers University Press. 2000.
35. Rund J. A. The changing context of campus safety. *New directions for student services*. 2002; 2002(99): 3-10.
36. Schreck C. J, Miller J. M. Sources of fear of crime at school: What is the relative contribution of disorder, individual characteristics, and school security?. *Journal of School Violence*. 2003; 2(4), 57-79.
37. Siegel L. J. *Criminology (8 th)*. Belmont, CA: WadsworthPublishingCompany. 2006.
38. Sloan J. J, Fisher B. S. Campus crime. *Encyclopedia of Criminology and Criminal Justice*. 2014; 255-267.
39. Soh C, Lee J. Representation of Human Rights Violations by Human Rights NGOs. *국제관계연구*. 2012. 17(1), 55-87.
40. Sue T. R. *Crime and Criminology, U.S*, McGraw-Hill Higher Education. 2000.
41. Taylor R. B, Harrell A. *Physical environment and crime*. Washington, DC: US Department of Justice, Office of Justice Programs, National Institute of Justice. 1996; pp. 11-12.
42. Tewksbury R, Mustaine E. E. College students' lifestyles and self-protective behaviors: Further considerations of the guardianship concept in routine activity theory. *Criminal Justice and Behavior*. 2003; 30(3), 302-327.
43. Turrentine C. G, Schnure S. L, Ostroth D. D, Ward-Roof J. A. The parent project: What parents want from the college experience. *NASPA Journal*. 2000; 38(1), 31-43.
44. Weiss K. G. Too Ashamed to report: Deconstructing the Shame of Sexual Victimisation. *Feminist Criminology*. 2010; 5(3), 286-310.
45. Wickes R, Zahnw R, White G, Mazerolle L. Ethnic diversity and its impact on community social cohesion and neighborly exchange. *Journal of Urban Affairs*. 2014; 36(1), 51-78.

Items' Validity and Reliability Using Rasch Measurement Model for Factors that Influence Clothing Disposal Behaviour

Arasinah Kamis¹, Farah Najwa Ahmad Puad¹, Suriani Mohamed¹, Ridzwan Che' Rus¹, Baity Bujeng¹, Rodia Syamwil², Emy Budiastuti³

¹Faculty of Technical & Vocational, Universiti Pendidikan Sultan Idris, 35900 Perak, Malaysia;

²UNNES-FT-Pendidikan Kejuruan, Universitas Negeri Semarang, Semarang, Indonesia;

³PTBB Faculty of Engineering Yogyakarta State University, Yogyakarta, Indonesia

ABSTRACT

The purpose of this study was conducted to assess the validity and reliability of this research instrument using the Rasch Measurement Model (RMM). This instrument will be used to measure the factors that influences young consumers towards sustainable clothing disposal behaviour. The respondents consisted of 45 students of Fashion and Textile Design Course (SRFT) and there were 43 likert scale items with five sub-constructs which are attitude, awareness of environmental issues, controlled behaviour, social norms, and social action. Therefore, Winsteps 3.73.0 software was used to analyse the reliability of the items and respondents, the separation index of items and respondents, polarity of items, items suitability, difficulty level of items and item mapping. The findings showed that the reliability index of item is 0.89 and respondent is 0.99. The results also indicate that 9 out of the 43 items were misfit due to unfulfilled the conditional value of PTMEA CORR and Infit/Outfit MNSQ and these items need to be improved after consulting with the experts. Based on the research findings, it was evident that the items are quite good, acceptable and valid to be used. Apart from this, this research also intended to create awareness among the community regarding the importance ways to dispose clothing products.

Keywords: *Clothing disposal behavior, young consumer, rasch measurement model, validity and reliability.*

INTRODUCTION

Nowadays, clothing product is the most important asset of consumers (Lang, Armstrong & Brannon²⁷) especially for the younger generation consumers that are more interested to keep up with the latest fashion trend (Wai Yee, Siti Hasnah, & Ramayah⁴⁵; Saeid, Asghar, Asadollah, & Parviz⁴⁰). However, the rapid growth of the fashion and textile industry contributed towards alarming wastage of clothings and environmental pollution (Najdah, Marhana, Khatijah, & Shafiek³⁴; Arasinah, Suriani, & Zaliza¹). In western countries, the issue that is related to disposal of second-hand clothing is one of the serious issues. This problem has been discussed in some previous studies by Cruz-Cardenas, Gonza'lez, and Gasco¹⁶; Xu, Chen, Burman, and Zhao⁴⁷; Lang et al²⁷; Bianchi and Birtwistle⁹ and others. Not only that, Malaysia is also experiencing the similar problem (Lee, Ghozali, & Zulkifli²⁸; Wai Yee et al⁴⁵). However, in Malaysia this issue has not been taken seriously yet. This can be proven by the statistics issued by the

National Solid Waste Management Department in which Malaysia has produced approximately 8.4 million tonnes of solid waste per year and 4% of solid waste is made up of clothing and textiles (Wai Yee et al⁴⁵).

The unlimited production and usage of clothes also raises questions regarding how Malaysians practice sustainable clothing disposal behaviour in order to reduce the environmental pollution (Najdah, Marhana, Khatijah, & Shafiek³⁴). Some consumers threw their clothing directly into waste bins without thinking about the consequences of their action. This is because they have no clear understanding that this irresponsible behavior could bring negative impacts toward their daily lives (Wai Yee et al⁴⁵; Farah, Arasinah, Rahimah, Asliza, Rodia, & Baity²⁰). Thus, it is really crucial to create awareness among the public especially young fashion designer regarding the importance of disposing second-hand clothing in environmentally sound manner. Students of fashion majors are students who are more susceptible to the development of the fashion world. According to

Bianchi & Birtwistle⁹, fashion students are also known as young fashion designers. Therefore, they are said to be more susceptible in having the latest fashion and will dispose of clothes in a short period of time.

Other than that, second-hand clothing can be recycle or redesign to make a new product. This process will need some human labour. Thus, not only this method can solved the issue of increasing clothing wasted, but it also gives opportunities for citizen to create a new job. Based on the International Labor Organization's report, 200 million people in the world are unemployed and 75 million are made up of young people aged between 15-24 (Zanariah⁴⁸). Therefore, to help achieve the government's target of creating 60% of new jobs to meet the needs of TVET skills (Zanariah⁴⁸), this study was able to open the minds of young fashion designers that second-hand clothes not only can be donated (Laitala²⁶), but can even be recycled (Ekstrom & Salomonson¹⁹), redesigned into a new exclusive costume (Rahman & Gong³⁷), and this redesigned clothing can be sold (Bianchi & Birtwistle¹⁰) at high prices. Indirectly, these behaviors can help to create jobs opportunities and generate their daily income as well as generating highly skilled human beings, in line with the aspirations to be achieved in 2020 (Eleventh Malaysia Plan¹⁸, RMKe-11). Therefore, in order to ensure that the items adapted from literature reviews are able to measure accurately the factors that influences young consumers towards sustainable clothing disposal behaviour, RMM that was founded by Rasch³⁸ was used to provide empirical evidences regarding the validity and reliability of this instrument, so that it can be used in the real study.

Validity defines the level to which an instrument used in a research is able to measure what it is supposed to measure and maintain the accuracy of the instrument by protecting it from flaws (Hair, Black, Babin, & Anderson²³). According to Arasinah, Suriani, Zaliza, Che Ghani, & Rahimah² and Fraenkal and Wallen²², a researcher must validate the instrument so that the items are defensibility, accuracy, appropriateness, meaningfulness, and usefulness. In this research, the researcher chose content validity and construct validity in order to determine the accuracy and validity of this instrument.

Content validity is the measurement of the items in the instrument to ensure that those items indeed measure the intended construct. According to Creswell¹⁵, high content validity is based on the ability of the items that

have been developed, modified, or adapted to measure the intended construct precisely. Content validity is assessed by expert review. In this research, a total of three expert panels from the fashion field were appointed to determine the content validity and evaluate the items present in the questionnaire. The research selected the expert panels based on their expertise and experience in the fashion field. They were tasked to check the research objectives and provide comments on whether the adapted and modified items in the instrument are parallel with the research objectives and suit the Asian culture. As for the construct validity, the researcher utilised RMM to measure whether the adapted and modified items are suitable and fit to measure the intended construct. The analyses used to determine the construct validity were items' polarity, misfit of items, and items' map.

Reliability is the consistency that measures the variables of the research instrument and provides the degree of consistency and accuracy of the research instrument (Arasinah, Rahimah, Ab. Rahim, & Zaliza³). An instrument that has high reliability level produces the same result every time the instrument is used. There are three types of measurement and ways that are normally used to determine the reliability of an instrument which are sequential measurement, simultaneous measurement and internal consistency measurement (Cooper & Schindler¹⁴). In this research, the researcher determined the reliability by using internal consistency measurement utilising Cronbach's Alpha (α) coefficient.

Marnburg and Luo³² stated that α coefficient can be used to determine the reliability of a research instrument with multiple scales such as Likert, Thurstone, Guttman atau Semantic Differential, and Kuder-Richardson (instruments which has dichotomy). The reliability coefficient value must be between 0 and 1.0. When the coefficient value nears 1.0, the instrument is said to have high reliability (Arasinah et al⁵). In relation to that, this research was carried out to determine whether the items of this instrument measure the constructs of factors that influence clothing disposal behaviour. RMM also was used to produce empirical evidences regarding the validity and reliability of this instrument because this model is able to measure the consistency of a construct.

THE AIM OF RESEARCH

Generally, this research intended to measure the validity and reliability of items in this factors that influence

clothing disposal among SRFT students questionnaire. Sub-constructs involved in this research are attitude, awareness of environmental issues, controlled behaviour, social norms, and social behaviours. In this research, RMM was used to measure the reliability and separation index of items and respondents, the separation rate of items and respondents, polarity of items, item suitability, difficulty level of items and ability of the respondents.

METHOD OF RESEARCH

This research was carried out in Faculty of Art & Design, Universiti Teknologi Mara, Shah Alam. Cooper and Schindler¹³ stated that the need number of samples are around 25 to 100, meanwhile Johanson and Brooks²⁴ opined that there needs to be at least a minimum of 30 samples for a research. Thus, the researcher determined that the number of samples needed for this research was 45 students from UiTM Shah Alam using the simple random sampling technique. The questionnaires were distributed to 45 research samples by meeting them face-to-face. All the questionnaires were collected and all were completely answered.

This research used the instrument with Likert scale which were from 1 (Strongly Disagree) to 5 (Strongly Agree). A total of 43 items were modified and adapted from past researches by (Wai Yee et al⁴⁵); Zala Zurga et al⁴⁹; Taljaard⁴¹; Bianchi & Birtwistle⁹; Thompson & Tong⁴⁴; Azah³⁵; Chen & Chai¹²; Awuni et al⁷; and Lang et al²⁷. The main construct of this research was factors that influence clothing disposal behaviour and sub-constructs were attitude (5 items), awareness of environment (23 items), controlled behaviour (6 items), social norms (6 items), and social action (3 items). The number of items was deemed sufficient to measure the validity and reliability of the items because in the study of Khotimah and Sri²⁵, the researcher tested validity and reliability of items using RMM for only 20 items.

ANALYSIS AND DISCUSSION

In order to test the quality of the items in this instrument, the instrument’s validity and reliability were measure using the RMM with Winsteps 3.73.0 software. The RMM was used to (i) test the reliability and separation index of items and respondents, (ii) detect the polarity of items, (iii) determine the items’ suitability, and (iv) determine the difficulty level of items and ability of the respondents.

Reliability and Separation Index of Items and Respondents: Reliability refers to how far an instrument is able to produce the same or similar score when it used repeatedly (Arasinah et al²). When an instrument used on same samples but at different times produces same or similar scores, that particular instrument is said to have high reliability value and if the scores produced are different, the instrument is said to have low reliability value. Fisher²¹ classified the value of reliability when used RMM between 0.81 and 0.90 as good, 0.91-0.94 as very good, and best is 0.94. Devellis¹⁷ and Pallant and Tennant³⁶ stated that the minimum reliability value that can be accepted is 0.70. According to Bond and Fox¹¹, good reliability value when using RMM is between 0.70 and 0.89 and very good is between 0.90 and 1.0. Separation refers to the level of respondents’ consent distribution and good value of separation is between 3 and 4, very good is between 4 and 5 and best is 5 (Fisher²¹). However, (Linarc²⁹) suggested that good separation value is 2 and above.

Table 1 shows the reliability and separation value of items and respondents. The pilot test data analyses showed that the respondent reliability value based was 0.88 and separation value was 2.75 while the item reliability value was 0.93 and separation value was 3.59. The showed reliability values proved that the items of factors that influence clothing disposal behaviour among young fashion designers were good, acceptable, and can be trusted to be used in real research. Once the values were rounded, the respondent separation value showed that there were three levels of respondent agreeableness while item separation value showed that there were four levels of agreeableness and according to Fisher²¹, separation value between 3 and 4 can be considered good.

Table 1: Reliability and separation index of items and respondents

	Person	Item
Reliability	0.88	0.93
Separation	2.75	3.59

Detect the Polarity of Item: Point Measure Correlation (PTMEA CORR) can be used to detect item polarity (Mad Noor³¹). The purpose of detecting item polarity is to ensure that the items are parallel in measuring the intended construct (Arasinah, Rahim, Ramlah, & Soaib⁶; Linarc³⁰). On the contrary, if the PTMEA CORR value

is negative (-), the items do not fulfil the criteria of the measured construct and it is deemed that the items or individuals provided responses conflicting with the sub-constructs. Thus, those items and individuals need to be eliminated or modified (Ruhizan, Faizal, Ridzwan, Azmi, & Mohd Bekri³⁹).

Based on the Table 2, there were two items that showed negative PTMEA CORR values which were N6 and TLK1 while other items showed positive PTMEA

CORR values. Item N6 and TLK1 that produced negative PTMEA CORR values were repaired because did not fulfil the construct criteria. Apart from that, there were three items that had positive PTMEA CORR value but the values were too low which were K19, K7, and S2. It may mean that these items were hard to comprehend by the respondents and it lead to conflicting responses. The item that had the highest PTMEA CORR value was TLK2 and according to Linacre³⁰, this value showed the ability of an individual to distinguish the said item.

Table 2: Item polarity based on the PTMEA CORR values

Entry Number	PTMEA CORR	ITEM	Entry Number	PTMEA CORR	ITEM
41	0.60	TS1	16	0.61	K11
34	-0.04	N6	18	0.40	K13
31	0.50	N3	15	0.64	K10
30	0.67	N2	11	0.40	K6
35	-0.13	TLK1	13	0.36	K8
43	0.64	TS3	21	0.56	K16
42	0.65	TS2	14	0.56	K9
32	0.53	N4	22	0.54	K17
33	0.53	N5	20	0.52	K15
29	0.64	N1	10	0.43	K5
27	0.52	K22	3	0.38	S3
24	0.13	K19	5	0.54	S5
25	0.62	K20	6	0.39	K1
12	0.08	K7	7	0.32	K2
37	0.35	TLK3	4	0.45	S4
36	0.70	TLK2	8	0.42	K3
40	0.61	TLK6	17	0.28	K12
26	0.45	K21	9	0.47	K4
28	0.26	K23	1	0.37	S1
38	0.56	TLK4	19	0.34	K14
39	0.55	TLK5	23	0.61	K18
2	0.21	S2			

(PTMEA CORR = Point Measure Correlation)

Detecting Misfit Items: Infit Mean Square (MNSQ) is used to detect mismatch of items (Arasinah et al³; Ruhizan et al³⁹). The purpose of this is to ensure that the items in the instrument fulfil the construct criteria. According to Arasinah et al⁶, for items with Likert scale, the range of item fit that is acceptable is between 0.6 logits and 1.4 logits while Wright and Linacre⁴⁶, suggested that acceptable item fit range should be between the range

of 0.5 logits and 1.5 logits. A value of 0.6 and lower shows that the item overlaps other items (Linacre²⁹) while 1.4 logits and above shows that the items are not homogenous with other items in one measurement scale (Arasinah et al⁴). According to Bond and Fox¹¹, the value of Infit ZSTD should be between -2 and +2. However, if the value of Infit Mean Square (MNSQ) is acceptable, the Infit ZSTD value can be ignored (Linacre²⁹).

Based on the Infit MNSQ values suggested by Wright and Linacre⁴⁶, Table 3 shows four misfit items out of 43 items that measured factors that influenced clothing disposal behaviour. No items showed Infit MNSQ value

of 0.5 and lower and items that showed Infit MNSQ values of more than 1.5 were TLK1, N6, S2, and K19. The items that did not fulfil the requirements of Infit MNSQ values were repaired after consulting the experts.

Table 3: Item Misfit based on the MNSQ values

Entry Number	Item	Measure	Model S. E	INFIT		OUTFIT	
				MNSQ	ZSTD	MNSQ	ZSTD
35	TLK1	1.22	0.20	2.04	3.9	3.07	0.65
34	N6	1.52	0.19	1.72	3.0	2.42	5.1
2	S2	0.12	0.24	1.86	2.9	2.11	3.7
28	K23	0.39	0.23	1.46	1.8	1.81	2.9
24	K19	0.82	0.21	1.54	2.1	1.75	2.8
12	K7	0.63	0.22	1.39	1.6	1.70	2.6
31	N3	1.34	0.19	1.50	2.2	1.67	2.7
33	N5	1.03	0.20	1.18	0.9	1.21	1.0
18	K13	-0.48	0.25	1.18	0.8	1.19	0.8
29	N1	0.90	0.21	1.18	0.8	1.13	0.6
22	K17	-0.74	0.26	1.05	0.3	0.95	-0.1
30	N2	1.22	0.20	0.98	0.0	1.01	0.1
17	K12	-1.17	0.27	0.96	-0.1	0.92	-0.3
26	K21	0.39	0.23	0.93	-0.2	0.95	-0.2
13	K8	-0.67	0.26	0.91	-0.3	0.94	-0.2
6	K1	-1.02	0.27	0.93	-0.3	0.87	-0.5
8	K3	-1.10	0.27	0.93	-0.3	0.86	-0.5
27	K22	0.86	0.21	0.82	-0.7	0.92	-0.3
32	N4	1.03	0.20	0.87	-0.5	0.86	-0.6
5	S5	-1.02	0.27	0.86	-0.6	0.79	-0.9
37	TLK3	0.59	0.22	0.66	-1.5	0.86	-0.5
43	TS3	1.19	0.20	0.82	-0.8	0.86	-0.6
41	TS1	1.59	0.19	0.81	-0.9	0.85	-0.7
11	K6	-0.61	0.26	0.85	-0.6	0.81	-0.8
20	K15	-0.88	0.27	0.85	-0.7	0.77	-1.0
19	K14	-1.48	0.29	0.84	-0.8	0.77	-1.0
42	TS2	1.15	0.20	0.81	-0.9	0.84	-0.7
3	S3	-1.02	0.27	0.82	-0.9	0.78	-1.0
1	S1	-1.40	0.28	0.80	-1.0	0.73	-1.2
9	K4	-1.25	0.28	0.79	-1.0	0.72	-1.3
38	TLK4	0.29	0.23	0.76	-1.0	0.78	-0.9
7	K2	-1.02	0.27	0.77	-1.1	0.72	-1.3
25	K20	0.73	0.21	0.68	-1.5	0.76	-1.0
10	K5	-0.95	0.27	0.76	-1.2	0.69	-1.4
23	K18	0.07	0.24	0.76	-1.0	0.74	-1.1
14	K9	-0.74	0.26	0.73	-1.2	0.70	-1.4

Conted...

15	K10	-0.54	0.26	0.73	-1.2	0.67	-1.5
40	TLK6	0.44	0.22	0.68	-1.4	0.68	-1.4
39	TLK5	0.23	0.23	0.68	-1.4	0.67	-1.5
4	S4	-1.10	0.27	0.65	-1.9	0.65	-1.7
16	K11	-0.41	0.25	0.62	-1.8	0.59	-2.0
21	K16	-0.67	0.26	0.62	-1.9	0.58	-2.1
36	TLK2	0.54	0.22	0.58	-2.0	0.61	-1.9

(MNSQ = Infit/Outfit Mean Square; ZSTD = Z-Score)

Determine the Difficulty Level of Item and Ability of Respondents: The RMM is able to help the researchers to measure the difficulty of the items and ability of the respondents. In order to measure whether the adapted and modified items were parallel with the ability of the respondents, item map is used (Azrilah & Azami⁸). The dotted lines on the left show the position of the respondents involved in this study while the dotted lines on the right showed the items' position.

Upper part of the left map shows the position of respondents with high ability in answering the questionnaire while the upper right of the map shows the highest level of item difficulty. Figure 1 shows the level of item difficulty and ability of respondents towards the 43 items.

Based on Figure 1, most of the respondents were in between the min value of logit 0 and 4.45 for ability of respondents, which is almost nearing the min value of logit 0 determined for the items. This mapping describes that most of the individuals has high ability in answering the questionnaire items. It can be observed that the toughest item (TS1) was positioned at the top of the scale and the easiest item (K14) positioned at the bottom of the scale.

DISCUSSION

In order to achieve the standard validity and reliability of items using RMM, there are a few conditions to be fulfilled during the implementation of item checking. If the item did not fulfil the determined conditions, the researcher must refer back to the experts to determine whether the item needs to be eliminated or maintained (Arasinah et al³).

Based on the analyses, the item reliability value for the constructs of the factors that influence clothing disposal behaviour is 0.93 which is classified as very good while the respondent reliability value was 0.88 deemed good. These findings are parallel with the findings of Fisher²¹ and Bond and Fox¹¹ in which the reliability value between

0.81 and 0.90 considered good while value between 0.91 and 0.94 considered very good.

The item separation value of the 43 items was 3.59 and this is categorised as very good. This finding showed that the items modified and adapted can be divided into four strata. The separation value for the 45 respondents was 2.75 which is good and shows that the ability of the respondents can be divided into three strata. Thus, this research found that the separation values were inlined with Fisher²¹ in which the value between 3 and 4 is considered good and any value between 4 and 5 is very good. The reliability and separation analyses of the items and respondents showed that the items in this instrument can be trusted and able to measure the factors that influence clothing disposal among students.

Apart from that, the research found that there were two items which produces negative PTMEA CORR values while other items produced positive PTMEA CORR values. However, there were three items that produced positive PTMEA CORR values but the values were lower than 0.3, thus needed to be repaired because did not fulfil the criteria of the construct. This is corresponding with Ruhizan et al³⁹ who stated that whichever item that did not fulfil the criteria needs to be eliminated or repaired to ensure that the item able to measure the intended construct. Meanwhile, the Infit/Outfit MNSQ values of the items showed fit values between the range of 0.5 logits and 1.5 logits as suggested by Wright and Linacre⁴⁶. However, there were four items that showed Infit/Outfit MNSQ values of more than 1.5 logits. According to Arasinah et al⁶, these items need to be separated for modification.

Moreover, by using RMM, the researcher was able to identify the level of item difficulty and the ability of the respondents in answering the questionnaire. Based on the item map analysis, it described that there 10 respondents who are highly able to answer the items in the questionnaire and there was no respondents with low

level ability. The easiest item was K14 with a value of -1.48 logits and the hardest item in the instrument was TS1 with a value of 1.59 logits. Table 5.0 shows the summary of the items that did not fulfil the criteria of RMM usage and these items were repaired according to the needs of the research context.

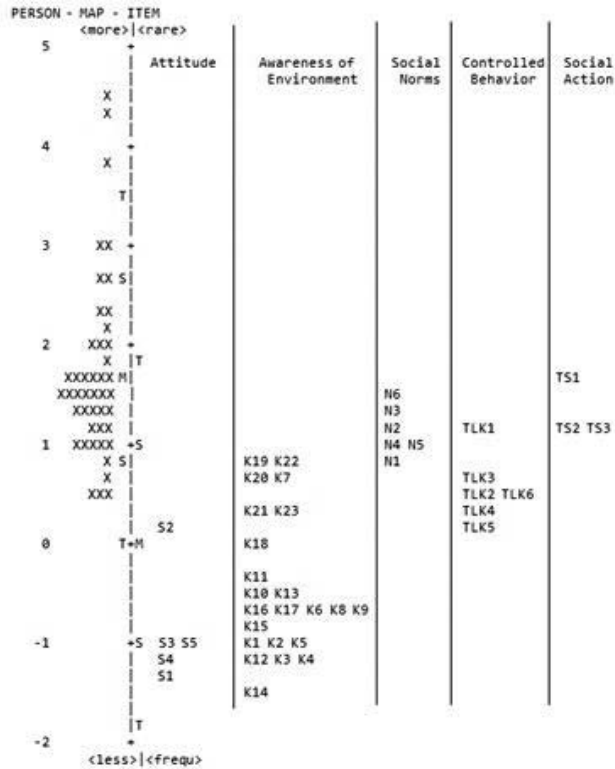


Figure 1: Item map for constructs of factors that influence clothing disposal

Table 5: Summary of items that need to be repaired

Sub-Constructs	Total Item	Misfit Item	Infit	Outfit	PTMEA CORR	RMM
						Items that need to be repaired
Attitude	5	S2	1.86	2.11	0.21	1
Awareness of Environmental Issues	23	K19	1.54	1.75	0.13	3
		K7	-	-	0.08	
		K23	1.46	1.81	0.26	
Social Norms	6	N3	-	-	0.50	2
		N6	1.72	2.42	-0.04	
Controlled Behavior	6	TLK1	2.04	3.07	-0.13	1
Social Action	3	-	-	-	-	-
Total	43					7

CONCLUSION

First of all, the authors wish to acknowledge their gratitude to the anonymous reviewers who gave freely time and effort, constructive recommendations that enhanced the value of this manuscript. The authors also would like to express their deepest thanks and appreciation to all the farmers of Turatea Distric who participated in the interview research. Special thanks go to Jeneponto Government, Bappeda Jeneponto and Hasanuddin University for supporting the studies of the authors that enabled them to conduct this research.

ACKNOWLEDGMENT

The author gratefully acknowledges Universiti Pendidikan Sultan Idris for the funding of the project GPU (University Research Grant). The author also acknowledges the constructive comments received by the anonymous reviewers.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Arasinah Kamis, Suriani Mohamed, Zaliza Hanapi. Selamatkan planet kita: Mereka bentuk semula pakaian terpakai untuk pelbagai kegunaan. In Malay Proc. 2nd International Conference. Creative Media, Design and Technology (REKA), Malaysia. 2016a;603-617.
2. Arasinah Kamis, Suriani Mohamed, Zaliza Hanapi, Che Ghani Che Kob, Rahimah Jamaluddin. Fashion and clothing instrument for Malaysian fashion lecturers: An analysis of the instructors' competency scale. GEOGRAFIA: Online Malaysian Journal of Society and Space. 2016b;12(3):35 – 45.
3. Arasinah Kamis, Rahimah Jamaludin, Rahim Bakar Ab, Zaliza Hanapi. Clothing Fashion Design Competency Instrument: An Application of Rasch Measurement Model. Advanced Science Letters. 2016c;22(5/6):1343-1347.
4. Arasinah Kamis, Rahim Bakar Ab, Ramlah Hamzah, Soaib Asmiran. Validity and

- Reliability of Clothing Fashion Design (CFaDC) Competency Instrument. *Middle-East Journal of Scientific Research (Innovation Challenges in Multidisciplinary Research & Practice)*. 2014;19:89-97. ISSN 1990-9233. DOI: 10.5829/idosi.mejsr.2014.19.icmrp.14
5. Arasinah Kamis, Rahim Bakar Ab, Ramlah Hamzah, Soaib Asmiran, Norhaily. Competency Assessments of Clothing Fashion Design: Rasch Measurement Model for Construct Validity and Reliability. *Journal of Technical Education and Training (JTET)*. 2013;5(2):1-12.
 6. Arasinah Kamis, Rahim Bakar Ab, Ramlah Hamzah, Soaib Asmiran. Kesahan dan Kebolehpercayaan Instrumen Kompetensi Rekaan Fesyen Pakaian (RFP). In *Malay Jurnal Pendidikan Malaysia*. 2012;37(2):11-19.
 7. Awuni J. A, Du J, Yiranbon E. Factors Influencing Green Purchasing Behaviors: Some Insights from Tamale, Ghana. *British Journal of Economics, Management & Trade*. 2016;14(4):1-12.
 8. Azrilah Abdul Aziz, Mohd Saidudin Masodi, Azami Zaharim. Asas Model Pengukuran Rasch: Pembentukan Skala dan Struktur Pengukuran. In *Malay. Bangi, malaysia: Penerbit Universiti Kebangsaan Malaysia*. 2013.
 9. Bianchi C, Birtwistle G. Consumer Clothing Disposal Behavior: A Comparative Study. *International Journal of Consumer Studies*. 2012;3:335-341.
 10. Bianchi C, Birtwistle G. (2010). Sell, Give Away, or Donate: An Exploratory Study of Fashion Clothing Disposal Behavior In Two Countries. *The International Review of Retail, Distribution, and Consumer Research*. 2010;20(3):353-368.
 11. Bond T. G, Fox C. M. *Applying the Rasch Model: Fundamental Measurement in The Human Sciences* (2nd ed.). Mahwah, New Jersey: Lawrence Erlbaum. 2007.
 12. Booi Chen T, Teck Chai L. (2010). Attitude towards the Environment and Green Products: Consumers' Perspective. *Management Science and Engineering*. 2010;v4(2):27-39. ISSN 1913-0341.
 13. Cooper D. R, Schindler P. S. *Business Research Methods* (11th ed.). New York: McGraw-Hill/Irwin. 2011.
 14. Cooper D. R, Schindler P. S. *Business Research Methods* (8th ed.). New York: McGraw-Hill. 2003.
 15. Creswell J.W. *Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research*. (4th ed.). Boston, MA: Pearson Education. 2012.
 16. Cruz-Cárdenas J, González R, Gasco J. (2016). Clothing Disposal System by Gifting: Characteristics, Processes, and Interactions. *Clothing and Textiles Research Journal*. 2016;1-15.
 17. DeVellis R. F. *Scale Development Theory and Applications*. (2nd ed.). Thousand Oaks, California: Sage Publications. 2012.
 18. Eleventh Malaysia Plan (RMK-11) 2016-2020. Executive Summary Eleventh Malaysia Plan 2016-2020. [WWW. Document]. URL <http://www.epu.gov.my/en/rmk/eleventh-malaysia-plan-2016-2020>. Accessed on 2017 September 12th.
 19. Ekstrom K. M, Salomonson N. Reuse and Recycling of Clothing and Textiles-A Network Approach. *Journal of Macromarketing*. 2014;34:383-399.
 20. Farah Najwa Ahmad Puad, Arasinah Kamis, Rahimah Jamaluddin, Asliza Aris, Rodia Syamwil, Baiy Bujeng. Environmental Responsibility by Sustaining the Practice of Disposal of Clothing. Manuscript submitted for publication. 2017.
 21. Fisher W. P. Jr. Rating scale instrument quality criteria. *Rasch Measurement Transactions*. 2007;21(1):1095. [WWW. Document]. URL <http://www.rasch.org/rmt/rmt211m.htm> (Accessed on 1st May, 2017).
 22. Fraenkel J. R, Wallen E. W. *How to design and evaluate research in education*. Boston, MA: McGraw-Hill. 2006.
 23. Hair J. F, Black W. C, Babin B. J, Anderson R. E. *Multivariate Data Analysis* (7th ed.). Beijing: China Machine Press. 2011.
 24. Johanson G.A, Brooks G.P. Initial Scale Development: Sample Size for Pilot Studies. *Educational and Psychological Measurement*. 2010;70(3):394-400.
 25. Khotimah Marjiastuti, Sri Wahyuni. Analisis Kemampuan Peserta Didik dengan Model Rasch.

- In Malay. Seminar Nasional Evaluasi Pendidikan. 2014. ISBN 978-602-14215-5-0.
26. Laitala K. Consumer's Clothing Disposal Behavior-A Synthesis of Research Results. *International Journal of Consumer Studies*. 2014;38:444-457.
 27. Lang C, Armstrong C. M, Brannon L. A. Drivers of Clothing Disposal in the US: An Exploration of the Role of Personal Attributes and Behaviours in Frequent Disposal. *International Journal of Consumer Studies*. 2013;37:706-714.
 28. Lee Khai Loon, Mohamad Ghazali Hassan, Zulkifli Mohamed Udin. The Effect of Supply Chain Technology Adoption: An Empirical Study of Textile and Apparel Industry in Malaysia. *Journal of Engineering and Applied Sciences*. 2016;11:1727-1734.
 29. Linacre J. M. A User's Guide to WINDTEPS Rasch-Model Computer Programs. Chicago, Illinois: MESA Press. 2007.
 30. Linacre J.M. Test Validity and Rasch Measurement: Construct, Content, etc. *Rasch Measurement Transactions*. 2004;18(1):970-971.
 31. Mad Noor Madjapuni, Jamaluddin Harun. Validity and Reliability of Digital Games-Featured Instrument Towards Critical Thinking Using the Rasch Model Measurement. 2016. [WWW. Document]. URL https://www.researchgate.net/publication/313842169_Validity_and_Reliability_of_Digital_Games-Featured_Instrument_towards_Critical_Thinking_using_the_Rasch_Model_Measurement?enrichId=rgreq-553074d78e08b27a0a5637086ec006ce-XXX&enrichSource=Y292ZXJQYWdlOzMxMzg0MjE2OTtBUzo0NjM1MDcwODc5OTA3ODRAMTQ4NzUyMDEwOTA1Mg%3D%3D&el=1_x_3&esc=publicationCoverPdf. (Accessed on 21st April, 2017). DOI: 10.1109/AMC.2016.12.
 32. Marnburg E, Luo Z. Testing The Validity and Reliability of the Levels of Self-Concept Scale in the Hospitality Industry. *Journal of Tourism & Recreation*. 2014;1(1):37-50. ISSN 2368-2655. DOI: 10.12735/jotr.v1i1p37.
 33. Mat Salleh N. S, Din R, Abdul Manaf S. Z, Hamdan A, Karim A. A. Kesahan dan Kebolehpercayaan Soal Selidik Kebolegunaan Modul Pembelajaran Kendiri Menggunakan Model Pengukuran Rasch. *In Malay Journal of Advanced Research Design*. 2015;8(1):1-11. ISSN: 2289-7984.
 34. Najdah Abd Aziz, Marhana Mohamad Anuar, Khatijah Omar, Shafiek Mokhlis. Fashion and Environment: Antecedents of Ethical Consumer Behavior. *International Business Management*. 2017;11:25-32.
 35. Norazah Mohd. Suki. Green Awareness Effects on Consumers' Purchasing Decision: Some Insights from Malaysia. *IJAPS*. 2013;9(2):49-63.
 36. Pallant J. F, Tennant. A. (2007). An Introduction to the Rasch Measurement Model: An Example Using the Hospital Anxiety and Depression Scale (HADS). *Br J. Clin Psychol*. 2007;46(1):1-18.
 37. Rahman O, Gong M. Sustainable Practices and Transformable Fashion Design-Chinese Professional and Consumer Perspectives. *International Journal of Fashion Design, Technology and Education*. 2016;9(3):233-247.
 38. Rasch G. Probabilistic Models For Some Intelligence And Attainment Tests. Chicago: The University of Chicago Press. 1980.
 39. Ruhizan Mohd. Yasin, Faizal Amin Nur Yunus, Ridzwan Che Rus, Azmi Ahmad, Mohd Bekri Rahim. Validity and Reliability Learning Transfer Item Using Rasch Measurement Model. *Procedia - Social and Behavioral Sciences*. 2015;204:212 - 217. 4th World Congress on Technical and Vocational Education and Training (WoCTVET), 5th-6th November 2014, Malaysia.
 40. Saeid Dehyadegari, Asghar Moshabaki Esfahani, Asadollah Kordnaiej, Parviz Ahmadi. Study the Relationship Between Religiosity, Subjective Norm, Islamic Veil Involvement and Purchase Intention of Veil Clothing Among Iranian Muslim Women. *International Business Management*. 2016;10:2624-2631.
 41. Taljaard H. Male Consumers' Pro-Environmental Motivation and Intent to Acquire Eco-Friendly Apparel in South Africa. Dissertation submitted in partial fulfilment of the requirements for the Degree Master Consumer Science (Clothing Retail Management). University of Pretoria. 2015 July.

42. Tennant A, Pallant J. F. Data Variance Explained by Rasch Measures. Transactions of the Rasch Measurement SIG American Educational Research Association. 2006;20(1):1045-1048. ISSN 1051-0796.
43. Textile Exchange. FastFacts: textile and product waste. 2012. [WWW. Document]. URL <http://www.purewaste.org/media/pdf/textile-product-waste-fast-facts.pdf>. (Accessed on 10th March, 2017).
44. Thompson A, Tong X. Factors Influencing College Students' Purchase Intention towards Bamboo Textile and Apparel Products. International Journal of Fashion Design, Technology and Education. 2016;9(1):62-70. DOI: 10.1080/17543266.2015.1132781.
45. Wai Yee L, Siti Hasnah Hassan, Ramayah T. (2016). Sustainability and Philanthropic Awareness in Clothing Disposal Behavior Among Young Malaysian Consumers. SAGE Open. 2016;1-10.
46. Wright B, Linacre J. Combining and Splitting Categories. Rasch Measurement Transactions. 1992;6:233-235.
47. Xu Y, Chen Y, Burman R, Zhao H. Second-Hand Clothing Consumption: A Cross-Cultural Comparison Between American and Chinese Young Consumers. International Journal of Consumer Studies. 2014;38:670-677.
48. Zanariah. Technical and Vocational Education and Training (TVET). Education 2030 Launch and Symposium, Hotel Istana, Kuala Lumpur, Malaysia. 2016 August 23rd. [WWW. Document]. URL <http://www.moe.gov.my/images/Terbitan/Rujukan-Akademik/Presentation-Education-2030-Launch-Symposium-23rd-August-2016-Hotel-Istana-Ballroom-Kuala-Lumpur/Zanariah-Hj-Ahmad/Zanariah%20Hj.%20Ahmad.pdf>. (Accessed on 10th September, 2017).
49. Zurga Z, Hladnik A, Tavcer P. F. Environmentally Sustainable Apparel Acquisition and Disposal Behaviors among Slovenian Consumers. Autex Research Journal. 2015;15 (4):243-259.

Reflection on Teaching ‘Statistics in Education’ for Postgraduates Students

Arsaythamby Veloo¹, Hariharan N Krishnasamy¹, Ruzlan Md. Ali¹

¹*School of Education and Modern Languages, Universiti Utara Malaysia, Malaysia*

ABSTRACT

Many countries are taking efforts to review the way statistics is being taught so that it can be mastered. Malaysia is no exception and recognises that statistics is a challenging subject to teach. Generally postgraduate students perceive it to be a difficult subject. Negative perceptions of statistics involve a complex set of emotional reactions which is likely to cause considerable discomfort and results in unfavourable consequences such as apprehension. The purpose of the study is to explore students’ initial perceptions of statistics and subsequently throughout the class for one semester for the subject “Statistics in Education”. This study uses qualitative methods comprising focus group interviews and individual face-to-face interviews. 24 postgraduate students enrolled in a Masters of Education program for the subject Statistics in Education at a public university participated in this study. Focus group interviews were conducted for duration of one hour per group in two groups of 12 students each. Based on the findings, students felt that knowledge of mathematics was an important prerequisite to perform statistics and to understand statistical concepts. Initial perceptions of statistics are related to calculation, memorizing formula, mastery of additional mathematics and in-depth contents, fear and anxiety, as well as a lack of interest. However, during class, it was felt that although the subject was difficult, the appropriate teaching approach made the students more confident and less burdened because they were asked to recap what had been taught during the previous lesson. The preferred characteristics of teachers and the teaching process in “Statistics in Education” involves the teaching approach, questioning techniques, relevance to daily life, interaction, humour, monitoring, being knowledgeable and patience. The implication of this study is that although statistics is perceived to be a difficult subject, appropriate teaching methods and pedagogical practices that emphasize outcome-based education need to be observed.

Keywords: *Statistics in Education, negative perception, initial perception, class perception, postgraduate students*

INTRODUCTION

Similar to educational trends in many advanced countries, teaching and learning at the Institutions of Higher Learning (IPT) in Malaysia focus on Outcome Based Education (OBE) (Ministry of Higher Education¹³). The alignment of teaching and learning activities, assessment and learning outcomes helps to optimize learning outcomes. In order to achieve this objective, lecturers must first master the learning outcomes of study programs, courses and related subjects. Constructive alignment is done to ensure that teaching and learning activities and assessment tasks are in line with the mastery of learning outcomes in a course. Constructive alignment can be achieved by using the Structure of the Observed Learning Outcomes known as the SOLO taxonomy (Biggs & Tang³).

In general, to accommodate teachers who come from various disciplines and diverse backgrounds, there is a need for teaching strategies that are more specific to a particular domain (Lee & Picanco¹⁵). Thus, Lee and Picanco propose that there are three stages required to plan lessons, namely, (i) the goal or objective of the teaching and learning be aligned with the different phases of learning, (ii) different teaching methods that are suitable depending on the learning phase, and (iii) focused assessment on different types of measurement depending on the contents of the subject being taught at each phase of learning. The learning phases include acquisition, proficiency, maintenance, and generalization. Hall, Meyer, & Rose¹¹ believe that all students learn the same concepts or skills but with different levels of preparation according to the learning phase.

Based on the OBE approach, there is a set of beliefs and assumptions about learning and teaching in which learning can occur in depth (Arter&Chappuis¹; Carey&Gregory⁴). An important assumption in the OBE approach is the belief that all students are capable of learning. However, teaching institutions determine performance expectations and results at the end of the learning experience. Teachers can be empowered to make changes to learning approaches from being confined to a teacher-centred activity to one that combines the teacher and learner centred approach to optimize the learning experience.

Within the broader fields of knowledge, the knowledge of statistics is widely used in academia. However, statistics' teachers or lecturers often face the challenges on how to reduce anxiety and enhance the learning of statistics among their students (Chiou, Wang, & Lee⁵). Furthermore, according to Onwuegbuzie and Leech²¹, the anxiety related to statistics could lead to a negative perception of statistics among students, and also be considered as a major obstacle to obtaining a 'degree'. The findings of Onwuegbuzie²⁰ provide evidence that statistics anxiety involves a complex set of emotional reactions which is likely to cause considerable discomfort or discomfort at a high level and results in severe consequences such as apprehension, fear, nervousness, and panic that hinder learning

The literature review suggests that fear, anxiety or apprehension about statistics is inversely connected with learning (Teman²⁵). In related studies to determine students' expectations and learning experiences on statistics, Ruggeri, Dempster, Hanna, and Cleary²⁴ found that poor communication with course instructors as well as concerns over failure in the course were the main reasons for statistics' anxiety. Onwuegbuzie²⁰ had categorized statistics' anxiety as "state anxiety". This refers to a temporary state of anxiety because of a particular situation. Since 'state of anxiety' is a reaction to an external situation, the situation can be improved. Such anxieties can be overcome and removed (Richardson & Suinn²²).

Statistics is a challenging subject to teach at any level of education. It can be seen that many students enter statistics courses with negative attitudes (Tremblay, Gardner, & Heipel²⁶) and uncomfortable levels of statistics anxiety (Onwuegbuzie, Slate, Paterson, Watson, & Schwartz¹⁹). However, research has also been conducted to investigate how stress, anxiety and other apprehension can be reduced so that students are able to engage positively with statistics in a meaningful manner (Morgan¹⁷; Morris, Joiner, & Scanlon¹⁸). Zeedyk²⁸

provides an example of an empirical study in which second and third year undergraduate psychology students were given a class exercise on statistical reasoning that was based on the analogy of police detective work. A handout was used that was written in a humorous style. The initiative was shown to improve performance on an assignment for students who were given the handout in comparison to students who did not have access to the handout. Another example of an empirical investigation is provided by a study by Berk and Nanda² in a graduate biostatistics course. Using a pretest-posttest control group design, the researchers examined the effects of humor in an examination on exam performance which yielded positive results.

Finally, it can be said that various countries are taking efforts to review the way statistics is being taught so that it can be mastered. For example, in New Zealand, educators consider statistics as at a critical juncture and call for new approaches to teaching statistics to reach new groups of learners and facilitate statistical understanding in fundamentally new ways (Wild, Pfannkuch, Regan, & Horton²⁷). The American Statistical Association (GAISE K-12 Report⁸; GAISE College Report⁹) and leading statistics educators (Cobb⁶; Rossman²³) emphasise the need for reforms in the way statistics is conceived and taught. Studies that have focused on revising traditional methods of teaching statistics, suggest changes which should be implemented to enable students to receive training which is both up-to-date and relevant to society's needs. The major directions of the statistics education reform movement involve (a) pedagogical reforms toward development of conceptual understanding and teaching to statistical thinking and reasoning; (b) changes in the content of statistics courses, especially introductory level courses; (c) improving the instructional techniques used in statistics courses; and (d) integration of technology and computer-based methods into teaching statistics as an important tool for effective delivery of teaching and essential part of effective pedagogy (Garfield & Ben-Zvi¹⁰).

An important aspect of effective pedagogy is active learning. Enquiry-Based Learning (EBL) is an active form of learning that arises out of a structured process of enquiry within a supportive environment, and which is designed to promote collaborative and active engagement with problems and issues (Lancaster¹⁴). EBL is an empowering, predominantly student-centred approach to learning and teaching with benefits for subject learning (Deignan⁷; Metz¹⁶). The flexibility of the method allows for the development of a range of student abilities and skills in areas including initiative, critical judgment, openness, creativity and independence of mind (Kahn, & O'Rourke¹²).

Researcher's own experience on teaching and learning in the Statistics in Education course: The Statistics in Education course is a core course for students enrolled in the Masters of Science in Management, Masters in Education, Masters in Applied Linguistics and Masters of Arts in the School of Education and Modern Languages. This course was introduced to equip Masters' students with data analysis techniques using the SPSS software. This course has been offered since 1998. However, until now, there is an irrational fear coming close to being a phobia and also uneasiness among students taking this course. In fact, some of these students suffered high levels of anxiety when they attended this course.

Students who attend this course come from different academic backgrounds and areas of specialization at the undergraduate level such as English, Linguistics, Literature, History, Islamic Studies, Mathematics, and Science. Thus, the course must accommodate students from various disciplinary backgrounds. In addition, this course is very valuable and meaningful because it introduces the study of statistics which provides the knowledge for students to apply in their research work. Nevertheless, there are several reasons for Masters' students to enrol for this course. Among the main reasons is that it is compulsory and they need a minimum pass. This shows that the enrolment in the statistics course cannot be based on the assumption that students are motivated to appreciate the science of statistics or it can be used in the research that they undertake. In other words, statistics is not seen beyond a compulsory course in the curriculum.

The researcher's own observations provide insights regarding students in the teaching and learning of Statistics in Education. Upon reflection, the researcher has noted that there are students who are still unable to successfully apply theories learned in real life contexts. There are sections of the statistics students who have a poor conceptual understanding of important statistical concepts and hence unable to apply these concepts in real life situations. There are also students who make the misguided assumption that this course requires a high level of mastery in the field of Mathematics and requires high levels of computational skills to solve complex problems.

Researchers' feedback (who is an instructor himself) received from those who have been appointed as supervisors for the research project under the Master's program indicate that there remain many unresolved challenges. For example, supervisors feel that there are students who are less familiar with the concepts and technical terms in statistics, such as the meaning of "relationship"; "difference"; "effectiveness"; and

"impact". Supervisors also receive complaints from students that they still cannot perform the quantitative data analysis. In relation to data analysis, some students are able to frame research questions correctly but unable to choose appropriate methods of analysis. Furthermore, interpretation of results based on their findings poses many challenges for the students. Students are also not able to make connections between the statistical knowledge and real life applications or see the relevance of statistical concepts beyond the classroom. Finally, there is still a gap between the results of the analysis and writing it in the form of a final report based on academic conventions in the discipline. Even those students who are able to understand lessons taught during class are not able to translate this knowledge towards the completion of the report.

METHOD

This study uses a qualitative design involving data acquisition through individual interviews and focused group interviews. Data collection will be conducted in the first semester of 2015/2016 session. This study focuses on teaching and learning approaches as well as strategies (based on student-centred learning (SCL) conducted in the Computer Lab room. 24 students from one class in a public university participated in this study. They had enrolled in a master's program under the field of education and took the course on Statistics in Education. Students who enrolled for this course comprised Masters of Education students who specialised in English Language Teaching and Learning (4 students), Psychology in Education (2), Curriculum and Instruction (16), Instruction in Technology (2). The 24 students comprised 14 students who had taught in secondary schools and 10 students who had taught in elementary schools. Their areas of specialization included different fields such as English, Tamil, and arts.

This study used qualitative methods which included face-to-face interviews and focus group interviews. Focus group interviews were conducted in week 13 by a lecturer who specializes in the field of conducting interviews. Focus group interviews were conducted in two groups of 12 students each. These interviews lasted for duration of one hour per group. Focus group interviews were recorded, transcribed and analyzed according to the themes in the study. Video recordings were made during the statistics classes. Two officers from the centre did the video recordings. The recording took two hours per session, each time the classes were conducted. After the video recording, the researchers studied and analysed the videos based on the objectives of the study.

Student's responses and feedback were checked for validity and accuracy. Three students were randomly

chosen and their field notes were checked. Additionally, member checking was used to look through all the documents. Students were given the opportunity to look through the video recording and responses from the focus group interviews. Lecturers asked if they did a pilot study on the questions that they formulated.

FINDINGS

Initial perceptions of postgraduates on the statistics education course: This postgraduate course is compulsory for all masters in education students. The duration of the course is 14 weeks. It is a prerequisite before embarking on the master’s dissertation. The course contents include descriptive and inferential statistics. When the postgraduates initially enrol for the course, most feel that it is a subject they would like to avoid if they were given that option. Most feel that the name of the course suggests that it is highly mathematical involving manipulation of numbers and solving mathematical problems which require high levels of numeracy skills. There is a preconceived notion that only those who are good in mathematics will be able to perform well in the statistics course.

Before attending the statistics class, they shared some initial perceptions on the nature of statistics and what the study of statistics involved. Students felt that statistics was very much based on calculations and highly mathematical. A deeper knowledge of mathematics was seen to be a necessary prerequisite to perform statistics and to understand statistics, complex mathematical operations and abstract notions of mathematical equations. For example, “my impression was that the subject was on calculations and needed to be calculated”.

Additionally, students associated statistics with the ability to memorize formulae. For example, “before enrolling for the course, I understand that this course has calculations and I need to memorize a lot of formulas, need to interpret the data because I have attended this course during my first degree.” Closely related to this aspect were emotions not conducive to the learning of statistics such as fear and doubt. For example, it was stated that “... I was still in a state of fear and doubt because of the ideas that it was a calculation subject that included mathematics.” The calculations associated with statistics also resulted in students’ lack of interest in the subject. For example, it was said that “most students will not be interested in the course because of the calculations which will make them take a qualitative subject”. Nevertheless, students enrolled for the statistics course because it was compulsory.

Statistics was seen to be an equivalent of mathematics as a subject because several concepts are common to both, such as the mean, median, mode, and variance. For example, it was mentioned that “ before I signed up for the course, I understood that this course will teach about the median, mode, mean, variance, standard deviation and will be a continuation about what we have learnt before”. Since there were some terms that appear in mathematics and statistics, students tend to categorize statistics under mathematics and a difficult subject to master.

In summary there are six themes related to students; initial perceptions of statistics, namely (i) the calculation, (ii) memorizing formula (iii) mastery of additional mathematics, (iv) and in-depth contents (v) fear and anxiety, (vi) lack of interest. Table 1 shows a summary of the interview excerpts and explains each theme concerned.

Table 1: Initial perception regarding statistics in education

Bil.	Theme	Excerpts from interviews
1.	Calculation	before I enrolled for this statistics course, my impression was that the subject was on calculations and needed to be calculated
2.	Lack of interest	most students will not be interested in the course because of the calculations which will make them take a qualitative subject
3.	Mastery of additional mathematics	My perception, because I am from the arts, I do not have any experience studying additional mathematics. So, when I heard that the course was called statistics, I thought that this course was a calculation subject that included additional mathematics
4.	Fear and anxiety	When I signed up for the course I was still in a state of fear and doubt because of the ideas that it was a calculation subject that included mathematics.
5.	In-depth content	before I signed up for the course, I understood that this course will teach about the median, mode, mean, variance, standard deviation and will be a continuation about what we have learnt before. When I was in high school I understood that statistics was the graphic base for presenting data for using bar graphs, charts such as pie charts and I had a good understanding of statistics which has become easier for me and I was actually quite excited when registering for the course.

Conted...

6.	Memorizing formula	Before enrolling for the course, I understand that this course has calculations and I need to memorize a lot of formulas, need to interpret the data because I have attended this course during my first degree. So at that time, I felt that statistics was pretty hard and so when I registered for this course at the master's level. I thought that statistics will become more difficult at this stage.
----	--------------------	--

Post graduates perceptions of the class: Students were also asked to give their opinions about the teaching of the “Statistics in Education” course which they had followed during the semester. Upon completion of the course, students reflected on the classes and the lessons they had attended. The major finding was related to the teaching approach and its effect on the learning process and learning outcomes. It was felt that although the subject was difficult, the appropriate teaching approach made the students confident and less burdened because they were asked to recap what had been taught during the previous lesson. This practice was continually observed during the thirteen weeks. For example, it was stated that “... this course is quite difficult, but the approach that Dr. A has made the class confident, class felt confident because in each class Dr. A will begin with a reflection or a recap of what he had taught in class before. We also felt less burdened when throughout the 13 weeks we could follow this course properly although the course was quite difficult.”

In relation to the teaching approach, students felt that the questioning technique had a positive impact as it served as a constant checking mechanism so that students were attentive. Students had to be alert all the time. For example, it was mentioned that “... students cannot sleep or do something else because he loves to ask questions to the students. Therefore, students should always be prepared for any questions he will ask.” Students were also continually monitored during the lesson as “he would not sit in one place but he prefers to walk and observe the activities of students in the class”. This constant monitoring helped to ensure that students needed to be attentive in class. In addition to the fear of statistics, there was also the unwelcoming presence of Dr. A who seemed rather fierce with a big build and a thick moustache which enhanced his ferocious look. Initially, he did not smile and gave a very sober presentation of what was expected in the course. In addition to the fear of statistics, there was also the unwelcoming presence of Dr. A. Initially, he did not smile and gave a very sober presentation of what was expected in the course. Refer to Table 2 which provides a summary of the interview excerpts and explains each theme concerned.

Table 2: Characteristics of teaching the “Statistics in Education” course

No.	Theme	Excerpts of interviews
1.	Teaching approach	<p>Actually, this course is quite difficult, but the approach that Dr. A has made the class confident class, felt confident because in each class Dr. will begin with a reflection or a recap of what he had taught in class before. We also felt less burdened when throughout the 13 weeks we could follow this course properly although the course was quite difficult.</p> <p>Dr. A often repeats or recaps in the class that makes students understand better, for example, on this day he was teaching about ANOVA and in the following class he will start the class by repeating about the ANOVA which will make the students to better understand in greater detail.</p> <p>I prefer the repetitive method because sometimes in our class, we are not able to focus properly. So through this repetitive method, students are able to recall everything that he teaches.</p>
2.	Questioning technique	<p>In addition, in Dr. A's class, students cannot sleep or do something else because he loves to ask questions to the students. Therefore, students should always be prepared for any questions he will ask.</p>
3.	Relevance to daily life	<p>Besides, Dr. A also likes to associate every thing that he has taught with everyday life. So this method makes it easier for us to remember well all that he has taught well.</p>
4.	Interaction	<p>Dr. A also likes ‘two way communications’. If we have any doubts we can ask him and address our doubts immediately.</p>
5.	Humor	<p>Sometimes he will joke using the students answers and relate it to the student content. His jokes are funny and we enjoy it.</p>

Conted...

6.	Monitor	Sometime she would joke and throughout the time in the class he would not sit in one place but he prefers to walk and observe the activities of students in the class.
7.	Knowledgeable	Yes, whatever he wants to deliver is at his fingertips. He will give handouts in each class.
8.	Patience	He always took the time to teach us slowly and this made it easier for us to understand. And when it comes to the application, I can do it myself using SPSS software for final semester project. Through this course, I believe that this course will be of great help for my future projects.

Besides the approach, students felt that the teacher needed to be knowledgeable and supplement it with handouts. For example, it was felt that "... whatever he wants to deliver is at his fingertips. He will give handouts in each class." Additionally, the way the lessons were delivered was also important. For example, "he always took the time to teach us slowly and this made it easier for us to understand. And when it comes to the application, I can do it myself using SPSS software for final semester project. Through this course, I believe that this course will be of great help for my future projects." Thus, students appreciated patience as they were able to understand better and apply the knowledge later.

Students also perceived the interaction between the lecturer and the students to be helpful as they could resolve any problems. For example, "Dr.A also likes 'two way communications'. If we have any doubts we can ask him and address our doubts immediately." Humor was greatly appreciated in the interactions as they were not only funny but also educational. For example "Sometimes he will joke using the students' answers and relate it to the student content."

The relevance of statistics to daily life seemed especially important as students were able to better remember the concepts. The concepts were more easily understood rather than seen to be abstract or not applicable outside the statistics class. For example, "Dr.A also likes to associate everything that he has taught with everyday life. So this method makes it easier for us to remember well all that he has taught well."

DISCUSSION

Initial perceptions of postgraduates on the statistics education course: Most of the postgraduates share the perception that the statistics education course is highly mathematical involving manipulation of numbers and solving mathematical problems. In other words, statistics requires high levels of numeracy skills. The preconceived

notion is that a student must be good in mathematics to perform well in the statistics course. The findings in this study are similar to the findings in Onwuegbuzie and Leech's²¹ study which concur with many researchers that when students are challenged with concepts, questions, cases, teaching or tests on statistics, they are most likely to experience anxiety.

Prior to attending classes, the students shared some initial perceptions on the nature of the statistics course and what it entails. There was a general feeling among students that statistics was driven by mathematics and calculations. A deeper knowledge of mathematics or numeracy skills was perceived to be an important prerequisite to understand statistics and to perform statistical procedures. The way the lessons were delivered was also seen to be important. For example, "he always took the time to teach us slowly and this made it easier for us to understand". The importance of this pedagogical aspect is supported by Hall, Meyer, and Rose¹¹ who believe that all students learn identical concepts or skills but differ in their levels of preparation according to the learning phase. A typical response to the application is; "I can do it myself using SPSS software for final semester project. Through this course, I believe that this course will be of great help for my future projects." In general, there is a need to accommodate teachers who come from various disciplines or diverse backgrounds. Therefore, there is a need to introduce teaching strategies that are more specifically customised to a particular domain as suggested by Lee and Picanco¹⁵.

One quality that students truly appreciated in their lecturer was patience as the students were able to understand better and apply the knowledge they had acquired at a later stage. Students were of the opinion that interaction between them and the lecturers was helpful as problems could be resolved. Any doubts on content, statistical procedures or understanding concepts could be addressed immediately. Humor was greatly appreciated in the interactions with the lecturer as they were not

only funny but also facilitated learning as suggested by constructive alignment. Constructive alignment is observed to ensure that teaching and learning activities together with assessment tasks are in line with them as a way of learning out comes in a course (Biggs & Tang³).

Post graduates perceptions of the class: The major finding upon completion of the course was the pivotal role of the teaching approach and its effect on the learning process together with the learning outcomes. Students recognised that the subject was difficult, but the choice of an appropriate teaching approach made the students more confident, less stressed and less burdened. This is because they had to continuously recap what had been taught during the previous lesson. The importance of reducing stress is supported by Teman²⁵.

Furthermore, the teaching approach which extensively incorporated the questioning technique was well received by the students. Questions had a positive impact on the students' attentiveness as they were constantly on the alert and needed to respond. The questioning technique provided an effective mechanism to ensure that students were continually monitored. Constructive alignment is done to ensure that teaching and learning activities and assessment tasks are in line with the mastery of learning outcomes in a course. Constructive alignment can be done by using the Structure of the Observed Learning Outcomes known as the SOLO taxonomy (Biggs & Tang³).

Students also perceived the interaction between the lecturer and the students to be helpful as they could resolve any problems. If students had any doubts, they could ask him and address their doubts immediately. An important aspect of effective pedagogy is active learning. Enquiry-Based Learning (EBL) is an active form of learning that arises out of a structured process of enquiry within a supportive environment, and which is designed to promote collaborative and active engagement with problems and issues (Lancaster¹⁴). The relevance of statistics to daily life seemed especially important as students were able to better remember the concepts. The concepts were more easily understood rather than seen to be abstract or not applicable outside the statistics class.

IMPLICATION AND SUGGESTIONS

The name of the course, which is "Statistics in Education", could be interpreted by students from the arts stream as a course which is highly focused on statistical

calculations. However, such an understanding could be misleading as the content of the subject focuses on the 'interpretation' of statistical results which is obtained through the use of SPSS software package. Hence it can be likened with a misnomer and the name of the course could be changed to reflect more accurately what the course does. A possible name could be the "Interpretation of Statistical Analysis in Education." Since most of the students were part-time students, there is definitely more need for pedagogical guidance, assistance and support. This need is more evident because the field of statistics is challenging in the sense that students are not familiar with the discipline or inclined to think the way statisticians do. The study shows that students' perceptions has changed through the course as students felt that it was not another mathematics course. It is not really about mathematics and not as difficult as they had thought initially. The change of attitude will help students perform better in the paper. In addition to the fear of statistics, there was also the anxiety and stress induced by the physical presence of Dr. A. His introduction and sober presentation at the initial stage only added to their discomfort. This view changed quickly as the students came to realize that initial impressions could be deceiving. It was a matter of time that they came to appreciate that he meant well and intended to guide them through the course using the most effective methods they were comfortable with in the classroom. Thus, the role of the teacher is very important to bridge the gap between preconceived notions and the actual pedagogical practices.

CONCLUSION

In summing up, it can be said that one major problem faced by students at the early stages of the course was that they were unable to see the connection between the concepts learnt in class and their relevance to the realm of statistics in the world outside the classroom. There was a preconceived notion that statistics is learnt as a separate field of knowledge and has very little application in daily life. It was believed that it would be challenging for students as they are not able to see how the more complex statistical operations can be used in domains outside the classroom or how to benefit from the knowledge of statistics. The study has shown that such initial apprehensions on the subject "Statistics in Education" gave way to a more positive view on statistics and how it could be applied in real life as they progressed during the course.

Ethical Clearance: Taken from the committee

ACKNOWLEDGMENT

The authors would like to thank the Universiti Utara Malaysia for the financial funding of this project through Scholarship of Teaching and Learning (SoTL) Research Grant S/O Code 13186.

Conflict of Interest: NIL

REFERENCES

1. Arter J, Chappuis J. *Creating and Recognizing Quality Rubrics*. Colombo: Pearson. 2006.
2. Berk R. A, Nanda J. P. A randomized trial of humor effects on test anxiety and test performance. *HUMOR: International Journal of Humor Research*. 2006;11:383-409.
3. Biggs J. B, Tang C. *Teaching for Quality Learning at University* (3rd Eds.). Maidenhead, UK: Open University. 2007.
4. Carey J, Gregory V. Towards improving students learning: Policy issues and design structures in Course level – outcome assessment, assessment & evaluation in higher education. 2003;28(3):215-227.
5. Chiou C, Wang Y, Lee L. Reducing Statistics Anxiety and Enhancing Statistics Learning Achievement: Effectiveness of a One-Minute Strategy. *Psychological Reports: Sociocultural Issues in Psychology*. 2014;115(1):297-310.
6. Cobb G. The Introductory Statistics Course: A Ptolemaic Curriculum?. *Technology Innovations in Statistics Education*. 2007;1(1). <http://escholarship.org/uc/item/6hb3k0nz>
7. Deignan T. Enquiry-Based Learning: Perspectives on Practice. *Teaching in Higher Education*. 2009;14(1):13-28.
8. GAISE K-12 Report. *Guidelines for Assessment and Instruction in Statistics Education (GAISE) Report: a pre-k-12 Curriculum Framework*. The American Statistical Association. 2007. <http://www.amstat.org/education/gaise>
9. GAISE College Report. *Guidelines for Assessment and Instruction in Statistical Education (GAISE) College Report*. The American Statistical Association. 2010. <http://www.amstat.org/education/gaise>
10. Garfield J, Ben-Zvi D. How Students Learn Statistics Revisited: A Current Review of Research on Teaching and Learning Statistics. *International Statistical Review*. 2007;75(3):372-396, doi:10.1111.
11. Hall T. E, Meyer A, Rose D. H. (Eds.). *Universal Design for Learning in the Classroom: Practical Application*. New York, NY: Guilford. 2012.
12. Kahn P, O'Rourke K. *Understanding Enquiry-Based Learning*, In Barrett, Mac Labhrainn, and Fallon (Eds.), *Handbook of Enquiry and Problem-Based Learning*. Galway: CELT. 2005. <http://www.nuigalway.ie/celt/pblbook/>
13. Ministry of Higher Education. *Asas Pembelajaran dan pengajaran Pensyarah Institusi Pengajian Tinggi* (Eds. 3), Johor, Penerbit UTHM. 2012.
14. Lancaster G. How Statistical Literacy, Official Statistics and Self-Directed Learning Shaped Social Enquiry in the 19th and Early 20th Centuries. *Journal of the International Association for Official Statistics*. 2011;27(3,4):99-111.
15. Lee C, Picanco K. E. Accommodating Diversity by Analyzing Practices of Teaching (ADAPT). *Teacher Education and Special Education*. 2013;36 (2):132-144.
16. Metz A. M. Teaching Statistics in Biology: Using Inquiry-based Learning to Strengthen Understanding of Statistical Analysis in Biology Laboratory Courses. (D. Ebert-May, Ed.) *CBE Life Sciences Education*. 2008;7(3):317-326.
17. Morgan B. L. Statistically lively uses for obituaries. *Teaching of Psychology*. 2001;(28):56-58
18. Morris E. J, Morris E. J, Joiner R, Scanlon E. The contribution of computer-based activities to understanding statistics. *Journal of Computer Assisted Learning*. 2002;(18):114-124.
19. Onwuegbuzie A. J, Slate J. R, Paterson F. R. A, Watson M. H, Schwartz R. A. Factors Associated with Achievement in Educational Research Courses. *Research in the Schools*. 2000;(7):53-65.
20. Onwuegbuzie A. J. Academic procrastination and statistics anxiety. *Assessment & Evaluation in Higher Education*. 2004;29(1):3-19.

21. Onwuegbuzie A. J, Leech N. L. Assessment In Statistics Courses: More Than A Tool For Evaluation. *Assessment & Evaluation in Higher Education*. 2003;28(2):115-127.
22. Richardson F. C, Suinn R. M. The Mathematics Anxiety Rating Scale: psychometric data. *Journal of Counseling Psychology*. 1972;19:551-554.
23. Rossman A. Reasoning about Informal Statistical Inference: a Statistician's View. *Statistics Education Research Journal*. 2008;7(2):5-19.
24. Ruggeri K, Dempster M, Hanna D, Cleary C. Experiences and Expectations: The Real Reason Nobody Likes Stats. *The British Psychological Society*. 2008;14(2):75 – 83.
25. Teman E. D. Factorial invariance of the Statistical Anxiety Rating Scale across sex and students' classification. *Comprehensive Psychology*. 2013;2(1):1-11.
26. Tremblay P. F, Gardner R. C, Heipel G. A model relationships among measures of affect, aptitud, and performance in introductory statistics. *Canadian Journal of Behavioral Science*. 2000;32(1):40-48.
27. Wild C. J, Pfannkuch M, Regan M, Horton N. J. Towards More Accessible Conceptions of Statistical Inference. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*. 2011;174:247-295.
28. Zeedyk M. S. Detective work on statistics street: Teaching statistics through humorous analogy. *Psychology Learning & Teaching*. 2006;5:97-109.

Scientific Imperatives in Entailing the Legitimacy for Harm Reduction Approach to Drug Use: Reduction of HIV Incidence

Yusramizza Md Isa Yusuff¹, Mazita Mohamed¹

¹*School of Law, Universiti Utara Malaysia, Malaysia*

ABSTRACT

Harm reduction constitutes a significant approach which aims at decreasing the harmful consequences of drug use. The approach involves a range of measures including Methadone Maintenance Therapy (MMT) and Needle and Exchange Programme (NSEP) for lowering drug-related harms, particularly the Human Immunodeficiency Virus (HIV) infection. Considerable debate still exists, particularly in Malaysia on whether the local government should legitimise the harm reduction practice. The vehement criticism for the approach is that it is not actually effective in achieving the outcomes but merely implies an aid and promotion of drug consumption and hence should be banned. This article seeks to address the scientific bases for legitimising harm reduction approach. It examines the effectiveness of MMT and NSEP strategies on the subset of its outcomes, namely the decrease in HIV transmission and its scientific evidence. This article relies on data sourced from materials including published peer-reviewed research articles, books and reports. The analysis provided in this article suggests that the MMT and NSEP practice is justifiable based on its contribution to the control of HIV pathogen transmission. The available national and international evidence compellingly indicates that both interventions are effective in reducing HIV risk behaviours and the viral infection incidence among drug users. The outcome is unaffected by negative empirical data as there is a persuasive expounding explanation for them. The effectiveness of the interventions for reducing the blood-borne virus may be further increased by multi-integrated strategies. Moreover, considering scant local empirical findings, the efficacy of harm reduction interventions, particularly with respect to NSEP, warrants further research. It is critically vital for the scientific bases for harm reduction approach to be firmly sustained and articulated in law and policy discourse.

Keywords: *harm reduction, public health, HIV, drug policy, criminal law and justice*

INTRODUCTION

Harm reduction appears to be an integral approach that seeks to decrease the negative consequences associated with drug use. Public health community believes that individuals who pursue in consuming drugs may nevertheless minimise negative effects of the habit. Accordingly, the harm reduction approach engages various strategies including provision of methadone; a type of substitute drug and distribution of sterile needle and syringe for mitigating drug-related risks, particularly the Human Immunodeficiency Virus (hereinafter referred to as HIV) infection. The long history of the approach might be supported by the opiate prescribing practice in the United Kingdom since the 1920s. Yet, the concept was revitalised during the mid-1980s as a consequence of HIV/AIDS outbreak. The harm reduction approach in drug use context has rapidly developed

across all continents. In 2005, Malaysia started to echo the international initiatives of implementing harm reduction approach. Against the backdrop of high HIV cases driven by drug users, the government underscored the Methadone Maintenance Therapy programme (hereinafter referred to as MMT) and Needle and Syringe Exchange Programme (hereinafter referred to as NSEP) as integral interventions for curbing the spread of HIV among drug using population.

Considerable debate still exists, particularly in Malaysia on whether the local government should legitimise the harm reduction practice. The vehement criticism for the approach is that it is not actually efficacious in achieving the outcomes but merely implies an aid and promotion of drug consumption and hence should be banned. This article is devoted to address the scientific basis for legalising harm reduction approach.

It seeks to examine the efficacy of MMT and NSEP measures on the subset of its outcomes, namely the reduction in HIV transmission and its scientific evidence. This article relies on data sourced from materials including published peer-reviewed research articles, books and reports. The consideration to international and local literature provides clearer insights and basis for the arguments.

EFFECTIVENESS IN MITIGATING HIV RISK BEHAVIOURS

Notably, MMT and NSEP are considered important strategies when seeking to restrain HIV spread through syringe use, by providing substitute drugs and adequate sterile syringes to drug users. The underlying prediction is that, as a consequence, drug users will no longer take part in syringe-related HIV risk behaviours including sharing, lending, borrowing and reusing of syringes and needles, thereby avoiding HIV infection.

An impressive volume of studies from many jurisdictions, including Malaysia, contain evidence regarding the actual efficacy of MMT and NSEP for HIV risk behaviours. There is research available that has discovered the relationship between MMT attendance and reduced HIV vulnerability (Wong and Lee et al⁵⁵; Gill and Sulaiman et al¹⁷; Zhao and Holzemer et al⁵⁸). In a study of long-term outcomes of MMT among 2662 participants in China, Wang and Wei et al⁵¹ found that the MMT attendance had a positive association with reduced illicit drug consumption and related risk behaviours. Findings are also documented by Karki and colleagues' (2015) systematic review and Macarthur and colleagues²⁹ meta-analysis of multiple studies in Asia, Europe and North America. Although it is remarkable that vast studies from various countries reveal similar findings on the beneficial impact of MMT on risk behaviours, opponents still invoke negative or neutral research results to propose a contradictory outcome. A study in a Malaysian hospital found that most of the subjects continued with HIV risk behaviours despite their MMT use (Ramli and Nora et al⁴⁰). A study by Van Ameijden and others⁴⁸ in Amsterdam found negative or no benefit of 'low threshold' MMT in mitigating risk behaviours. Some research has reported no difference between attendees, post-attendees and non-attendees of MMT programmes in needle-borrowing and lending (Baker and Kochan et al³). Arguably, these negative or mixed findings are limited exceptional cases that are

insufficient to exclude conclusive evidence on MMT efficacy from larger positive empirical data sources.

Further, the outcome of risk behaviour reduction is achievable via NSEP use. Theoretically, NSEP may affect diminution in patterns and time of syringe circulation. This is accomplished by adding more new syringes per IDU over a particular time period and increasing the volume of syringes evacuated from circulation through exchanging practice. Thus, the time for risk behaviours, including contaminated syringe sharing and reusing and the presence of used injection items in public settings, are possibly lessened, thereby decreasing HIV spread. The theoretical causality is confirmed by practical data in Malaysia and other countries regarding NSEP effectiveness. Numerous studies demonstrate the decrease of self-reported risky behaviours among NSEP clients (Bluthenthal and Kralc et al⁴; Zamani and Vazirian et al⁵⁷; Kerr and Small et al²⁴; Burt & Thiede⁷). The WHO comprehensive assessment discovers 'detectable impact (of Malaysian NSEP) on reducing needle and syringe sharing among Injecting Drug Users' (hereinafter referred to as IDUs) (World Health Organization (Western Pacific Region) & Ministry of Health Malaysia⁵⁶). The WHO review of NSEP found convincing evidence for the protective effect of NSEP against drug-related risks. The review found that most (23) of the 29 studies located showed results confirming the NSEP efficacy. There was only one piece of research finding negative outcomes and five studies reporting no effect (Wodak & Cooney⁵²). All evidence strongly shows the NSEP's outcome to lower HIV risk behaviours.

Despite evidence of the benefits of NSEP, there is much criticism of it which arises from the negative or mixed research findings. For example, the studies by Valenciano and colleagues⁴⁷ and Hope and colleagues¹⁹ reveal the association of NSEP use to high risk behaviours. Some others discover no significant difference between NSEP attendance and non-attendance in the frequency of needle-sharing (Hartgers and Van Ameijden et al¹⁸). Within this article it is argued that these data sources are inconclusively used to point towards NSEP inefficacy and give less consideration to the other potential factors affecting HIV risk behaviours such as homelessness and depression symptoms (Braine and Des Jarlais et al⁵). Braine and colleagues⁵ noted that the attributes of NSEP clients and environmental factors should be considered in analysing the subsisting risk behaviours. Therefore, the argument for NSEP influence on increased risk behaviours is unpersuasive.

Additionally, some critics raise the methodological issue of self-reporting. They question the accuracy of self-reported data about risk behaviours (Safaeian and Brookmeyer et al⁴²; Sloan and Bodapati et al⁴⁵). As contended, self-reporting potentially results in social desirability, recall or observational bias that affects the accuracy of derived data. Accepting this argument means evidence for risk behaviours reducing efficacy have less strength as they mostly come from studies relying on self-reported data. However, the claim has less merit when considering the sufficient validity and reliability of self-reporting achieved in most research involving using drugs and risk behaviours (Darke⁹). Further, the self-reported behaviour change could be considerably verified by options including comparing HIV seropositivity rates among IDUs obtaining supplied injection items and those who do not (Kaplan²²), conducting computer-assisted self-interviews (Metzger and Koblin et al³²) and corroborated urinalysis (Sherman and Bigelow⁴⁴). Thus, the data derived from self-reporting, with or without verification, is valid and reliable enough to show the efficacy of harm reduction interventions for reducing HIV risk behaviours.

EFFECTIVENESS IN REDUCING HIV SEROCONVERSION AND PREVALENCE

Drawing on evidence regarding MMT and NSEP outcomes of decreased drug-related risk behaviours, it seems plausible to claim their potential to decrease the rate of HIV seroconversion and prevalence. However, opponents argue that the modest risk behavioural change, if any, would not necessarily effectuate into actual reduced HIV infection. As a response to this, there is evidence that sufficiently demonstrates the contrary. The studies in Malaysia and other countries evaluate the impact of MMT on HIV prevention and have found a positive association between the programme admission and decreased HIV infection (Novick and Joseph et al³⁹; Metzger & Navaline³¹; Mohamed & Kasa³⁶; Ahamad and Hayashi et al¹). The results of a study in Tampin Health Clinic, Malaysia, demonstrate that none of the 143 subjects were infected with HIV during the course of the study from November 2006 to March 2009 (Norsiah and Dharmananda et al³⁸). The findings are further confirmed by international research, including by Metzger and others³³ and Duan and others¹² recording a high difference in HIV seroconversion levels between those continuing with MMT compared to those not receiving MMT.

Moreover, the intervention can significantly affect HIV prevalence in many settings. Indeed, in the WHO collaborative study using longitudinal cohort design, the data from opiate substitution treatment programmes, principally MMT, in selected developing countries (China, Indonesia, Thailand, Lithuania, Poland, Ukraine, Iran and Australia) indicates the protective effect of the substitution treatment in decreasing HIV prevalence. The rate of HIV prevalence reduced significantly in almost all the studied countries that provide the service. The report concludes that such positive implication achieved in high-resource countries could also be gained in countries with fewer resources (Lawrinson and Ali et al²⁵). Many systematic reviews of studies confirm this effectiveness (Gibson and Flynn et al¹⁵; Farrell and Gowing et al¹⁴; MacArthur and Minozzi et al²⁹). All positive findings constitute strong data on the impact of MMT on the decrease of HIV infection and prevalence.

Despite the evidence, the opposition to MMT efficacy is based on a few study results showing less favourable outcomes of MMT on HIV seroconversion. The studies involved cocaine and heroin injectors (Chaisson and Bacchetti et al⁸) and 'low threshold' MMT (Van Ameijden and Van Den Hoek et al⁴⁹). This outcome is unsurprising considering the absence of any pharmacotherapeutic treatment for cocaine. The few negative findings should also not be interpreted as overall inefficacy of MMT in HIV prevention as it is outweighed by the amount of research with positive results. Rather, the findings can be treated as a factor to ameliorate the service's quality and intensity. This may cover incorporating MMT with psychosocial facilities including healthcare and rehabilitation, ensuring longer retention in treatment and dispensing of a sufficient dosage of methadone. Such comprehensive strategies would increase MMT's benefits in halting adverse consequences including HIV infection from consumption of drugs including cocaine (Gibson and Flynn et al¹⁵).

Further, despite the limited findings in Malaysia, a handful of international studies using diverse research designs indicate that participation in NSEP is substantially associated with decreased HIV infection (Des Jarlais and Marmor et al¹⁰; Luo and Wu et al²⁶). By contrast, the lack of NSEPs may have resulted in the growth of HIV incidence, as suggested by high seroconversion levels observed in Pakistan and the USA (Lurie & Drucker²⁷; Emmanuel and Archibald et al¹³). This data concerning the reversed situation supports the consistency of efficacy arguments. The accumulated evidence strongly indicates the NSEP's protective effects against HIV seroconversion.

Additionally, there are studies that provide compelling evidence on this intervention's efficacy in reducing HIV prevalence. For instance, Hurley and others²⁰ conduct a large ecological analysis of HIV rates and NSEP use, comparing 81 cities across Asia, Europe, North America, South America and the South Pacific. 52 cities without NSEP had a mean annual growth of 5.9 per cent in HIV prevalence, compared to a mean annual fall of 5.8 per cent for 29 cities with NSEPs. More recently, the study of McDonald and others³⁰ involving 99 cities discloses the difference in HIV prevalence rates in cities with and without NSEPs; there was a decline of 18.6 per cent and an increase of 8.1 per cent respectively. The results lend strong support to the argument that NSEP is effective in minimising HIV prevalence. The capability of NSEP as part of a comprehensive set of measures to decrease HIV prevalence also extends to settings where HIV is already developed, including New York City (Des Jarlais and Perlis et al¹¹). The outcome of NSEP on HIV infection and prevalence is consistently supported by comprehensive reviews (Gibson and Flynn et al¹⁶; Ritter & Cameron⁴¹; Wodak & Cooney⁵⁴; Aspinall and Nambiar, et al²).

On the contrary, several studies did not discover the effect of NSEP attendance against HIV seroconversion. Higher levels of HIV infection substantially connected to NSEP access are observed by prospective cohort research in Montreal and Vancouver (Bruneau and Lamothe et al⁶; Strathdee and Patrick et al⁴⁶). Additionally, Strathdee and others⁴⁶ research reported the outburst of HIV prevalence subsequent to the five-year operation of vast NSEPs in Vancouver. Consistent with the above findings, the results of some studies in Amsterdam indicate no significant link between the presence of NSEPs and decrease in HIV incidence (Van Ameijden and Van Den Hoek et al⁴⁹). These findings are deduced by opponents to attribute the greater HIV incidents to NSEP presence.

As Strathdee and colleagues⁴⁶ suggest, the negative result is considerably affected by the insufficiency of NSEP on its own as a HIV prevention tool. Despite the coherent argument given the complexity of HIV transmission, this article argues that stronger explanation considering selection bias could be provided for mixed or negative results of research that compare NSEP clients and non-clients. The NSEPs attracted IDUs who were significantly associated with higher risk activities, than non-attendees (Gibson and Flynn et al¹⁶; Wodak & Cooney⁵³). This position is supported by studies and

commentaries (Lurie²⁷; Hagan and McGough et al., 2000; Noroozi and Mirzazadeh et al³⁷). Further, there is the possibility of the dilution factor. The Dutch, Canadian and UK studies with counterintuitive results were carried out in settings where lesser risk IDUs might have obtained syringes from alternative sources such as pharmacies, giving NSEP access to relatively individuals of greater risk of HIV seroconversion. This confounded the findings (Vlahov & Junge⁵⁰). All these arguments could give potential explanations for the discouraging data.

CONCLUSION

Overall, there is little doubt that MMT and NSEP do mitigate HIV risk behaviours, incidence and prevalence. Drawing on that point, this article contends that the availability of such strategies possibly becomes the main factor in the gradually declining trend of new HIV infection cases among IDUs in Malaysia in recent years. The cases fell from between 70 to 80 per cent of overall cases in the 1990s to 39 per cent by 2011 (Ministry of Health Malaysia³⁴). The rate further dropped to 19.3 per cent in 2014 (Ministry of Health Malaysia³⁵). This achievement rebuts Shan's⁴³ presumption in 2008 that the HIV rate in Malaysia would not decrease in the following three years despite harm reduction services. Malaysia's successful attainment in HIV prevention is endorsed by international bodies including the Joint United Nations Programme on HIV/AIDS (UNAIDS)²¹ and World Health Organization (Western Pacific Region) and Ministry of Health Malaysia⁵⁶. Thus, the hypothesis that both services do not contribute to halting HIV is invalid. The outcome is unaffected by negative empirical data as there is a compelling expounding explanation for them. Supporting evidence regarding this efficacy absolutely exceeds the contradicting evidence. The effectiveness of the interventions for reducing the blood-borne virus may be further increased by multi-integrated strategies. Additionally, considering scant local empirical results, the effectiveness of harm reduction interventions, particularly with respect to NSEP, warrants further research. It is critically vital for the scientific bases for harm reduction approach to be firmly sustained and articulated in law and policy discourse.

ACKNOWLEDGMENTS

This work is part of the research project supported by the University Utara Malaysia/Ministry of Higher Education (UUM/MOHE) the Fundamental Research Grant Scheme (FRGS) from the Ministry of Higher Education, Malaysia (grant ISO: 13580).

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Ahamad K, Hayashi K, Nguyen P, Dobrer S, Kerr T, Schütz C.G, Montaner J.S, Wood E. Effect of low-threshold methadone maintenance therapy for people who inject drugs on HIV incidence in Vancouver, BC, Canada: an observational cohort study. *Lancet HIV*. 2015;2(10):e445-50.
2. Aspinall E.J, Nambiar D, Goldberg D.J, Hickman M, Weir A, Van Velzen E, Palmateer N, Doyle J.S, Hellard M.E, Hutchinson S.J. Are needle and syringe programmes associated with a reduction in HIV transmission among people who inject drugs: a systematic review and meta-analysis. *International Journal of Epidemiology*. 2014;43(1):235-248.
3. Baker A, Kochan N, Dixon J, Wodak A, Heather N. HIV risk-taking behaviour among injecting drug users currently, previously and never enrolled in methadone treatment. *Addiction*. 1995;90(4):545-54.
4. Bluthenthal R.N, Kralc A.H, Geec L, Erringer E.A, Edlin B.R. The effect of syringe exchange use on high-risk injection drug users: a cohort study. *AIDS*. 2000;14(5):605-11.
5. Braine N, Des Jarlais D.C, Ahmad S, Purchase D, Turner C. Long-Term effects of syringe exchange on risk behavior and hiv prevention. *AIDS Education and Prevention*. 2004;16(3):264-75.
6. Bruneau J, Lamothe F, Franco E, Lachance N, Desy M, Soto J, Vincelette J. High rates of HIV infection among injection drug users participating in needle exchange programs in Montreal: results of a cohort study. *American Journal of Epidemiology*. 1997;146(12):994-1002.
7. Burt R.D, Thiede H. Reduction in needle sharing among seattle-area injection drug users across 4 surveys, 1994–2013. *American Journal of Public Health*. 2016;106(2):301-307.
8. Chaisson R.E, Bacchetti P, Osmond D, Brodie B, Sande M.A, Moss A.R. Cocaine use and HIV infection in intravenous drug users in San Francisco. *Journal of the American Medical Association*. 1989;261(4):561-65.
9. Darke S. Self-report among injecting drug users: a review. *Drug and Alcohol Dependence*. 1998;51(3):253-63.
10. Des Jarlais D.C, Marmor M, Paone D, Titus S, Shi Q, Perlis T, Jose B, Friedman S.R. HIV incidence among injecting drug users in New York City syringe-exchange programmes. *Lancet*. 1996;348(9033):987-91.
11. Des Jarlais D.C, Perlis T, Arasteh K, Torian L.V, Hagan H, Beatrice S, Smith L. Reductions in Hepatitis C virus and HIV infections among injecting drug users in New York City, 1990-2001. *AIDS*. 2005;19(Suppl 3):S20-S25.
12. Duan S, Yang Y.C, Han J, Yang S.S, Yang Y.B, Long Y.C, Gao J. Study on incidence of HIV infection among heroin addicts receiving methadone maintenance treatment in Dehong prefecture, Yunnan province. *Zhonghua liu xing bing xue za zhi= Zhonghua liuxingbingxue zazhi*. 2011;32(12):1227-1231.
13. Emmanuel F, Archibald C, Razaque A, Sandstrom P. Factors associated with an explosive HIV epidemic among injecting drug users in Sargodha, Pakistan. *Journal of Acquired Immune Deficiency Syndromes*. 2009;51(1):85-90.
14. Farrell M, Gowing L, Marsden J, Ling W, Ali R. Effectiveness of drug dependence treatment in HIV prevention. *International Journal of Drug Policy*. 2005;16:67-75.
15. Gibson D.R, Flynn N.M, McCarthy J.J. Effectiveness of methadone treatment in reducing HIV risk behavior and HIV seroconversion among injecting drug users. *AIDS*. 1999;13(14):1807-18.
16. Gibson D.R, Flynn N.M, Perales D. Effectiveness of syringe exchange programs in reducing HIV risk behavior and HIV seroconversion among injecting drug users. *AIDS*. 2001;15(11):1329-41.
17. Gill J.S, Sulaiman A.H, Habil M.H. The first methadone programme in Malaysia: overcoming obstacles and achieving the impossible. *ASEAN Journal of Psychiatry*. 2007;8(2):64-70.
18. Hartgers C, Van Ameijden E.J, Van Denhoek J.A, Coutinho R.A. Needle sharing and participation

- in the Amsterdam syringe exchange program among HIV seronegative injecting drug users. *Public Health Reports*. 1992;107(6):675-81.
19. Hope V.D, Rogers P.A, Jordan L, Paine T.C, Barnett S, Parry J.V, Gill O. Sustained increase in the sharing of needles and syringes among drug users in England and Wales. *AIDS*. 2002;16(18):2494-96.
 20. Hurley S.F, Jolley D.J, Kaldor J.M. Effectiveness of needle-exchange programmes for prevention of HIV infection. *Lancet*. 1997;349(9068):1797-800.
 21. Joint United Nations Programme on HIV/AIDS (UNAIDS). *Global Report: UNAIDS Report on the Global AIDS Epidemic 2010*. Geneva: UNAIDS. 2010.
 22. Kaplan E.H. Needle exchange or needles exchange? The state of the debate. *Infectious Agents and Disease*. 1992;1(2):92-98.
 23. Karki P, Shrestha R, Huedo-Medina T. B, Copenhaver M. The impact of methadone maintenance treatment on HIV risk behaviors among high-risk injection drug users: a systematic review. *Evidence-Based Medicine & Public Health*. 2016;2:e1229.
 24. Kerr T, Small W, Buchner C, Zhang R, Li K, Montaner J, Wood E. Syringe sharing and HIV incidence among injection drug users and increased access to sterile syringes. *American Journal of Public Health*. 2010;100(8):1449-53.
 25. Lawrinson P, Ali R, Buavirat A, Chiamwongpaet S, Dvoryak S, Habrat B, Jie S. & et al. Key findings from the WHO collaborative study on substitution therapy for opioid dependence and HIV/AIDS. *Addiction*. 2008;103:1484-92.
 26. Luo W, Wu Z, Poundstone K, McGoogan J. M, Dong W, Pang L, Cao X. Needle and syringe exchange programmes and prevalence of HIV infection among intravenous drug users in China. *Addiction*. 2015;110(S1):61-67.
 27. Lurie P, Drucker E. An opportunity lost: HIV infections associated with lack of a national needle-exchange programme in the USA. *Lancet*. 1997;349(9052):604-08.
 28. Lurie P. Invited commentary: Le Mystère De Montréal. *American Journal of Epidemiology*. 1997;146(12):1003-06.
 29. MacArthur G.J, Minozzi S, Martin N, Vickerman P, Deren S, Bruneau J, Degenhardt L, Hickman M. Opiate substitution treatment and HIV transmission in people who inject drugs: systematic review and meta-analysis. *British Medical Journal*. 2012;345.
 30. MacDonald M, Law M, Kaldor J, Hales J, Dore G.J. Effectiveness of needle and syringe programmes for preventing HIV transmission. *International Journal of Drug Policy*. 2003;14(5):353-57.
 31. Metzger D.S, Navaline H. (2003). Human Immunodeficiency Virus prevention and the potential of drug abuse treatment. *Clinical Infectious Diseases*. 2003;37(Suppl 5):S451-S56.
 32. Metzger D.S, Koblin B, Turner C, Navaline H, Valenti F, Holte S, Gross M & et al. Randomized controlled trial of audio computer-assisted self-interviewing: utility and acceptability in longitudinal studies. *American Journal of Epidemiology*. 2000;152(2):99-106.
 33. Metzger D.S, Woody G.E, McLellan A.T, O'Brien C.P, Druley P, Navaline H, DePhilippis D, Stolley P, Abrutyn E. Human Immunodeficiency Virus seroconversion among intravenous drug users in- and out-of-treatment: An 18-month prospective follow-up. *Journal of Acquired Immune Deficiency Syndrome*. 1993;6(9):1049-56.
 34. Ministry of Health Malaysia. *Global AIDS Response Country Progress Report 2012: Country Progress Report Malaysia*. Putrajaya, Malaysia: Ministry of Health Malaysia. 2012.
 35. Ministry of Health Malaysia. *National Strategic Plan Ending AIDS 2016-2030*. Putrajaya, Malaysia: Ministry of Health Malaysia. 2015.
 36. Mohamed M.N, Kasa, M.D. Drug substitution therapy: success and limitations of the methadone and buprenorphine maintenance programs. *Research Report*. Sintok, Malaysia: Universiti Utara Malaysia. 2006.
 37. Noroozi A, Mirzazadeh A, Hajebi A, Farhoudian A, Sharifi H, Higgs P, Noroozi M. Comparing profile of people who inject drugs (PWID) accessing different types of needle and syringe programs or secondary distribution in Kermanshah, Iran. *Journal of Substance Use*. 2016;1-6.
 38. Norsiah A, Dharmananda S, Nazri M.D.M, Marzafuan M.M, Lee B.W, Khalijah M.Y. Can primary care clinic run MMT service well?. *Malaysian Family Physician*. 2010;5(1):19-23.
 39. Novick D.M, Joseph H, Croxson T.S, Salsitz E.A, Wang G, Richman B.L, Poretzky L, Keefe

- J.B, Whimbey E. Absence of antibody to Human Immunodeficiency Virus in long-term, socially rehabilitated methadone maintenance patients. *Archives of Internal Medicine*. 1990;150(1):97-99.
40. Ramli M, Nora M.Z, Zafri A.A, Junid M.R, Umeed A.K, Hajee M.I. High-risk behaviours and concomitant medical illnesses among patients at methadone maintenance therapy clinic, Hospital Tengku Ampuan Afzan, Malaysia. *Malaysian Family Physician*. 2009;4(2-3):77-83.
 41. Ritter A, Cameron J. Drug Policy Modelling Project Monograph 06: A Systematic Review of Harm Reduction. Fitzroy: Turning Point Alcohol and Drug Centre. 2005.
 42. Safaeian M, Brookmeyer R, Vlahov D, Latkin C, Marx M, Strathdee S.A. Validity of self-reported needle exchange attendance among injection drug users: implications for program evaluation. *American Journal of Epidemiology*. 2002;155(2):169-75.
 43. Shan L.S. Report on an interim review and a gap analysis of the harm reduction programme in Malaysia. In Malaysia and Singapore Office of WHO Representative for Brunei Darussalam (Ed.), Review and Evaluation on Harm Reduction Programme in Malaysia Kuala Lumpur: World Health Organization. 2008;41-57.
 44. Sherman M.F, Bigelow G.E. (1992). Validity of patients' self-reported drug use as a function of treatment status. *Drug and Alcohol Dependence*. 1992;30(1):1-11.
 45. Sloan J.J, Bodapati M.R, Tucker T.A. Respondent misreporting of drug use in self-reports: social desirability and other correlates. *Journal of Drug Issues*. 2004;34(2):269-292.
 46. Strathdee S.A, Patrick D.M, Currie S.L, Cornelisse P.G.A, Rekart M.L, Montaner J.S.G, Schechter M.T, O'Shaughnessy M.V. Needle exchange is not enough: lessons from the Vancouver injecting drug use study. *AIDS*. 1997;11(8):F59-F65.
 47. Valenciano M, Emmanuelli J, Lert F. Unsafe injecting practices among attendees of syringe exchange programmes in France. *Addiction*. 2001;96(4):597-606.
 48. Van Ameijden E.J.C, Van Den Hoek A.A.R, Coutinho R.A. Injecting risk behavior among drug users in Amsterdam, 1986 to 1992, and its relationship to AIDS prevention programs. *American Journal of Public Health*. 1994;84(2):275-81.
 49. Van Ameijden E.J.C, Van Den Hoek J.A.R, Van Haastrecht H.J.A, Coutinho R.A. The harm reduction approach and risk factors for Human Immunodeficiency Virus (HIV) seroconversion in injecting drug users, Amsterdam. *American Journal of Epidemiology*. 1992;136(2):236-43.
 50. Vlahov D, Junge B. The role of needle exchange programs in HIV prevention. *Public Health Reports*. 1998;113(Suppl 1):75-80.
 51. Wang L, Wei X, Wang X, Li J, Li H, Jia W. Long-term effects of methadone maintenance treatment with different psychosocial intervention models. *PLoS One*. 9, e87931. 2014.
 52. Wodak A, A. Cooney. Effectiveness of Sterile Needle and Syringe Programming in Reducing HIV/AIDS among Injecting Drug Users. Geneva: World Health Organization. 2004.
 53. Wodak A, Cooney A. Effectiveness of sterile needle and syringe programmes. *International Journal of Drug Policy*. 2005;16:31-44.
 54. Wodak A, Cooney A. Do needle syringe programs reduce HIV infection among injecting drug users: a comprehensive review of the international evidence. *Substance Use & Misuse*. 2006;41(6-7):777-813.
 55. Wong K, Lee S, Lim W, Low H. Adherence to methadone is associated with a lower level of HIV-related risk behaviors in drug users. *Journal of Substance Abuse Treatment*. 2003;24(3):233-39.
 56. World Health Organization (Western Pacific Region) & Ministry of Health Malaysia. Good Practices in Asia: Scale-up of Harm Reduction in Malaysia. Manila: World Health Organization. 2011.
 57. Zamani S, Vazirian M, Nassirimanesh B, Razzaghi E.M, Ono-Kihara M, Mortazavi Ravari S, Gouya M.M, Kihara M. Needle and syringe sharing practices among injecting drug users in Tehran: a comparison of two neighborhoods, one with and one without a needle and syringe program. *AIDS and Behavior*. 2010;14(4):885-90.
 58. Zhao L, Holzemer W.L, Johnson M, Tulsy J.P, Rose C.D. HIV infection as a predictor of methadone maintenance outcomes in Chinese injection drug users. *AIDS Care*. 2012;24(2):195-203.

Linking Transformational Leadership to Firm Innovativeness

Donny Abdul Latief Poespowidjojo¹, Azahari Ramli², Ahmed Mohammed Kamaruddeen³,
Muhammad Shukri Bakar⁴, Khairunnisah Ahmad Shakir⁵

^{1,2,4}*School of Tourism, Hospitality and Event Management, Universiti Utara Malaysia, Malaysia;*

³*School of Built Environment, University College of Technology Sarawak, Sibul, Sarawak, Malaysia;*

⁴*Faculty of Muamalat University College of INSANIAH, Kedah, Malaysia*

ABSTRACT

The leadership style of the top management can have a significant effect on the innovativeness of the firm. The purpose of this study is to examine the impact of a particular leadership style, transformational leadership, on innovations among logistics companies. Drawing on a sample of 500 logistics companies were randomly selected and given the questionnaire to complete. A total of 86 questionnaires were returned and 84 questionnaires were useable for analysis. Findings revealed transformational leadership has a significant relationship and positive impact on innovativeness of logistics companies. The implication of the study brings new evidence to bear on the notion about the innovativeness in the logistics industry in Malaysia.

Keywords: *Transformational Leadership, Firm Innovativeness, Logistics.*

INTRODUCTION

Innovations are essential since they establish the basis for acquirement and retention of a sustainable competitive advantage and are critical for the economic survival of the firms. Various definitions of the term firm innovativeness have been provided by scholars Jain, Siddiquee, & Singal¹⁷. In this study, firm innovativeness is defined as the propensity or capacity of a firm to adopt innovative methods, processes, concepts, and business systems that are new to the logistics industry; not just for maximizing profits, but also to meet the needs of the customers or end users, taking into consideration sustainability and the environment.

The business environment in which the logistics companies operate is characterized by continuous changes and intense competition. To survive such an intense competitive business environment, companies must leverage their resources and manage both internal and external factors that influence their innovativeness Wahab and Cooper³⁰. Although innovativeness research on logistics companies is limited, empirical research has shown that innovativeness can provide company the ability to achieve lower cost and higher quality services that meet all the requirements of potential customers, introduce new products, services, business, environmental issues and maximum utilization of information technology Sundbo, Orfila-Sintes & Sorensen²⁹.

The need for a better empirical research and evidence about innovativeness in at industry level is documented in the literature Hall and Williams¹²; Hjalager¹⁵. The authors argue that industries should adequately represent during any comprehensive or national or international innovation survey. While there have been attempt to assess the organizational innovativeness in various sectors of the economy across the globe, the debate surrounding the best methodology or scale to use in measuring firm innovativeness has often been the source of considerable controversy. For this reason, Crespell, Knowles, and Hansen⁵; Desphande, and Farley⁷ called for a universally reliable and valid measuring scale for innovativeness which is robust enough, void of the weaknesses associated with existing scales.

Due to these reasons, this study attempts to conceptualize the firm innovativeness as a multi-dimensional approach which consists of product, process, business, and information technology innovativeness. A multidimensional approach to innovativeness research will enable the researcher to identify the innovative firms by examining all aspects of the firm innovativeness such as the propensity to adopt innovative products, concept, business, and practice, as well as new marketing strategies.

As the firm innovativeness is considered as driven-factor for firm sustainability and competitive advantage

as well as the driving force of economic growth at both national and international level Mei, Arcodia & Ruhanen²¹, the factor influencing the innovativeness of logistics companies has to be explored and researched. This study suggests the transformational leadership is highly potential to uplift the level of firm innovativeness among logistics companies. Transformational leadership has been recognized as the most advanced because it encompasses the symbolic, emotional and highly motivating behaviours that produce better results than ordinary leadership. Transformational leader is known for his or her ability to motivate followers (firm employees) to perform more than they are initially expected as they strive for better performance Ergeneli, Gohar, & Termirbekova⁸. Unfortunately, this study unable to learn from any empirical literature on the nature of the relationship between transformational leadership and firm innovativeness. Hence, this study sought to answer the following research question; What is the relationship between transformational leadership and firm innovativeness? The aspiration to assist logistics companies to innovate effectively and efficiently has motivated research on the factor and its relationship with firm innovativeness.

LITERATURE REVIEW

This study is grounded in a Resource-based view (RVB) where it recognizes the organizational resources as the fundamental driver of organizational performance. The firm innovativeness is considered as firm performance and indirectly affects firm value through its effects on market position and financial position Rubera & Kirca²⁶. The antecedent of firm innovativeness is transformational leadership. According to Chen (2016), transformational leadership is organizational resources as they argued that the transformational leadership as human capital resources of the firm.

Firm Innovativeness: Scholars have provided various definitions of firm innovativeness in the literature. While some of these definitions reflect the capacity of a firm to produce innovative products Wang & Ahmed³², others focus on innovative related culture or behaviours that reflect inclination or capacity towards innovation Auh & Mengu¹; Hurley & Hult¹⁶. Scholars such as Knowles, et al¹⁹ provided a definition that reflects a firm's capability in product and behavioural innovativeness. The scholars define innovativeness as "the propensity

to create and/or adopt new products, manufacturing process, and business system" Knowles et al¹⁹, p. 2).

In response to different conceptualizations of firm innovativeness in streams of research that result in difficulties in comparing findings across studies, Wang and Ahmed³², p 304 provided five dimensions of firm innovativeness. The five dimensions consist of product innovativeness, market innovativeness, process innovativeness, behavioural innovativeness, and strategic innovativeness.

Knowles et al¹⁹ conceptualized firm innovativeness as a product, process, and business system. This concept, however fails to capture information technology dimension of firm innovativeness despite the numerous literature that associate information technology adoption with innovation Ferneley & Bell¹⁰; Wang & Swanson³³. Thus, this study then added information technology innovativeness to a product, process, and business system, adapted from Knowles et al¹⁹ innovativeness dimension. The dimensions are a product, process, business system, and information technology innovativeness.

Transformational Leadership: Transformational leadership style is preferred to be examined in this study because empirical studies have shown that it is universally effective across cultures eg., Zagorsek, Marko & Stanley³⁵. It is also identified as one of the major factors that affect innovation. Leaders can improve organizational capacity to innovate by directing resources and energy toward implementing new programs and by lending power and legitimation to innovative activities Hasenfeld¹³. Transformational leader is known for his or her ability to motivate followers (firm employees) to perform more than they are initially expected as they strive for better performance Ergeneli, Gohar, & Termirbekova⁸. More importantly, Transformational leadership behavior has been identified to be representing the most active and effective form of leadership Rubin, Munz, & Bommer²⁷.

Furthermore, it has been identified as a strategic tool to manage a dynamic environment faced by the firms in recent times Nielsen & Cleal²². According to Waldman, Ramirez, House, & Puranam³¹ transformational leadership refers to a leadership style in which the leader uses ideology and values to achieve high end-values through motivating the firm's distant subordinates. They try to find to unite employees and inspire them to make the organization's vision a reality Bryman⁴.

It is unarguable to recognize the importance of transformational leadership in stimulating the ability of a firm to innovate. Studies on its relationship with firm innovativeness by Noruzy, A., Dalfard, V., Azhdari, B., Nazari-Shirkouhi, S., and Rezazadeh, A²³ and Jaskyte, K¹⁸ discovered that the relationship is positive and significant. However, little attention has been given to study the said relationship among logistics companies. Thus, the purpose of this paper is to study the relationship between transformational leadership and firm innovativeness in the context logistics companies. Due to this, we assume the following hypothesis:

H1: There is a significant and positive relationship between transformational leadership and firm innovativeness.

METHODOLOGY

This study is a correlational type of study, which is, examines the relationship between transformational leadership and firm innovativeness among logistics companies in Peninsular Malaysia. Since the collection and analyses of data were done at the firm level, the unit of analysis is the firm. Following Knowles et al¹⁹ innovativeness study in wood industry, top managers are the respondents of the study. This study is cross-sectional in nature such that the data were collected by means of the questionnaire at one point in time Sekaran²⁸.

There was a total 528 companies registered at Federation of Malaysian Freight Forwarders. Hence, according to Krejcie and Morgan²⁰; and Sekaran²⁸, the appropriate sample size to represent the logistics companies in Peninsular Malaysia would be 226. However, Krejcie and Morgan²⁰ has suggested providing for a 5% margin of error, 252 sample size would be required for a population of 528 logistics companies. In an attempt to receive the required sample size of 252 responses, a comparison was made with the return rate of similar innovativeness studies that have been conducted in Malaysia. Thus, to take account of the potential loss rate, 500 logistics companies were sampled. The required number of 500 samples for this study is equivalent to 95% (500/528 x 100) of the total logistics companies under study. A set of questionnaires were mailed to them via postal service.

The firm innovativeness is measured from four dimensions; namely as product, process, business

system, and information technology innovativeness. There are 17 items and were adopted from the Knowles et al¹⁹ and Beatty, Shim and Jones². To ensure these items have a proper degree of internal consistency, the Cronbach Alpha test was performed to all dimensions of firm innovativeness and found to obtain a score of 0.848, 0.788, 0.736 and 0.824 respectively. The transformational leadership is measured using 6 items and were adopted from Garcia-Morales et al. (2006). The Cronbach Alpha was at 0.853.

FINDINGS

A set of questionnaires were mailed to 500 logistics companies and 84 respondents responded. Thus, the response rate of the survey is 15.9% of the total population or 16.8% of the 500 respondents which were contacted by mail. However, one of the questionnaires was eliminated due to the outliers case, making to usable cases were 82. The underlying assumption of correlation regression analysis was that each variable and all linear combinations of the variables were normally distributed. As a general rule, when the sample size is at least 30, the sample distribution of the mean will be assumed as approximately normal Berenson, Levine & Krehbiel³. The normality of the distribution of data was examined thru the skewness and kurtosis values for each variable and in conclusion, all the variables did not deviate the normality test requirement.

The correlation analysis was conducted to test the H1 and the output of the test can be referred to Table 1.

Table 1: Relationship between Transformational Leadership and Firm Innovativeness

Variable	Firm Innovativeness
Transformational Leadership	.758**

Note: ** The mean difference is significant at the 0.01 (2-tailed)

Table 1 exhibits the results of correlations analysis to examine the relationship between transformational leadership and firm innovativeness. The results indicate the positive and significant relationship between transformational leadership and firm innovativeness among logistics companies in Malaysia ($r=0.731$, $p<0.01$). The result of analysis also revealed that the

direction of the association is positive. This indicates that additional efforts to enhance transformational leadership would result in the increase in level of firm innovativeness. Since, the result indicates the strength of association between is strong as suggested by Cohen Pallant²⁵, the possibility of transformational leadership to uplift level of firm innovativeness is high.

Table 2 illustrates the results of regression analysis to examine the effect of organizational resources on firm innovativeness.

Table 2: Effect of Transformational Leadership on Firms Innovativeness

	B	t	Sig.
Transformational Leadership	.699	10.380	.000
R2	0.574		
F	107.00		
Sig.	0.000		

As shown in Table 2, the transformational leadership were strongly explained 57.4 percent of firm innovativeness (R2=0.574, F=107.000, p<0.01). The transformational leadership was also found to have the significant effect on firm innovativeness as follows: Transformational Leadership (B=0.699, t=10.380, p<0.01). The result had successfully supported the H1. Hence, H1 is accepted.

DISCUSSION & CONCLUSION

This study made several contributions to the theory and practice specifically in logistics. Some previous studies had focused on adoption of type of innovation, thereby examining innovativeness from one-dimensional approach, such as product innovativeness Fell et al⁹, process innovativeness Yusof&MohdShafiei³⁴, market innovativeness Hilmi & Ramayah¹⁴, or information technology (Oh, Cruickshank, & Anderson²⁴ is impractical. This one-dimensional concept perhaps has brought about results on innovativeness definitions and research instruments that do not aggregate all the dimensions of firm innovativeness. The firm is a system where it is consisting of various activities and functions that inter-related and dependent to each other. The one-dimensional approach incapable to discover the nature of innovation in the firm. Thus, this study able to fulfil

the gap in the literature and provides definition and measures on innovativeness in logistics companies.

This study discovers that the transformational leadership is one of factor influencing firm innovativeness. According to Hartog (2012), leaders with transformational style can enhance employee proactive behaviour. This phenomenon could encourage employees to express their creative ideas and in turn, these ideas will be translated into innovative products, services or processes. Top managers are encouraged to give autonomy to their employees as it will give ample space to them to think about what and how they should perform their tasks. Better customer service and shorten the time in performing routine tasks could be achieved and will lead to low operating costs and capable to secure customer loyalty. This becomes the utmost importance since logistics is a service sector.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Auh S, Menguc B. Top management team diversity and innovativeness: The moderating role of inter-functional coordination. *Industrial Marketing Management*. 2005; 34(3): 249–261.
2. Beatty R.C, Shim J.P, Jones M.C. Factors influencing corporate web site adoption: A time-based assessment, “*Information & Management*”. 2001; Vol. 38: No. 6, pp 337-354.
3. Berenson M, Levine D, Krehbiel T. C. *Basic business statistics concepts and applications*. Upper Saddle River, NJ: Prentice-Hall. 2004.
4. Bryman A. *Charisma and leadership in organizations*. London: Sage. 1992.
5. Crespell P, Knowles C, Hansen E. Innovativeness in the North American softwood sawmilling industry. *Forest Science*. 2006; 52(5): 568-578.
6. Den Hartog D. N, Belschak F. D. When does transformational leadership enhance employee proactive behavior? The role of autonomy and role breadth selfefficacy. *Journal of Applied Psychology*. 2012; 97: 194–202.

7. Deshpande R, Farley J. U. Organizational culture, market orientation, innovativeness, and firm performance: an international research odyssey. *International Journal of Research in Marketing*. 2004; 21: 3-22.
8. Ergeneli A, Gohar R, Temirbekova Z. Transformational leadership to culture value dimensions. *International Journal of Intercultural Relations*. 2007; 31: 703-724.
9. Fell D, Hansen E. N, Panches J. Segmenting Single-Family Home Builders on a Measure of Innovativeness. *Forest Product Journal*. 2002; 52(6): 28-34.
10. Ferneley E, Bell F. Using bricolage to integrate business and information technology innovation in SMEs. *Technovation*. 2006; 26: 232-241.
11. Garcia-Morales VJ Jimenez-Barrionuevo MM Gutierrez-Gutierrez L. Transformational leadership influence on organizational performance through organizational learning and innovation. *Journal of business research*. 2012; 65(7): 1040-1050.
12. Hall CM, Williams AM. *Tourism and innovation*. Routledge. 2008.
13. Hasenfeld Y. *Human service organizations*. Englewood Cliffs. NJ: Prentice-Hall. 1983.
14. Hilmi M. F, Ramayah T. Market Innovativeness of Malaysian SMEs: Preliminary results from a first wave data collection. *Asian Social Science*. 2008; 4(12).
15. Hjalager A.-M. A review of innovation research in tourism. *Tourism Management*. 2010; 31: 1-12.
16. Hurley R. F, Hult G. T. M. Innovation, market orientation and organizational learning: an integration and empirical examination. *Journal of Marketing*. 1998; 62(3): 42-54.
17. Jain K, Siddiquee Q, Singal V. Measurement of Innovativeness in an Organisation Using AHP. Paper presented at the Portland International Conference on Management of Engineering & Technology, Phuket, Thailand. 2010, 18 - 22 July 2010.
18. Jaskyte K. Transformational leadership, organizational culture, and innovativeness in nonprofit organizations. *Nonprofit Management and Leadership*. 2004; 15: 153-168.
19. Knowles C, Hansen E, Dibrell C. Measuring firm innovativeness: Development and refinement of a new scale. *Journal of Forest Products Business Research*. 2008; 5(5): 1-24.
20. Krejcie R. V, Morgan D. W. Determining sample size for research activities. *Educational and Psychological Measurement*. 1970; 30: 607-610.
21. Mei X.Y, Arcodia C, Ruhanen L. Towards tourism innovation: A critical review of public policies at the national level. *Tourism Management Perspectives*. 2012; 4: 92-105.
22. Nielsen K, Cleal B. Under which condition do middle managers exhibit transformational leadership behavior? - An experience sampling method study on the predictors of transformational leadership behaviors. *The leadership Quarterly*. 2011; 22: 344-352.
23. Noruzy A, Dalfard V, Azhdari B, Nazari-Shirkouhi S, Rezazadeh A. Relations between Transformational Leadership, Organizational Learning, Knowledge Management, Organizational Innovation, and Organizational Performance: an Empirical Investigation of Manufacturing Firms. *The International Journal of Advanced Manufacturing Technology*, in press. 2012; 1-13.
24. Oh K.-Y, Cruickshank D, Anderson A.R. The adoption of e-trade innovations by Korean small and medium sized firms. *Technovation*. 2009; 29(2): 110-121.
25. Pallant J. *SPSS Survival manual: a step by step guide to data analysis using SPSS for Window (Version 12) (2 ed.)*. Australia: Allen & Unwin. 2005.
26. Rubera, Gaia, Ahmet H. Kirca. "Firm innovativeness and its performance outcomes: A meta-analytic review and theoretical integration." *Journal of Marketing*. 2012; 76 (3): 130-147.
27. Rubin R. S, Munz D. C, Boomer W. H. Leading form within: The effects of emotion recognition and personality on transformational leadership behavior. *Academy of management Journal*. 2005; 48: 845-858.
28. Sekaran *UResearch Method for Busines, A skill Building Approach (4 ed.)*. New delhi, India: John Willey& Sons. 2006.

29. Sundbo J; Orfila-Sintes F, Sørensen F.'The Innovative Behaviour of Tourism Firms', *Research Policy*. 2007; 36(1): 88-106.
30. Wahab S, Cooper C. *Tourism in the age of globalisation*. London: Routledge. 2001.
31. Waldman D.A, Ramirez G. G, House R. A, Puraman P. Does leadership matter? CEO leadership attributes and profitability under conditions of perceived environmental uncertainty. *Academy of management Journal*. 2001; 44: 134-143.
32. Wang C. L, Ahmed P. K. The development and validation of the organisational innovativeness construct using confirmatory factor analysis. *European Journal of Innovation Management*. 2004; 7(4): 303-313
33. Wang P, Swanson E. B. Launching professional services automation: Institutional entrepreneurship for information technology innovations. *Information and Organization*. 2007; 17: 59-88.
34. Yusof N, M.W.M. Shafiei. Factors affecting housing developers' readiness to adopt innovative system. *Hous. Stud*. 2011; 26: 369-384.
35. Zagorsek H, Marko J, Stanley J. S. Comparing leadership practices between the United States, Nigeria, and Slovenia: Does culture matter? *Cross Cultural Management*. 2004; 11: 16-34.

A Process-Oriented Quality Assurance and Organizational Performance: A Conceptual Approach

M. G. Hassan¹, M. D. Akanmu¹, A. Y. Bahaudin¹

¹*School of Technology Management and Logistics, College of Business, 06010 UUM Sintok, Kedah Darul Aman, Malaysia.*

ABSTRACT

The main objective of this study is to develop a life cycle mode for a process-oriented quality assurance in organizational performance of food and beverage companies. As an iterative and dynamic process, quality assurance is interwoven in the production and process of food and beverages in the agro-allied industry. Through the review of literatures in existence, specifically those that focus on procedures, frameworks and methodology, a process oriented framework is developed around non-linear sequential stages presented as: planning (before), design and production (during), post production and delivery (after). The model is approved through an advanced systematic methods employed in collecting, organizing and generating reports about quality assurance for updates or changes. Many studies emphasize that quality assurance needs a friendly environs that take quality as a key factor and a work value for attaining the objectives of an organization. A practical quality assurance model is then proposed by this study that complies with the guide of food and beverage developmental stages. Practical steps are recommended in each stage. There is great potential in the quality assurance model for its transformation from static, the state of after-the-fact to a state of dynamism and iterative state, thereby improving the ongoing self-improvement culture.

Keywords: *Total quality management; quality management; production; continuous improvement; agro-allied industry.*

INTRODUCTION

The concept of quality is associated with a definitional challenge alongside its associated derivatives which include quality assurance, quality control, quality audit, quality enhancement and total quality management, expectations, interest, stems from the juxtaposition of external and internal stakeholder's requirements of a company. Those contradictory expectations and requirements are often contribute and complicated to the imprecision of operation and concept that encapsulate all efforts to get quality explained. However, quality is viewed to be stakeholder-relative. Thus, it is elusive, multi-dimensional and slippery concept rather than unitary idea¹. In this vein, it was pointed out by Van Damme² that no consensual definition of this rather controversial and vague in spite of operational experience for 20 years in improving an organizational quality is accepted universally³. In addition, definition of quality is not universal⁴. Pounder⁵ stated that quality is rather an ambiguous term. However, Harvey and Newton⁶ proposed on of the earlier categorizations

of quality which produce unanimous consensus that fitness of purpose, added value, positive transformation and customer satisfaction can be perceived as quality. According to ISO 9001, a standard describes the requirements of a quality management system that needs to be implemented so that the company can produce the products according to the requirement of customers, achieve continual improvement and customer satisfaction on the effectiveness of their quality management system⁷.

As a subset of the semantic cluster word: quality assurance, quality seems to be clearer. However, quality assurance by the International Organization for Standardization (IOS) is regarded as an approach focusing on processes from the quality management part that focuses on confidence provision while quality goals are being achieved. Quality assurance is also defined as the systematic assessment procedure and management employed to ensure achievement of improved quality or quality outputs. A proposed definition closed to this meaning is from Tran, Cahoon, and Chen⁸ where quality

assurance is defined to be a systematic or planned process of review of an organization or project to find out the acceptable standard of infrastructure, production, and how manufacturing can be enhanced and maintained.

The absence of understanding around the context of quality is majorly prompted by the points of view of the stakeholder from this quick quality review and definitions of quality assurance. In contrast, the absence of clarification attracts a doubled-edged possibility; it is conducive to meet the interests and needs on the other hand of the various external and internal stakeholders. In another word, this renders the quality concept hard to conceptualize due to its impression and vagueness. Quality assurance seems to be both implementable and achievable but it is subjected to various perspectives and narratives as a technique employed to measure the achieved goals and objectives of the organization⁹. The use of pragmatic approach by stakeholders is to foster quality assurance in ongoing improvement and culture particularly within the unpredictable, diverse and dynamic context of agro-allied sector in contrast to the perspective of the tradition that posits quality assurance as a systematic approach used to anticipate and prevent mistakes. Thus, this has led to the next question: 'how to understand the context of the key factors that influence quality assurance?'

Quality assurance based on clarification and comprehensive review is designed from three non-linear sequential phases namely: Planning and Analysis; Design, Production; and Post-production and Delivery [10]. Basically, the maintenance of a desired level of quality in a service and product is called quality assurance especially by means of attention to every phase of the process of delivery or production. It involves assessment procedures and systematic management employed to ensure quality outputs and improved quality improvement. This study employs planning and analysis, design, production, post production and delivery as befitting sub-variables to investigate Quality assurance in Food and Beverage companies of Malaysia^{8,10-11}.

In the planning phase, quality is broadly employed as a scale of distinction and approval in the growing presence of agro-allied industry. Additionally, evaluation is promoted to improve both with steering resources and strategic decisions through the pressure exerted by the constraints of budget. Self-evaluation process and competition awareness is achieved

through benchmarking while indulging in exchanging and sharing of experiences¹². However, accrediting agencies and agro-allied sector institutions to implement proactively transparent and rigorous Quality assurance procedure and guideline have been forced by certain action caused by the above-mentioned contextual factors (competitiveness, accreditation and technology). According to Belawati and Zuhairi¹³, the implementation of the quality assurance framework has been promoted locally and internationally by these agencies with a high level of comparability and similarities focusing on improving the organizational performance.

Koul and Kanwar¹⁴ highlight the introduction of quality culture, enhancing building of capacity to implement and promote the systems of quality assurance while establishing quality focus on planning and production. There is variation in the integration of quality assurance system with the frameworks of the policy which is reflected particularly in the criteria and standards applied in various perspectives of quality control. At companies that take quality as their first priority, predetermined criteria and standard are followed generally. Less prescriptive general guidelines and self-improvement as sacrifice are always imbibed at many companies. From this point of view, there is proposition of process-oriented quality assurance based on development and delivery phase with the belief that integrating quality assurance within this context will probably enhance organizational performance with the provision of enabling conditions.

METHODOLOGY

This paper focuses on the development of quality assurance standards and organizational business models. The study included a literature review and evaluation to determine the mechanisms presently in place with particular emphasis on food and beverages.

Model Development of Quality Assurance: Many studies have developed models on quality and quality assurance in respect to agricultural and rural development¹⁵; food supply chain¹⁶; genetically modified organisms; techno-managerial approach in food quality management¹⁷; and analysis of food products¹⁸. Miguel and Bruce¹⁵ developed a repeated purchase model to explore the fundamental economic factor that lie behind the choice of different systems in quality assurance and their associated degrees of stringency by firms. The study revealed that a close

attention is given to the role of reputations in providing the incentives for firms to deliver high quality goods in an environment of symmetrically imperfect information. The model here is developed to deal with complicating factors where in some circumstances, delivering quality can only be imperfectly learned and/or affected by producers. According to Manning *et al*¹⁶, the standards of quality assurance are considered to be a proven mechanism for delivering quality of product and services. There the result shows that in order to demonstrate to stakeholders and the consumer that quality assurance schemes actually deliver tangible benefits, quality measurements should be included in quality assurance models as these measures can improve intrinsic product quality, supply chain efficiency and compliance with legislative requirements and drive business performance. Caswell *et al*¹⁸ developed a two-unified framework for analyzing quality and quality assurance for food products. The unified quality framework offers a systematic means of analyzing quality and quality assurance as this is important in a trade environment where the dimensionality of the issues is growing rapidly. Decision-making in the managerial functions affects food quality by deciding on variability and conditioning of food and human systems; thus, quality assurance deals with deciding on the design, implementation, and performance of the quality system¹⁷.

This study proposed a model of a process-oriented lifecycle in Quality assurance, where Quality assurance can iteratively and dynamically be intertwined with developmental process of food and beverage. This idea recognizes the most paramount factors that affect the quality of food and beverage companies' experiences. These are informed and purposeful design of adequate learning skills with the addition of materials to support the interaction and development¹⁹. In support of this, the study affirms the assertions of the choice of Ellis *et al*²⁰ for a process oriented approach in the Quality assurance implementation.

During practices by making effort on the production and delivery design, QA is transformed to a state of more iterative and dynamic that promotes ongoing self-improvement culture in contrary to circumstantial compliance from a static, after-the-fact state. From this vein, the model proposed focuses on those practices of 'front-line companies' that are involving in shaping the experience of the industry: quality manager, top manager, instructional technologists and instructional designers. It is hoped ultimately that the model proposed

shall enrich and contribute to issues surrounding the food and beverage companies' quality performance by making a provision for practical model of quality assurance strong enough of eliminating the skepticism in Food and Beverage industry. This paper thereby clarifies the context and concept of Quality assurance and quality in an attempt to articulate these goals. It then examines the literatures concerning Quality assurance framework, methodologies and procedures.

A lifecycle of process-oriented Quality assurance built around non-linear sequential phases based on review and clarification is presented below:

1. **Before:** planning
2. **During:** design and production
3. **After:** post-production and delivery

To propose a systematic and practical model suitable of ensuring agro-allied sector to integrate Quality assurance ideas into development of the sector and to share the lesson learnt from this model's trial and initial implementation is the main objective of this paper. However, there is difficulty in isolating this process from the conceptual factors affecting it although this paper opines that Quality assurance model should be structured around organizational performance of F&B companies. Contextual understanding of Quality assurance is important as it establishes the standards to be used in the process and scopes the process of quality assurance, during the translation of the standards in existence into operational performance in particular. Newton²¹ stated that any quality assurance system, method or model would always be influenced through a situational context or factor. A framework is then proposed to fully understand the contextual factors and its dynamic nature influencing quality assurance. From the figure 1 shown below, it is clear that Quality assurance is a core value.

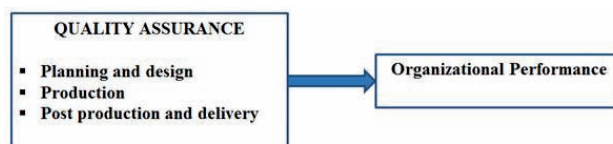


Figure 1: Proposed situational factors of QA affecting organizational performance

This is seen as an iterative, dynamic and continuous program. Thus, it can be easily incorporated into practices daily of the frontline quality control restructuring the food and beverage industry experience instead of serving

as an approach of after-the-fact. Variables such as planning, design, production, post-production, delivery and organizational performance shape the QA process. The culture of Quality assurance in agro-allied sector is permeated by pressures impacted by the technology burgeon with afterward consequences on the narratives of quality assurance to determine standards in particular and procedures for collaboration and communication on the accessibility and usability design on any of the aspect.

Among the commonest challenges shaping Quality assurance are market forces, employers and transnational industry. The new era of these sector executors consisting profit-oriented firms, financial performance, transnational providers and publishing corporations is encouraging the companies to differentiate themselves by providing quality services and products. Quality assurance is fast turning to a distinction seal as a recruiting and marketing tool in the midst of the growing and competitive market. In accordance with this philosophy, the Quality assurance context is a complicated chain of dynamics and interactions in the mist of numerous variables that are interlinked.

The lack of comprehension and acknowledgment of those forces and dynamic is restructuring the narrative and debate of what quality constitute is possible to inhibit the implementation of quality assurance into the paradigm of Food and Beverage industry.

RESULT AND DISCUSSION RESULT

Mode of Process-oriented Lifecycle for Quality Assurance in the Food and Beverage Companies: The consumers' health is an important problem which calls for better training strategies of the personnel implied in quality control and safety. The multitude of changes encountered in quality and processing technologies in raw material also impose a permanent readjusting of the professional formation²². From the discussion made above, there is a proposition of a process-oriented model developed with the aim of helping organization to apply the process of Quality assurance structured around the fundamental process of food and beverage development and delivery. It is noteworthy to disclose the fact that, the planning, design, production and delivery of products need collaboration and a streamlined workflow of many experts for instructional subject matter and working together in a team environment²³. Therefore,

the proposed quality assurance model portrays a centralized and institutionalized frameworks for planning, designing, producing and delivering Food and Beverage products. Abdous and He²⁴ stated that content, technology and design are combined synergistically from this centralized model by using different template series developed on key concepts of research and practices. Hence, the new model for quality assurance implementation is summarized as:

1. Planning (before)
2. Design and production (during)
3. Post-production and delivery (after)

Starting from the phase of planning, a workflow diagram with a project plan is used as quality assurance tools for the flowchart of the development process and for the clarity of presumptions, expectations and timeline. In the arrangement of the stage for the proposed model of quality assurance, the phase is critical, particularly in updating and refining development templates. The sets of standards of quality underpinning the content collection checklists and production templates are defined by this phase.

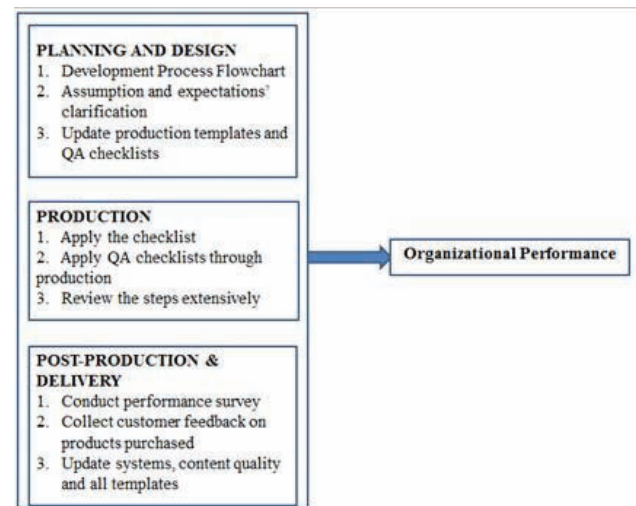


Figure 2: Lifecycle of Process-oriented Model in Food and Beverage Companies

During the phase of design and production, consistency, appropriateness and comprehensiveness of the services are provided by using collection templates of pre-designed content. These templates consist of the crucial factors of an environment that is conducive like the employee-centered developmental programs, content matrix with objective integration, the use of diversified activities of design and engagement, opportunity offer for interaction, collaboration, feedback and meaningful

assessment. Tailored Quality assurance checklists in this phase are employed by a team to enable the implementation of the guidelines and standards as indicated in the first phase²⁵. The adaptation and design of the checklists is done by best practice application of structural design and through proof from research-based standards.

The templates are created by technicians, designers and instructional technologists as improvement tools and self-assessment without affecting freedom and creativity. These systematic practices are applied within the process to make sure there is effectiveness and consistency to embrace the culture of unity. This leads to consistency and uniformity throughout the process of the production by consistently providing features according to the standards indicated from the first phase. A quality assurance checklist in details is used for each production tool during the production phase by team members. There was a development of an advanced system to streamline this process in order to collect, generate and organize reports about quality assurance needed changes and updates.

With the integration of the checklists used for production process, Quality assurance reporting and implementation are facilitated by this system and also reduces the number of tasks related to the process. This system allows the companies to improve the checklists during the production process connect with their roles. The model gives a solid operational framework which enhances quality assurance as a practice done daily by process of production using and mirroring a pre-defined production templates and procedures. Opportunities are provided by this process-oriented model for refinement and continuous improvement which is supported by an advance dynamic system to provide effective organizational performance.

DISCUSSION

Today, the acceleration in knowledge generation, science progression and development of innovative technologies, open up the opportunity for combining new concepts in safety science and corresponding new technologies with good theoretical framework²⁶. For a framework of operational and systemic quality assurance, the proposed model needs a supportive and conducive surrounding that takes quality into consideration as a great value of work and an enhancer for attaining goals within an organization as it provides and documents guidance, in line with continuous improvement and

reinforcement²⁷. The early trial of the model application gives some important lessons in accordance with this valuable enabling condition. Therefore, the findings of this study prompted by the proposed model are enveloped within the following ideas are:

In the stage of planning, there is clarification on expectations of quality supports to execute the implementation path of quality assurance. Provision of a clear view about overall quality requirement, process and expectation is very important. In this regards, keeping in mind the three production consideration is critical.

1. Gain the buy-in of the employees by explaining the importance of each step to be taken and clarifying the overall process of the practices. Frequently, employee resistance is prompted from lack of understanding of the process objectives and from eagerness to accept new methods of practice development.
2. The assurance that workers, both technical employees and the top managers comprehend truly the meaning of the differences in checklist's items.
3. To reach a common understanding of the checklist items, support the members of the production team to ensure that they would be implemented. Quality is contingent upon how it is experienced and used in implementation by the managers.

In the design phase, as well as production, creating additional checklists for the production team is liable to be unproductive except responsibilities and roles are understood and identified clearly. Additionally, implementation of Quality assurance must be supported by a well standardized system to facilitate crucial tasks. Flexibility, efficiency and systematic practices of system are crucial for a successful implementation of quality assurance's model.

In the phase of delivery, there is need for double consideration. From the managerial view of staff, procedure abilities and readiness significantly affect how F&B products are delivered. Therefore, providing both ongoing technical support and development opportunities is highly important for a pleasant experience of F&B companies.

From the manager side, the readiness of the managers, delivery strategies, tactics and technical literacy affect their degree of interaction with the consent. The result from quality assurance does not exclusively

dependent on the process of production but rather on manager enablement and empowerment by providing systematic ongoing support, orientations and collections of feedback. It is very paramount to affirm the fact that the proposed model with these considerations in mind is a kind of roadmap and an operational tool that sustains organization to apply efficient and systematic procedures of quality assurance. However, its implementation success depends on key enabling factors including a common understanding of Quality assurance checklists, the clarification of quality requirements and support of both employees and managers.

CONCLUSION

This study started by highlighting the inefficiency of quality assurance procedures and frameworks in existence by providing justifications for the choice to build a model around development and delivery in food and beverage companies. The study reviewed the existing literatures on quality assurance and its framework and mechanism after shedding light on Quality assurance and quality definitional issues. It is in this regards that a three-phase model that parallels to the process of development is proposed. The model aims to move quality from static state, after-the-fact state to an iterative and dynamic state thereby promoting a culture of continuous self-improvement rather than one of the compliance. Additionally, the model is compatible with daily processes of TQM and it enables a deep penetration to the main activities of the developmental operations. Despite the fact that the model construction is developed from other sector and its application is generic in nature, it is highly recommended for food and beverage companies to employ as it encompasses all the strategic practices and procedures of Quality Assurance. There is potentiality in this approach to increase the overall quality of experience and organizational efficiency in food and beverage products to resolve some of the skepticism that wraps the system of food and beverage production.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. D Green. "What is quality in higher education? Concepts, policies and practice. What is Quality in Higher Education?", SRHE and Open University Press, Buckingham. 1994; pp. 3-21.

2. D Van Damme. "Trends and models in international quality assurance and accreditation in higher education in relation to trade in education services", Paper presented at The OECD/ US Forum on Trade in Educational Services, Washington, DC. 2002.
3. Y Chengand M.Tam. "Multi-models of quality in education"Quality Assurance in Education. 1997; Vol. 5: No. 1; pp. 22-31.
4. I U.Scott, O D. Schein, S West, K Bandeen-Roche, C Enger, M.F.Folstein. "Functional status and quality of life measurement among ophthalmic patients", *Archives of Ophthalmology*. 1994; 112(3): pp.329-335.
5. J Pounder. "Institutional performance in higher education: is quality a relevant concept?"Quality Assurance in Education. 1999; Vol. 7: No. 3: pp. 156-63.
6. L Harvey, J.Newton. Transforming quality evaluation",Quality in Higher Education. 2004; Vol. 10: No. 2: pp. 149-65.
7. E L.Psomas, D P. Kafetzopoulosand C V.Fotopoulos. "Developing and validating a measurement instrument of ISO 9001 effectiveness in food manufacturing SMEs"Journal of Manufacturing Technology Management. 2013; 24(1): 52-77.
8. H Tran, S Cahoonand S. L.Chen. "A Quality Management Framework for Seaports in their Supply Chains in the 21st Century", The Asian Journal of Shipping and Logistics. 2011; 27(3): 363-386.
9. G Doherty. "On quality in education", Quality Assurance in Education. 2008; Vol. 16: No. 3: pp. 255-65.
10. M Abdous. "E-learning Quality Assurance: a process oriented lifecycle model",Quality Assurance in Education. 2009; 17(3): 281-295.
11. W Cukier, E Barkel, T Vaughanand G Gekas. "Quality assurance in Canadian police services",The TQM Journal. 2012; 24(4): 295-309,
12. N Jackson. "Benchmarking in UK HE: an overview", Quality Assurance in Education. 2001; Vol. 9: No. 4: pp. 218-35

13. T Belawatiand, A. Zuhairi. "The practice of a quality assurance system in open and distance learning: a case study at Universitas Terbuka Indonesia (The Indonesia Open University)", *The International Review of Research in Open and Distance Learning*. 2007; Vol.8: No.1.
14. B Kouland, A Kanwar. "Perspectives on Distance Education: Towards a Culture of Quality", *Commonwealth of Learning, Vancouver*,2006.
15. C.Miguel, A B.Bruce. "Reputation, Quality Observability and the Choice of Quality Assurance Systems", *Center for Agricultural and Rural Development (CARD). Working Paper 04-WP 373*,2004.
16. L Manning, R N. Baines, S.A.Chadd. "Quality assurance models in the food supply chain", *British Food Journal*. 2006; Vol. 108: Iss 2: pp. 91 – 104,
17. P A. Luningand, W.J. Marcelis. "A conceptual model of food quality management functions based on a techno-managerial approach", *Trends in Food Science & Technology*. 2007; 18(3): pp.159-166,
18. J A.Caswell, C M.Noelkeand, E M. Mojduszka. "Unifying Two Frameworks for Analyzing Quality and Quality Assurance for Food Products", by, in press, in *Global Food Trade and Consumer Demand for Quality*, B. Krissoff, M. Bohman, and J.A. Caswell (Eds.),2002.
19. R Oliver, J. Herrington. "Factors influencing quality online learning experiences", *Quality Education at a Distance*, Kluwer Academic, London, 2003.
20. R Ellis, N Jarkey, M Mahoney, M Peat, S Sheely, "Managing quality improvement of eLearning in a large, campus-based university", *Quality Assurance in Education*. 2007; Vol. 15: No. 1: pp. 9-23,
21. J Newton. "From policy to reality: enhancing quality is a messy business". 2002.
22. T Liliana ,B Luminitaand, N Denisa. "Professional competences of the personnel working on quality control and food safety in the food industry", *Procedia - Social and Behavioral Sciences*. 2015; 180: 1030 – 1037.
23. R Phillips. "Pedagogical, institutional and human factors influencing the widespread adoption of educational technology in higher education", *Proceedings of the 22nd ASCILITE Conference*. Queensland University of Technology, Brisbane, December 4-7, 2005.
24. M Abdous, W He. "Streamlining online course development process by using project management tools" *Quarterly Review of Distance Education*. 2008; Vol. 9: No. 2: pp. 181-8.
25. P Hosiea, R Schibecib, A Backhaus. "A framework and checklists for evaluating online learning in higher education" *Assessment and Evaluation in Higher Education*. 2005; Vol. 30: No. 5: pp. 539-53.
26. C Van Thriel, R H.Westerink, C Beste, A S., Bale, P J. Lein, M Leist. "Translating neurobehavioural endpoints of developmental neurotoxicity tests into in vitro assays and readouts" *Neurotoxicology*. 2012; 33: 911-924.
27. D Silimperi, L Franco, T Van Zantenand, C Macaulay. "A framework for institutionalizing quality assurance", *International Journal for Quality in Health Care*. 2002; Vol. 14: No. 1: pp. 67-73.

Livelihood Assets and Food Security Achievement : An Empirical Study of the Coastal Fishermen in Northern Peninsular Malaysia

Ahmad Zubir Ibrahim¹, Kalthum Hassan², Roslina Kamaruddin³, Abdul Rahim Anuar⁴

^{1,2,4}*School of Government, Universiti Utara Malaysia, 06010 Sintok, Kedah DarulAman, Malaysia;*

³*School of Economics, Finance and Banking, Universiti Utara Malaysia, 06010 Sintok, Kedah DarulAman, Malaysia*

ABSTRACT

The aim of this study is to analyze the food security achievement among coastal fishermen in Northern Peninsular Malaysia (Kedah and Perlis,) based on ownership livelihood asset. For this purpose, a structured questionnaire is designed. It consists of livelihood asset (human, physical, finance, natural and social asset), government intervention and livelihood outcome. To achieve the aim of the study, data were collected from a sample of 400 coastal fishermen in Kuala Kedah, TanjungDawai and Yan in Kedah and Kuala Perlis in Perlis Malaysia. The smart PLS-SEM 2.0 was used to evaluate the relationship between the independent and dependent variables. This study discovers that 4 out of the 6 hypotheses were supported by the statistical analysis while 2 hypotheses were not supported. Lastly, a few recommendations were provided with a view to ensuring food security among the coastal fishermen in Northern Peninsular Malaysia.

Keywords: *Sustainability livelihood, livelihood assets, food security, vulnerability group.*

INTRODUCTION

The World Food and Agriculture Organization (FAO) 1998 has defined food security as the ability of every resident to access adequate food for a healthy and active life. Food security can be achieved if the following three elements are met; (1) the guarantee of adequate food, (2) stable food supply and (3) it can be easily accessed by everyone (FAO, 1998). At the same time, food security also emphasizes the ability of every resident to have physical and economic access to sufficient food to meet dietary requirement at all time. Four main components are assessed to determine the achievement of food security, namely food readiness, food access, food consumption, and food stability. The ownership of livelihood assets (human assets, financial assets, natural assets, physical assets and social assets) also has a direct relationship with food security achievement.

Fishermen communities who are mostly relying solely on fishing catchment and fish related products as their sources of income, are easily exposed to economic recession and natural disaster (monsoon rain or tsunami). Hence, they have low-income and lacked of livelihood

asset. Lacked of livelihood assets ownership causes them to trap in poverty which also strongly related to food security achievement. This also causes them to be in the poverty trap and become a vulnerable group for a long time. Lack of material assets reduces their income elasticity and thus affect their purchasing power on food which could result in absence of food and malnutrition (Schoch & Campaign, 2010 and Nnakwe & Yegamina, 2002).

In this regard, it is clear that food security at a household level has a direct relationship with the household's ownership of livelihood assets. The ownership of livelihood asset will determine the capability of a household to have sufficient and nutritious food to meet the dietary requirement as needed. As most studies focus on discussing the ownership of livelihood assets and less emphasis on achieving the food security through the ownership of livelihood assets, the measurement on food security attainment in a household cannot be determined effectively. Therefore, this paper aims to analyze the achievement of food security among the fishermen community through the acquisition of livelihood assets with analytical techniques such as simple regression and structured equation models.

This paper also examines the strategies taken by the fishermen community in facing a vulnerable situation and also develops the sustainable livelihood index (SLI) to determine the ability of the community to deal with vulnerable situation.

LITERATURE REVIEW

Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for active and healthy life. Household food security is the application of this concept at the household level, with individuals within households as the focus of concern. Meanwhile, food insecurity exists when people do not have adequate physical, social or economic access to food as defined above. Food Summit (1996) defines food security concepts in a more complex way, which is when all people, at all times, have sufficient access to safe and nutritious food to meet dietary needs and food reference for active and healthy life. The Food and Agricultural Organization (FAO, 2003) conceives food security as a situation in which all households have both physical and economic access to adequate food for all members and where households are not at risk of losing such access.

Meanwhile, at a household level, Frankenberger et al. (1995) state that food security at an individual level will be achieved when each individual able to access to adequate nutrition and diet for the purpose of physical activity, disease prevention and for sufficient for growth including during pregnancy and breastfeeding. To achieve food security at a household level, livelihood assets are the main factors that contribute to successful food security among households. Thus, Chamber and Conway (1992) proposed a sustainable livelihoods as the combination of capabilities and assets with which a able household to generate its livelihoods to meet the basic needs or physiological needs of the household members. Chamber and Conway (1992) have further identified assets as human, social, financial, physical, and natural resources which households and individuals need to acquire to meet their livelihood objectives.

The Community Nutritionist Council of British Columbia Canada (2004) acknowledged that food security exists when everybody able to obtain safe food and receives nutritious diet through a sustainable food system which maximizes food choices. This definition

also includes: (i). Guarantee access to food; (ii). Food can be obtained without having to compromise human dignity; (iii). Food is secure, adequate and also personally and culturally acceptable; (iv). The quality and quantity of food is sufficient to maintain healthy growth and development as well as able to ward off diseases; and (v). There is no compromise in terms of production, processing and distribution of food in the use of natural resources, land, water and air for the future generations. Food security is the outcome of an efficient food system operation. Efficient food system contributes positively to all dimensions of food security.

These widely accepted definitions point to the following dimensions of food security FAO¹⁵.

- i. Food availability:** The availability of sufficient quantities of food with appropriate quality, supplied through domestic production or imports (including food aid).
- ii. Food access:** Access by individuals to acquire adequate food (entitlements) with suitable nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live (including traditional rights such as access to common resources).
- iii. Food Utilization:** Utilization of food through adequate diet, clean water, proper sanitation and health care to attain a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security.
- iv. Stability:** A population, a household or an individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both dimensions; the availability and access to food.

Previous studies submitted that physical asset is among the main stimulus to attain sustainable livelihoods which secures livelihood outcomes and facilitates achievement of physiological needs. A study by Kamaruddin and Baharuddin²⁴ reveals that ownership of physical asset affects livelihoods outcomes as it

enhances income, thereby improve the well-being of the vulnerable households. The findings affirmed the finding of a study by Seng³⁹ on the ability to access physical asset able to enhance income which help to fulfill the need of food. For instance availability of electricity supply can help to promote economic activities that generate income to a household Lim, & Mansur³⁰; Kamaruddin, & Samsudin²⁵; Ahmed et al².

Meanwhile financial asset enables a vulnerable household or an individual to attain a good life and meet the physiological needs of the household or the individual (Scoones, 1999; DFID¹². Several empirical studies confirmed that financial asset has significance influence in fighting vulnerability and in ensuring well-being of households and individuals. Akudugu³ in a study asserted that financial asset contributes to well-being in terms affording the bills of medical expenses and food consumption which relate to human asset thereby improving the productive capacity of the households and individuals which in the final analysis enhance food security. Similarly, Kamaruddin and Baharuddin²⁴ in their study affirmed that increase in income helps vulnerable households to overcome vulnerability to livelihoods and enhance well-being to which food security is ensured. Furthermore, Seng³⁹ observed that financial asset enhances well-being thereby increasing food security as the vulnerable households and individuals who have financial asset will have sustainable livelihood which empowers them to meet their basic needs.

Human asset connotes capabilities, skills and knowledge, and material health which enable households and individuals to meet livelihoods outcomes Krantz²⁷. Empirical studies suggested the link between human asset and households' well-being, for instance, studies by Seng³⁹, and Kamaruddin, & Samsudin²⁵ observed that human asset has impact on the income of vulnerable households and individuals which affect food consumption thereby ensuring food security. Similarly, Lim and Mansur³⁰ in study confirmed the effect of human asset as it enhances resilience which reduce vulnerability and further safeguard livelihood outcomes of vulnerable households. Consequently, from the results of the previous studies on the impact human asset and livelihood outcomes this study suggests that:

Social asset consists of social resources which empower vulnerable households through social relations and interactions which bring mutual benefit, for instance communal farming, to parties in the social interaction

Coleman¹⁰. Accordingly, Oumer and De Neergaard³⁴ averred that lack of connection to non-governmental organizations and research bodies impedes livelihood outcomes which guarantee food security and well-being of vulnerable households. The finding of the study concurred with the studies of Alfonso et al³; Islam, & Yew²³; Thi et al⁴³.

Government intervention means how government policy-response to address social-economic problems in the society. It implies whatever government does to intervene or support vulnerable households in ensuring relief in the society therefore, government intervention has no definite meaning as it address a myriad of social problems Loewen³¹. Likewise, Ibrahim and Alam²² conceived government intervention as policy action by government in terms of subsidizing agriculture via provision of improved seeds and fertilizer with a view to food production and economic well-being of farming farmer. In summary government intervention symbolizes support from government which usually comes in form of incentives, subsidy of policy action that aims at ensuring relief and well-being of the people. Ibrahim and Alam²² in a study found that subsidies extended by government on fertilizer and improved seedling to paddy farmers enhanced their economic well-being which in turn boost food production and livelihood outcome. Similarly, in a study by Kasim, Ibrahim, & Din²⁶ finding revealed that government support has positive effect on food production and livelihood outcomes. Other studies that advocated the impact of government intervention on livelihoods include Shehu and Abubakar⁴¹, Unmesh and Narayanan⁴⁵, and Kamaruddin and Samsudin²⁵.

Based on discussion with the results of previous empirical studies this study hypothesized that;

H₁: There is significant relationship between physical asset and food security.

H₂: There is significant relationship between financial asset and food security.

H₃: There is significant relationship between human asset and food security.

H₄: There is significant relationship between social asset and food security.

H₅: There is significant relationship between natural asset and food security.

H₆: There is significant relationship between government intervention and food security

METHODOLOGY

The study is based on a descriptive quantitative survey design. Data for the study was collected from the vulnerability group through self-designed and self-administered questionnaire covering the various variables identified in the literature. Non-probability convenience sampling technique was adopted. This study is based on primary data collected from 400 coastal fishermen in Kuala Perlis, Perlis, Kuala Kedah, Yan and TanjungDawai in Kedah Malaysia. The questionnaire consisted of four parts: demographic information; livelihood asset, vulnerability, coping strategies and government intervention intention to contribute food security among the vulnerable group. The data was processed and analyzed by partial least-squares (PLS) path modeling with SmartPLS 2.0 M2 software Ringle et al³⁵. The Smart PLS M2 Version 2.0 and two-step analysis approach was used to analyze the data. PLS is used because it makes minimal demands on the data distributions, sample size and measurement scales and as this study were exploratory in nature; it is a better tool to explain the data. Also a bootstrapping method was

used to determine the significance levels of the loadings, weights, and path coefficients Gholami et al¹⁸.

Measurement Model: This study began with the assessment of the reflective measures using both convergence and discriminant validity analysis. As presented in Table 1 below the measurement models returned Cronbach's alpha values <0.70. Factor loadings, average variance extracted (AVE) and composite reliability (CR) were used to assess convergence validity. The loadings for all reflective items exceeded the recommended value of 0.6. CR values (see Table 1), which showed the degree to which the item captured the latent construct, ranging from 0.616 to 0.877, which exceeded the critical value of 0.4 Hair et al²¹. The AVE was in the range of 0.54 and 0.71 which exceeded the recommended value of 0.5 Fornell and Lacker¹⁷. Next, the discriminant validity was examined by comparing the correlations between constructs and the square root of the AVE for that construct. As shown in Table2, the square root of the AVE is greater than the correlation with other constructs indicating adequate discriminant validity. Thus the reflective measurement model demonstrated adequate convergent and discriminant validity.

Table 1: The Convergent Validity Assessment Results

Construct	Measurement Item	Loading	Average Variance Extracted	Composite Reliability
Physical Asset	AF1- Transportation	0.83	0.66	0.88
	AF2- Distance to town	0.88		
	AF3- Clean water supply	0.79		
	AF6- Electricity supply	0.74		
Finance asset	AK1- Saving	0.65	0.54	0.82
	AK2- Income	0.76		
	AK3- Part time income	0.84		
	AK4- Subsidies	0.66		
Human Asset	AM1-Education	0.72	0.55	0.83
	AM2- Skill	0.81		
	AM3- Age	0.77		
	AM4- Knowledge	0.67		
Social Asset	AS1-Involve in society	0.84	0.61	0.82
	AS2-Involve in non-government organization	0.62		
	AS3-Involve in community engagement	0.84		
	AS4- Relationship in community	0.78		
Natural Asset	ASJ1-Access food from environment	0.77	0.60	0.85
	ASJ2-Impact climate change	0.91		
	ASJ3- Pollution problem	0.64		

Conted...

Govt. Intervention	G1- Health facilities	0.86	0.71	0.91
	G2- Economic development by government	0.85		
	G3 -Public participation	0.88		
	G4- Subsidies delivery	0.79		
Food Security	HP1- Food Access	0.83	0.64	0.87
	HP2- Food Utilization	0.84		
	HP3- Food Availability	0.86		
	HP4- Food Stability	0.64		

Table 2: Discriminant Validity (Fornell-Lacker Criterion)

Construct	1	2	3	4	5	6	7
Physical asset	0.81						
Financial asset	0.42	0.73					
Human asset	0.64	0.43	0.74				
Social asset	0.53	0.45	0.50	0.78			
Natural asset	0.58	0.47	0.53	0.55	0.77		
Government Intervention	0.39	0.23	0.40	0.25	0.39	0.84	
Food security	0.66	0.31	0.57	0.46	0.51	0.48	0.80

Discriminant validity is used to assess construct validity of a reflective construct. It determines how a construct is totally different from other constructs of the model in terms of empirical measures Duarte &Roposo¹³; Hair et al²¹. Therefore based on Table 2 above the discriminant validity of the study’s constructs is attained

Table 3: Hypothesis Testing (Path Coefficients Estimates)

Path relationship and Direction	Beta	Std. Err	T value	Results
Physical asset -> Food Security	0.16	0.07	2.39	Supported
Financial asset -> Food Security	0.08	0.05	1.48	Not Supported
Human asset -> Food Security	0.11	0.07	1.56	Not Supported
Social asset -> Food Security	0.15	0.06	2.39	Supported
Natural asset -> Food Security	0.11	0.07	1.63	Supported
Government Intervention -> Food security	0.37	0.04	8.52	Supported

Table 3 shows the results of testing the structural model. These show that (physical asset β = 0.16, T value = 2.39; social asset β =0.15, T value= 2.39; natural asset β = 0.11, T value= 1.63; government intervention β = 0.37, T value= 8.52) which means that H₁, H₄, H₅, H₆, are supported positively (see Hair et al²¹, signifying that the concerned assets are related to food security. Furthermore, financial asset (β = 0.08, T value = 0.48); human asset (β = 0.11, T value = 1.56) were found to be non-significant see Hair et al²¹, signifying that the hypothesized relationships (H₂ and H₃) are not supported.

DISCUSSION AND CONCLUSION

Finding of this study shows that H₁ is supported signifying the positive relationship between physical asset and food security. This finding conforms with the finding of Kamaruddin and Baharuddin²⁴, Lim and Mansur³⁰, and Kasim et al²⁶, which all advocated that access to physical asset enhances income and well-being of households and individuals as such has impact on the food security of the households and individual. Therefore this study submits that physical asset correlates positively and significantly with food security.

However, the finding of this study shows that H_2 is not supported signifying that there is no relationship between financial asset and food security. This result is, however, contrary to the findings of previous studies by Lim & Mansur³⁰; Unmesh, & Narayanan⁴⁵; Shehu, & Abubakar⁴¹; Kamaruddin, & Samsudin²⁵; Kasim et al²⁶, which discovered that increases in income enhances livelihoods and well-being of a household or an individual.

The finding of this study also indicates that H_3 is not supported statistically, which is quite contrary to the findings of previous studies that there is no relationship between human asset and food security Chen et al⁹; Samsudin, & Kamaruddin³⁶; Kasim et al²⁶. The mentioned studies indicated that human asset has significant relationship with well-being and income of the household which could be translated to food security of households. In essence, the finding shows that human asset has no effect on food security.

In relation to H_4 , this study indicates that there is a relationship between social asset and food security. The finding of the study conforms with prior empirical studies indicated that there is a relation between social asset and livelihood outcomes through linkage to social connections and non-governmental organization which further secure households' basic needs of food and well being Oumer, & De Neergaard³⁴; Alfonso et al⁴; Islam, & Yew²³; Thi et al⁴³. Similarly, H_5 of this study was supported is consistent with past empirical studies which stressed that natural asset (land for agriculture, water resources for irrigation and fishing) improves income, livelihood outcomes and livelihood security which all have effect on food security Lim, & Mansur³⁰, Kamaruddin, & Samsuddin²⁵; Adunga¹; Oumer, & De Neergard³⁴; Van der Berg⁴⁶, Ansoms, 2010).

H_6 which presumes a relationship between government intervention and food security is found to be statistically supported by the empirical data of this study. The result concurs with the studies of Lim, & Mansur³⁰; Ibrahim, & Alam²²; Kasim et al²⁶, which asserted that government support or intervention in the area of subsidy on agriculture and food production. Accordingly, the finding of the present study confirmed that there is positive relationship between government intervention and food security. In a nutshell the result depicts that support from government has effect on livelihood outcomes of households and individuals which in the end enhances food security.

ACKNOWLEDGMENT

Funding for this project comes from the Ministry of Higher Education (MOHE) Research Grant FRGS Code SO 13249.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Adunga E. Factors influencing income level of agro-pastoral communities. *International Journal of Social Economics*. 2013; 40(3): 207–219.
2. Ahmed N, Troel M, Allison E. H, Muir J. F. Prawn postlarvae fishing in coastal Bangladesh: Challenges for sustainable livelihood. *Marine Policy*. 2010; 34(2): 218-227
3. Akudugu M. A. Rural banks, financial capital and livelihoods development of women farmers in Ghana. *Journal of Enterprising Communities: People and Places in the Global Economy*. 2011; 5(4): 248–264.
4. Alfonso C, Mendoza S, Czerny M, Allec A, Pineda L, Alonso O, Rojas V. *Miscellanea geographica*. Regional studies on development livelihood assessment in district 1 of Medellin–Colombia. 2015; 19(4): 9–20.
5. Ansoms A. Rural poverty and livelihoods profiles in post-genocide Rwanda. Discussion paper. Institute of Development Policy and Management. University of Antwerp. 2008.
6. Bajwa S. K. A study of status of livelihood assets at household Level: Evidence from Saidpur Village. Pakistan Institute for development Economics. Discussion paper 3. 2015.
7. Carney D. Implementing the sustainable rural livelihoods: What contribution can we make? Department of International Development, UK. 1998.
8. Chambers R, Conway G. R. “Sustainable Rural Livelihoods: Practical Concepts for the 21st Century,”. Institute of Development Studies Discussion Paper No. 296. Brighton: University of Sussex. 1991.

9. Chen H, Zhu T, Krott M, Calvo J. F, Ganesh S. P, Makoto I. Measurement and evaluation of livelihood assets in sustainable forest common governance. *Land Use Policy*. 2013; 30: 908-914.
10. Coleman J. S. Social capital in the creation of human capital. *American Journal of Sociology*. 1988; 9: 95–120.
11. Department for International Development. Sustainable livelihoods guidance sheets. London: DFID. 1999.
12. Department for International Development. Sustainable livelihoods guidance sheets. www.livelihoods.org/info/info_guidanceSheets.html#6: DFID. 2001.
13. Duarte P. A. O, Raposo M. L. B. “A PLS model to study brand preference: An application to the mobile phone market”. In V. Esposito Vinzi, W. W. Chin, J. Henseler & H. Wang (Eds.), *Handbook of Partial Least Squares* (pp. 449-485). Springer Berlin Heidelberg. 2010.
14. Ellis F. The determinants of rural livelihood diversification in developing countries. *Journal of Agricultural Economics*. 2000; 51: 289–302.
15. Food and Agriculture Organization (FAO) (2006) Food Security Policy Brief, Issue 2, <http://www.fao.org/forestry/13128-0e6f36f27e0091055bec28e830f46b3.pdf>
16. Food and Agriculture Organization(FAO) (2009) The Livelihood Assessment Tool-kit Analysing and responding to the impact of disasters on the livelihoods of people, FAO: Rome
17. Fornell C, Larcker D. F. Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*. 1981; 18(1): 39-50.
18. Gholami R, Sulaiman A. B, Ramayah T, Molla A. Senior managers’ perception on green information system (IS) adoption and environmental performance: Results from a field survey. *Information & Management*. 2013; 50: 431-438.
19. Guerry A. D, Polasky S, Lubchenco J, Chaplin-Kramer R, Daily G. C, Griffin R, Vira B. Natural capital and ecosystem services informing decisions: From promise to practice. In *proceedings of the National academy of Sciences*. 2015; 112: 7348–7355.
20. Hair Jr J. F, Hult G. T. M, Ringle C, Sarstedt M. A primer on partial least squares structural equation modeling (PLS-SEM): Sage Publications. 2016.
21. Hair F. J, Joe, Sarstedt M, Hopkins L, Kuppelwieser G. V. Partial least squares structural equation modeling (PLS-SEM). An emerging tool in business research. *European Business Review*. 2014; 26(2): 106-121.
22. Ibrahim A. Z, Alam M. M. Climatic changes, government interventions, and paddy production: an empirical study of the Muda irrigation area in Malaysia. *International Journal of Agricultural Resources, Governance and Ecology*. 2016; 12(3): 292-304.
23. Islam G. M. N, Yew T. S. Property rights and access: The case of community based fisheries management in Bangladesh. *Journal of Agricultural Science*. 2013; 5(6):
24. Kamaruddin R, Baharuddin A. The importance of good aqua-culture in improving fish farmers’ income: A case of Malaysia. *International Journal of Social Economics*. 2015; 42(12): 1090–1105.
25. Kamaruddin R, Samsudin S. The sustainable livelihoods index: A tool to assess the ability and preparedness of the rural poor in receiving entrepreneurial project. *Journal of Social Economics Research*. 2014; 1(6): 108–117.
26. Kasim Y, Ibrahim A. Z, Din B. B. H. Understanding the effect of access to livelihood assets and government intervention on poverty reduction: A partial least squares approach. *International Journal of Emerging Trends in Engineering and Development*. 2017; 7(4): 139-154.
27. Krantz L. The sustainable livelihood approach to poverty reduction, SIDA. Division for policy and socio-economic analysis. 2001; Retrieved from- http://www.forestry.umn.edu/prod/groups/cfans/@pub/@cfans/@forestry/documents/asset/cfans_asset_202603.pdf.
28. Kataria K, Curtiss J, Balmann A. Drivers of agricultural physical capital development: Theoretical Framework and Hypotheses (No. 122). Centre for European Policy Studies. 2012.

29. Kumo K. Research on Poverty in Transition Economies: A Meta-analysis on Changes in the Determinants of Poverty (No. 51). Russian Research Center, Institute of Economic Research, Hitotsubashi University. 2015.
30. Lim G. N, Mansur K. Understanding poverty and vulnerability by utilizing the sustainable livelihood approach: A comprehensive study among Rungus ethnic in Sabah, Malaysia. *Malaysian Journal of Business and Economics*. 2015; 2(1): 1-24.
31. Loewen G. A compendium of poverty reduction strategies and framework. 2009; Canada, Tamarack. www.tamarackcommunity.ca
32. Mendez-Lemus, Vieyra A. Tracing processes in poverty dynamics: A tale of peri-urban small-scale farmers in Mexico City. *Urban Studies*. 2013; 51(10): 2009-2035.
33. Ng'ang'a S. K, Jeannette V, Notenbaert A, Moyo S, Herrero M. Household livelihood strategies and livestock benefits dependence in Gaza province of Mozambique. *African Journal of Agricultural Research*. 2011; 6(3): 560-572.
34. Oumer A. M, de Neergaard A. Understanding livelihood strategy-poverty links: empirical evidence from central highlands of Ethiopia. *Environment, Development and Sustainability*. 2011; 13(3): 547-564.
35. Ringle C, Wende S, Will A. Smart-PLS Version 2.0 M3. University of Hamburg. 2005.
36. Samsudin S, Kamaruddin R. Distribution of the livelihood asset among the hardcore poor: Evidence from Kedah, Malaysia. *World Applied Science Journal*. 2013; 28: 38-42.
37. Scoones I. "Sustainable rural livelihoods: A framework for analysis". IDS Working Paper 72, IDS, Brighton, UK. 1998.
38. Sen A. Editorial: Human Capital and Human Capability. *World Development*. 1997; 25(12): 1959-1961.
39. Seng K. The effects of non-farm activities on farm households' food consumption in rural Cambodia. *Development Studies Research*. 2015; 2(1): 77-89
40. Shaw D.J. World Food Summit, 1996. In: *World Food Security*. Palgrave Macmillan, London. 2007; https://doi.org/10.1057/9780230589780_35
41. Shehu A, Abubakar N. Determinants of participation of farm households in non-enterprise activities in Nigeria. *International Journal of Economics, Commerce and Management*. III 2015; (6): 57-71.
42. Su F, Shang H.Y. Relationship analysis between livelihood assets and livelihood strategies: A Heihe River Basin example, *Sciences in Cold and Arid Regions*. 2012; 4(3): 0265-0274
43. Thi H, Dao T, Manh P. H. Settlement of household livelihoods for poor fishermen: The case of Cam Ranh reservoir, KhanhHoa Province. *Asian Journal of Poverty*. 2013; 1(1): 1-7.
44. Twyman C, Slater R. Hidden livelihoods? Natural resource-dependent livelihoods and urban development policy. *Progress in Development Studies*. 2005; 5(1): 1-15.
45. Unmesh P, Narayanan K. How effective are coping mechanisms in securing livelihoods against climatic aberrations? *International Journal of Climate Change Strategies and Management*. 2015; 7(3): 359-374.
46. Van den Berg M. M. Household income strategies and natural disasters: dynamic livelihoods in rural Nicaragua. *Ecological Economics*. 2010; 69: 592-602.
47. Weiss Y. Gary Becker on human capital. *Journal of Demographic Economics*. 2015; 81(01): 27-31.

A Preliminary Insight into the Nature of Street-Level Bureaucracy amongst Front-Line Workers of the Malaysian Social Welfare Department

Ahmad Shukri Abdul Hamid¹, Noor Azizah Ahmad¹, Norruzeyati Che Mohd. Nasir¹

¹*School of Applied Psychology, Social Work and Policy, Universiti Utara Malaysia*

ABSTRACT

This paper presents a preliminary findings of an on-going study on service delivery by front-line workers of the Malaysian Social Welfare Department (SWD) in the area of child welfare services. The study utilises Michael Lipsky's Street-Level Bureaucracy theory as its theoretical basis. The analysis conducted on data derived from a pilot study had produced a preliminary insight which supports the assumptions contained in the Street-Level Bureaucracy theory. The findings suggest that, as far as the front-line workers of the SWD are concerned, the nature of work expected of them by their organization is naturally wide-ranging. Even though their role within the organization seemed to be focused on one service area, namely child welfare services, in reality they have numerous responsibilities tied to their jobs. As front-line workers, they are equipped with various rules, regulations and standard operating procedures, yet when it comes to actually performing their tasks, they still have to depend on the use of discretions in various aspects of their job. Hence this preliminary analysis provides a valuable insight regarding the nature of problem plaguing the service delivery and job performance of the SWD street-level workers, and by inference, the policy process within the area of child welfare services.

Keywords: *Street-Level Bureaucracy, Malaysian Welfare Department, child welfare services, policy process*

Jel Classification: H50, H53, H54

INTRODUCTION

The Malaysian Department of Social Welfare is the de facto agency responsible for providing social services in this country. Under its wings are thousands of workers, the majority of whom are responsible in carrying out the task of facing the public and their demand for service. Their jobs constitute the end of a long line of policy directives (Sim⁴). Unlike their higher-up counterparts, the front-line workers have to deal with the public face on which often demand prompt actions on their behalf. The fact that they are also dealing with the disadvantaged or marginalised population adds another set of challenges. At the same time they have to consider the demand from the other end as well. All in all their work often involves juggling between two expectations which could be incompatible at times. This paper presents a preliminary report on a study currently underway which investigates the scope of work that these workers perform on their daily schedule. The study however focuses only on those workers who work with children.

Of pertinent concern regarding the performance of their daily duties are the level of freedom that they are subjected to, especially in carrying out tasks that either do not have clear guidelines or in the case that they are available, the guidelines do not cater for their specific needs. The issue of freedom is of critical importance in this regard because being front-line workers, their tasks often demand a certain degree of discretions particularly when dealing with difficult or uncertain situations—a fairly common circumstance when dealing with children. The street-level bureaucracy theory developed by Michael Lipsky² serves as the framework for this study and current analysis.

STREET-LEVEL BUREAUCRACY THEORY

Michael Lipsky¹ describes the front-line workers such as police officers, teachers and social workers as street-level bureaucrats (SLBs). Lipsky² defines SLBs as 'public service workers who interact directly with citizens in the course of their jobs, and who have

substantial discretion in the execution of their work¹. The term bureaucrats is intentional in the sense that it is reflective of the nature of challenges that these workers have to face in carrying out their duties. Even though their position is at the implementation end of the policy spectrum, they are 'bureaucrats' nonetheless, due to the 'substantial discretion' that they have in deciding how to carry out their policy-related tasks. In a sense this definition alone contains a contradicting interpretation of who exactly the SLBs. Based on their review of different interpretations of SLBs Meyers and Vorsanger³ aptly explains the contradiction as follows: '... (in some interpretations) these workers are portrayed as occupying a powerless position downstream of political and bureaucratic decisions; in others they emerge as loyal public servants who pursue the public good even when it means bending agency regulations; in still others they are described as self-interested bureaucrats whose coping mechanisms frustrate the will of elected officials.

The dilemmas facing the SLBs have been described as coming from two conditions Lipsky². Firstly, their jobs demand substantial exercise of discretion. Their work necessitates them to interact regularly with citizens who demand and expect services in any particular way. Often lacking in resources, time and information they have to devise ways to juggle their way to fulfil both public expectations and the demand of the policies themselves. For many workers, developing ways of coping using unsanctioned practices and to some extent, psychological manoeuvring become a necessary part of their job (Michie, S⁵). Given the enormous mass of the workers involved in such conditions, the outcome of such manoeuvres, in turn, can affect the way public policy is conceived. Secondly, the various professions that involve street-level operators are structurally similar in the sense that a certain expectations have been built into their work process. This follows from the policies themselves that often prescribe certain outcomes to be achieved using prescribed protocols. At the same time however, their work often requires fulfilling the demands from their immediate clients which can vary enormously. What this means is essentially that they have to exercise improvisation in order to create an impression of diligence and quality service. When policies need to be implemented and the public needs to be entertained, both to the best of their abilities, then they will often end up with a dilemma in their hands (Belk, R., Devinney, T., & Eckhardt, G⁶).

In the case of the SWD workers, the same dilemma is conceivable. Public expectations are considerably high in their case bearing the fact that their clientele are mostly from the disadvantaged or marginalised population. The precarious situation of the clients also translates into extraordinary pressure being placed upon the workers to perform. Specifically in the service delivery area that involves children, workers are often burdened with an extra consideration due to the fragile nature of their clients. Emotions may come into play amidst the fact that they have to be vigilantly professional and objective (Fong, C. T⁷). It is within this working conditions that this study tries to explore how the front-line workers manage their tasks of implementing such crucial policies while at the same time deal with the uncertainties of their clients' demands and situations.

THE STUDY

The report of finding on which this paper is based is part of a pilot study. The study, entitled Developing a Typological Framework of Service Delivery in Child Welfare Services from the Perspective of Street-Level Bureaucrats aims to develop a framework which captures the intricate process of policy delivery mechanism based on the perspective of the front-line workers. A data collection instrument was devised based on literature review and consultation with staffs of the SWD. This paper shall report on the preliminary finding based on pilot data collection involving 37 SWD personnel. Because the study is still on-going this report is not meant to provide any conclusion on the topic of study. Rather, it dwells more on the development of data collection instrument and refinement of the scope of research itself. Nonetheless a valuable insight is to be expected from this pilot study regarding the nature of the problem since no research of this kind have been done previously.

The scope of inquiry is limited to those workers who are currently or have been in recent years dealt with children and the provision of child welfare services. The SWD deals with different target groups. They represent different categories of vulnerable or marginalised people, which include children, the elderly, the disabled, the destitute, families and disaster victims. Children, particularly those who are living in institutions under the purview of the SWD is one category of clients which represent an enormous challenge for the SWD workers. Those who deal directly with the children bear the most

brunt as far as the policy process is concerned. As such workers of the SWD in this service area are considered the most suitable for this investigation.

FINDINGS

This discussion on findings shall be focused on several outcomes of the pilot study. These include the demographic analysis of the respondents involved, the scope of work that they perform, the availability of guidelines, rules or protocols concerning their daily tasks, elements of work that are vague or lack clear guidelines, and their views regarding the use of discretion in carrying out their duties.

Demographic Analysis: The pilot study involved 37 respondents who are willing to be involved in the study and picked randomly from amongst SWD workers from various branches of the department all over the country. Originally 39 questionnaires were distributed but two were considered incomplete and therefore discarded. In terms of gender distribution the respondents comprise 62.2 percent males and 37.8 percent females. In terms of age, majority of respondents belong in the 30 to 39 years old age group which represents 59.4 percent of the sample. The rest belong to the 20 to 29 years old age group (4 respondents or 10.8 percent) and 40 and above age group (11 respondents or 29.7 percent). A total of 36 respondents or 97.3 percent were from the Malay ethnic category and only one respondent or 2.7 percent belongs to Sabah indigenous. All respondents are Muslim. As for their academic qualification, 40.5 percent or 15 respondents possess an undergraduate degree, 24.3 percent or 9 respondents have a diploma and 32.2 percent or 12 respondents possess high school qualification. Only one respondent or 2.7 percent possesses a master's degree. As for other forms of qualification, three respondents or 8.1 percent each reported having certification in childhood education, automotive works and social work. Another important demographic characteristic is their position (grade) within the organisation. Majority of the respondents belong to the S17 grade which comprise 32.4 percent or 12 respondents, followed by 9 respondents or 24.3 percent in the S27 grade category and 8 respondents or 21.6 percent in the S41 grade category. A more detailed analysis of the above demographic characteristic is shown in Table 1.

Table 1: Demographic Characteristics

Item	Frequency (Percent)
Gender	
Male	14 (37.8)
Female	23 (62.2)
Total	37 (100.0)
Age	
20 – 29 years old	4 (10.8)
30 – 39 years old	22 (59.4)
40 and above	11 (29.7)
Total	37 (100.0)
Ethnicity	
Malay	36 (97.3)
Sabah Indigenous	1 (2.7)
Total	37 (100.0)
Religion	
Islam	37 (100.0)
Total	37 (100.0)
Academic qualifications	
SPM/SPMV	4 (10.8)
STPM/STAM	8 (21.6)
Diploma	9 (24.3)
Undergraduate	15 (40.5)
Master	1 (2.7)
Total	37 (100.0)
Other qualifications	
Permata Childhood Education Certificate	1 (2.7)
Automotive Works Certificate	1 (2.7)
Social Work Certificate	1 (2.7)
Total	3 (8.1)
Grade	
S17	12 (32.4)
S22	2 (5.4)
S27	9 (24.3)
S32	1 (2.7)
S41	8 (21.6)
S44	2 (5.4)
U11	1 (2.7)
Undeclared	2 (5.4)
Total	37 (100.0)

Scope of Work: When asked regarding their scope of work that they typically perform, the respondents reported a wide range of tasks and responsibilities that they are involved in. An analysis into the data suggests that the tasks that the workers have to perform varied widely and require a lot of interfacing with the public. For example, as shown in Table 2, counter services, case acquisition, prevention program, intervention services, children placement and dealing with the children’s families are amongst the most frequent tasks that many of the respondents (ranging from 18 percent to 24 percent) are tasked to perform.

Table 2: Scope of Work of DSW Personnel

Scope of Work	Frequency (%)
Counter services	24
Case acquisition	29
Prevention program services	18
Intervention services	18
Legal-related services	13
Recruiting and selecting of foster family (adoption)	10
Managing placement of children in institutions	18
Supervising children in child protection and rehabilitation institutions	17
Services related to children’s families	22
Follow-up services (after discharge from institutions)	12
Children adoption services	13
Children counselling and therapy services	10
Others	15

Sources of Rules or Policies Used in Daily Work: When it comes to children welfare services, there are many sources of policies, guidelines and conventions that are available for the workers to refer to in their work. In fact these documents were stated clearly in the SWD website. When asked to cite the sources of rules and regulations that they used in performing their duties, the respondents mentioned most of these documents as their guide. Chief amongst these guidelines are the Child Act 2001, Guidelines and Standard Operating Procedures (SOPs), Child Regulations (Places of Safety) 2007, Child (Fit and Proper Person) Regulations 2009, Child (Forms

and Register set) Regulations 2007 and Child Protection Team (Procedure and Practice) Regulations 1995. Table 3 shows the percentage of respondents who claimed to have utilised these documents and regulations as guide in performing their duties.

Table 3: Types of Guidelines, Rules and Policies Used in Performing Duties

Sources of Guidelines	Frequency (%)
Child Act 2001	32
Guidelines and Standard Operating Procedures (SOP)	28
Child (Forms and Register set) Regulations 2007	15
Child (Fit and Proper Person) Regulations 2009	15
Child (Shelter) Regulations 2007	21
Child Protection Team (Procedure and Practice) Regulations 1995	14
Probation Hostels Regulations 1982	8
Others	5

Usage of Rules and Regulations and Standard Operating Procedures: Further inquiries into the nature of their work respondents also revealed the extent to which they actually use the rules and regulations that are available. Table 4 shows the distribution of responses to the question regarding how much of the available documents were utilised. The responses were categorized based on two major categories of documentation: rules and regulations, and standard operating procedures. The data shows that as far as rules and regulations are concerned, only 35.1 percent of the respondents actually used them 100 percent of the time, 24.3 percent cited 80 percent of usage, 16.2 percent cited 90 percent usage and the rest were scattered in between with 5.4 percent failed to declare. But none of the respondents cited less than 70 percent of usage of the rules and regulations. Similarly in terms of standard operating procedures, 37.8 percent of the respondents declared 100 percent usage of the SOPs in their daily work, 18.9 percent cited 90 percent usage, 16.2 percent mentioned 80 percent of usage and the rest are scattered in between 60 percent and 99 percent of usage, with only 5.4 percent did not declare. All in all the data suggest that for the most part, in performing their duties, the workers still rely heavily on the rules and regulations as well as standard operating procedures.

Table 4: The Extent of Use of Rules and Regulations, and Standard Operating Procedures

Extent of Usage (%)	Percentage of workers who use:	
	Rules and Regulations	Standard Operating Procedures
60	-	5.4
70	2.7	2.7
78	2.7	-
80	24.3	16.2
85	5.4	5.4
90	16.2	18.9
95	5.4	5.4
99	2.7	2.7
100	35.1	37.8
Undeclared	5.4	5.4

Tasks that Require the Use of Discretions: Since an inquiry into the use of discretions involve largely an uncharted territory, partly due to the qualitative nature of the problem itself and partly because lack of available data, this study opens up the query by using a qualitative approach. Respondents were given an opportunity to state which area within their work scope that they often use discretions. The data collected revealed an extensive area of service concerning welfare provision to children that the workers face difficulties in carrying out their duties. A thematic analysis indicates that amongst the tasks that the workers deemed necessary to use discretions include those that cater for the children’s subjective needs, those that demands special skills on behalf of the workers and those that involve extraneous circumstances.

With regard to the subjective needs of the children, some of the issues cited by the respondents are disciplinary problems, providing personalised support and assistance to the children, communication, supervising activities, taking care of the children’s hygiene and handling specialised needs. At times, the workers also face difficulties when their tasks demand specialised skills for which they are not adequately trained. These include interviewing and extracting reliable information, handling the children’s emotional episodes, consoling, interacting with families and finding fit person. Also when special circumstances present themselves, the workers find it very tempting to use discretions. This is largely due to the unanticipated nature of the situation and therefore require solutions that are both unique and creative (for which there are no clear or formal guidelines available). Examples include dealing

with children with special needs, dealing with situations that require extensive coordination with multiple agencies and provide advisement to clients and families.

This list is by no means exhaustive. There are myriad of issues that the respondents listed out as indicative of the need for discretion. In addition, the fact that many of the respondents cited multiple instances in their task performance that require the use of discretion indicates the available guidelines failed to provide adequate support for the workers to perform their duties properly.

CONCLUSION

Policy implementation is a complex process with influences coming from multiple interacting factors which calls for the need to develop sophisticated theoretical models in order to understand how the SLBs actually negotiate their working situations (Meyers and Vorsanger³). The preceding discussions highlight some of the issues plaguing the nature of work amongst front-line workers in the area of child welfare service delivery. Being at the forefront of the policy implementation process, these workers face difficult challenges in performing their duties. On the outset, their jobs can be said to have been designed with proper rules, guidelines and instructions on how to deliver services and translate policies into productive outcomes. Yet as this analysis has portrayed, the supposed guidelines are far from adequate. In all likelihood it is perhaps unreasonable to expect that whatever protocols that the organisations were able to concoct for their workers will be able to cover all circumstances that may arise in the course of performing their duties. Still this is the issue at hand – that front-line workers will always be faced with such challenges that require them to constantly adapt to their dynamic working conditions. Research into how these challenges present themselves will definitely be useful so that organizations can take measures to improve the working conditions of their most valuable yet often underappreciated assets.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Lipsky M. Street-level bureaucracy: Dilemmas of the individual in public service. New York: Russel Sage Foundation. 1980.
2. Lipsky M. Street-level bureaucracy. 30th anniversary expanded edition: Dilemmas of the individual in public service. New York: Russel Sage Foundation. 2010.
3. Meyers M. K, Vorsanger S. Street-level bureaucrats and the implementation of public policy. In B. G. Peters & J. Pierre. Handbook of Public Administration. Thousand Oaks: Sage. 2007.
4. Sim O. F. Ageing in Malaysia: A review of national policies and programmes. Aging and Long Term Care: National Policies in the Asia-Pacific ISEAS. IDRC. 2002;107-149.
5. Michie S. Causes and management of stress at work. Occupational and environmental medicine. 2002;59(1):67-72.
6. Belk R, Devinney T, Eckhardt G. Consumer ethics across cultures. Consumption Markets & Culture. 2005;8(3):275-289.
7. Fong C T. The effects of emotional ambivalence on creativity. Academy of Management Journal. 2006;49(5):1016-1030.

Correctional Rehabilitation of Inmates: A Solution to Reduce Recidivism in Oke Kura Prison Kwara State, Nigeria

Jamaludin Mustaffa¹, Kehinde Adekunle Aliyu¹

¹*School of Applied Psychology, Social Work and Policy, Universiti Utara Malaysia, 06010 UUM Sintok, Kedah, Malaysia*

ABSTRACT

Education supports security, public safety, rehabilitation that is the entire range of correctional services. There have always been good reasons to provide correctional rehabilitation to inmates. In any case, more ex-offenders still return to the prison. The dissatisfaction of restorative programme to decrease crime should be given due attention. Recovery of prisoners by means of subjective and professional empowerment is fundamental. This researched on the impression of community members, prison staffs and the social workers on the impact of rehabilitation training on prisoners as a remedy for their restoration and coordination into the society. Quantitative research design was adopted for the work. A total of 242 participants were selected as the sample size of this study. The sample of the study was drawn from the prison where rehabilitation activity is to be carried out. The sample size comprises both male and female inmates, Instructors/facilitators and the staff of the Prison and social workers, from the Oke Kura Prison, Kwara State, Nigeria. The outcome demonstrated that the respondents concurred that subjective and individual training for prisoners were deficient. There was no connection between detainees' restoration and formal learning. In view of the discovering, it was suggested that prisoners ought to be given subjective and professional training for restoration and settlement back to the society.

Keywords: *Prisoners, Professional, Recidivism, Rehabilitation, Training.*

INTRODUCTION

The issue of helping the distressed has been a noteworthy worry to educationists. However detainees who have a place in this classification are not given the consideration they merit as far as instruction and directing, recovery and incorporation. There is generally a high applause to the legitimate establishment every year when reprieve is allowed to detainees and guilty parties remanded in police guardianship. This generosity, in any case, has not decreased the high rate of guilty parties and re-wrongdoers in our detainment facilities. The reason is not implausible. The issue of instruction, advising, restoration and the incorporation of this gathering has not been given the important consideration it merits. Detainees' recovery, as indicated by Souleimanov and Aliyev¹⁵, is a politically disagreeable reason. Ex-detainees have the solid motivator to perpetrate violations to survive and are dangers to the tranquility of the general public. He additionally states that concerned individuals have abundant chances to attempt an assortment of rehabilitative systems, for example,

guiding, work preparing and assisting ex-detainees with receiving support. The scientists have been included in jail religious service and found the abnormal state of the savagery of man to man in some of these detainment facilities. It is qualified to take note of that a portion of the detainees were guiltless of the wrongdoing they were blamed for Dichter⁸. Denying them the chance to carry on with an ordinary life in the wake of serving is another level of brutality.

With more detainment facilities being revamped and new ones raised to suit guilty parties, the solid part of jail training now turns out to be exceptionally basic. Jail training has the essential errand of expanding the possibility of work for ex-convicts. This will help in diminishing wrongdoing rates in the nation. As such, ex-convicts will keep on re-insult unless they are given more professional preparing and formal instruction Foucault⁹. A large portion of the crooks met admitted that they had no instructive capability and no occupations. A significant number of them showed low levels of proficiency and numeracy and have been in and out of the jails severally.

There is a shortage of preparing projects, research and writing in the region of restorative guiding for detainees. Employment preparing would give chances to the sound improvement of the positive possibilities in the detainees Beaudoin⁴. The motivation behind this examination, along these lines, was to analyze the degree to which jail prisoners have been presented to professional preparing, formal instruction and advising administrations. This is with a view to enhancing their recovery and joining into the general public. This initial part will talk about the accompanying terms all the more expressly.

Prison Education System: Education can be considered as the transfer of the values and gathered information of a general public. In this regards, it can be compared to socialization or enculturation as regarded by the social scientists. As social orders develop more perplexing, be that as it may, the amount of information to be gone on starting with one era then onto the next turns out to be more than any one individual can know; and consequently there must advance more particular and productive method for social transmission Pearce, Weller, Scanlon, & Kinsley¹³. The result is formal instruction the school and the pro called the teacher. Schools become more institutionalized as there increased in the complexity of the society. Prison correctional education is part of the prison reform movement. It is a window through which one can observe and encourage human progress. Simply put, it is the education given to prisoners to enable them leave the prison with more skills and be in a position to find meaningful and long-term employment Baron, Draine and Salzer².

Correctional education movement began in 1789 by William Rogers to prevent a riot at the Philadelphia's Walnut Street prison Gray¹⁰. The correctional educators operate on the principles that attitude, ideas and behaviour can be corrected and that humans are capable of progressing to higher thresholds of awareness. For ex-offenders to redirect their lives away from crimes, they need one to three years of transitional services such as life skills, anger management, basic education, job training and placement. Meek¹¹. Stated that the prison must be a centre for information and not for punishment. The primary task of prison education is to increase the chances of employment by ex-offenders and hence reduce recidivism. It can only be done through education resulting in better communication and vocational training.

However, there increases the indirect relationship between educational experience and the daily life

phenomenon. As such, there is a reduced evidenced of learning in the daily life activities and vague practices with more out of context learning. Prison education also known as correctional education are a type of professional training provided to prisoners while they are imprisoned. Usually, this education is a part of programmes organized for the rehabilitation of the inmates and which is useful in helping to prepare the inmates to be useful in the societies. Prison education can be provided from various sources; such as within the prison or from the outside sources such as professional schools, colleges and/or universities. Researches have shown that, apart from helping the prisoners, an entire societies can as well benefit from the prison education Clear⁶. In addition to the vocational and academic training given to the prisoners, moral training are also provided Christian and Islamic scholars. This is aimed at inculcating the virtue and the knowledge of God into the inmates. All these put together help the inmates to fit back into the societies.

Rehabilitation of Inmate: Zastrow¹⁶ stated that, rehabilitation may be regarded as the transfer of values and knowledge gathered from the society. As such, social scientists regards to education as socialization or enculturation. As the complexity of a society increases, the amount of knowledge to be passed from generation to the other becomes more than what an individual can know. Therefore, a more efficient and effective means of transmitting knowledge must be developed. Partridge¹² affirm that, society becomes more perpetually intricate and schools becomes standardized, instructive experience turns out to be less specifically identified with day by day life, less a matter of appearing and learning with regards to the workaday world, and, increasingly a matter of refining, telling, and learning things outside the realm of relevance.

Rehabilitation is a transitional or after-care service rendered to ex-prisoners to avoid revolving-door re-arrests. According to Partridge¹², prisons should be run in a progressive and more human spirit that will ensure ultimate reformation, social rehabilitation, and conducive psychological climate. Incarcerating criminals is a costly endeavor. Without effective treatment programmed to help and reform prisoners, such an exercise would just be a lot of waste. This study/research attempted to find out if prison education could help in fostering ex-prisoners' rehabilitation into the mainstream of the society.

Prison correctional rehabilitation programme provided to prisoners while imprisoned might be in the form of vocational or academic instruction. These programmes can be provided to inmates as a rehabilitation programme or from the outside sources by vocational schools, colleges and universities. The programme is schedule to help the prisoners and I was shown by previous studies that the program can as well benefit the entire community as a whole Partridge¹². Besides the vocational training provided to the inmates, moral training through preaching from both the Christian and Muslim scholars are also benefited by the inmates. The reason for the moral training is to inculcate the knowledge and virtue of God into the inmates to enhance their acceptance back into the societies after release.

A prison is the building designated by law or used by the sheriff for the confinement or detention of persons who are judicially ordered to be kept in custody. According to Cunneen, Baldry, Brown, Brown, Schwartz, and Steel⁷, a prison is a place where persons are confined or restrained from personal liberty. It can also be regarded as a correctional, detention or penal faculty. Hence the prison is often referred to as a correctional institution where offenders are confined or punished. The prison, like vampires, drains its wards of all that makes for maturity. Bright⁵ claims that the prison robs inmates of all independence of thought and action and that all vestiges of autism in the individual succumb to the disintegrating process. In other words, there is a gradual decay of those traits in the personality leading to psychological degradation. The researchers are of the view that only proper education and counseling can help rehabilitate the integrity of such persons.

Statement of Problem: There is a general agreement by good natured Nigerians that the prison establishment needs redesigning. The present prison framework should be in a more dynamic and compassionate way, to empower prisoners to have extreme reconstruction and professional aptitudes. This comes full circle in legitimate coordination into the general public. Along these lines, the prison staff are the ones in coordinate contact with the detainees and know the genuine condition of the undertakings in the prison this investigation endeavored to address this inquiry: ‘Would subjective training in the prison assist ex-detainees with being restored and incorporated into the standard of society, as indicated by prison staff’s perspective?

Hypotheses: The following research hypotheses were adopted to guide the study:

Ho1: There is a positive significant relationship between experiences of re-offenders and correctional rehabilitation programs.

Ho2: There is a positive significant relationship between Empowered (inmates and ex-offenders), and inmates recidivism.

Significance of the Study: The discoveries of this investigation will be of colossal advantages to educationists, jail directors, instructors, educational programs organizers and the administration. In particular, it will enable them to set out plans on the most proficient method to teach, restore and incorporate ex-detainees into the general public. It will similarly enhance the parcel of the detainees who will now have positive methods for employment subsequent to serving their correctional facility terms. Ultimately, the investigation will enable jail chairmen to discover better methods for redressing prisoners to change decidedly to existence without getting to be dangers to their kindred natives.

METHODOLOGY

Research Design: It is a descriptive study employing the survey method to stimulate information from the subjects.

Population of the Study: The target population of Oke Kura prisoners is 651 inmates (NPS, 2017) the prison staff in Oke Kura prison 50 and 50 ex-offenders

Table 1: The summary of the population of the study

Population type	Number	Source	Selected population
Inmates	651	NPS	180
ex-offenders	N/A	N/A	50
Prison officials	50	NPS	12
Total stratified random sampled number			242

Note: there is no adequate data on the ex-offender, the researcher decide to take 50 of Ex-offender to represent them.

Sample: A total of 180 inmates were used 12 prison staff and 50 ex-offenders were randomly selected from Oke

Kura prison. The choice of the three settings was found appropriate for the simple reason that they involve of people from varied backgrounds and exposure. There is, therefore, a wide variety of opinions. The stratified random sampling technique was used.

Instrument: Semi structure questionnaire, interview schedule and focus group discussion guide were used without the need to contact the counselors unless the need emerges based on literature relating to prison education and rehabilitation. Consequently, a panel of twelve experts who are familiar with the constructs carried out a review of the original draft of the survey questionnaire for this study. The panel of experts' composition. The instrument was divided into two sections. Section A requested subjects to give information on biodata of respondents. Section B consists of twenty-five items in relation to respondents' opinions to issues on prison rehabilitation programme, vocational training and empowerment. A 5-point Likert Scale ranging from To a Very Large Extent to Not at All and Strongly Agree to Strongly Disagree was used to score responses of subjects.

Validity and Reliability of Instrument: The instrument was found to have both face and content validity by panel of twelve experts who are familiar with the constructs carried out a review of the original draft of the survey questionnaire for this study in the field of rehabilitation and criminal justice. It had are liability coefficient the results that all measures attained satisfactory reliability coefficient ranging from 0.70 to 0.90 for indicators or items internal consistency reliability index of 0.87 using the Cronbach Alpha Statistics.

Method of Data Analysis: The data collected was analyzed using the descriptive and inferential statistics as methods of data analysis. Specifically, this study used Statistical Packages for Social Sciences (IBM SPSS) for Windows Version 20.0 and PLS-SEM (SmartPLS) software Version 2.0 3M in addition to PLS-Graph in the analysis of the data Correlation Statistics for hypothesis 1 while the t-test statistic was used for hypothesis 2.

RESULT

The results of the data analyses are presented below:

Hypothesis 1: There is no positive significant relationship between experiences of re-offenders and correctional rehabilitation programs

Hypothesis 2: There is positive significant relationship between Empowered (inmates and ex-offenders), and inmates recidivism

Table 2: Direct relationship effects of Rehabilitation (RR), Empowerment (ER) and Economy (EIR) on Inmate Empowerment Problem of Recidivism Assessment (IER) and Preventive or Incapacitation Related Problem (PRP)

	Beta	Standard Error	T-value	P-value
EIR -> RR	0.193	0.076	2.538**	0.011
ER -> RR	0.617	0.067	9.125***	0.000
IER -> RR	0.048	0.090	0.469	0.639
PRP -> RR	-0.036	0.101	0.352	0.725

Note: ***Shows the item is significant at the $p < 0.01$ p 0.05(1% level)

This table of direct relationships between rehabilitation (RR), empowerment (ER), economy (EIR), inmate empowerment problem of recidivism (IER) and preventive or incapacitation related problem (PRP) assessment portends four scenarios.

Firstly, the result shows that rehabilitation, as an attribute, maintained no significant relationship with inmate empowerment problem of recidivism assessment (competency). In essence, inmate empowerment problem of recidivism assessment (IER) in the prison requires specialised rehabilitation expert of social worker (beta = 0.048; t = 0.469; p = 0.639).

Secondly, inmate and ex-offender empowerment (ER) recorded significant relationship with rehabilitation programme (RR). This indicates that empowerment, as an attribute are held by individuals, which enable both inmate and ex-offender to perform their roles competently in the prison is relevant to empower the inmate to reduce recidivism, most especially in the Oku Kura and Kwara state (beta = 0.617; t = 9.125; p = 0.000).

Thirdly, economy of the inmates and ex-offenders (EIR) as an attitude enhances the behaviour and reasoning of both inmates and ex-offender towards the discharge of their roles with specific emphasises on prevention and incapacitation assessment. The results from the PLS-SEM indicates a very strong relationship between economy and rehabilitation programme (RR). (beta = 0.193; t = 2.538. p = 0.011).

Fourthly, the result shows that rehabilitation, as an attribute, maintained no significant relationship with preventive or incapacitation related problem assessment (IER)(competency). In essence, preventive or incapacitation related problem assessment (IER)in the prison requires specialised rehabilitation expert of social worker (beta = 0.036; t = 0.352; p = 0.725).

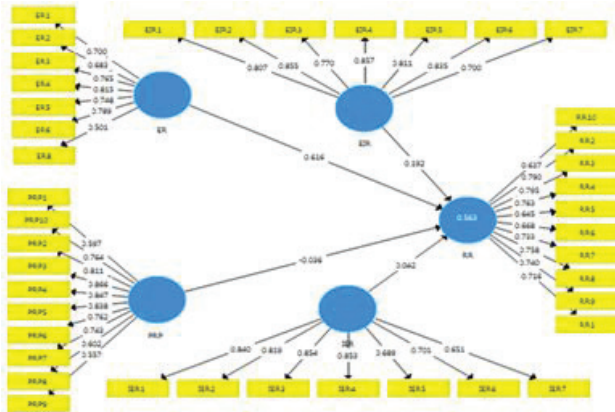


Figure 1: Results of the PLS-SEM Algorithm Direct Effects: RR, ER, EIR, PRP and IER

Most specifically, the results highlights that among the three predictors of IER, Economy (EIR) requirement of inmates and ex-offender recorded the highest significant path coefficient (beta = 0.511). Thus, it indicates the significant contribution of RR as the most important predictor of task performance prevention or incapacitation assessment by social worker in the Oke Kura, Prison Kwara State and Nigerian prison service.

Similarly, RR recorded the lowest path coefficient (beta = 0.129) among the three predictors of IER. Although, significant at p = 0.000), the results of the relationship between inmates and social worker skills and prevention or incapacitation assessment is somehow surprising. This is more so when considering the influence of enhanced empowerment to the inmate and ex-offender in assessing prevention or incapacitation in the era of globalisation that is characterised with information technology as a behaviour enabler or encourager, and coupled with new and complex legislation, thereby creating opportunities to perpetrate unlawful behaviour and high demand for worker. The results achieved on the significant direct relationships between rehabilitation, empowerment and economy (inmates and ex-offender) and inmate empowerment to problem of recidivism assessment are reliable and valid.

DISCUSSION AND FINDINGS

It is clear from the discoveries of this examination that human experience response to certain wonder is a result of a certain factorial transaction in their lives. The finding in theory 1 demonstrates that the subjects trust that detainees’ recovery is not identified with formal and professional instruction. It is amazing to take note of that the finding demonstrated that there is no connection between detainees’ recovery and instruction.

It uncovers to the analysts the indifferent mentality of individuals towards detainees’ welfare. It additionally affirms the perspective of Skocpol¹⁴, who attests that mechanical arrangement in the jail was constantly implausible and that the gathered restoration was nothing not as much as de-habilitation. He additionally clarifies that jail offices were not appropriate for recovery. In all actuality, individuals feel that detainees needn’t bother with instruction. Zastrow¹⁶, detailed that not as much as 33% of detainees approach instruction, and the individuals who do, spend just nine hours every week in formal learning exercises.

Detainees’ regaining is a politically detested reason. Dichter⁸, claims that New York State spent just six for every penny of its redress spending plan on instruction. He advocates that a portion of the reserve funds must go to what is called transitional administrations or aftercare. Numerous detainment facilities do get ready prisoners for life after discharge. Despite the fact that the scientists discovered from the penitentiaries that administration has been making arrangement for the training of the detainees, very little have been done to help the detainees. The prison staff’s declaration that a large number of the detainees have composed senior school authentication examination and other professional courses are at change with their reactions to the survey on restoration and prison programme. This likewise demonstrates the standard of instruction in prison is insufficient and unsuitable.

The discoveries demonstrate that the two gatherings concur that detainees require professional and formal training. The first part of hypothesis testing relates to the relationship between the rehabilitation, empowerment, and economy (inmate and ex-offender) and. inmate empowerment problem of recidivism assessment In addition, the relationship between rehabilitation, empowerment, and economy (social worker and prison staff) and preventive or incapacitation related problem representation and finally, the relationship between preventive or incapacitation related problem

representation and inmate empowerment problem of recidivism assessment. As per Antonovskaya¹, trust that gets ready detainees for discharge is a vital component to guaranteeing open well-being. An examination survey demonstrated that 90% of the 800 respondents upheld that detainment facilities ought to give preparing, training, and genuine occupation encounter and in addition medication and liquor treatment for prisoners. He additionally reports that 75% felt that most previous detainees will keep on needing help after discharge so as to have profitable existences. On the off chance that penitentiaries are to be habitats for renewal as attested by Dichter⁸, at that point the issue of professional and formal training can't be overemphasized.

The outcome additionally concurs with the feeling by Beach, Thein, and Webb³, that remedial teachers are expected to help recognize, illuminate and resolve the issues going up against the prisoners. He additionally clarifies that there was have to assemble and re-establish the person's abilities including his or her professional capacity. Imprisoning offenders is an exorbitant attempt, without viable treatment projects to help change detainees; such an action would simply be an insignificant goliath squander. Recovery programs cost far less.

Recovery pathways can prompt any of the strengthening of the prisoners since they are the extra-ordinarily helpless stratum of society; they are significantly more inclined to have malingered or been overlooked from school because of one reason or the other and more are probably going to have left school without any capabilities as the case possibly. Frequently they need to utilize time helpfully, however, can't take part in classroom condition and the standard instruction in jail (where it exists) concentrates on fundamental and fundamental abilities and may not be suitable for their level or what they coveted to be. This will enable them to build up the confidence and attitudes to increase important work upon discharge and to open entryways which they never knew existed they were detained. Detainment facilities are assembled basically as an establishment to help control the rate of wrongdoing in the general public and furthermore change the detainees.

CONCLUSION

Convicts are assembly of troubled people who have been dehumanized, underestimated and prevented from securing different rights including instruction,

professional preparing, recovery, and reconciliation. Jail directors, educators, and the Legislature have given careful consideration to their correction and restoration. Training is said to be the bedrock of any human attempt in accomplishing improvement and profitability. It will help keep ex-detainees from finding their way back to the penitentiaries. Medicinal directing, professional preparing, formal training and their securing of fundamental abilities have been prescribed. Government and jail executives ought to give an empowering situation to these detainees. Adjustment ought not to be by discipline but rather by reconstruction. This is an assignment for guides and instructors.

RECOMMENDATION

The circumstance in Nigerian detainment facilities falls underneath human models and is not helpful for recovery and treatment. Instruction prompts correspondence and professional capabilities. Detainees need to leave the correctional facility with more abilities and be in a position to discover important and long haul work. Recovery and coordination of detainees are fundamental. In this way:

Prison programme could be supported that would be the free stream of correspondence between the detainees and the staff. Extreme renewal, social restoration, and a more favorable mental atmosphere ought to be given to help mend the officially battered detainees.

The government ought to be urged to finance the detainment facilities in the range of professional and formal instruction. At the end of the day, the instruction of detainees ought to get nearer government's consideration monetarily. Reoffenders are costing the citizens more cash. Instruction assumes a key part in restoring detainees and coordinating them into the general public. Professional preparing in detainment facilities that can plan prisoners for genuine occupations on their discharge is crucial to lessen their reoffending.

Inmates require top notch showing that is suited to their individual needs. There must be a branch of instruction and aptitudes in our penitentiaries. All around qualified educators ought to be utilized. Instruction in the penitentiaries ought to be upgraded to guarantee that detainees are offered an indistinguishable quality and level of training from students in the group.

The nearness of an instructor gives another mental experience to prisoners. It is along these lines suggested that remedial foundations ought to be given advisors to utilize their authoritative and demonstrative aptitudes in helping detainees. Guides help detainees to manufacture and re-establish their confidence and professional capacities.

Prison heads require preparing and retraining on the most proficient method to emphatically impact the detainees to end up plainly balanced individuals from the general public. They similarly should be prepared in the administration of material, human and money related assets as it influences the prisoners' welfare.

Prisoners require one to three years' transitional administrations to effectively deter their lives far from wrongdoing. Consequently, it is upheld that fundamental abilities, outrage administration, essential instruction, and employment preparing ought to be made accessible to detainees.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Antonovskaya V. Disarmament, Demobilization and Reintegration (DDR) in the context of a total victory: elimination or evolution of the concept. The case of Sri Lanka (Master's thesis, UiT Norges arktiske universitet). 2015.
2. Baron R. C, Draine J, Salzer M. S. "I'm Not Sure That I Can Figure Out How to Do That": Pursuit of Work Among People with Mental Illnesses Leaving Jail. *American journal of psychiatric rehabilitation*. 2013; 16(2): 115-135.
3. Beach R, Thein A. H, Webb A. Teaching to exceed the English Language Arts Common Core State Standards: A critical inquiry approach for 6-12 classrooms. Routledge. 2015.
4. Beaudoin N. Elevating student voice: How to enhance student participation, citizenship and leadership. Routledge. 2013.
5. Bright B. Culture collapse disorder: Ecopsychopathy, exile, and the end of home. Pacifica Graduate Institute. 2015.
6. Clear T. R. Imprisoning communities: How mass incarceration makes disadvantaged neighborhoods worse. Oxford University Press. 2009.
7. Cunneen C, Baldry E, Brown D, Brown M, Schwartz M, Steel A. Penal culture and hyperincarceration: the revival of the prison. Routledge. 2016.
8. Dichter T. Violent convictions: Punishment, literature, and the reconstruction of race. University of Pennsylvania. 2015.
9. Foucault M. Discipline & punish: The birth of the prison. Vintage. 2012.
10. Gray M. Musical politics in French Philadelphia. University of Pennsylvania. 2014; 1781-1801.
11. Meek R. Sport in prison: Exploring the role of physical activity in correctional settings. 2013; Vol. 28: Routledge.
12. Partridge P. H. Society, schools and progress in Australia. Elsevier. 2014.
13. Pearce N, Weller M, Scanlon E, Kinsley S. Digital scholarship considered: how new technologies could transform academic work. in education. 2012; 16(1).
14. Skocpol M. The Emerging Constitutional Law of Prison Gerrymandering. *Stan. L. Rev.* 2017; 69: 1473-1541.
15. Souleimanov E, Aliyev H. The Individual Disengagement of Avengers, Nationalists, and Jihadists: Why Ex-Militants Choose to Abandon Violence in the North Caucasus. Springer. 2014.
16. Zastrow C. Brooks/Cole Empowerment Series: Introduction to Social Work and Social Welfare. Cengage Learning. 2013.

Towards Formulating a Specific Legislation on the Law of Presumption of Death in Malaysia

Nor Azlina Mohd Noor¹, Ahmad Shamsul Abd Aziz¹, Akmal Hidayah Halim²

¹School of Law, College of Law, Government & International Studies, Universiti Utara Malaysia, 06010

UUM Sintok Kedah, Malaysia; ²Ahmad Ibrahim Kulliyah of Laws, International Islamic University Malaysia, 53100 Gombak, Malaysia

ABSTRACT

The existing law in Malaysia authorized an evidence of existence of physical body before the law recognized the end of presumption of life of person. Hence, problem may arise where a person has been missing and his whereabouts is not known to the person close to them as no declaration of dead can be made as there is no body to support the contention. This article seeks to examine the specific law in England & Wales namely Presumption of Death Act 2013 in order to suggest an appropriate legal framework on presumption of death in Malaysia. For this purpose, the discussion adopts the doctrinal analysis by examining the existing primary and secondary materials includes statutory provisions, case law and other legal and non-legal literatures relating to the presumption of death and missing persons. This article concludes that there is a need to propose a specific legislative act to harmonize the uncertainties in the existing legal framework. There must be a statutory recognition of 'specific peril' rules to circumvent the hardship of seven years common law waiting period. The law must have following features which are, the court must have jurisdiction's over the property of the missing person; notice to the presumed missing person must be attempted; the lapse of time before the presumption can be raised must be reasonable and there should be some safeguard for the missing person should he return.

Keywords: *Presumption of death, missing persons, England, Al-Mafqud, Malaysia.*

INTRODUCTION

Proving that a missing person is dead is not an easy task. Such situations in which a presumption of death may be employed may gave rise to different legal problems. At present, there is no specific legislation which deals with presumption of death in Malaysia despite of many cases had occurred in the past. To cater the issue, the judiciary has followed the common law position which has been incorporated in section 107 and section 108 of Malaysian Evidence Act 1950. The common law has developed doctrine of presumption of death rules to handle long-term unexplained absences.

Even though the position has been left in abeyance and acknowledged universally without objection, the traumatic loss of Malaysian Flight MH17 and mysterious disappearance of MH370 has trigger the needs to revisit the doctrine of presumption of death and its application in Malaysia. There exist opinions from the scholars and academician that the common law waiting period of

seven year to be tolerate by the family members before the application of presumption of death can be filed before the High court is absurd and no longer relevant in the modern society. England law has started to move from the common law principle waiting period of seven years to a much shorter period by acknowledging the 'specific peril' such as accident and disaster as justification to make a declaration of presumption of death to missing persons where their physical body cannot be found¹.

PROBLEM STATEMENT AND RESEARCH METHOD

Problem Statement: Despite of many tragedy of missing person such as the missing of pilgrims in Al-Muassim Tunnel tragedy in 1990, the collapse of condominium Highland Tower in 1993 and the disappearance of Malaysian Airlines Flight MH370 in 2014, there is no specific legislation which deals with presumption of death in Malaysia² causing problems in administration of missing persons estate³.

These tragedies are among the many cases where one has to deal with the agony of not knowing whether the missing person is still alive or already died until and unless the death is confirmed or presumed after some lapse of time. The ascertainment of death and the survival of legal heirs in a missing person case is extremely important because it determines whether any rights of inheritance exist or not⁴ and also Muslim women's right to marriage dissolution in the case of missing husband.⁵ Based on that premised, this article is undertaken to formulate an appropriate legal framework relating to presumption of death in circumventing the ambiguities and inconsistencies of existing laws in Malaysia. Hence, this article aims to examine the specific statute in England & Wales namely, Presumption of Death Act 2013 in order to suggest an appropriate legal framework on presumption of death in Malaysia.

RESEARCH METHOD

Aiming to formulate an appropriate legal framework on presumption of death in Malaysia, this article employed a qualitative doctrinal legal research as the article intends to discuss in-depth and detailed on the particular matters. By using qualitative methods many new aspects of problem can be identified and thus once they are identified, suggestion would follow resulting in the research result and findings being more beneficial and practical⁶. For this purpose, the discussion adopts the doctrinal analysis by examining the existing primary and secondary materials gathered from multiple sources especially statutory provisions as provided by Presumption of Death Act 2013 of England, case law and other legal and non-legal literatures relating to the presumption of death and missing persons. An analysis of the statutes is made in order to evaluate the loopholes in the law and suggest necessary improvement to the existing law in Malaysia that there are various law that governed the matters relating to the missing person to be presumed dead.

EXISTING LAW ON PRESUMPTION OF DEATH IN MALAYSIA

In Malaysia, there are various laws that governed the matters relating to the missing person to be presumed dead⁷. At present, there is no specific legislation which deals with presumption of death in Malaysia except the common law doctrine of presumption of death rules

which has been incorporated in the Malaysian Evidence Act 1950. There are also other provisions which discuss on the framework relating to presumption of death which are scattered in several provisions of distinct statutes such as Births and Deaths Registration Act 1957, Criminal Procedure Code, Syariah Court Evidence (Federal Territories) Act 1997 and Islamic Family Law (Federal Territories) Act 1984.

The Presumption of Death based on Common Law

Principle: The presumption of death is an exception to the presumption of life. A "missing person" can be defined as a person who is observed to be missing from his or her normal patterns of life, that those who are likely to have heard from the person are unaware of the person's whereabouts and that the circumstances of the person being missing raises concerns for his or her safety and well-being. The definition invoke that in claiming a presumption of death, two basic facts must be proved, firstly that the person must not have been heard of for seven years; and secondly that he must not have been heard during that time by those who would naturally have heard of him.

The prevailing law in Malaysia relating to the presumption of death are section 107 and section 108 of Malaysian Evidence Act 1950. Both section incorporate the Common law presumption of life up to seven years and presumption of death after seven years. The principle has been explained in *In Re Application of Tay Soon Pang; Ex P* [2009] 9 CLJ 778 where the court held that the mere facts of person not having been heard of affords no inference of his death, for in certain circumstances, it is probable that he could never be heard of again by his relatives. The onus of proving death must rest with the person to whose case that fact is essential. If the circumstances of a man's disappearance are such that it is unlikely that his relatives would have heard of him in any event then the court will not presume his death. The principle has furtherly been discussed in *Lau Suet Wan v Hong Leong Assurance Bhd* [2015] 2 CLJ 681 where the court held that the person who has been missing from 2002 was presumed death as no prove has been adduced to rebut the claim by those who would naturally have heard from that person if he had been alive.

Registration of Births and Deaths: Prior to the latest amendment in 2017 to the Births and Deaths Registration Act 1957, the National Registration Department (NRD) will not register or issue a death certificate for a person

presumed dead. This is based on the fact that a person cannot be declared dead if there is no body to support the claim. The information on person who has been presumed dead by the High Court will only be update in the NRD system. However, by virtue of section 19 of the Births and Deaths Registration (Amendment) Act 2017 (Act A1524), the legislature has inserted two new provisions relating to registration of presumed dead namely Section 24A and 24B, where the Registrar shall now issue a Certificate of Presumed Death to the person forwarding the Court order of presumption of death under any written law. In other words, on receipt of the order, the Registrar shall make an entry in a register containing the name of missing person and such other information as may be necessary in relation to the missing person's presumed death. By this amendment, it shows that the Malaysian legislation had acknowledge two types of death in Malaysia, firstly by an actual death and secondly a presume death declared by the court.

Death based on the Circumstantial Evidence: It is to be noted that section 108 of the Evidence Act 1950 does not prevent the court from finding on circumstantial evidence that the death of a person occurred before the expiry of seven years from the date of disappearance. The stand is entangled with the decision made by Augustine Paul in *Re Osman Bachit* [1997] 4 MLJ 445 where the learned judge held that in cases where circumstantial evidence existed that may prove that the person is dead, the family or interested party cannot be forced to wait for seven agonizing years just for formality. The court has the jurisdiction to decide based on circumstantial evidence to shorten the length of time period. The circumstantial evidence causing the death may be by misadventure causes, such as accident, struck by lightning, drowning, suicide or death caused by person or persons unknown as a result of lawful or unlawful intentional and or unintentional act culminating in unforeseeable death, death caused by act of God or death caused by natural causes (*PP v. Shanmugam & 5 Others* [2002] 1 LNS 160; [2002] 6 MLJ 562) & *Inquest into the death of Azaria Chantel Loren Chamberlain* [2012] NTMC 020)

In the current system, there exist a statutory framework which would provide for the making of a presumption of death order in respect of two categories of missing persons. The first category is where the circumstances of the disappearance indicate that death is virtually certain. The second category is where both the circumstances and the length of the disappearance indicate that it is highly

probable that the missing person has died and will not return, which is where the disappearance occurred in dangerous circumstances or in other circumstances in which loss of life may be presumed.

For the first category, section 329(6) of the Criminal Procedure Code provides a hideaway from the normal inquest proceeding where the body of the dead person could not be found and give the family an opportunity to circumvent the general rule of 7 years waiting period. The court in *Re Inquest into the Death of Lim Chin Aik, Deceased* [2014] 1 CLJ 136 come to the conclusion after determining the evidence presented by the wife of the victim is sufficient, adequate, cogent and exact that at the material time. The decision was made based on the proof that the victim's daily routine was to pick his daughter using the similar road in Penang where on that unfortunate date, a structure fell down from a building known as Menara UMNO and crushed unto the said car creating a big hole in the road and incidentally buried the victim to death.

For the second category, the tragedy of the missing Malaysian Flight MH 370 in 2014 would be the best examples as the disappearance occurred in dangerous circumstances or in other circumstances in which loss of life may be presumed. The length of the disappearance also indicate that it is highly probable that the missing person has died.

Presumption of Death under Islamic Law: Islamic law too recognises the concept of presumption of death but wisely it is not stuck with the common law and Evidence Act notion of not less than seven years⁸. Interestingly to note that Muslim heirs of missing person have the option to apply to civil court or Syariah court to obtain a declaration of presumption of death⁹. For illustration, even though the wording in section 80 of the Syariah Court Evidence (Federal Territories) Act 1997 is similar as provision in section 108 of Evidence Act 1950. The only difference is the waiting period under the former is only four years not seven years as provided by the later legislation. The situation is supported by the law that allow for the purpose of enabling a woman to remarry, she may file for an order of dissolution of marriage or fasakh on the ground that her husband is believed to have died, or has not been heard of for a period of four years or more.

For instance, Section 53(1) of the Islamic Family Law (Federal Territories) Act 1984 provides that if the

husband of any woman has died, or is believed to have died, or has not been heard of for a period of four years or more, and the circumstances are such that he ought, for the purpose of enabling the woman to remarry, to be presumed in accordance with Hukum Syara' to be dead, the Court may, on the application of the woman and after such inquiry as may be proper, issue in the prescribed form a certificate of presumption of death of the husband and the Court may on the application of the woman make an order for the dissolution of marriage or fasakh. This provision is interweaved with the provision in Syariah Court Evidence (Federal Territories) Act 1997 as the law acknowledge four years to be the waiting period before a missing husband is presumed to be dead in allowing a wife to remarry.

In discussing the issue, the court in *Re Ex Parte Application of Ridzwan Ibrahim (Presumption of Death)* [2002] 4 CLJ 502 held that where there is no inconsistency between section 108 as found under the Evidence Act 1950 and section 80 of the Syariah Court Evidence (Federal Territories) Act 1997. The provision in former legislation is regarded as general law and the fact that it provides for a period longer than what is available under the latter legislation justify their consistency to each other. Moreover, the learned judge opined that with the two legislations available in respect of an application for a presumption of death the implementation is to be harmonised rather than to construe that there is any inconsistency as to accommodate the applicant in seeking another jurisdiction of a civil court in order to obtain the letters of administration. The waiting period of seven years should be amended [10] to a shorter period of four years following the provision in Islamic law to give effect of certainty in law¹¹.

LAW ON PRESUMPTION OF DEATH IN ENGLAND AND WALES

Under the law of England and Wales the disappearance of a person does not affect the ownership or control of their property and affairs. In such circumstances, it may be difficult or impossible for those left behind to obtain a death certificate if they believe the missing person must be dead. Without a death certificate, the missing person will for legal purposes generally be assumed to be alive. In these circumstances, there are a number of specific procedures under which the missing person may be presumed dead. In most of these cases the presumption of death is limited to the purposes of the specific procedure in question.

Presumption of Death Act 2013 (PDA) was passed in England to simplify the earlier common law process in presumption of death. The Act broadly follows the form and content of the Presumption of Death (Scotland) Act 1977 and the Presumption of Death Act (Northern Ireland) 2009 and is considered to be consistent with the Council of Europe's 2009 Recommendation on principles concerning missing persons and the presumption of death. The Act allows relevant person to apply to the Court for the declaration of presumption of death on the ground that the missing person is thought to have died or has not been known to be alive for at least seven years¹². At that time the declaration will be conclusive cannot be appealed as to the presumed death and effective for all purposes and against all persons¹³. The missing person's property will pass to others in the same way as if the missing person had died and been certified dead in the normal way and his or her marriage will end as a marriage on death¹⁴. It is recorded on a new Register of Presumed Deaths, and has the same effect as a registration of death. Death is taken to occur on (a) the last day that they could have been alive (if the court is satisfied that they are dead), or (b) the day seven years after the date they were last seen (if death is presumed by the elapse of time).

Section 5 provides that the High Court can order the variation or revocation of a declaration of presumed death (an obvious example of circumstances in which this would be appropriate being where the missing person returns, still alive; or where there is clear evidence of the missing person having been alive at a time later than that declared as the time of death in the original declaration. The variation order however neither of itself affect property acquired as a result of the declaration as to protects those coming into possession of property in good faith, nor reviving any marriage or civil partnership ended by the declaration in ensuring validity of the subsequent marriages or civil partnerships of the missing person's spouse or civil partner¹⁵.

The legislation in England and Wales have inserted a 'specific peril rule' provision in their legislation to circumvent the lengthy seven years waiting period¹⁶ as to the suspended years to wait will prejudicially effect the family members. This principle has been inserted in Section 17 of PDA, enabling the Secretary of State to change the length of the periods specified in the Act that are currently seven years; and the period after which an order under section 7(3) can only be made in exceptional

circumstances and the length of period currently is five years. This power is to be exercised by making regulations by statutory instrument and the regulations will be subject to affirmative resolution procedure¹⁷

The ‘specific peril’ rule was first enunciated in *Burr v. Sim*, 4 Whart 150, 171 (Pa. 1838), where the judge opined that to accelerate the presumption from time, it is necessary to bring the person within the range of a particular and immediate danger. Under the specific peril rule, attempts to fix the time of death within the period are universally successful, when it can be satisfactorily shown that, when last seen, the missing person was confronted with some dangerous, specific peril, calculated presently to destroy his life¹⁸. Some Western scholar has pointed out that the common law waiting period of seven years is arbitrary, impractical, anachronistic, obstructive, harsh and unrealistic¹⁹ and might pose hardships on surviving family. Comparatively, in United States, the post 9/11 amendments represent an important step in the evolution of mass fatality and presumptive death certificates by adding specific peril clauses such as catastrophic event or disaster to existing presumptive death statutes, or creating new statutes exclusively dealt with mass fatalities²⁰.

CONCLUSION

This article concludes that there is a need to establish a specific legislation to harmonise the uncertainties in the existing law in Malaysia. The Presumption of Death Act 2013 of England would be a good model to the Malaysian legal framework subject to several modifications to suit the existing law and the local circumstances by acknowledging the existing of parallel judicial system for Muslim and Non-Muslim. There must be a statutory recognition of ‘specific peril’ rules to circumvent the hardship of seven years common law waiting period. The model law must have the following features which are, the court must have jurisdiction’s over the property of the missing person; notice to the presumed missing person must be attempted; the lapse of time before the presumption can be raised must be reasonable and there should be some safeguard for the missing person should he return.

ACKNOWLEDGMENT

This article is benefited from the funding of Universiti Utara Malaysia Research Grant (Revisiting the Law on

Presumption of Death in Malaysia in Addressing the Cases of Missing Persons) S/O Code: 13498

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Nor Azlina Mohd Noor, Akmal Hidayah Halim. “Post MH370 Mysterious Dissappearance: Presumption of Death in Estate Administration of a Missing Person.” Paper presented at the Proceeding 8th UUM International Legal Conference 2015, Bandung Indonesia. 2015.
2. Mohd Muslim Salleh, Siti Mashitoh Mahamood. “Konsep Hukum Dan Perundangan Serta Model Penyelesaian Bagi Kes Al-Mafqūd Dalam Pentadbiran Harta Pusaka.”: <http://ukmsyariah.org/terbitan/wp-content/uploads/2016/10/18-Mohd-Muslim-Salleh.pdf> and Ahmad Tarmizi Mahmud & Shahrul Ridhwan S. Ali. (2013). Harta Al-Mafqud: Satu Analisis Menurut Perspektif Syariah Dan Undang-Undang. Jurnal Muamalat. 2016; Bil 6: 1-24.
3. Mariyatul Qibtiyah Mohamad, and Noralfishah Sulaiman. “Isu Dalam Menguruskan Harta Al-Mafqud Di Malaysia.” Paper presented at the International Conference and Ph.D Colloquium on Islamic Economics and Finance 2015, Lombok Indonesia. 2015.
4. See Mohd Muslim Salleh, Nasrul Hisyam Nor Muhamad, Ezwan Rafiq Husin. “Penyelesaian Harta Pusaka Mafqūd Menurut Perspektif Undang-Undang Islam.” UMRAN-International Journal of Islamic and Civilizational Studies 4, no. 1. See also Mohamad Asmadi Abdullah. (2012). The Applicability of The Uşūl Al-Fiqh Principle “Istishūb” to the Presumption of Death of A Missing Person in Islamic Law of Succession and Malaysian Law. IIUM Law Journal. 2017; 18(2).
5. Tengku Fatimah Muliana Tengku Muda, Azizah Mohd. “Muslim Women’s Right to Marriage Dissolution in the Case of Missing Husband: A Juristic Analysis on Missing Passengers of Mh370.” Jurnal Syariah 23, no. 3 : 495-516..

- See also Siti Zulaikha Mokhtar, and Mek Wok Mahmud. (2015) "Implications of Al-Mafqud on Wife: Analysis of Fiqh and Islamic Family Law (Federal Territories), Malaysia." Paper presented at the e-Prosiding Seminar Fiqh Semasa (SeFis) 2015, USIM. 2015.
6. Yin, Robert K. Case Study Research: Design and Methods. United States: SAGE Publications. 2009.
 7. Nor Azlina Mohd Noor, and Ahmad Shamsul Abd Aziz. (2017). Analysis On The Presumption Of Death Legal Framework In Malaysia: The Case Of Missing Persons. Paper presented at UUM International Legal conference 2017 in Sintok Kedah, Malaysia, on 23 and 24 September 2017. (unpublished)
 8. Mohd Akram Shair Mohamed, and Zulfakar Ramlee. (2015) "The Presumption of Death: A Comparative Appraisal from the Perspective of the Common Law, Malaysian Law and Shariah." *Journal of Islamic Law Review* 11, no. 1 (2015): 59-76.
 9. Mohd Kamarul Khaidzir Bin Saadan, and Mohamad Sabri Bin Haron. (2015) "Penentuan Anggapan Kematian Al-Mafqud Menurut Maqasid Syariah Dan Undang-Undang Di Malaysia." Paper presented at the International Conference On Aqidah, Dakwah And Syariah 2015 (IRSYAD2015), Kuala Lumpur, 2015. 1-11. See also Mohd Kamarul Khaidzir Bin Saadan. (2016) "Implikasi Pengisytiharan Kematian Al-Mafqud Terhadap Pemilikan Harta Pusaka." Paper presented at the International Conference On Aqidah, Dakwah And Syariah 2016 (IRSYAD2016), Shah Alam, 2016. 1-11; and Mohamed Hadi Abd Hamid (2014). Anggapan Kematian Al-Mafqud Menurut Undang-undang Sivil dan Syariah: Satu Penilaian Semasa. 26 *KANUN* (1) 26-37
 10. Muhamad Azwan Sulaiman, Wan Zahari Wan Yusoff, and Syed Muhamad Dawilah al-Edrus. "Management of Missing Person's (Al-Mafqud) Property in Islamic Perspectives: Issues and Challenges." *The European Proceedings of Social & Behavioural Sciences* (2016): 252-57. See also Muhammad Azwan Sulaiman, and Wan Zahari Wan Yusoff. (2015). "Management of Missing Person's Property: In Malaysia Civil and Shariah Law Prospective." Paper presented at the The Second Asia-Pacific Conference on Global Business, Economics, Finance and Social Sciences (AP15Vietnam Conference), Danang, Vietnam.
 11. Mohamed Hadi Abd Hamid Anggapan Kematian Al-Mafqud Menurut Undang-undang Sivil dan Syariah: Satu Penilaian Semasa. 2014; 26 *KANUN* (1): 26-37
 12. See Section 1 (1) of PDA. Refer Explanatory Notes for Presumption of Death Act 2013. Accessed online at <http://www.legislation.gov.uk/ukpga/2013/13/notes> on May,1 2017
 13. See Section 1 (2) of PDA. Refer Explanatory Notes for Presumption of Death Act 2013. Accessed online at <http://www.legislation.gov.uk/ukpga/2013/13/notes> on May,1 2017
 14. See Section 3 of PDA. Refer Explanatory Notes for Presumption of Death Act 2013. Accessed online at <http://www.legislation.gov.uk/ukpga/2013/13/notes> on May,1 2017
 15. See Section 6 of PDA. Refer Explanatory Notes for Presumption of Death Act 2013. Accessed online at <http://www.legislation.gov.uk/ukpga/2013/13/notes> on May,1 2017
 16. Henson, T. (2012). Before Next Time: The Continued Evolution of Statutory Responses to Mass Fatality Incidents. *J. Contemp. Health L. & Pol'y*, 29, 7.
 17. See Section 19 (1) and (2)(a) of PDA. Refer Explanatory Notes for Presumption of Death Act 2013. Accessed online at <http://www.legislation.gov.uk/ukpga/2013/13/notes> on May,1 2017 19(1) and (2)(a) PDA).
 18. Kimball S. L. Time of Presumed Death in Life Insurance Disappearance Cases, *The Utah L. Rev.* 1954; 4: 293.
 19. Radford M. F. Wills, Trusts, Guardianships, and Fiduciary Administration. *Mercer L. Rev.* 2010; 62: 365-1335.
 20. Henson T. Before Next Time: The Continued Evolution of Statutory Responses to Mass Fatality Incidents. *J. Contemp. Health L. & Pol'y.* 2012; 29: 7.

The Restricted Autonomy of Will: The Disregarded Values in Shariah Based Contract

Hakimah Yaacob¹, Selamah Maamor²

¹Faculty of Islamic Economics and Finance, Universiti Islam Sultan Sharif Ali, Simpang 347, Jalan Pasar Baharu, Gadong BE 1310, Negara Brunei Darussalam; Islamic Business School, Universiti Utara Malaysia, 06010 Sintok, Kedah Darul Aman, Malaysia

ABSTRACT

The disregarded values are the principles in Shariah that are secured by disciplines while contracting. These values are disregarded due to influx of conventional doctrines in contracting. This has resulted in losing of identity. The principles are diluted into the conventional system till the main objectives of Islamic economics and financial systems are losing out grasp of the intended results. This paper is an attempt to analyse the dynamism, sanctity and features of shariah contracts rationale. The paper claims that Shariah based contract offers special characteristics and features that never present in the conventional. In addition, this paper claims that there are restricted autonomy of will in Shariah contract. The paper utilises library research. Several cases referred to for evidence purposes. The finding concludes that shariah based contracts are disciplined under the values prescribed in the quran and al-hadith. The autonomy of will is restricted within the ambit of these lines.

Keywords: *Restricted autonomy, will, values, riba, maysir, gharar, shariah, contracts.*

INTRODUCTION

It has been recorded that in the immediate pre Islamic era, the life in Mecca was decadent that reflects the moral and cultural decline. The decadencies can be seen in every transaction and way of life including trade. Being a trade centre, Mecca was a central of attention for trader. The main attention of the prophet was to redress the abusive practices in trade. Being a merchant before his Prophethood, he imposed trade based on Shariah values and principles. As mentioned by Shaikh Taqi Usmani says that Al-Quran in verses 278 and 279 reveal on these as:

“After the conquest of Makkah, the holy Prophet (pbuh) had declared as void all the amounts of Riba that were due at that time. The declaration embodied that nobody could claim any interest on any loan advanced by him. Then the holy Prophet (pbuh) proceeded to Taaif, which could not be conquered, but later on the inhabitants of Taaif, who belonged mostly to the tribe of Thaqif, came to him and after embracing Islam surrendered to the holy Prophet (pbuh) and entered into a treaty with him. One of the proposed clauses of the treaty was that Banu Thaqif would not forego the amounts of interest

due on their debtors but their creditors would forego the amounts of interest. The holy Prophet (pbuh) instead of signing that treaty simply ordered to write a sentence on the proposed draft that Banu Thaqif will have the same rights as other Muslims have. Banu Thaqif, having the impression that their proposed treaty was accepted by the holy Prophet (pbuh), claimed the amount of interest from Banu Amr Ibnal-Mughirah, but they declined to pay interest on the ground that Riba was prohibited after embracing Islam. The matter was placed before Attaab ibn Aseed (God be pleased with him), the Governor of Makkah. Banu Thaqif argued that according to the treaty they were not bound to forego the amounts of interest. Attaab ibn Aseed placed the matter before the holy Prophet (pbuh) on which the following verses of Surah al-Baqarah (278–279) were revealed:”

“O those who believe, fear Allah and give up what still remains of the Riba if you are believers. But if you do not do so, then listen to the declaration of war from Allah and His Messenger. And if you repent, yours is your principal. Neither you wrong, nor be wronged.”

“At that point of time, Banu Thaqif surrendered and said that they had no power to wage war against Allah and

his Messenger.”¹Three cardinal principles introduced as the basis for contractual obligations arising out of the muamalat. S.M. Hasanuz Zaman, an IDB Laureate in Islamic economics, has critically examined definitions by a number of scholars and given his own definition:

“Islamic Economics is the knowledge of application of injunctions and rules of the Sharī‘ah that

stop injustice in the acquisition and disposition of material resources in order to provide satisfaction to individuals and enable them to perform their obligations to Allah and society.”

When conventional economy are based on the “using of the limited resources with unlimited wants, while Islamic economy believes that resources are unlimited with limited wants.” With different doctrinal ideology, the two can never be the same. Mohsin S. Khan, a senior economist at the IMF, says:

“Broadly speaking, the term ‘Islamic Economics’ defines a complete system that prescribes a specific pattern of social and economic behaviour for all individuals. It deals with a wide-ranging

set of issues, such as property rights, incentive system, allocation of resources, types of economic

freedom, system of economic decision-making and proper role of the government. The over-riding

objective of the system is social justice and specific patterns of income and wealth distribution and consequently economic policies are to be designed to achieve these ends.”

THE CONNECTION OF ISLAMIC ECONOMICS AND CONTRACTS

The reflection of Islamic economy is transpired in the contract. To uphold the Islamic economy, the principles on the prohibition of riba, maysir and gharar were introduced. These principles are the basis of Islamic economy to ensure the circulation of economy are free from oppression and injustice. As the vicegerent of God, human is accountable to Him for all his actions on the Day of Judgment. Thus Islam prescribes a strong system of accountability at all levels. Islamic economic teaches human to observe certain limits in the exercise of his freedom. Within these bounds all his acts are worship

of God. As the vicegerent of God man is accountable to Him for all his actions on the Day of Judgment. Thus Islam prescribes a strong system of accountability at all levels. In an Islamic society taqwa (God-consciousness) is considered very highly. The more a person is God-conscious, the more highly he is esteemed in the society. Taqwa comprises a cluster of values like justice (‘ad/), benevolence (ihsan), benevolent spending in the cause of God (infaq), remembering God (zikr), etc. Taqwa is a multi-dimensional value. The values brings towards wasathiyah (moderation). In Islam, money is not the objective of life, it is just means to achieve the objectives.

In Islam, the objectives of Muslims are to pursue the maqasid al-shariah (the objective of shariah), to protect life, intellect, religion, property and Nasab. Surah Al-Baqarah of verse 274 states:

“Those who consume interest cannot stand [on the Day of Resurrection] except as one stands who is being beaten by Satan into insanity. That is because they say, ‘Trade is [just] like interest’. But Allah has permitted trade and has forbidden interest. So whoever has received an admonition from his Lord and desists may have what is past, and his affair rests with Allah . But whoever returns to [dealing in interest or usury] - those are the companions of the Fire; they will abide eternally therein.”

Yusuf Ali has commented the verse explaining that usury is any increase sought through illegal means. These include usury, fraudulent trading and bribery. The prohibition is due to economic selfishness. Islam has prohibited interest on capital and thus has foreclosed the door of accumulating wealth without work or without assuming risk. Imposing any interest or riba on principal is an act of transgression and diverted from the value of Islamic economic. From Usamah ibn Zayd: The Prophet, peace be on him, said:

“There is no riba except in nasi’ah [waiting].” (Bukhari, Kitab al-Buyu, Bab Bay al-dinari bi al-dinar nasa’an; also Muslim and Musnad Ahmad). “There is no riba in hand-to-hand [spot] transactions.” (Muslim, Kitab al-Musaqat, Bab bay’i al-ta’ami mithlan bi mithlin; also in Nasa’i).

From Ibn Mas’ud: The Prophet, peace be on him, said: “Even when riba is much, it is bound to end up into paltriness.” (Ibn Majah, Kitab al-Tijarat, Bab al-taghlizi fi al-riba; also in Musnad Ahmad).

From Anas ibn Malik: The Prophet, peace be on him, said: “When one of you grants a loan [of money] and the borrower offers him a dish, he should not accept it; and if the borrower offers a ride on an animal, he should not ride, unless the two of them have been previously accustomed to exchanging such favours mutually.” (Sunan al-Bayhaqi, Kitab al-Buyu, Bab kulli qardin jarra manfa’atan fa huwa riban).

The general rule is that whoever wants to earn a profit must assume risk. The operating principle is “no risk, no gain”.² There is nothing prohibited except that which God prohibits. According to Ibn Qayyum, to declare something permitted prohibited is like declaring something prohibited permitted. The above verses indicate the clear prohibition of Riba.

The basis of shariah contract are free from riba, gharar, maysir and injustice. As mention in Surah Al-Baqarah, Verse 276, “Allah destroys interest and gives increase for charities. And Allah does not like every sinning disbeliever.”

The second principle is the prohibition of gharar. Gharar means uncertainty or hazard that might lead to destruction or loss. Hanafi scholars have defined Gharar as “something which its consequence is undetermined.” Shafi’i scholars have described it as “something which in its manner and its consequence is hidden. Al-Sarakshi, “anything that the end result is hidden or the risk is equally uncommon, whether it exists or not.”

Imam Ibn Tamiyah “Gharar” is involved in the business that one’s deals with unknown about its existence, Rahman (1979) “Gharar” may be divided into two groups, the first group referred to risk that involved uncertainty and probability is dominant, whereby the second group referred to the element of doubt due to deceit or fraud.

“Eat not your property among yourselves unjustly by falsehood and deception, except it be a trade amongst you by mutual consent.” (Al-Bakarah, 2:188; Al-Nisa, 4:29). The Quran has categorically prohibited gambling (Al-Bakarah, 2:219 and Al-Maidah, 5:93). Many scholars argue that Gharar is one of the branches of gambling (Rahman, 2010; p.71).

Prophet (s.a.w.) on many occasions forbade many transactions which included Gharar. For example, “the Prophet (s.a.w.) has forbidden the purchase of the unborn

animal in the mother’s womb, the sale of the milk in the udder without measurement, the purchase of spoils of war prior to distribution, the purchase of charities prior to their receipt, and the purchase of the catch of a diver.”

Taking advantage as part of elements in maysir (gambling), is mention clearly in the Quran: “O ye who believe, eat not up your property among yourselves in vanities but let there be amongst you traffic and trade by mutual good-will...” (Quran 4:29). Hence, it is understood that to take advantage of another person is denounced by Islam, which is, specifically, the taking advantage of the weakness of a speculator and investor, and taking advantage of real or artificially devised inefficiencies in the market.

Based on the above doctrines and principles, Shariah imposes the principles to be incorporated into the system. Be it economic trade or financial system. The autonomy of will and freedom of contract are therefore subjected to Islamic prohibition. Due to this, Islamic contract need to reflect the objective of Islamic economics. The foundation laid down by the Islamic economics and principles are built within the principles of contract. The objective of Shariah based contract is heading towards wasatiyyah.

In order to avoid invalidity, Islam prohibits any transaction contradicts the above three principles, ie; riba, gharar and maysir. The principles goes beyond prohibition of dealing in any transaction involving mal ghaira mutaqawwim (the asset is not valid in the eyes of syara’), selling Ma’dum (object is not in existence), selling something which does not belong to the seller, selling something which is impossible to be delivered. Abdullah ibn Abbas (Gbpwh) extended the prohibition of Bai’ al Gharar to Bai’al-Gh^{ai}b (the sale of absent or concealed goods). The latter contract is considered as falling within the notion of Gharar, since the object of sale is uncertain and the purchaser has the right of option (Khiy^{ar}) to revoke the contract upon sight.

Examples of Gharar are: ignorance about the species being sold, about the quantity of the object and the price, lack of specification of the item being sold, e.g. saying: “I sell you one of the houses of this project” without specifying that house, sale of debt (assignment without recourse to the seller) is prohibited as realization of the debt in the future is not certain, ignorance of the time of payment in deferred sales, contracting on a nonexistent object and/or the inability to deliver the object, indicating more than one price or option in a contract unless one

is specifically chosen. As this uncertainty may lead to undue benefit to one party at the cost of the other, Gharar sometimes also implies deceit.

According to AyyubM. (2007), Gharar can also mean any deception through the act of juhulah or ignorance by one or more parties to a contract. He proposed “the following to reflect the examples of Gharar:

Selling goods that the seller is unable to deliver, as this involves counterparty or settlement risk. This is why, for goods to be covered under the subject of Salam (which is permitted), it is necessary that the relevant commodity might be available in the market at least at the time when delivery has been stipulated.

Making a contract conditional on an unknown event, such as ‘___when it rains’. Two sales in one transaction in such a way that two different prices are given for one article, one for cash and one for credit, without specifying at which price one buys the item with the understanding that the sale is binding on the buyer at either price; or selling.”

SHARIAH BASED CONTRACT AND PRINCIPLES OF AUTONOMY OF WILL

Shariah does not allow freedom of contract in toto. The principles of autonomy of will is limited to several restrictions being the basis of contracting. Imam Ibn Taymiyah explains the difference between ibadah and Muamalat as follows:

“The acts and deeds of individuals are of two types: Ibadat, whereby their religiousness is improved, and Adat or Muamalat (transactions), which they need in their worldly matters. A n inductive survey of the sources of the Shariah establishes that devotional acts are sanctioned by express injunctions of the Shariah. Thus, what is not commanded cannot be made obligatory. As regards transactions, the principle governing them would be permissibility and absence of prohibition. So nothing can be prohibited unless it is prescribed by Allah (SWT) and His Prophet (pbuh) in the overall framework.” As stated in - Ibn Taymiyah, Fatawa al Kubra, cf, Mansoori, 2005, pp. 3, 4.

DISCIPLINES AND FEATURES OF SHARIAH CONTRACT/AQD

Ibnu Taymiyyah indeed encourage the freedom of exercising ijthadiyyah as long as no transgression against the prohibition. There are splitting views in categorising the types of Shariah contracts.

“Aqd or contract is an implied obligation arising out of a mutual agreement. The term ‘Aqd has an underlying idea of conjunction, as it joins the intention as well as the declaration of two parties. The Holy Qur’an has used the word in this sense: ‘O believers! fulfil your contracts (‘Uqud)’.”(Ibn Taymiyah, Fatawa al Kubra, cf, Mansoori, 2005, 2: 235; 5: 88).

According to Al-mansoori (2005), “Aqd is used in two senses: in the general sense, it is applied to every act which is undertaken in earnestness and with firm determination, regardless of whether it emerges from a unilateral intention such as Waqf, remission of debt, divorce, undertaking an oath, or from a mutual agreement, such as a sale, lease, agency or mortgage. In this sense, ‘Aqd is applicable to an obligation irrespective of the fact that the source of this obligation is unilateral declaration or agreement of the two declarations. In the specific sense, it is a combination of an offer and acceptance, which gives rise to certain legal consequences.”

Contracts are structured on various models such as sole proprietorship, partnership (Shirkah), agency (Wakalah) or labour (Ujrah) or forms like sale and lease. All such activities are subject to the observance of certain rules, making the transactions valid and legally enforceable. These rules together constitute the Islamic law of contracts. Shariah contract is divided into 7 types or known as Table of 7 as follows;

Table 1: Table of 7 type of contracts

No.	Types of contract	Muqtadha al-aqd	Contracts
1.	Sale based contract	To transfer ownership	Murabahah, BBA, Salam, itisna’, etc
2.	Equity based	To share profit and losses	Mudharabah, musharakah
3.	Lease based	To enjoy usufruct	Ijarah thumma al-bai’
4.	Fee based	To get ujrah	Wakalah
5.	Security based	To get collateral security	Kafalah/ dhamanah
6.	Tabarru’ based	To be rewarded and not expected any return	Takaful, sadaqa, waqf, qard
7.	Amanah based	To keep in safe custody and not to use it	Wadiyah yadh amanah

Source: Yaacob et al. (2017)

Based on the above table, every contract executed with specific objectives. Each contract executed with tartib or sequence. This is part of ethics in Islam. The modus operandi in writing shariah contract emphasises the existence of pillars and the execution of sequence. These elements are not a requirement under the Contract Act 1950. The Shariah contract consist of Rukn (Pillars). These pillars determine the validity of a contract executed. All Muslim scholars agreed that the contract is void if the pillars incomplete. Every pillar established its own syuruth or conditions. The breach of these syurut conditions may eventually resulted in void or voidable contract contract depends on the opinion of scholars from different school of thought.

Unlike Contract Act 1950, the shariah contract does not impose conditions for a valid contract. syuruth comes later after the pillars. In order to make a contract valid in the Contract Act 1950, there are conditions that must be fulfilled. Unlike Islamic contract, these conditions are not pre conditioned with pillars. Islam also imposes prohibition on execution of a contract based on time. For example it is not allowed to do sell and trade during jumaah prayer. As mentioned in Surah Al-Jumu'ah (62:9-10);

“O you who believe! When the call is proclaimed for the Salah on Al-Jumu'ah (Friday), then hasten (Fas'aw) to the remembrance of Allah and leave off business. That is better for you if you did but know! 10. Then when the Salah is complete, you may disperse through the land, and seek the bounty of Allah, and remember Allah much, that you may be successful.”

The above ayat shows prohibition of conducting business during jumah prayer. Disciplines while contracting is essential. There is no full freedom of autonomy without observing the principles and disciplines. In brief, the principles are read within the ambit of non free autonomy due to dynamic features of shariah contracts. Shariah contracts featured and translated in tartil or composed. The composition of pillars, and every syuruth/conditions emanates of pillars reflects the sequence in contracting. Shariah contracts never imposed syuruth or conditions precede the pillars. The consequences of breach in each composition may lead to different consequences. The pillars of each contracts can never be the same from one contract to another. For example, bai' bithamin ajil (BBA) is a contract riding on the principles of bai' al-inah.

Therefore, the principles of bai' al-inah applies in the context of BBA. Indeed BBA itself is not a contract but a product riding on the contract or aqd of al-inah. Inah contract is prohibited by all schools of thought except shafie. Hence, strict features imposed to ensure the execution of aqd is free from any prohibited elements. Imam Shafii defines Bai' al-inah as “a credit purchase of an asset which is later sold to the original owner or a third party, whether at a deferred or spot, higher or lower price than the first contract or for an exchange of goods”³. Al Haskafi defines it as “a deferred sale of an asset with a motive to generate profit. The debtor, then, resells the asset to the original seller at a lower price in order to settle his debt”⁴.

Bai' al-inah refers to a contract which involves sale and buy back transactions of an asset by the seller. In these transactions, the seller sells an asset to the buyer on cash basis and then buys back the asset at a deferred price which is higher than the cash sale price. It may also be conducted where the seller sells the asset to the buyer at a deferred price and subsequently buys back the asset on cash basis at a lower price than the deferred sale price.⁵ In a celebrated case “Bank Islam Malaysia Bhd v Lim Kok Hoe & Anor And Other Appeals [2009] 6 CLJ 22”, Raus Sharif JCA (as he then was) defined BBA contract as “a deferred payment sale contract”⁶.

The SAC, in its 16th meeting dated 11 November 2000 and 82nd meeting dated 17 February 2009, has resolved that “a valid bai' `inah contract shall fulfill the following conditions:

1. Consisting of two clear and separate contracts, namely, a purchase contract and a sale contract;
2. No stipulated condition in the contract to repurchase the asset;
3. Both contracts are concluded at different times;
4. The sequence of each contract is correct, whereby, the first sale contract shall be completely executed before the conclusion of the second sale contract; and
5. Transfer of ownership of the asset and a valid possession (qabd) of the asset in accordance with Shariah and current business practice (`urf tijari).”

The above requirements are the pillars for inah contract apart from seller and buyer. If the above sequence and pillars are not followed, it may trigger shariah issues.

For example if the contract executed without sequence, there will be an issue of selling something which is not owned by the seller. Separate contracts are required and non interconditional to each other to avoid riba.

Shariah contracts imposes principles on prohibition of riba, gharar and maysir. These prohibitions are well guarded in the contracts. Indeed this paper submits that 'No riba policy', 'No gharar policy' and 'No maysir policy' clauses should be introduced to be incorporated into the contracts. These elements are the identity of shariah contracts. Conventional contracts do not feature these elements. Shariah contracts mentoring caution in disciplining intention, parties involved and the objective of contracts. These characteristics are not present in the conventional. Another interesting features of Shariah contracts is the imposition of obligations beyond riba, maysir and gharar, indication for Taqwa and obedience of a vicegerant.

With all special features and characteristics, this paper claims that harmonisation of conventional contracts and shariah are misleading. As explained above, the shariah based contracts supported by features that is not present in conventional. Harmonisation may misinterpret the values and gate provisions as urged in Al-Quran and al-Hadith.

CONCLUSION AND RECOMMENDATIONS

In conclusion, shariah contracts develops its own identity, features and characteristics. The above indicates a proper way of contracting in accordance with the muqtadha al-aqd. This is essential in order to avoid mimicking conventional. Lacuna in understanding the absorption of terms and conditions into a product is vital. This can invalidate sharia contracts. Hence, this paper propose the following;

- a. The regulators must strictly adhere to shariah principles and the demand the industry to be strict to the discipline while contracting.
- b. Shariah contracts features beyond prohibition of riba maysir and gharar that requires strict observance.
- c. Shariah offers various types of contracts that requires pillars and syuruth (conditions) that are non presente in the conventional.
- d. The disregarded values are the principles in Shariah that are secured by disiciplines while

contracting. These values are disregarded due to influx of conventional doctrines in contracting. The principles are diluted into the conventional system till the main objectives of Islamic economics and financial systems are losing out grasp of the intended results.

- e. There is no such thing as free autonomy of will in shariah contracting based on restrictions and obedience that requires strict adherence.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Khafif Ali, Al Milkiyyah fi al Shariah Islamiya wa Muqaranatiha bil Kawanin al Arabia, Dar Al Nahda al Arabia, Beirut. 1990.
2. Mariam El Hamiani Khatat. IMF Working Paper, Monetary Policy in the Presence of Islamic Banking Authorized for distribution by Ghiath Shabsigh March. 2016.
3. Meera, Ahamed Kameel Mydin, Moussa Larbani, Seigniorage of Fiat Money and the Maqasid al-Shari'ah: The Compatibility of the Gold Dinar with the Maqasid, Humanomics. 2006; 22 (2): 84-97.
4. Meera, Ahamed Kameel Mydin. The Theft of Nations. Subang Jaya, Malaysia: Pelanduk Publications. 2004.
5. Meera, Ahamed Kameel Mydin, Moussa Larbani. "The Seigniorage of Fiat Money and the Maqasid al-Shari'ah: The Unattainableness of the Maqasid". Humanomics. 2006; 22 (1): 17-33.
6. Montias, John Michael. The Structure of Economic Systems, New Haven : Yale University Press. 1976.
7. Muhammad Akram Khan, Commodity Exchange and Stock Exchange in an Islamic Economy', dalam Sheikh Ghazali Sheikh Abod et.al (eds), *An Introduction to Islamic Economics & Finance*, Cert Publications Sdn. Bhd, Kuala Lumpur. 2008.

8. Muhammad Akram Khan, Commodity Exchange and Stock Exchange in AnIslamic Economy', *Journal of Islamic Economics*. 1988; 1/2 (Julai): 31-55.
9. Salin (n2) 193; Gamoran "The Biblical law against loan on interest" 1971 *J of Near Eastern Studies* 127-128. Adopted from JJ Henning, The mediaeval contractum trinius and the law of partnership, *Fundamina* 2007, 13(2) available at uir.unisa.ac.za/bitstream/..../Fundamina%20Final%20Henning%2030%20Nov.pdf.
10. Usmani M. T, What Shari'ah Experts Say, *International Journal of Islamic Financial Services*. 1999; 1/1 (April-Jun 1999): 1-3.
11. Wafica Ghoul, Risk Management and Islamic Finance: Never the Twain Shall Meet? *Journal of Investing*. 2008; 17(3): 96-104.
12. Wahl, Peter Food Speculation: The Main Factor of The Price Bubble in 2008, Washington: World Economy, Ecology and Development. 2009.
13. Wong, So-Ling, Sophia, Analysis of The Relationship Among Speculation, Shortage of Land And Housing Supply, Master Thesis, University of Hong Kong. 1998.

The Homeless Life: A Profile Study in Penang

Md Zawawi Abu Bakar¹, Rajwani Md Zain¹, Azlizamani Zubir Salim¹

¹*School of Applied Psychology, Policy and Social Work, College of Arts and Sciences, Universiti Utara Malaysia, 06010 UUM Sintok, Kedah Darul Aman, Malaysia*

ABSTRACT

Living on the streets is a common scenario in the cities including Malaysia. The Malay idiom “Berat Mata Memandang Berat Lagi Bahu Yang Memikulnya”, which means it is difficult to watch but even more difficult to be the one bearing the weight, is a suitable idiom to describe the way of life of these homeless people. There are reasons why they chose this life that is far apart from their own family. Thus, a profile study has been conducted to identify the reasons why the respondents choose the life of being homeless. This qualitative study was conducted in the form of an interview with 11 respondents amongst the Muslim homeless people at the Kapitan Mosque, Lebu Acheh and KOMTAR, in the state of Penang. The data was analysed manually to answer the research questions. The findings show that the response of each respondent has their own reasons for choosing the life of being homeless. They surrendered it all to God and did not regret choosing to live in such a way. Therefore, the study suggests that in order to help the welfare of homelessness, the establishment of “one stop centre” for accommodation, eating, worship and self-management, is better than “rescue” efforts and placing them in institutions, their parents’ homes or in retirement homes.

Keywords: *Homeless, Profile, Religion, Muslim*

INTRODUCTION

Being homeless is the choice or action that some individuals have to take when faced with certain problems including poverty, high cost of living, family crisis and other reasons. Despite recognizing the particular risks that need to be faced such as safety, comfort, the community’s perceptions and health, they were forced to live in a state of deprivation out of the desperations of life. Based on the definition given by the Labor Department, the Ministry of Human Resources, Malaysia’s definition of homeless is an individual who lives in a state of disagreement with the proper norms of living within the local community. They also do not have permanent residences & jobs in certain areas and live wandering in public places. (Labor Department of Peninsular Malaysia, 2017).

In Malaysia, this scenario can be seen in urban places like Kuala Lumpur, Penang, Johor Bharu and so on. It became normal for the townspeople to see the homeless. On the other hand, in the suburbs or villages it is said that this scenario does not happen. Nevertheless, as a concerned society, every member of the community should not be neglected, including homeless people.

Hence, such responsibilities are carried out by the authorities such as the Social Welfare Department as well as non-governmental organizations (NGOs) and individuals. The welfare of the homeless should be given careful attention to because of the increase of homeless people due to the higher demands of life. It not only happens in Malaysia but in developed countries as well.

Hodge¹⁴ has conducted a study on the spirituality and mental health among homeless women. The study was conducted in the United States and took 15 months. Over the last few decades, homeless people have set off a major social issue Fertig & Reingold¹¹. The number of homeless people in the United States has increased dramatically since the 1970’s (Wachholz, 2005). The majority of homeless families are led by single mothers, but amongst the people, women make up the highest number of homeless people in the United States (Arangua, Andersen, & Gelberg, 2006).

Other than the Western countries, neighboring countries in Asia, like Indonesia, is also involved with this issue. Muhadi Zainuddin and Lukman Hakim (2013) conducted a study on religion among the homeless children at Ahmad Dahlan Shelter Home and Diponegoro

Shelter Home. The study reveals how homeless children feel when they have a religion, believe in God and have motivation. Homeless people are defined as individuals who do not have a home, any life direction and social access. Moreover, homeless people are also considered to have no identity. Their lives are free and they spend a lot of time in uncertain life directions. They live with social and religious identities which are not clear that they are often considered bad in social life or religious life.

Religion among homeless people is only considered as merchandise that can be exchanged for a meal and a place to stay. Religious traits among homeless children are still at an early-stage and tend to be more materialistic. Children who live on the streets are sociable beings in terms of social, education, economy and religion. Ahmad Dahlan Shelter Home and Diponegoro Shelter Home accommodate some homeless children by offering various motivational programs towards religious activities. The findings show that homeless children are no exception to religious norms and they still can have a sense of religiousness and conviction, although in another perspective, they are viewed negatively by the people (Muhadi Zainuddin and Lukman Hakim (2013).

Hall (2010) conducted a study on homelessness in the 21st century focusing on the spiritual implications of the Muslim population. According to the Housing and Urban Development Department (HUD), homelessness is defined as an individual who lives in an unsuitable location for human habitation including cars, urban parks, sidewalks, roads, abandoned buildings, public places and transitional housing devoted to homeless individuals. There are also Muslims among the homeless people in the United States. But the authorities carrying out the social work do not recognize the spiritual importance that Muslims very much need. In fact, spirituality has a positive impact on homeless Muslims because it contains mechanisms that enable them to cope and overcome the challenges of daily life especially in relation to public housing. The objective of this study is to provide a brief overview of the Muslim population, provide an early introduction to the Muslim spirituality and to propose an alternative in the provision of shelter protection.

There are some factors in becoming homeless. According to the study of Hodge¹⁴, homelessness can be a result of the social factors and economic conditions that operate at the macro level. It is followed by structural factors that include poverty, disability and lack of social

services assistance that are beyond the control of the individual to overcome them. In addition, the factor of domestic violence, expensive rent, divorce or separation, job loss etc may also result in homelessness. This situation can in turn lead to anxiety, stress, depression and it leads to the potential of having other mental illness. Another factor that causes homelessness is the lack of spiritual elements within oneself. It is acknowledged by oKoenig (2008), who states that, hundreds of studies have found that a higher level of spirituality can lead to psychological well-being Hodge¹⁴.

Moreover, the rising living costs, including places for rent or purchase, are increasingly costly to some individuals who are incapacitated and are forced to make a decision to become homeless. There are two kinds of factors, external and internal, that causes a person to become homeless. External factors include poverty, no employment, very low income and inability to own or rent a home. While internal factors involve having mental health problems (or symptoms), lack of support & social networks, abandonment & abuse in childhood and are involved with substance abuse (Morrell-Bellai et al, 2000). The study by Sharifah Mariam Alhabshi & Alifatul Kamilah¹⁷ also found that among the factors that cause a person to be stuck with being homeless is the absence of employment, poverty, involvement with drug addiction or alcohol, family rejection and mental health problems.

When viewed from a scenario especially in the city, homeless people do not make up of merely men and are not limited to those who are involved with drug abuse but also involve women, and even families. The issue of homeless women living on the pavement along with a male vagabond is feared to cause other social problems such as exploitation, sexual abuse, illegal relationships etc. There are also homeless people involved in snatching, stealing and so on (Harian Metro, August 4, 2011). In regard to this, a study has been conducted to identify the profile of homelessness and the reasons why they choose to be homeless and far away from their family.

RESEARCH METHODOLOGY

Qualitative studies involving face-to-face interviews have been conducted in Penang, focussing on the locations with homeless Malays -Jalan Masjid Kapitan Keling, Lebuh Acheh and Tun Abdul Razak Complex (KOMTAR). A total of 11 homeless people was interviewed by our own researchers using

structured interviews. The respondents' characteristics (homelessness) set out to be involved in this study are:

- i. The individual is homeless.
- ii. The homeless individual is a Muslim.
- iii. The individual agreed to be interviewed.

The data was then analysed manually to answer the research questions.

FINDINGS OF RESEARCH & DISCUSSION

The analysis of the findings tries to explain in relation to the profile of respondents and the factors why they choose to be homeless. The findings are as follows:

Respondents' Profile: Based on the results of the research, the background of the respondents involved is as shown in Table 1.

Table 1: Respondent's Profile

No.	Sex	Age	Marital Status	Education	Job	Income	Place They were Born in	How long they have been homeless
1.	Male	57	Married	SPM	Security guard	RM700	Penang	3 years
2.	Male	60	Married	SRP/LCE	Trishaw driver	RM500 -+	Penang	2 years
3.	Male	66	Married	SPM	-	-	Penang	6 years
4.	Male	50	Divorced	SRP	Construction worker	RM500	Penang	5 years
5.	Male	54	Married	SRP	Dishwasher	RM650	Miri, Sarawak	5 years
6.	Male	70	Widower	SRP	-	-	Kelantan	6 years
7.	Male	57	Single	SPM	Street artist	Not stable	Penang (Bukit Mertajam)	20 years
8.	Male	59	Single	SRP	Security guard	RM1700	Penang (Bukit Mertajam)	20 years
9.	Male	50	Single	SPM	Trishaw driver	RM300	Kuala Lumpur	5 years
10.	Male	53	Single	SRP	Security guard	RM1600	Perak	3 months
11.	Male	57	Widower	None	-	-	Melaka	6 months

Based on the results and observation (which was done in the field) of the research, most of the homeless individuals were male. In terms of age, all the involved respondents were 50 years old and above (eight people who were 50 to 59 years old; two who were 60 to 69 years old; and one who was 70 years old). In terms of marital status, four respondents were married, four were single (never married), three were widowers (two were married to a wife and one divorced). For the three married and Penang-born respondents, they only return home once every few months (not fixed). As for the Sarawakian respondent, he no longer contacts his family and wife ever since he became homeless. Most of the respondents have secondary school level of education (graduated in Form 3 or Form 5) while only one respondent has no formal education. Out of the 11 respondents interviewed, only three respondents did not have a job. Three respondents worked as security guards (having an income from RM700 to RM1700 per month);

two respondents worked as a trishaw driver (having an income from RM300 to RM500 per month); one respondent worked as a construction worker (having an income of RM500 per month); one respondent worked as a dishwasher (having an income of RM650 a month); and one respondent worked as street painter (monthly income is not fixed).

As for where they were born in, six of the respondents came from Penang, one from Melaka, one from Perak, one from Kelantan, one from Kuala Lumpur and one from Miri, Sarawak. For those who were not born from Penang, they migrated to Penang for several factors including the purpose of finding work and following friends. Out of the 11 respondents, it was found that two of them have been homeless for less than a year (three months and six months); two of them have been homeless for two to three years; five of them have been homeless for over five to six years; two of them have been homeless for almost 20 years.

Based on the above findings, most respondents have a job to support their livelihood, despite of their low income. This finding rejects the study done by Sharifah Mariam Alhabshi & Alifatul Kamilah¹⁷ which stated that homeless people do not have a job. Although there are homeless people without jobs, some of them do have jobs. Similarly, the study of Morrell-Bellai et al, (2000) also states that occupational factors are one of the causes of homelessness. The researchers stated that there were other factors that made them choose to be homeless.

In addition, there are two respondents who have chosen to be homeless for 20 years and 20 years is not a short period of time for a human being. Robert E. Hall, (2010) states that there is inner strength or “spirit” among the homeless people. This is because, living in the streets makes them exposed to various threats such as weather, safety, health, welfare and so on. Only the strong ones can survive in such a state of life.

Factors of Leading a Homeless Life: The findings show that all the respondents have their own reasons for choosing to be homeless.

Table 2: Factors individuals lead a homeless life

Respondent	Factors of Leading a Homeless Life	Statement
R1	Expensive cost of living quarters	In the beginning, we had a shuttle from home to work but every day I had to spend money on the ride which was very tiring...it's better if I just sit like this. Even renting a house is also very expensive. Staying like this is easier....
R2	Unstable job	In Penang if we don't have money, we don't have to think about a house. With this low income and thinking about a house. It's better if we think about what job opportunities there are out there....
R3	Family did not show any concern about them	When I go home, nobody cares... when we don't have anything and our children and wife also abandons us....
R4	Inferiority	In the condition I am in (physically handicapped), I think I am much less than everyone else. Moreover, it is the same if I am at home and when I am not at home...I cannot give anything to my mother or siblings. So it's better if I live alone...and work for myself only...
R5	Desperations of life	Previously, we used to rent but the rental became very expensive. After that, my wife went back to Miri and it was easier for me to live like this...I don't need to think about house rental. The money is for things that are more in need...
R6	Does not want to trouble the family	After my wife died, I felt too lonely. I didn't want to trouble my children either. So I made up my mind to wander around....
R7	No life purpose	Isn't it easy to live like this...? You just face what you see....
R8	Likes to live alone	Living like this is easy...no one will disturb you and no one will care....
R9	Likes to choose the easy way of life	While life is good, we should enjoy...life like this is easier
R10	Does not mind	Living anywhere is the same...living like this is easier and more convenient....
R11	Tired of living in institutions	When I was in the old folks' home...it was so boring...I didn't know what to do. Might as well just go out and live alone....

In Table 2, it illustrates the factors and reasons why the respondents lead a homeless life (as obtained through the research interview done in the field). It can be seen that each respondent gives a different answer about why they chose to lead a homeless life. The first respondent or R1 informed that he was unable to buy or rent a place to stay. Therefore, he chose to become a homeless. The

second respondent gave the reason of because he had to do various work in one day, he was always not in time to think of a place to stay for the night. Thus, he chose to become homeless.

Next, the third respondent said that he had been ignored by his children and wife who had caused him

to become homeless. Meanwhile, the fourth respondent said that he felt inferior when he was at home because he did not contribute anything to the household. Eventually, he chose the path of being alone and homeless. The fifth respondent gave the reason that the desperations of life forced him to become homeless while the sixth respondent did not want to trouble his family and that led him to become homeless instead.

The seventh respondent led a homeless life because he had no life purpose while the eighth respondent chose that because he preferred to live alone without being disturbed by anyone. In addition, the seventh, eighth and ninth respondent said the reason why they chose this was because it was an easy way to manage their lives by living so casually like that. The tenth and eleventh respondent gave the reason that it was because they didn't mind living like that and it was boring living in the retirement home (old folks' home) respectively.

Based on the factors discussed above, the study found that these factors can be classified into two categories:

(i) External factor: There are five external factors that caused the respondents to choose to be homeless - the cost of living, unstable work, the absence of their family, the desperations of life and not wanting to trouble the family.

(ii) Internal factor: While the six internal factors that caused the respondents to lead a homeless life were - inferiority, no life purpose, like to be alone, like to choose the easy way of life, the casual attitude of not caring and bored of the life in a retirement home.

Based on the respondents' given factors of why they chose to become homeless, it shows that the internal factors have deeper impact than the external factors. This shows that in order to help the homeless, the psychosocial elements must be improved rather than just materialistic things such as food, clothes and so on. In addition, spiritual elements should also be given to the homeless to build a stronger self. On the contrary, people view the homeless with empathy based on their looks, living environment, welfare, hygiene and health. However, far from the common assumptions, they also have internal struggles that need to be helped. That is why, this research suggests that the aid received from professional helpers should also focus on the aspects of psychosocial and spiritual, especially in handling the problems of being homeless.

CONCLUSION

The results showed that there were multiple profiles among the homeless who were surveyed. In fact, there were respondents who have been homeless for over 20 years. Whereas for the factors that led them to choosing to become homeless, there are two factors, that is - internal factors and external factors. The internal factor dominates the external factor in terms of why the respondents chose to become homeless. Hence, studies suggest that in order to help the homeless, social workers, counsellors, volunteers and others should involve psychosocial and spiritual elements as well as material aspects such as food, clothing and so on. Efforts to help homeless people also need to be focused on internal issues because it dominates over the external issue as for the reason why they are homeless.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Azizah Othman. Konsep ibadah. Dalam Mardzelah Makhsin (Ed.) Pendidikan Islam. Bentong: PTS Publication & Distributors Sdn Bhd. 2003.
2. Averitt S. S. "Homelessness is not a choice!" The light of homeless women with preschool children living in temporary shelters. *Journa/ of Family Nursing*. 2003; 9(1): 79-100.
3. Berry D. Methodological pitfalls in the study of religiosity and spirituality. *Western Journal of Nursing Research*. 2005; 21: 628-647.
4. Best R. Situation or Social Problem: The Influence of Events on Media Coverage of Homelessness. *Social Problems*. 2010; 57(1): 74-92.
5. Bhui K, Shanahan L, Harding G. Homelessness and mental illness: A literature review and a qualitative study of perceptions of the adequacy of care. *Intemational Journal of Social Psychiatry*. 2006; 52: 152-165.
6. Brush B.L, McGee E.M. Evaluating the spiritual perspectives of homeless men in recovery. *Applied Nursing Research*. 2000; 13(4): 181-186. Retrieved from <http://www.appliednursingresearch.org/article/>

7. Caton C.L, Dominguez B, Schanzer B, Hasin D.S, Shrout P.E, Felix A, McQuiston H, Opler L.A, Hsu E. Risk factors for long-term homelessness: Findings from a longitudinal study of first-time homeless single adults. *American Journal of Public Health.* 2005; 95(10): 1753-1759.
8. Cummins L.K, First R.J, Tommey B.G. Comparisons of rural and urban homeless women. *Affilia Journal of Women and Social Work.* 1998; 13(4): 435+. Retrieved from <http://go.galegroup.com.ezproxy.tcu.edu>
9. Day Resource Center for the Homeless. (2014). What we do. Retrieved from <http://www.fwdayresourcectr.org/what-we-do>
10. Douglas A. N, Jimenez S, Lin H.-J, Frisman L. K. Ethnic differences in the effects of spiritual well-being on long-term psychological and behavioral outcomes within a sample of homeless women. *Cultural Diversity and Ethnic Minority Psychology.* 2008; 14: 344-352.
11. Fertig A. R, Reingold D. A. Homelessness among at-risk families with children in twenty American cities. *Social Service Review.* 2008; 82: 485-510.
12. Gabbard W.J, Nelson-Gardell D, Miller K.M, Chamiec-Case R. Spirituality and religiosity among homeless individuals: A preliminary investigation. *Arete.* 2006; 30(1): 150-162. Retrieved from <http://web.ebscohost.com.ezproxy.tcu.edu/ehost/>
13. Greene J.A, Ball K, Belcher J.R, McAlpine C, Substance abuse, homelessness, developmental decision-making, and spirituality: A women's health issue. *Journal of Social Work Practice in the Addictions.* 2003; 3(1): p. 39-53. Retrieved from <http://web.ebscohost.com.ezproxy.tcu.edu/ehost/>
14. Hodge D.R, Moser S.E, Shafer M.S. Spirituality and mental health among homeless mothers. *Social Work Research.* 2012; 36(4): Retrieved from <http://go.galegroup.com/ps/>
15. Kushel M.B, Evans J.L, Perry S, Robertson M.J, Moses A.R. No door to lock: victimization among homeless and marginally housed persons. *JAMA Internal Medicine.* 2003; 163(20): Retrieved from <http://archinte.jamanetwork.com/article.aspx?articleid=216287>
16. Moxley D, Freddolino P. Needs of homeless people coping with psychiatric problems: Findings from an innovative advocacy project. *Health and Social Work.* 2012; 1991; 16(1): 19-26.
17. Sharifah Mariam Alhabshi, Alifatul Kamilah Abdul Manan. Homelessness in Kuala Lumpur, Malaysia: A Case of Agenda Denial. *International Journal of Social Science Tomorrow,* 1 (2).
18. Jabatan Tenaga Kerja Semenanjung Malaysia. (2017). Diakses daripada <http://jtksm.mohr.gov.my/index.php/my/>.
19. HUD (2010). Federal Definition of Homeless. Retrieved on February 18, 2010 from <http://portal.hud.gov/portal/page/portal/HUD/topics/homelessness/definition>.

The Matrimonial Property: Causes of Claim and Distribution Rate in the Alor Setar Syariah High Court

Mohd Akram Bin Dato' Dahaman Dahlan¹, Khairani BtNawawi¹

¹*Civilization and Philosophy Department, School of Languages, Civilization and Philosophy (SLCP), UUM CAS, Universiti Utara Malaysia, Sintok, Malaysia*

ABSTRACT

Matrimonial property or hartasepencarian is a form of property division that is practiced by the Malaysian Malay Muslim community based on the custom of people in the Nusantara. Terms such as 'carianlakibini' as in the pepatih custom and other states customs in the South-East Asia regions as proposed by Sheikh Ahmed bin Zain al-Fatani are clear evidence of these practices. On this basis, in Kedah there are two issues that need to be examined which are; the reason of matrimonial property and rate of equitable division as it is not the same in other states. A study in the form of content analysis is conducted on cases that were listed and discussed in the Syariah High Court, AlorSetar as the court is empowered to resolve *mal*(financial) issues. Based on the analysis, there are three conditions that lead to matrimonial property claim. The causes are divorce, the death of a spouse and polygamous marriages. Based on the analysis made, it is shown that all three conditions have been given a strong base by the Syariah High Court for a claim to be a case. Whereas in connection with the claim, there are three rates as the solution to a matrimonial property claim which are 1/2: 1/2, 1/3, 2/3 and 3/4: 1/4. These divisions are made by looking at the facts and evidence of contributions of both the husband and wife, directly or indirectly. Based on the analysis made, it is shown that all three of rates have been applied by the Syariah High Court to resolve all cases billed in this Court.

Keywords: *Matrimonial Property, Syariah High Court AlorSetar, Causes of Claim, Distribution Rates.*

INTRODUCTION

Matrimonial property is one of the rights that can be claimed by both husband and wife whether after divorce, death and polygamy. According to Miszairi Sitiris⁶, there is no definition nor explanation of matrimonial property given by the Islamic scholars in their books. This is because of their custom during their time, only the husbands worked for their families, while the wives managed their household. The issue of matrimonial property did not arise. Contrary to the custom of the archipelago such as Indonesia, Brunei, Patani and also Malaysia, the average population was formerly a farmer. Husband and wife worked together to cultivate their farmland. When they divorced, the property or land they worked together will be divided between them. The case judged by Judge Briggs in 1950 became a clear evidence of the position of a matrimonial property in the local community (Hajjah Lijah Bt Jamal against Fatimah Bt Mat Diah³. Therefore, the matrimonial property is more closely related to the customs practiced in society in this country.

MATRIMONIAL PROPERTY IN KEDAH

Generally matrimonial property is a property acquired by husband and wife. According to Suwaid Tapah⁷, the matrimonial property is the property acquired by the husband and wife during the marriage according to the conditions determined by the Syariah Law. Whereas according to Zaleha Kamaruddin⁸ the matrimonial property can be defined as any movable or immovable property acquired by the spouses directly or indirectly during a legitimate marriage.

Matrimonial property has been enacted in the legislation of the Islamic Family Law in the respective states. Variety of definitions have been given and contained in the Islamic Family Enactment which is generally concluded as property acquired jointly by husband and wife during legitimate marriages and both parties directly or indirectly contribute to the acquisition or possession of such property. In Kedah context, the Kedah Islamic Family Law Enactment (EUKI) 1994 has allocated property acquired by both parties during the period of marriage divided between the two, or ordering the assets to be sold and the proceeds of sale are divided between both husband and wife.

Although there is no affirmation through the Sharia law, the matrimonial property is allowed by the customary law. The custom is permitted by the Sharia Law is a matter of common practice and is often done by them in daily life matters either in words or deeds that are not contrary to the Qur'an and as-Sunnah. According to Jasni Sulong⁵, in the context of Islamic society in Malaysia besides the teachings of the Shafi'i sect, the community also adopts the customary practices accepted by syarak (al-'Adah Muhakkamah) such as the distribution of inheritance by consensus. This practice is accepted as long as the elements of tolerance among the heirs are achieved fairly and openly.

REASONS FOR MATRIMONIAL PROPERTY CLAIMS IN THE STATE OF KEDAH

Based on the records of the Alor Setar Syariah High Court which are examined through the files of the matrimonial property from 2011 to 2013, there are 3 main reasons for a claim to be made to acquire the matrimonial property which are divorce, death and polygamy. Claims for matrimonial property are made under the section of (SEK) 122, Distribution of Matrimonial Property under the Kedah Islamic Family Law.

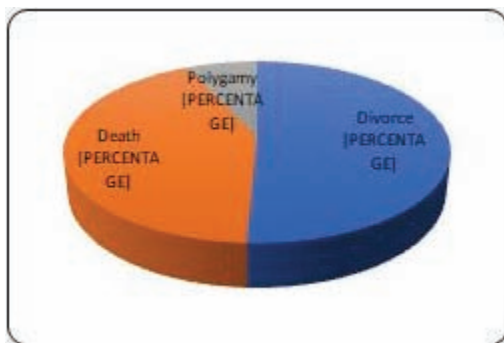


Figure 1: Reasons for Matrimonial Property Claims 2011

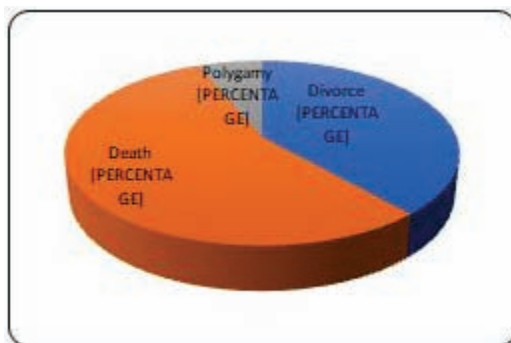


Figure 2: Reasons for Matrimonial Property Claims 2012

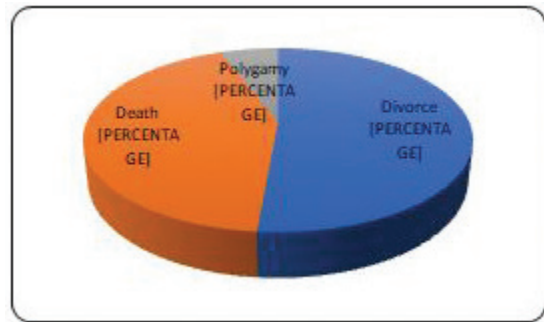


Figure 3: Reasons for Matrimonial Property Claims 2013

Divorce: Divorce generally involves the dissolution of bond, unbinding, liberation and the like (Kamus Dewan, 1997)². In terminology, the divorce term means the interruption of marriage or the dissolution of ties based on certain reasons (Wahbah al-Zuhaily, 2010)⁹.

Based on the cases of matrimonial property recorded in the Syariah High Court of Alor Setar in 2011-2013, divorce is one of the causes for the demands of a matrimonial property.

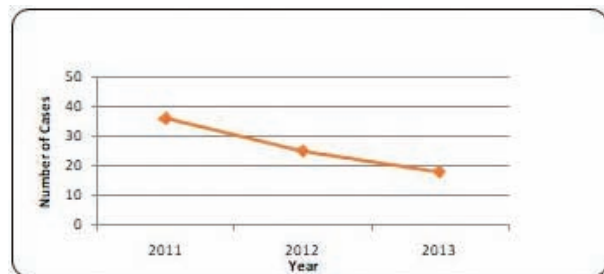


Figure 4: Divorce Cases in 2011-2013

Here are some examples of cases recorded by the Alor Setar Syariah High Court around 2011 to 2013 involving the demands of austerity. The first case that proved divorce was the cause of the matrimonial property claim was between Samsiah Bt Otoh and her former husband, Jaafar Bin Ibrahim. They were married on April 12, 1985 and divorced on October 12, 2010. For almost 30 years they lived on a piece of land with a house at No. 185, Lorong Angsana 1, Taman Angsana, No. Lot PT 3792 Mukim Bandar Kulim. Having divorced, the property is divided equally as a matrimonial property.

The next case of divorce is between Habshah Bt Abdullah Sani and Zulkifli B Muhamad Hanafiah. The married couple divorced on May 10, 2010. Throughout their marriage they were awarded 3 children. As a result of the divorce the wife or the plaintiff make a claim on the property of the tenant on land Lot No. 7644 Mukim of Parit Buntar, District of Kerian Perak, Land Lot 105

Mukim of Bandar Baru Kedah and 3 buildings on it. They agreed to divide ½ - ½. In addition, there are 2 rent houses, an Usahajaya Company, the income of the Rumah Mesra Rakyat project, the income of Pertubuhan Peladang, a Pajero car, a Honda Prelude, a Kriss motorcycle, 3 lorries, 2 bulldozers. They are evenly distributed at the rate of ½ - ½. The properties other land are plaintiff's. Case closed on July 31, 2012.

The next case is Haniza Bt Abd Mohsin's case with ex-husband Anizar B Md Nor. They divorced on February 20, 2013, during their marriage with a child. The wife is the plaintiff or the claimant while the husband is the defendant. Plaintiff claimed for land of Lot PT 1429, Mukim Semeling, Sungai Kroh, Kuala Muda Kedah District which was bought in 1999 as the matrimonial property. Their case went on until March 17, 2013.

Through the three chronologically arranged cases have proven clearly divorce is one of the reasons for the demands of matrimonial property.

Death: According to Ibn Manzur⁴, the word death means silence, delusion, calm, immobile. According to Ar-Raghib al-Asfahani¹, death is a form of spirit separation from the body. Allah SWT has explained in the Qur'an: *Every soul will taste death. And We test you with evil and with good as trial; and to Us you will be returned.* al-Anbiya': 35

Death is also a cause for the demands of matrimonial property. The analysis made in the Syariah High Court of Alor Setar on cases of the matrimonial property claims clearly proved the matter. According to cases registered in 2011, 30 cases of matrimonial property claim due to death, 35 cases in 2012 and in 2013, 15 cases.

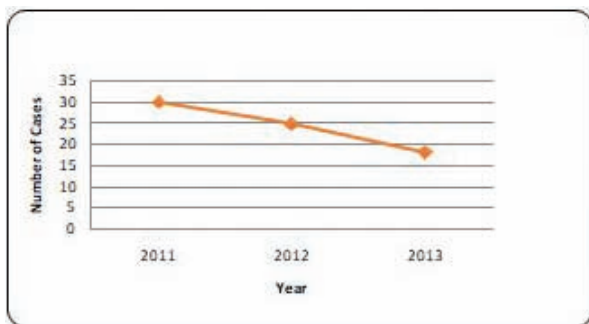


Figure 5: Death Cases in 2011-2013

Here are some cases that indicate death is one of the causes of matrimonial property claim. The case that occurred in 2011 when Adzma Bt Fadzil, widow of the deceased Abdul Rahim Bin Hasan, was the plaintiff.

Doyah bt Yusuf is the mother of the deceased and in-law to Adzma and her seven sons, Mohd Faaiz, Anis, Adilah, Afizah, Adzni, Azira and Adib are defendants. Adzma was married to Abdul Rahim on July 14, 1985. On April 1, 2001, Abdul Rahim passed away. Throughout the marriage, they have accumulated the following property 1) a semi-detached house at address No. 69, Lorong Semarak 5, Taman Semarak, 08000 Sungai Petani, Kedah. 2) A Proton Saga car with registration number KX 4242. 3) A Toyota Corolla with registration number KBK 3062. 4) A Modenas Kris motorcycle with registration number KBK 3062. 5) A Modenas Kris motorcycle with registration number PFW 2205. 6) A Honda motorcycle with registration number KBE 6519. 7) EPF Fund and Tabung Haji savings. All properties are divided ½ to the matrimonial property and the rest are divided into heirs.

The next case is between Haslinda Bt Ishak, the widow of Mohd Aswandi. They were married on September 09, 2001. Mohd Aswandi died on April 16, 2012. They had a daughter named Nursyafiqah. Mohd Aswandi has a mother named Ara and 6 younger siblings, Md Noor Hisham, Herolnizam, Mohd Suhaimi, Muhammad Taufiq, Mohammad Nur Firdaus and Nurhidayah. Matrimonial property claimed is the deceased compensation money of RM 87,780.04 in the account of Amanah Raya.

In 2013, another case of death was the case of Asah Bt Beram, a widow of Man Bin Said. They were married in 1986. The husband died on January 1, 2013. They had a daughter named Satariah Bt Man. The property that was left is BSN savings money of RM 11,280.75. Matrimonial property is ¾ and the rest to the heirs.

Through these three examples of cases in the current year has shown clearly that death is one reason to matrimonial property.

Polygamy: Polygamy is defined as having more than a wife (Kamus Dewan, 1997)². Islam clearly approves polygamy based on verse 3 of Surah al-Nisa'. In the Islamic family law in Malaysia, polygamy is permitted provided that the husband must obtain written permission from the Syariah Court first. For example, as in the provision in section 23 (1) of the Islamic Family Law (Federal Territories) Act 1984.

Based on the case of a matrimonial property claim in the Syariah High Court throughout 2011-2013, it is clear that polygamy is one of the causes of the claim of matrimonial property. In 2011, 5 cases were recorded, 4 cases in 2012 and 2 cases in 2013.

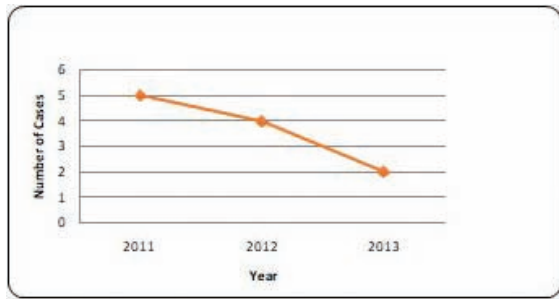


Figure 6: Polygamy Cases in 2011-2013

Here are some cases of polygamy which are the reasons for the demands of matrimonial property. The first case is between Bt Mek Saad with the three defendants; Hassan Bin Johari, Harfizi Bin Mohamad Hassan and Nor Silah Bt Hassan. Hassan has polygamy with 4 wives. The first wife, Juriah Bt Hanafi, was the mother of Johari Bin Hassan, who died during confinement. Che Kai's second wife, was divorced while still alive. His third wife, Puteh Bt Arshad, was the mother of Nor Silah Bt Hassan, who left her daughter, Nor Silah when she was 7 months old. The fourth wife, Mek Bt Saad, is the mother of Mohamad Harfizi Bin Hassan. The property claimed is land Lot 1847 and Lot 957. The distribution rate is $\frac{1}{2}$ - $\frac{1}{2}$.

Bt Hassan, Mohd Hanif Bin Hassan, Siti Rafiah Bt Hassan, Mohd Salman Bin Hassan and Munirah Bt Hassan. Through mutual agreement on property Lot 6383, 5874 acres (tekai), Lot 7592 an area of 0.8572 hectares tekai, Lot 6033 area of 11,705 square feet tekai, Lot 2992 in an area of 472 jemba has declared as matrimonial property. The rate is $\frac{1}{2}$ to the claimant and $\frac{1}{2}$ to the deceased. For Lot 986, 5 relong 26 jemba, the division is: $\frac{1}{4}$ to the deceased, $\frac{1}{2}$ part to the second wife Norizan Saad Bt Muhd and the remaining $\frac{1}{2}$ is divided (Faraid) to the heirs. For the money in Simpanan Amanah Saham amounting to RM 33,210.50, $\frac{1}{3}$ division rate has been divided to the claimant, $\frac{1}{3}$ to the second wife and the other $\frac{1}{3}$ has been faraid.

Through these examples of cases according to the specific year, it has proven that polygamy is one of the reasons for the claims of matrimonial property.

MATRIMONIAL PROPERTY DISTRIBUTION RATES IN KEDAH

In addressing the problem of division of property rates there are several rules have been made. However, these rules still have not been developed to provide

a well- structured base for solving the division of matrimonial property. SuwaidTapah⁷, states that the concept and division of matrimonial property in Malaysia has been enacted in the Islamic Family law in the respective states. The states Syariah High Court have been granted exclusive jurisdiction to hear and speak of the demands of matrimonial property. The rate of claim under the judgment of the Syariah High Court depends on the extent or proportion of contributions granted by the claimant to the property collected during a marriage. The Syariah High Court takes into account the contribution of the spouses directly or indirectly. This division is based on *Qadhi's* discretion after taking into account the various angles and evidence presented. Rates given under the respective states' Islamic Family Laws. There are some fractional rates often used $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{3}{4}$. There are also cases where the wives will not get anything from the property claimed.

MATRIMONIAL PROPERTY DISTRIBUTION RATE

The proportion of matrimonial property in Malaysia varies from one state to another. In general, the proportion of matrimonial property distribution becomes difficult because there is no specific provision for determining $\frac{1}{2}$: $\frac{1}{2}$, $\frac{1}{3}$: $\frac{2}{3}$, $\frac{3}{4}$: $\frac{1}{4}$ or the like. The study specializes in rates in the Alor Setar Syariah High Court, indicates the difference according to the clear evidence of the property acquired during the marriage between husband and wife. The rate of acquisition of the property is based on the contribution of the husband and wife. The rate is not set because the Court will take into account several aspects before determining the rate setting either $\frac{1}{2}$: $\frac{1}{2}$, $\frac{1}{3}$: $\frac{2}{3}$, $\frac{3}{4}$: $\frac{1}{4}$.

The cases of matrimonial property claims from 2011 to 2013 found in the Syariah High Court of Alor Setar proved that the rate of division of matrimonial property is at the discretion of the Judge or Qadhi by referring to precedence cases. According to Qadhi Besar Syariah High Court Alor Setar, Mohd Roze Bin Abdul Wahab, there is no specific reference to the rate of division of the matrimonial property practiced in the State of Kedah. Most cases are determined by the proof (record) and the level of contribution of the spouses. Most cases are also determined by $\frac{1}{2}$: $\frac{1}{2}$ when the case is settled by mutual agreement. The study on the proportionate share of the matrimonial property clearly proves that most cases ended up with $\frac{1}{2}$ share being the property of the husband and $\frac{1}{2}$ of the remaining belong to the wife. Only a few cases recorded $\frac{3}{4}$: $\frac{1}{4}$ and $\frac{1}{3}$: $\frac{2}{3}$ and the like.

1/2:1/2 Rate

Case Reference Number : 02200-017-0087-2011	
Between	
Remarks	The case is settled by mutual consent
Plaintiff Halimah Binti Awang	Defendant Mohd Azmi Bin Shafie
<p>The claimant Halimah Binti Awang has divorced with the alleged party, Mohd Azmi Bin Shafie. Their divorce took place on 18.10.2006. During the marriage they were awarded a total of 4 children. The properties acquired by them during the marriage are:</p> <ol style="list-style-type: none"> 1) A terrace House No. 30 Taman Aman, Mukim of Guar Kepayang, Pendang, Kedah 2) A Proton Wira car No. KAW Registration 6879 3) A Kancil car No. PFJ Registration 7689 <p>The above property became the matrimonial property and the claimant applied for the Court to divide the property into half of her property and the balance was handed over to the defendant.</p>	

Reason for Claim: The reason for the matrimonial property claim is divorce. Mohd Azi Bin Shafie has pronounced a divorce on Halimah Bt Awang on 18.10.2006. During the marriage they both have 4 children. Claims of matrimonial property is made on 3 properties acquired during their marriage.

Solution Method: The case is dealt with by mutual consent. Based on the case report it is clear that the settlement was made by consensus when there was no dispute between the plaintiff and the defendant.

Matrimonial Property Distribution Rate: The case is resolved by the Court’s decision to show the property to be joint property of both: 1/2. This clearly shows the rate of division of the matrimonial property in the Syariah High Court of Alor Setar is 1/2.

Property Type/Contribution Point: The case also indicates that there is an immovable property and two movable property. Immovable property is a terrace house with address No. 30 Taman Aman, Mukim Guar Kepayang, Pendang, while 2 movable property is a Proton Wira car registration number KAW 6879 and a Kancil car registration number PFJ 7689. The plaintiff’s claim for the Syariah High Court Alor Setar divides the above assets into two parts . Half handed over to the plaintiff or the claimant and the other half to his ex-husband as the defendant. The contribution of both parties to these assets is a direct contribution. This can be proved when they are together trying to acquire the property.

This case is settled at a rate of 1/2 given to both parties and this proves 1/2 is the rate of claim of the matrimonial property applied in the Syariah High Court of Alor Setar.

2/3:1/3 Rate

Case Reference Number : 02200-017-0028-2012	
Between	
Plaintiff Aishah Binti Zakaria	Defendants 1) Nur’izzati 2) Nur’Adlina 3) Muhammad Hasif 4) Muhammad Haziq Iman 5) Mohd Hidzir 6) Nur Hafizah
Remarks	Case resolved Sulh Judge
<p>The case of Aishah Binti Zakaria is a widow to Azhar Bin Pawanteh. They were married on 27.04.1986 and were blessed with 4 children, Nur’izzati, Nur’Adlina, Muhammad Hasif and Muhammad Haziq Iman. There are 2 step-children called Mohd Hidzir and Nur Hafizah. Azhar died on 18.08.2011. The deceased left a mother named Charum Bee Binti Md Ali. During his life, the accumulated assets are as follows, 1 immovable property and 3 movable properties:</p> <ol style="list-style-type: none"> 1) A home addressed No. 122, Lorong KS 2/2, Kulim Square, Lunas, Kulim Kedah. Title No. H.S (M) 800. PT 16551, Mukim Lunas on behalf of Azhar Bin Pawanteh 2) A Toyota Unser 1.8GLI (A) Registration Number PFH 9877 registered under the name of Azhar Bin Pawanteh 3) A Perodua Kancil EX650, Registration Number PEX 9137 registered under the name of Azhar Bin Pawanteh 4) Naza Nando 250 Motorcycle, Registration Number PHP 284 registered under the name of Azhar Bin Pawanteh 	

Cause of Claim: According to the case report, the cause of respective matrimonial property claim case which has been registererd under the 02200-017-0028-2012 reference number, is death. This case of Aishah Binti Zakaria is a widow to Azhar Bin Pawanteh. They were married on 27.04.1986 and were blessed with 4 children, Nur’izzati, Nur’Adlina, Muhammad Hasif and Muhammad Haziq Iman. There are 2 step-children called Mohd Hidzir and Nur Hafizah. Azhar died on 18.08.2011. The deceased left a mother named Charum Bee Binti Md Ali.

Solution Method: This case has been tried under the Sulh Judiciary based on the case report filed. When a case cannot reach a concensus, Sulh will be the mediator for two or more disputed parties.

Matrimonial Property Distribution Rate: The Court has decided all the property involved in the case to be the matrimonial property between the plaintiff, Aishah Binti Zakaria and the deceased, Azhar bin Pawanteh. 2/3 of the parts or value from the buying price of the house RM RM 176,800.00 has been given to the plaintiff and the 1/3 belongs to the deceased has been given to the first defendant, Nur'izzati till the third which is Muhammad Hasif.

Property Type/Contribution Point: While living together, the accumulated assets are as follows, 1 immovable property and 3 movable properties:

Immovable property

1. A home addressed No. 122, Lorong KS 2/2, Kulim Square, Lunas, Kulim Kedah. Title No. H.S (M) 800. PT 16551, Mukim Lunas on behalf of Azhar Bin Pawanteh

Movable Properties

1. A Toyota Unser 1.8GLI (A) Registration Number PFH 9877
2. A Perodua Kancil EX650, Registration Number PEX 9137
3. Naza Nando 250 Motorcycle, Registration Number PHP 284

The Syariah High Court of Alor Setarruled that all the properties in the case to be the matrimonial property between the plaintiff , Aishah Binti Zakaria and the deceased, Azhar bin Pawanteh. 2/3 of the parts or value from the buying price of the house RM RM 176,800.00 has been given to the plaintiff and the 1/3 belongs to the deceased has been given to the defendants.

The verdict is a proof that the rate of division of matrimonial property other than 1/2, 2/3:1/3 has been used in the court to settle the claim of matrimonial property.

3/4:1/4 Rate

Case Reference Number : 02100-017-0057-2013	
Between	
Plaintiff Azizah Bt Ahmad	Defendants 1) Zulkifli Bin Ramli 2) Rohaiza Binti Ramli 3) Rohani Binti Ramli 4) Faridah Binti Chea Abdullah 5) Raihan Marini Binti Ramli 6) Raihani Syamimi Binti Ramli
Remarks	The case is settled by mutual consent

The case is between Azizah Bt Ahmad, a widow to Ramli Bin Md Noh. They were married on 22.03.1962 and has been blessed with 3 children, Zulkifli, Rohaiza and Rohaini. Ramli had married to the second wife, Faridah Chea Bt Abdullah and had 2 daughters which are Raihan Marini dan Raihan Syamimi. On 24.06.2012 Ramli died. Azizah has filed a matrimonial property claim as Azizah and the deceased has acquired the immovable properties together:

- 1) Lot 1725, Property No. 2165, Bt 4 ½ Jalan Changloon, Mukim Kapelu, Kubang Pasu, Kedah
- 2) Lot 14, Property No. 1799, Changkat Jejawi, Mukim Kapelu, Kubang Pasu, Kedah
- 3) Lot 1426, GM 31. Padang Besar, Perlis
- 4) Lot 3956, GM 2110, Kampung Sena, Mukim Kurung Anai, Perlis
- 5) Lot 3957, GM 2111, Kampung Sena, Mukim Kurung Anai, Perlis

Cause of Claim: Case reference number 02100-017-0057-201, is a matrimonial property claim because of death and polygamy. This is shown in the case of Azizah Bt Ahmad which is a widow to Ramli Bin Md Noh.

They were married on 22.03.1962 and has been blessed with 3 children, Zulkifli, Rohaiza and Rohaini. Ramli had married to the second wife, Faridah Chea Bt Abdullah and had 2 daughters which are Raihan Marini dan Raihan Syamimi.

Solution Method: The case is dealt with by mutual consent. Based on the case report it is clear that the settlement was made by consensus when there was no dispute between the plaintiff and the defendant.

Matrimonial Property Distribution Rate: The plaintiff pleaded the Syariah High Court to rule that the disputed properties to be the matrimonial property between the plaintiff and the deceased, Ramli Bin Md Noh and the plaintiff received 3/4 over the properties and the other 1/4 to be divided (*faraid*) to the eligible beneficiaries and the parties concerned.

Property Type / Contribution Point: Azizah has filed a matrimonial property claim as Azizah and the deceased has acquired the immovable properties together:

1. Lot 1725, Property No. 2165, Bt 4 ½ Jalan Changloon, Mukim Kapelu, Kubang Pasu, Kedah
2. Lot 14, Property No. 1799, Changkat Jejawi, Mukim Kapelu, Kubang Pasu, Kedah
3. Lot 1426, GM 31. Padang Besar, Perlis

4. Lot 3956, GM 2110, Kampung Sena, Mukim Kurung Anai, Perlis
5. Lot 3957, GM 2111, Kampung Sena, Mukim Kurung Anai, Perlis

As the whole property claimed was the property acquired between the plaintiff and the deceased, Ramli Bin Md Noh, the Court decided that the plaintiff's rate was 3/4 shares on the property and the remaining 1/4 was divided (*faraid*) to the entitled beneficiary and the parties concerned.

The decision of the Syariah High Court of Alor Setar clearly demonstrates that there is another division rate value of a claim of the matrimonial property of 3/4: 1/4, in addition to 1/2 and 2/3: 1/3.

FINDINGS

Through the analysis of the case files registered at the Syariah High Court Alor Setar from 2011 to 2013, there are three conditions which have been the causes of a claim of matrimonial property. The causes are divorce that occurs in a spouse's relationship, the death of either spouse and a polygamous marriage. An analysis of the contents of each case report found that these three conditions had been given a strong basis by the Syariah High Court of Alor Setar for a claim to be raised.

Whereas in relation to the rate of distribution, based on the case reports and decisions decided by the Judge in the Syariah High Court of Alor Setar, there are three rates which are the solutions to a claim of a matrimonial property which are 1/2: 1/2, 1/3: 2/3 And 3/4: 1/4. This division is made by looking at the evidence and description of the contribution directly or indirectly of both the husband and wife. All three rates have been applied by the Alor Setar Syariah High Court in settling cases throughout the period of study that has been registered in this Court.

CONCLUSION

Matrimonial property is a form of property jointly acquired by a spouse during the duration of the marriage. This type of property has become the custom of society in Malaysia particularly in Kedah. The existence of this matter has become the basis of the Syariah High Court of Alor Setar to decide on the distribution of property between husband and wife when a matrimonial property claim is due to divorce, death and polygamy. This is done

to give and restore the rights between the couple during the marriage period based on the contributions they have given. On this basis, some rates have been decided by the Alor Setar Syariah High Court involving 1/2: 1/2, 1/3: 2/3 and 3/4: 1/4.

ACKNOWLEDGMENTS

The title of this paper is a part of the findings of the Post Graduate Incentive Research Grants, S/O code: 15849, under the title "The Claim of Matrimonial Property: A Study on Financial Cases at Alor Setar Syariah High Court".

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. al-Asfahani A. al-Mufradat fi Gharib al-Quran. Dar al-Ma'rifah.2001.
2. Kamus Dewan. 3rd ed. Dewan Bahasa dan Pustaka.2013.
3. Muhammad A. K. Harta Sepencarian: Konsep dan Pelaksanaannya di Malaysia. Shariah Journal. 1996; 4(1): 97-106.
4. Manzur I. Lisan al-'Arab. Dar Sadir.1996.
5. Sulong J. Kedudukan Mazhab Syafi'i Dalam Amalan Pembahagian Pusakadan Wasiat Islam di Malaysia. Shariah Journal. 2008; 16(1): 163-183.
6. Sitoris M. al-Huquq al-Maliyyah lil Mutallaqah. (PhD's thesis, International Islamic University Malaysia). 2008.
7. Tapah S. Konsep dan Amalan Pembahagian Harta Sepencarian. In: Akmal Hidayah Halim. Undang-undang Hartadan Amanah. International Islamic University Malaysia.2009.
8. Kamaruddin Z. Hukum Harta Sepencarian Dari Sudut Pandangan Wanita Peneroka FELDA. In: Akmal Hidayah Halim. Undang-undang Hartadan Amanah. International Islamic University Malaysia.2009.
9. al-Zuhaily W. al-Fiqh al-Islami wa Adillatuh. Dar al-Fikr.2010.

The Green and Sustainable Care Facilities of Elderly Care Home: An Exploratory study of Rumah Seri Kenangan Cheras, Selangor

Hasif Rafidee Hasbollah¹, Mohd. Nazaruddin Yusoff², Mohd Nasrun Mohd Nawi³

¹Faculty of Hospitality, Tourism and Wellness, Universiti Malaysia Kelantan, 16100 Kota Bharu, Kelantan, Malaysia; ²School of Government College of Law, Government and International Studies, Universiti Utara Malaysia, 06010, UUM Sintok, Kedah, Malaysia; ³School of Technology Management and Logistic, Universiti Utara Malaysia, 06010, UUM Sintok, Kedah, Malaysia

ABSTRACT

The terminologies of “Green Building” and “Sustainable Building” explore the practice of creating structures by using processes that are environmentally responsible and resource-efficient. This is done through examining a building’s life-cycle that is related with economy, utility, durability, and comfort of occupants. In Malaysia, “Green Building” and “Sustainable Building” for Care Facilities of Elderly Care Homes are still in its infancy. Elderly Care Home is a long term care facility that provides permanent living space and support for the elderly, with the activities of daily living that offers personal care and support. This research explores the Green and Sustainable Care Facilities of Elderly Care Home– Rumah Seri Kenangan (RSK) in Cheras, Selangor (GSch-RSK). RSK is established to provide care, treatment and shelter to the elderly poor, aged 60 years and above. It provides care and protection services; guidance and counselling; recreational activities; medical treatment; occupational therapy; and physiotherapy for the elderly to live in peace and enjoy a good quality of life. This research adopts observation, interview, and document review methods in gathering data. The findings indicate six characteristics of GSch-RSK which consists of (1) Location and Surrounding area of RSK which is explored and consisted of road, RSK building and green landscape; (2) Integrated Operation of Operations and Maintenance in daily cleaning and monthly elevator maintenance; (3) Healthy Environment of Atmosphere and Well-being that consist of bright colours and ventilation system (modern windows and exhaust fan); (4) Waste Management System that includes garbage removal and designated sewerage; (5) Energy Efficiency characteristic that is the installation of the Energy Efficiency Appliances and Solar Panel System; and (6) Sustainable and Green Management of Green Landscape which has been practiced by setting up Rain Garden and planting Edible Green leaves and flowers. All these characteristics are vital in developing the theoretical framework of Green and Sustainable Care Facilities of Elderly Care Homes in Malaysia. Finally, these characteristics will be used for the development framework of existing buildings of Elderly Care Homes in Malaysia.

Keywords: *Green, Sustainable, Care Facilities, Elderly Care Home, Exploratory.*

INTRODUCTION

The word “Green Building” and “Sustainability Building” are gaining popularity in the building construction development. They are used interchangeably for development projects for residential homes, commercial buildings, schools, institutional buildings, and care facilities (Eichholtz et al.¹⁰; Larsen²²; MohdNazaruddinYusoff et al.³¹).

“Green Building” is designed to reduce the overall impact of the built environment on human health and

the natural environment with the efficient usage of energy, water, materials, and other resources; protecting occupant health by improving employee productivity; reducing waste, pollution and environmental degradation of the building life cycle (Howe¹⁷; EPA¹¹).

“Sustainable Building” is constructed for integral quality of a building which includes economic, social and environment. It is designed to maximise aesthetic quality, life cycle-cost, has a minimum environmental impact, and provides a healthy environment for users (OECD³⁶; Feige et al.¹³; Kibert²⁰).

According to Berardi¹ “Sustainable Building” is a “GreenBuilding” that goes further in making the best adaptive use of the building which provides a sense of community, and increases social equity, cultural heritage, human health, healthy environments, and at the same time maintaining an effective level of operations and maintenance.

“Sustainable Building” incorporates all environmental, social and economic aspects, while “Green Building” refers to the environmental leg of sustainability or the economic leg(Yanarellaet. Al⁴⁸).

The terminologies of “Green Building” and “Sustainable Building” explore the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building’s life-cycle that are concernedwithetheconomy, utility, durability, and comfort of users and occupants.

Therefore, whether it is “Green Building” or “Sustainable Building”, both the terminologies encompass the practice of creating and using healthier and more resource-efficient models of building development constructionin the sustainable world.

Green and Sustainable Care Facilities for Elderly Care Home: The United Kingdom is one of the developed countries that practices “Green and Sustainable Building” for care facilities which has the “Minimum Standard Care Home” (Ministry of Health United Kingdom²⁷).The Green Building Council’s LEED for Existing Buildings: Operations and Maintenance (2008) has released “The Green Guide for Health Care” that practices “Green”. The Green Guide for Health Care¹⁵ provides guidance to integrate enhanced environmental health principles and practices into the planning, design, construction, operations and maintenance of sustainable healthcare facilities. The guide has already played an important role in spurring development of healthier building materials and gives the healthcare industry especially for the Elderly Care Home.

The development of “Green” House Project and Eden Alternative is an example of the new America’s National Model that exercises the “Green” and “Sustainable” Elderly Care Home Programmes. The Model provides a home-like atmosphere, including physical environment and social functions of Elderly Care Home (Rabiqet. Al⁴⁰; Koren²¹; Zimmerman and Cohen⁴⁹). It incorporates environmental aspects of “Green” living with the access

of plenty of sunlight, plants and garden areas; social function of warmth (living situation that consists of a layout, furnishing and decorations that encourages social activities), autonomy (the elderly has their own private room and bathroom) and intimacy (consists of clusters of smaller home care with 6 to 10 elderly).

In Malaysia, “Green Building” and “Sustainable Building” for Care Facilities especially Elderly Care Homes are still in its infancy. Only few researches are done on “Green” and “Sustainable Building” on Care Facilities such as “Opportunities for the Transfer of United Kingdom Best Practices for the Provision of Public Residential Care Facilities for the Elderly in Malaysia” by Noralfishah³⁴ and “The Minimum Standard Facilities at the Nursing Homes in Klang Valley” by Nik Muhammad Faris³³ However, to date there is no substantial findings on the characteristics of “Green Building” and “Sustainable Building” for Care Facilities especially in Malaysia. Therefore, this research attempts to explore the Green and Sustainable Care Facilities of Elderly Care Home in Malaysia.

METHODOLOGY

This research adopts observation, interview, and documents review methods to gather data by exploring the Green and Sustainable Care Facilities of Elderly Care Home–RumahSeri Kenangan(RSK) in Cheras, Selangor. Observation is used in theorising, generating descriptions and explaining the phenomena in the research (Malderez²⁶). The data from observational study can be integrated as auxiliary or confirmatory research (Gray¹⁴). In this study, observation method is used in collecting information that includes the process of “seeing” and theorising the characteristics of Green and Sustainable Care Facilities of Elderly Care Home.

An interview is conducted with the management of RSK to provide information on the characteristics of Green and Sustainable Care Facilities of Elderly Care Home - RSK. The semi-structured interview technique is used to cover a wide range of subject matter; a series of questions are in the general form of an interview schedule but it has the ability to diverge from the sequence of questions should the opportunity arise (Bryman and Bell³).

In this research, the documents of contracts and reports of the development of Green and Sustainable Care

Facilities of RSK are reviewed and analysed. Document analysis is a systematic procedure for reviewing and evaluating documents both printed and electronic material. It requires data to be examined and interpreted in order to elicit meaning, gain understanding, and develop empirical knowledge (Corbin and Strauss⁶; Bowen²).

Elderly Care Home-Rumah Seri Kenangan: Elderly Care Home is perceived as one of the long term care facilities. Long term care facilities are places that provide permanent living space and support for the elderly, with the activities of daily living that offers higher levels of personal care and support to elderly needs (Ministry of Health Care and Long Term Care²⁸). Nursing Homes, Hospitals, Hospices, and Care Homes are referred as long term care facilities (Philips and Chan³⁹; Sulaiman, 2013; Hasifet. Al¹⁶).

In Malaysia, Elderly Care Homes are known as Rumah Seri Kenangan(RSK). There are ten RSK that are supervised and managed by the Department of Social Welfare, Ministry of Women, Family and Community Development which are situated in Cheras, Selangor; Kangar, Perlis; Taiping, Kinta and Seri Iskandar, Perak; Seremban, Negeri Sembilan; Cheng Melaka; Johor Bahru, Johor; Kemumin, Kelantan; and Bedong in Kedah (Department of Social Welfare⁷).

RSK is established to provide care, treatment and shelter to the elderly poor and aged 60 years and above with care and protection services; guidance and counselling; recreational activities; medical treatment; occupational therapy; and physiotherapy for the elderly to live in peace and enjoy a good quality of life (Malaysian Institute of Economic Research²⁵; Selvaratnamet. Al⁴²; Department of Social Welfare⁷).

Theorising the Characteristics of Green and Sustainable Care Facilities for Elderly Care Home:

Most of the researches of the Green and Sustainable Care Facilities of Elderly Care Homes discuss the philosophy of resident care, staff culture and the physical structure of the care facilities (Doty et. Al⁹; Sharkey et. Al⁴³; Bowers and Nolet³; Care Quality Commission⁵). However, the aim of this study attempts to theorise the Characteristics of the Green and Sustainable Care Facilities of Elderly Care Home from the perspective of built environment.

The characteristics of “Green and Sustainable Building” are distinguished by Berardi¹ and Olaniyi³⁷. Table 1 indicates the characteristics of “Green and Sustainable Building”. The characteristics of “Green Building” illuminate the environmental friendly part of a building, while the characteristics of “Sustainable Building” highlight the built environment, social, and economic part of a building.

Table 1: The Characteristics of Green and Sustainable Building

Characteristics	Green Building	Sustainable Building
Consumption of non-renewable resources	/	/
Water consumption	/	/
Materials consumption	/	/
Land use	/	/
Impacts on site ecology	/	/
Urban and planning issues	/	/
Greenhouse gas emissions	/	/
Solid waste and liquid effluents	/	/
Indoor well-being: air quality, lighting, acoustics	/	/
Longevity, adaptability, flexibility		/
Operations and Maintenance		/
Facilities Management		/
Social Issues (access, education, inclusion, cohesion)		/
Economic considerations		/
Cultural perception and inspiration		/

Source: Adapted from Berardi¹ and Olaniyi³⁷

The characteristics of “Green and Sustainable Building” cover psychological and social functions of Care Facilities of Elderly Care Home with a meaningful building functionality. It caters the holistic concept of well-being which covers the location, design, and resource efficiency towards the healthy environment.

The Green Guide for Health Care (2008) is one of the resources and foundation to characterise the Green and Sustainable Care Facilities for Elderly Care Home. Table 2 shows the Required Green Guide for Health Care Facilities.

Table 2: The Required Green Guide for Health Care Facilities

Characteristics	Sub- Characteristics	Aim
Integrated Operations	Integrated Operations & Maintenance Process	Demonstrate a cross discipline in Operations and Maintenance decision-making and implementation to ensure safe, healthful, environmentally sensitive methods and materials.
Facilities Management	Energy Efficiency Best Practices: Planning, Documentation & Opportunity Assessment	Promote continuity of information to ensure that energy-efficient operating strategies are maintained and provide a foundation for training and system analysis.
	Minimum Building Energy Efficiency Performance	Establish the minimum level of energy efficiency for the building and systems.
	Refrigerant Management– Ozone Protection	Reduce stratospheric ozone depletion.
	Minimum Indoor Plumbing Fixture and Fitting Efficiency	Reduce indoor fixture and fitting water use within buildings to reduce the burdens on potable water supply and wastewater systems.
	Outdoor Air Introduction & Exhaust Systems	Establish minimum Indoor Air Quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the health and well-being of occupants.
	Environmental Tobacco Smoke (ETS) Control	Prevent exposure of building, occupants, indoor surfaces, and systems to ETS.
Chemical Management	Polychlorinated Biphenyl (PCB) Removal and Asbestos-Containing Materials (ACM) Management	Reduce the potential exposure of building occupants to PCB and ACM. Prevent associated harmful effects of these hazardous materials in new and existing buildings.
	Chemical Management Policy and Audit	Institute a comprehensive chemical management policy and audit process to establish a framework of policies and procedures to reduce and eliminate the use, emission and improper disposal of chemical hazards and toxic materials within the healthcare facility and to the surrounding community.
	Community Contaminant Reduction: Leaks & Spills	Mitigate leaks, spills and waterborne effluents to prevent releasing waterborne environmental, health and safety burdens to the site neighbours and surrounding community
Waste Management	Waste Management Plan	Institute a waste management plan to establish a framework of policies and procedures with a goal of zero waste.
	Waste Generation Profile and Measurement	Establish baseline generation rates of all waste categories to enhance environmental goal setting and performance tracking.

Source: Adapted from the Green Guide for Health Care¹⁵

Table 2: The Required Green Guide for Health Care Facilities (Continued)

Characteristics	Sub- Characteristics	Aim
Waste Management	Solid Waste Land Disposal	Prevent contamination of the land associated disposal of toxic, hazardous, infectious or radiological substances.
Environmentally Preferable Purchasing	Mercury Reduction	Protect the health of patients, staff, and visitors, reduce disposal costs and liability, by avoiding purchase of mercury-containing equipment, devices and phasing out existing mercury sources.
	Electronic Assets Environmental Management Plan	Reduce the environmental and health burdens associated with the manufacture, use and disposal of electronic products.

Source: Adapted from the Green Guide for Health Care¹⁵

There are five (5) Required Green Guide for Health Care Facilities, which are Integrated Operations, Facilities Management, Chemical Management, Waste Management, and Environmentally Preferable Purchasing. These five Required Characteristics are vital to ensure the standard and continuity of Green and Sustainable Building for existing care facilities.

In Malaysia, there are no guidelines, framework or standard Characteristics of Green and Sustainable Care Facilities of Elderly Care Home to date. However, the issues and phenomenon of “Green and Sustainable Building” have been discussed by MohdNazaruddinYusoff and KamarudinMohdNor (2014) in their book “Sustainable Development of Built Environment and Global Warming”. MohdNazaruddinYusoff (2011) also highlighted the characteristics concept of “Green and Sustainable Building” that include the following characteristics:

- i. Location and surrounding area;
- ii. Energy efficiency;
- iii. Healthy environment;
- iv. Integration design;

- v. Water supply management;
- vi. New development considerations;
- vii. Utilising the usage of resources; and
- viii. Site conservation.

The eight (8) characteristics of “Green and Sustainable Building” that have been mentioned by MohdNazaruddinYusoff (2011) are also adapted in theorising the Characteristics of the Green and Sustainable Care Facilities of Elderly Care Home in Malaysia.

Expoloring the Green and Sustainable Care Facilities of Elderly Care Home–RSK, Cheras, Selangor: In exploring the Green and Sustainable Care Facilities of Elderly Care Home (GSch)-RSK Cheras, Selangor, the underlying theory of Characteristics of Green and Sustainable Building (Berardi, 2013; Olaniyi, 2017); The Required Green Guide for Health Care (Green Guide for Health Care, 2008); and the Characteristic Concepts of Green and Sustainable Building (Mohd Nazaruddin Yusoff, 2011) are adapted. Table 3 indicates the exploration and findings of GSch-RSK.

Table 3: Exploration and Findings of GSch-RSK

Characteristics	Exploration and Findings
Location and surrounding	<ul style="list-style-type: none"> ● Location <ul style="list-style-type: none"> ● RSK Cheras is situated at Kilometre 18, JalanCheras, 43000 Kajang, Selangor and can be accessed by road transportations. ● Surrounding area <ul style="list-style-type: none"> ● The land estimation area is about 15 hectares which consists of road, RSK building (office, dormitory and other facilities) and green landscape (flowers and edible green leaves).

Conted...




<p>Integrated Operations</p>	<ul style="list-style-type: none"> ● Operations & Maintenance <ul style="list-style-type: none"> ● Operations of daily cleaning and disinfection are practiced at dormitory, floor, furnishings, office and bathroom. ● Monthly elevator maintenance is done to ensure the continuation of operation performance. <div style="text-align: center;">  </div> <p style="text-align: center;">Figure 1: Elevators in RSK</p>
<p>Healthy Environment</p>	<ul style="list-style-type: none"> ● Atmosphere well-being <ul style="list-style-type: none"> ● The colour of RSK building is painted white and cream. Bright colours are used for heat absorption reduction. ● RSK has modern transparent windows for ventilation that allows air, light and sound. ● Exhaust fan is used in Store and Kitchen to reduce moisture. <div style="text-align: center;">  </div> <p style="text-align: center;">Figure 2: Modern windows in RSK</p>

Table 3: Exploration and Findings of GSch-RSK (Continued)

Characteristics	Exploration and Findings
<p>Waste Management</p>	<ul style="list-style-type: none"> ● Waste Management System <ul style="list-style-type: none"> ● Residual and Garbage removal are managed by private company from RSK to disposal plant 3 times a week. ● RSK has designated sewerage that is managed by private company which incorporates the sewers, disposal pipes, and pumping stations. <div style="text-align: center;">  </div> <p style="text-align: center;">Figure 3: Designated sewerage in RSK</p>

<p>Energy efficiency</p>	<ul style="list-style-type: none"> ● Energy efficiency appliances <ul style="list-style-type: none"> ● The installation of appropriate electrical equipment such as an air conditioner, refrigerator and fans are according to ENERGY STAR standard benchmark. ● Solar Panel System <ul style="list-style-type: none"> ● The installation of Solar Panel System as a community sustainable project by a private company helps to absorb sunlight as source of energy to generate electricity. <div style="text-align: center;"> </div> <p style="text-align: center;">Figure 4: Solar Panel System in RSK</p>
<p>Sustainable and Green Management</p>	<ul style="list-style-type: none"> ● Green Landscape <ul style="list-style-type: none"> ● RSK has practiced sustainable and green landscape of Rain Garden to conserve water decrease runoff. ● Flowers and Edible Green leaves are planted in the landscape area of RSK. <div style="text-align: center;"> </div> <p style="text-align: center;">Figure 5: Rain Garden and Edible Green leaves in RSK</p>

DISCUSSION

The findings indicate six characteristics of GSch-RSK are gathered. The location and surrounding area of RSK is explored and consisted of road, RSK building and green landscape. Mohd Nazaruddin Yusoff and Kamarudin Mohd Nor³⁰. Asserted that the location and surrounding area have a huge impact towards green and sustainable building. The locality of the building surrounded by the green landscape helps to reduce heat and increase the energy efficiency. Retaining and sustaining the green landscape contributes to the local water sources and the surrounding area fertility of the soil.

The Integrated operation characteristic discovers that RSK has practiced Operations and Maintenance (OM)

of daily cleaning and monthly elevator maintenance. The International Facility Management Association or IFMA¹⁸ states that “OM is essential in maintaining the original anticipated useful life and the original intended usage of a fixed asset. OM is the upkeep of property and equipment that includes periodic inspection, adjustment, lubrication, cleaning (non-janitorial), painting, replacement of parts, minor repairs, and other actions to prolong service and prevent unscheduled breakdowns”.

According to the Green Guide for Health Care¹⁵, the objectives of OM for Care Facilities are to ensure safe, healthful, environmentally sensitive methods and materials. The characteristics of OM are also mentioned by Berardi¹ and Olaniyi³⁷ in Sustainable Building criteria.

MohdNazaruddinYusoff²⁹ has highlighted that Healthy Environment as one of the characteristics of “Green and Sustainable Building”. He illustrates that, Healthy Environment of Atmosphere Well-being exists in RSK. Atmosphere Well-being is the basic human rights that includes the rights to breathe clean air, the rights to thermal comfort, the rights to visual health and comfort (WHO^{46,47}). The Atmosphere Well-being consists of bright colours (RSK building) and ventilation system that includes modern windows and exhaust fan. The bright colours help to reflect heat away from the building (LEED²³). The ventilation system improves indoor air quality for enhancement of occupants comfort, productivity, and well-being to reduce the chances of ill health (Paola³⁸; LEED²⁴; Siew⁴⁴).

The findings indicate that RSK has exercised the waste management system that includes garbage removal and designated sewerage. The garbage removal service is operated three times a week transported from RSK to Solid Waste Land Disposal. According to Green Guide for Health Care¹⁵ Solid Waste Land Disposal aims to prevent contamination of the land associated disposal of toxic, hazardous, infectious or radiological substances. The Designated Sewage is a sewerage system that collects and transports sewage to a required level, uses, disposes of or discharges effluent, bio solids, methane or any other products from the sewage treatment process and returning them to the environment (New South Wales Department of Urban Affairs and Planning³²). The Waste Management System is administered by an appointed private company.

RSK has taken up the Energy Efficiency Characteristics by the installation of the Energy Efficiency Appliances and Solar Panel System. The usage of electrical appliances with ENERGY STAR standard and renewable Solar Panel. The Energy Efficiency Characteristics are related to the equipment that helps to do more work with less energy usages whilst providing the same service. It is a strategy for decreasing the usage of energy and has negative impacts on the environment (Joelsson and Gustavsson¹⁹; Rosen⁴¹; Wang et. Al⁴⁵, Olaniyi³⁷).

Sustainable and Green Management of Green Landscape have been practiced by RSK by setting up a Rain Garden. A Rain Garden is a depressed area in the landscape that collects rain water from a roof, driveway or street and allows it to soak into the ground and is used by the plants (Environmental Protection Agency¹²). The Green Landscape of RSK is planted with flowers and Edible Green leaves which are beautiful, cost-effective and reduce water runoff.

CONCLUSION

In conclusion this exploratory study has observed six important characteristics. Firstly, the characteristic of GSch-RSK begins with the Location and Surrounding Area, which is the locality of the building surrounded by the green landscape. Secondly, it is the exploration of Integrated Operation of OM that discusses the Cleaning Operation and Elevator Maintenance in ensuring safe and healthy environment. Then, the Healthy Environment of Atmosphere Well-being is discovered in GSch-RSK. This consists of bright colours and good ventilation system for occupants and productivity. Another characteristic of GSch-RSK is Waste Management System that includes Garbage Removal Service to Solid Waste Land Disposal and Designated Sewage for green environment. Next, is the Energy Efficiency that includes the installation of electrical appliances with ENERGY STAR standard and renewable Solar Panel. Finally, it is the Sustainable and Green Management characteristic that consists of Rain Garden and Edible Green that have been set up.

All these characteristics are vital in developing the theoretical framework of Green and Sustainable Care Facilities of Elderly Care Homes in Malaysia. Eventually, these characteristics will be used for the development framework of existing buildings of Elderly Care Homes in Malaysia.

ACKNOWLEDGMENT

Special thanks are directed to the Ministry of Women, Family and Community Development, Department Social Welfare and Rumah Seri Kenangan, Cheras, Selangor for material support and cooperation given for this research.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Berardi U. Clarifying Assessment in the Interpretations of the Concept of Sustainable Building. *Sustainable Cities and Society*. 2013;8:72 – 78.
2. Bowen G. A. Document Analysis as a Qualitative Research Method. *Qualitative Research Journal*. 2009;9(2):27-40.

3. Bowers B. J, Nolet K. Developing the Green House Nursing Care Team: Variations on Development and Implementation. *The Gerontologist*. 2014;54(S1):S53-S64.
4. Bryman A, Bell E. *Business Research Methods (Second Edition)*. Oxford: Oxford University Press. 2007.
5. Care Quality Commission. *The Green Nursing Home Inspection Report*. 2017 June16. <http://www.cqc.org.uk/location/1-206809853/reports>.
6. Corbin J, Strauss A. *Basic of Qualitative Research: Technique and Procedures for Development Grounded Theory (Third Edition)*. California: Sage Publications. 2008.
7. Department of Social Welfare. *Rumah Seri Kenangan*. 2018.
8. <http://www.jkm.gov.my/jkm/index.php?r=portal/left&id=M2k3Q2xST0JJWE9>
9. Doty M. M, Koren M. J, Sturla E. J. *Culture Change in Nursing Homes: How Far Have We Come? Findings from the Commonwealth Fund National Survey of Nursing Homes*. 2008.
10. Eichholtz P, Nils K, Quigley J. M. *Doing Well by Doing Good? Green Office Buildings*. 2009. <http://escholarship.org/uc/item/4bf4j0gw>.
11. Environmental Protection Agency. *Why is Green Building?*. 2016. <https://archive.epa.gov/greenbuilding/web/html/>
12. Environmental Protection Agency. *Soak Up the Rain: Rain Gardens*. 2018. <https://www.epa.gov/soakuptherain/soak-rain-rain-gardens>
13. Feige A, Wallbaum H, Marcel Janser M, Windlinger L. *Impact of Sustainable Office Building on Occupant's Comfort and Productivity*. *Journal of Corporate Real Estate*. 2013;15(1):7 – 34.
14. Gray D. E. *Doing Research in the Real World (Second Edition)*. California: Sage Publications. 2009.
15. Green Guide Health Care. *Best Practices for Creating High Performance Healing Environments*. 2008. <http://www.gghc.org/documents/Version2.2/GGHC-v2-2-Ops-08Rev.pdf>.
16. Hasif R. H, NurulHafizah M. Y, MohdFirdaus M. N. *Introduction to Nursing Home*. Kuala Lumpur: Power Action Resources. 2015.
17. Howe J. C. *Law of Green Buildings: Regulatory and Legal Issues in Design, Construction, Operations, and Financing*. New York: American Bar Association. 2011.
18. IFMA. *The Business of FM: An IFMA Fundamentals Based Course*. USA: International Facility Management Association. 2006.
19. Joelsson A, Gustavsson L. *District Heating and Energy Efficiency in Detached Houses of Differing Size and Construction*. *Applied Energy*. 2009;86(2):126-134.
20. Kibert C. J. *Sustainable Construction: Green Building Design and Delivery, 4th Edition*. New Jersey: John Wiley & Sons. 2016.
21. Koren M. J. *Person-centred Care for Nursing Home Residents: The Culture Change Movement*. *Health Affairs*. 2010;29:312-317.
22. Larsen D. *The Green House Project: The Next Big Thing in Long-Term Care?*. 2015. <http://www.aplaceformom.com/blog/green-house-project-next-big-thing-in-long-term-care/>
23. LEED. *Checklist: LEED v2008 for Homes*. 2008. <https://www.usgbc.org/resources/homes-v2008-checklist-xls>
24. LEED. *New Construction and Major Renovations Rating System*. US Green Building Council. 2009.
25. Malaysian Institute of Economic Research. *Caring for the Elderly*. 2006. http://www.mier.org.my/newsarticles/archives/pdf/chaynee_17-4-2006.pdf
26. Malderez A. (2003). *Key Concepts in ELT: Observation*. *ELT Journal*. 2003 April;57/2:179 – 181.
27. Ministry of Health United Kingdom. *Minimum Standard Care Home in United Kingdom. Care Home for Older People*. 2003;21-26.
28. Ministry of Health Care and Long Term Care. *Ministry of Health and Long-Term Care's Emergency Response Plan*. 2013. http://www.health.gov.on.ca/en/pro/programs/emb/pan_flu/docs/emerg_resp_plan.pdf

29. MohdNazaruddinYusoff. Kelestariandalam Pembangunan Hartanah (Sustainability in Property Development).Unpublished PhD Thesis. University Malaysia Perlis. 2011.
30. Mohd Nazaruddin Yusoff and Kamarudin Mohd Nor. Pemanasan Global dan Pembangunan Lestari Alam Bina (Sustainable Development of Built Environment and Global Warming). UUM Press. 2014.
31. Mohd Nazaruddin Yusoff, Kamarudin Ngah, Azlizan Talib and Mohd Fitri Abdul Rahman. The Acceptance of Buyer to the Greenhouse Residency Concept. *International Journal of Supply Chain Management*. 2016 Dec;5(4):161- 165.
32. New South Wales Department of Urban Affairs and Planning. Sewerage System: Environment Impact Statement. 1996. <http://www.planning.nsw.gov.au/~media/Files/DPE/Guidelines/sewerage-systems-eis-guideline-1996-10.ashx>.
33. Nik Muhammad Faris N. N. The Minimum Standard Facilities at the Nursing Homes In Klang Valley. Master Thesis. Universiti Malaysia Kelantan. 2017.
34. Noralfishah S. Opportunities for the Transfer of United Kingdom Best Practices for the Provision of Public Residential Care Facilities for the Elderly to Malaysia. PhD Thesis. University of Salford. 2012.
35. Noralfishah S. The Future of Healthcare and Engineering Management.Proceeding of Healthcare Facilities and Engineering Management Forum Asia. 2013 August 27-28;JW Marriott Hotel Kuala Lumpur, Malaysia.
36. OECD. Organisation for Economic Co-operation and Environment. Environmentally Sustainable Buildings: Challenges and Policies. Paris: France. 2003.
37. Olaniyi O. Development of a Facilities Management Framework for Sustainable Building Practice in Nigeria. PhD Thesis. University of Central Lancashire, United Kingdom. 2017.
38. Paola S. Strategies for Sustainable Architecture. London: Taylor and Francis. 2006.
39. Philips D. R, Chan A. C. M. Ageing and Long Term Care: National Policies in Asia Pacific. Canada: IDRC. 2002.
40. Rabiq J, Thomas W, Kane R. A, Cutler L. J, McAlilly S. Radical Redesign of Nursing Homes: Applying the Green House Concept in Tupelo, Mississippi. *The Gerontologist*. 2006;46:533-539.
41. Rosen M. A. Energy Sustainability: A Pragmatic Approach and Illustrations. *Sustainability*. 2009;1:55-80.
42. Selvaratnam D. P, Abu Bakar N, Idris N. A. Economic Well-being and Morbidity of the Elderly in Malaysia. *Journal of Modern Accounting and Auditing*. 2010;6(4):45-51.
43. Sharkey S. S, Hudak S, Horn S. D, Howe J. Frontline Caregiver Daily Practices: A Comparison Study of Traditional Nursing Homes and The Green House Project Sites. *Journal of American Geriatrics Society*. 2011 Jan;59(1):126 – 131.
44. Siew C. C, CheAni A. I, Tawil N M, Abdullah N. A. G, Mohd Tahir M. Classification of Natural Ventilation Strategies in Optimising Energy Consumption in Malaysia Office Building, *Journal of Procedia Engineering*. 2011;20:363-371.
45. Wang S, Yan C, Xiao F. Quantitative Energy Performance Assessment: Methods for Existing Buildings, *Energy and Buildings*. 2012;55:873-888.
46. WHO. Constitution adopted by the International Health Conference, New York, 19thJune – 22nd July 1946, with amendments adopted by the 20th, 26th, and 29thWorld Health Assemblies, 1975, 1977, and 1984. World Health Organisation, Geneva. 1985.
47. WHO. WHO/EURO 2000. The Right to Healthy Indoor Air. EUR/00/5020494, World Health Organisation, Regional Office for Europe, Copenhagen. 2000.
48. Yanarella E. J, Levine R. S, Lancaster R. W. Green versus Sustainability from Semantics to Enlightenment. *Sustainability*. 2009;2(5):296-300.
49. Zimmerman S, Cohen L. W. Evidence behind the Green House and Similar Models of Nursing Home Care. *Aging Health*. 2010;6:717-737.

Travel Motivation of Malaysian University Students

Ahmad Edwin Mohamed¹, Kalsom Kayat²

¹*School of Tourism, Hospitality and Event Management;* ²*Othman Yeop Abdullah Graduate School of Business, Universiti Utara Malaysia*

ABSTRACT

The segment of youth travel has been considered a niche market and was treated as a branch of the tourism industry. In the past few decades, its market value has begun to increase significantly bringing real benefits to the companies tapping into this segment by developing appropriate strategies and policies. Given its significance, there have been an increasing number of researches in this topic with a focus on university students market, which have been largely neglected in the past. This study in particular, utilized the push and pull analysis in decrypting university students motivation to travel. For that purposes, a total of 500 students from Universiti Utara Malaysia were selected for the self-administered surveys using systematic random sampling approach. The statistical analysis indicates that several push and pull factors were considered very important for the university students in making travel decisions. In addition to that, travel characteristics of university students revealed crucial information for travel suppliers and marketers in delivering specialised services that could satisfy their unique needs and desires.

Keywords: *Travel Motivation, Push and Pull Factors, University Students.*

INTRODUCTION

Youth travel is one of the fastest growing and most dynamic markets of the global tourism sector. According to World Youth, Student and Education Travel Confederation (WYSE), youth traveller businesses generated USD285 billion towards global tourism receipts in 2017, affirming their financial value to the global tourism industry and local economies¹. United Nation World Tourism Organisation (UNWTO) has also projected that by the year 2020, the number of youth travellers will rise to 300 million². The power of youth travel is not solely an economic story. The social and cultural benefits for the young traveller and the communities that host them are far reaching, long-term and measurably more sustainable than other forms of tourism.

In Malaysia, youth is defined as those who belong to the age group of between 15 to 40 years old³. There were about 10.1 million youth within the above age group in 2005, and this number has grown since then⁴. In fact, the majority of university students also belong to this group. Currently, there are about 566,266 university students enrolling in the local public universities, and another 608,378 in private universities as in 2015⁵. This

is a significant volume for a niche market of youth travel that has been largely neglected by the tourism industry. Unfortunately, there is no statistics on local university student travel market reported thus far.

Studies on travel motivation have received considerable attention for the past decades^{6, 7, 8}. It is because, motivation can be considered as one of the most important variables that predict tourist behaviour^{6, 9}. Such information is highly needed by both the practitioners and researchers to make important decision on how to successfully develop and promote a sustainable destination. In marketing, it is also very crucial to understand why a person travel and make decision about where to go and what to do at the destinations.

Currently there have been a growing researches conducted to understand youth travel markets. This growing interest could be attributed to the substantial growth of youth travellers¹⁰. Moreover, the youth market has the potential to be a very lucrative market segment^{11, 12}. WYSE Travel Confederation¹⁰ also reports that young and youth travellers comprise a group of 'loyal repeat consumer', and recommends that travel sectors focus on this market by providing specific products tailored to meet their needs.

Despite ample studies on youth travel motivation, very little focus have been put on understanding university students' travel market in particular^{7, 13, 14}. There are several reasons for the limited studies in this area. First, the existing studies on youth travel market are assumed to be adequate to address university students travel behaviour⁷. This is attributed to the fact that there is a predominant belief that students' travel is homogeneous to youth travel market. Secondly, there are some difficulties in measuring student travel behaviour due to scarcity of related studies.

The research objective for this study was mainly to examine the push and pull factors that influence university students' travel decision. In addition to that, several other information related to the common holiday activities and source of information searched by students in making travel decision were also investigated.

LITERATURE REVIEW

Motivation being an important factor influencing an individual into action, it would be useful to understand how a particular decision is arrived at. Travel motivation is the set of needs and attitudes which predispose a potential tourist to act in a specific goal-directed away^{8, 15}. There are a number of studies on motivation in the tourism industry using different theories the likes of Gray's¹⁶ sunlust and wanderlust typology of tourists, Dann's¹⁷ push and pull model, Iso-Aloha's¹⁸ optimal arousal theory, Pearce and Lee's¹⁹ travel career ladder, and various adapted versions. However, the most widely used approach in understanding travel motivation is push and pull model. Scholars claimed that push factor originates from Maslow's hierarchy of needs in which a motivation arises when there is deficiency in a person's needs²⁰. A study by Uysal and Jurowski²¹ found that many of the push factors were derived from intangible or intrinsic desires of human beings, including the desire for escape, rest and relaxation, adventure seeking, novelty seeking, dream fulfilment, health and fitness, prestige, and socialization. Pull factor on the other hand relates to destination-specific characteristics that may fulfil a person's needs to travel^{18, 22}. For example, people from temperate climate countries often visit tropical tourist destinations that offer sunny weather the likes of Hawaii and Bali which enables them to escape from harsh winter.

Currently researches on student travel motivation are limited but gaining momentum. A study by Perrett²³ for example identified that five main travel motives that

drive youth to travel as intellectual, social, competency, stimulus avoidance, and other generic motives. The findings suggest that the most dominant motive for travel was intellectual motives. These include the activities of learning, exploring, discovering, creating, and imagining. Some travel motives were found to differ significantly with socio-demographic variables such as gender and education level. Meanwhile, travel characteristics such as size of travel group, length of stay, fund available, mode of transportation, and booking method were also found to correlate positively with a number of travel motives.

Bicikova⁷ on the other hand proposed only two dimensions of motivation factors simply as push and pull factors. Under the push factor, three motives were highly rated including discovering new places, good times with friends, and mental relaxation. Meanwhile under pull factor - price, beautiful environment, and climate became the main motives for travel amongst British university students. The study also identified four distinct clusters namely 'the sun-seeker', 'the sightseers', 'the in-betweeners', and 'the clubbers' based upon their holiday activities.

Kim, Oh, and Jogaratnam's¹⁴ research on United State college student travel motivations indicated that there were seven push motives including knowledge, sport, adventure, relax, lifestyle, travel bragging, and family. Three top motives recorded were knowledge, sport and adventure. A study by Paris and Teye²⁴ on backpackers using university students as the survey subjects assigned travel motivation as personal growth, experiential, relaxation, cultural knowledge, budget travel, and being independence. This study however, did not use push and pull factor model as a reference. Instead, they used travel career pattern as the theoretical framework. Further analysis also indicated that all the travel motivations differ significantly according to travel frequencies (or experience) except for cultural knowledge motives.

A recent study by Cavagnaro and Steffieri⁸ on student travel motivations discovered three factors as culture, escapism and relaxation, and vogue. Each factor represents both push and pull motivations. For example, motives such as to know different cultures, feel independent, interact with other people, and study/work can be categorised as 'push' under the cultural factors. Meanwhile, under the same cultural factor, seeing a beautiful place can be considered as 'pull'. The rest of the factors; escapism and relaxation motives are self-explanatory, and vogue on the other hand refers to the influences of fashion trends on travel needs.

A study in Malaysia carried out by Mohamad and Jamil²⁵ identified the travel motives into 11 factors namely escape, self-actualization, rest and relaxation, medical treatment, health and fitness, visiting friends and relatives, meeting new people, novelty seeking, culture exploration, enjoying nightlife and shopping, and lastly adventure seeking. All these internal motives (or push factor) then were categorised under several factors namely, Psychological Factor (i.e. escape and self-actualization), Physical Factor (i.e. rest and relaxation, medical treatment, health and fitness), Social Interaction (i.e. visiting friends and relatives, meeting new people), Seeking or Exploration Factor (i.e. novelty seeking, culture exploration, enjoying nightlife and shopping, and lastly adventure seeking). The above categorization of travel motives in their study was borrowed from Hsu, Tsai and Wu²⁶. However, these travel motives differ from destination to another. Thus, the choosing of destination depends on the push factors that drive tourist to travel in the first place.

METHODOLOGY

In this research, the quantitative research approach was chosen to answer the research objectives. Generally, quantitative research is about asking people for their opinions in a structured way so that the researcher can produce hard fact and statistics as a guidance²⁷. To get reliable statistical results, it is important to survey people in fairly large number and to make sure they are a representative sample of the target market. According to Kumar et al²⁷ quantitative approach is where the researcher decides what to study, ask specific questions, narrow the scope of the question, collect data that can be translated from participants, analyse these numbers using statistics and carry out an inquiry in an objective and unbiased manner.

Sampling Procedures: The population of this study was the students of Universiti Utara Malaysia, one of the largest universities situated in the northern part of Malaysia. Currently, there are 18,000 students staying full-time in the main campus²⁸. This study employed systematic random sampling by targeting university students who are between 18 to 33 years old following Bicikova⁷. The appropriate sample size for this study was 377 based on Krejcie & Morgan²⁹. However, the actual sample selected in this study was 500 respondents in an attempt to increase the accuracy of the data.

Instrumentation: The survey questionnaire was designed consisting of a combination of close-ended and open-minded questions. Both of the motivation variables were developed on the basis of a review of the

related literature and modified to apply to the research site and target population^{7, 22}. A five point Likert-type scale was used as the response format for the motivation variables, with assigned values ranging from 1 being “Not at all important”, to 5 being “Very important”. The respondents were asked to read each statement then tick the box to the right of the statement that best describes their answers. The following table exhibits the detailed instrument used in this study.

Table 1: Research instrument

Items		Measurement
Push Factors		
1.	Discover new places and cultures	1 to 5 point Likert-type scale
2.	Have a good time with friends	
3.	Relax mentally	
4.	Avoid everyday routine	
5.	Develop a closer relationship with others	
6.	Relax physically	
7.	Be indulged	
8.	Meet new people	
9.	Being daring and adventure some	
10.	Finding thrills and excitements	
11.	Clubbing/night club	
12.	Gaining knowledge	
13.	Coursework requirement	
Pull Factors		
1.	Easy access	1 to 5 point Likert-type scale
2.	Affordable	
3.	Safety	
4.	Beautiful natural environment	
5.	Cultural and historical places	
6.	Local food and drink	
7.	Friendly local people	
8.	Authentic/untouched places	
9.	Cold Climate (e.g. highland destinations)	
10.	Famous tourist sites	
11.	Seaside/beaches	
12.	Popularity of the place among young people	
13.	Nightlife and entertainment	
14.	Shopping opportunities	
15.	Adventure activities	
16.	Party reputation of the destination	
17.	Sports facilities	
18.	Attractive events	

Source: adapted from Bicikova⁷, Kim et al²²

Data Collection Procedure: The questionnaires were distributed using systematic random sample of students visiting the library. The library is considered as one of the students’ meeting point within the campus. Thus, every 5th respondents passing through the library were selected for this survey.

Data Analysis: Data analysis was carried out using SPSS (Statistical Package for the Social Sciences) version 20.0 for windows in two major steps. Firstly, descriptive statistics analysed the demographic profiles and travel characteristics of respondents. Secondly, another descriptive analysis was conducted on travel motivations(i.e. push and pull factors) among the university students.

FINDINGS

The total number of respondents in this study was 500 students enrolling in various degree programmes at Universiti Utara Malaysia. The analysis indicates that the majority of respondents were female totalling 66.6 percent. Meanwhile in terms of age group, the majority were between 18-25 years (89.4%). The biggest ethnic group were Malay (59.6%), followed by the Chinese (26.6%), Indian (8.0%), Siamese (0.6%), and others (5.2%). In terms of family’s income, a large proportion earned between RM1001 to 3000 per month (34.6%), and followed closely by the income group of between RM3001 to RM5000 per month (30.8%). The details are depicted in Table 2 below.

Table 2: Respondents’ demographic profiles

Profiles	Frequency	Percentage
Gender		
Male	167	33.4
Female	333	66.6
Age		
18-25	447	89.4
26-30	45	9.0
31-35	8	1.6
Ethnic		
Malay	298	59.6
Chinese	133	26.6
Indian	40	8.0
Siam	3	0.6
Others	26	5.2

Conted...

Nationality		
Malaysian	448	89.6
Non-Malaysian	52	10.4
Family Income		
Below RM 1000	72	14.4
RM 1001-3000	173	34.6
RM3001-5000	154	30.8
RM 5001- 700	48	9.6
Above 7000	49	9.8

Travel Characteristics: The travel behaviour of respondents was also captured in terms of amount of money spent, travel companion, types of tour, type of accommodation, and information source for travel. From the analysis, it was found that the majority of respondents spent below RM500 per trip (70.6%), and tend to travel with friends (73.0%). At the same time, the respondents also have high tendency to travel independently without packaged tour (79.6%).The types of accommodation highly preferred by respondents were budget hotel (26.2%), hotels with rating of 1 to 3 star (23.2%), and homestay (20.6%).

The descriptive result also presents the preferred holiday activities among university students. The analysis suggests that the most preferred activities during travel were trying local foods (85.0%), visiting interesting places (84.2%), sightseeing (64.4%), shopping (62.8%), and water and beach activities (53.8%). Meanwhile, the five top sources of information referred by the students were social media (70.0%), word-of-mouth (49.0%), youtube (42.4%), official destination website (37.4%), and travel booking website (31.4%). The details can be seen in Table 3 below.

Table 3: Travel Characteristics

Factors	Frequency	Percentage
Amount of money spent per trip		
RM1–500	345	70.6
RM501–1000	76	15.5
RM1001–1500	21	4.30
RM1501–2000	22	4.49
RM2001 and above	25	5.11
Travel Companion Last Trip		
With friends	365	73.0
With family	110	22.0

Conted...

Alone	24	4.8
Types of Tour		
Independent Tour	398	79.6
Packaged Tour	95	19.0
Accommodation Chosen During Last Trip		
Budget Hotel	131	26.2
1 to 3 star hotel	116	23.2
Homestay	103	20.6
Stay at friend or relatives house	72	14.4
4 to 5 star hotel	42	8.4
Youth Hostel	34	6.8
Holiday Activity		
Trying local foods	425	85.0
Visiting interesting places	421	84.2
Sightseeing	322	64.4
Shopping	314	62.8
Water & beach activities	269	53.8
BBQ or picnic	257	51.4
Recreation & adventure activities	233	46.6
Discovering local culture	213	42.6
Socializing with others	193	38.6
Sport and physical activities	163	32.6
Visiting museums & heritage sites	135	27.0
Clubbing	118	23.6
Information Source for Travel		
Social media	350	70.0
Word-of-mouth	245	49.0
Youtube	212	42.4
Official destination websites	187	37.4
Travel booking websites	157	31.4
Travel brochure	87	17.4
Radio	59	11.8
Television	55	11.0
Magazines	53	10.6
Newspaper	43	8.6

Push and Pull Factors Analysis: The following section discusses the results of descriptive analysis of the understudy variables. Table 4 lists the five top push factors that drive students to travel as mental relaxation (m=4.42), having good time with friends (m=4.38), to discover new places and culture (m=4.26), physical relaxation (m=4.17), and gaining knowledge (m=4.16). Meanwhile, the least important push factors were found to be coursework requirement (m=3.79), and clubbing/night club (m=2.92).

Table 4: Push Factor Analysis

Push Factors	Mean Value	Ranking	Standard Deviation
Discover new places and cultures	4.26	3	.641
Have a good time with friends	4.38	2	.632
Relax Mentally	4.42	1	.684
Avoid everyday routine	4.01	8	.959
Develop a closer relationship with others	4.13	6	.905
Relax physically	4.17	4	.930
Be indulged	3.93	10	.906
Meet new people	3.85	11	1.025
Being daring and adventuresome	3.97	9	.924
Finding thrills and excitements	4.08	7	.894
Clubbing/night club	2.92	13	1.501
Gaining knowledge	4.16	5	.835
Coursework requirement	3.79	12	1.025

The following table on the other hand exhibits the results of descriptive analysis for pull factor. The top five factors that drive students to choose travel destinations were affordable (m=4.39), beautiful natural environment (m=4.32), local food and drink (m=4.31), safety(m=4.28), seaside and beaches(m=4.28), and easy access (m=4.26). Meanwhile, the least important factors in choosing holiday destination for students were shopping opportunities (m=3.92), sport facilities (m=3.80), and party reputation of destination (m=3.68).

Table 5: Pull Factor Analysis

Pull Factors	Mean Value	Ranking	Standard Deviation
Easy access	4.26	5	.681
Affordable	4.39	1	.635
Safety	4.28	4 Tied	.931
Beautiful natural environment	4.32	2	.896
Cultural and historical places	4.08	11 Tied	.940
Local food and drink	4.31	3	.841
Friendly local people	4.24	6	.820
Authentic/untouched places	4.08	11 Tied	.881
Cold climate	3.95	12 Tied	.758
Famous tourist sites	4.17	8	.682
Seaside/beaches	4.28	4 Tied	.726
Popularity of the place among young people	4.14	9	.787
Nightlife and entertainment	3.95	12 Tied	.886
Shopping opportunities	3.92	13	.929
Adventure activities	4.09	10	.881
Party reputation of the destination	3.68	15	1.092
Sports facilities	3.80	14	1.012
Attractive events	4.21	7	.842

DISCUSSION

The analysis carried out has successfully answered all the research objectives laid out at the beginning of this paper. In particular, this research has able to determine the major push and pull factors sought after by university students when making travel decision.

University students in consensus agreed that mental relaxation, having good time with friends, to discover new places and culture, physical relaxation, and gaining knowledge as their main push motivation to travel. In particular, a mental relaxation from academic pressures at school became the top motivation to travel. In addition, as the majority of students were single, spending time with friends during travel was one of the most sought after experience for them. Meanwhile for pull factor, aspects such as affordability, beautiful natural

environment, local food and drink, safety, seaside and beaches, and easy access became their major motivation in choosing holiday destination. As the students rely heavily on parents or scholarships for sources of income, affordability became one of the most important criteria when choosing travel destination.

In terms of travel characteristics, a number of observations can be made. First, university students in general were found to choose budget hotel compared to higher scale hotel due to economic factor. Secondly, their preferred holiday activities were trying local foods and drink, visiting interesting places, shopping, and beach activities. In the contrary, very few were interested to visit museums and heritage sites. Museums and heritage sites might be perceived as unattractive for students to visit.

University students also in general used social media, word-or-mouth, and youtube as their main source of information when making decision to travel. In fact, very few went to look for information on television, magazines, and newspapers. Thus in conclusion, social media and internet became important medium in disseminating information about travel destinations compared to the traditional methods likes television and newspapers.

The major implications of this study can be explained in terms what the travel suppliers and travel marketers can do to meet the above travel motivations. For example, the main reason that pushes university students to travel was mental relaxation. Therefore, the travel experience offered must portray young people in relaxing mood, and having good times experiencing activities that are different from those in their everyday lives. Another aspect that should be focused on was the fondness of these university students for tasting the local food and drink at the destination visited. This in turn could open a greater opportunity for local entrepreneurs to offer a variety of street foods that not only cheap, but also appetizing.

In addition, the selection of marketing tools especially through social media and youtube should be designed in a way that attracts the attention of the university students. This study indicates that students rely heavily on social media and other internet platforms to access travel information. In addition, the travel service providers need to deliver travel experience in a satisfying manner as this could lead to positive word-of-mouth which was considered as the second most referred source of information among university students.

ACKNOWLEDGMENTS

The authors would like to thank the Universiti Utara Malaysia for the research funding (SO Code 13426) that enables this study to be completed.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. WYSE Travel Confederation (2018, May 11). Facts and statistics. [Online]. Available: <https://www.wysetc.org/about-us/facts-and-stats/>
2. UNWTO, "UNWTO annual report 2017", UNWTO, Madrid, 2017.
3. Government of Malaysia, Youth Societies and Youth Development Act 2007. Kuala Lumpur: Percetakan National Bhd, 2007.
4. Economic and Social Commission for Asia and the Pacific, "Youth in Malaysia: A review of the youth situation and national policies and programmes", United Nations, New York, 2002.
5. Ministry of Higher Education, Malaysian Higher Education Blueprint 2015-2025. Putrajaya: Ministry of Higher Education, 2016.
6. S Baloglu, M Uysal. "Market segments of pull and push motivations: A canonical correlation approach", *International Journal of Contemporary Hospitality Management*. 1996; vol. 8: no. 3: pp. 32-38.
7. K Bickova. "Understanding student travel behaviour: A segmentation analysis of British university students", *Journal of Travel and Tourism Marketing*. 2014; vol. 31: no. 7: pp. 854-867.
8. E Cavagnaro, S Staffieri. "A study of students' travellers values and needs in order to establish future patterns and insights", *Journal of Tourism Futures*. 2015; vol. 1: no. 2: pp. 94-107.
9. J L. Crompton. "Motivations for pleasure vacation", *Annals of Tourism Research*. 1979; vol. 6: No. 4: pp. 408-424.
10. WYSE Travel Confederation, "Global report on the power of youth travel 2016", UNWTO & WYSE Travel Confederation, Amsterdam, 2016.
11. M Bywater. "Market segment", *EIU Travel & Tourism Analyst*. 1993; vol. 3: pp. 35-51.
12. G Richard, J. Wilson. "The international student travel market: Travelstyle, Motivations, and Activities", *Tourism Review International*. 2004; vol. 8: no. 2: pp.57-67.
13. A B. Grigolon, A D A M. Kemperman, H J P. Timmermans. "Exploring interdependencies in students' vacation portfolios using association rules", *European Journal of Tourism Research*. 2012; vol. 5: no. 2: pp. 93-105.
14. K Kim, I-K Oh, G. Jogaratnam. "College student travel: A revised model of push motives", *Journal of Vacation Marketing*. Jan 2007; vol. 13: no. 1: pp. 73-85.
15. A Pizam, Y Neuman, A Reichel. "Tourist satisfaction uses and misuses", *Annals of Tourism Research*. 1979; vol. 6: no. 2: pp. 195-197.
16. H P. Gray. "An analysis of summer sun tourists – outbound package holiday from Dublin airport", *Irish Geography*. 1970; vol. 29: no. 2: pp. 106-115.
17. G M. Dann. "Tourism motivation: An appraisal", *Annals of Tourism Research*. 1981; vol. 8: no. 2: pp. 89-219.
18. S Iso-Ahola. "Toward a social psychology theory of tourism motivation", *Annals of Tourism Research*. 1982; vol. 12: pp. 256-262.
19. P L. Pearce, U. Lee. "Developing the travel career approach to tourist motivation", *Journal of Travel Research*. 2005; vol. 43: pp. 226-237,
20. E J. Mayo, L P. Jarvis. *The Psychology of Leisure Travel*. Boston: CBI Publishing, 1981.
21. M Uysal, C Jurowski. "Testing the push and pull factors", *Annals of Travel Research*. 1994; vol. 21: no. 4: pp. 844-846.
22. S S. Kim, C K. Lee, D. B. Klenosky. "The influence of push and pull factors at Korean national parks", *Tourism Management*. 2013; vol. 24: no. 2: pp. 169-180
23. Perrett. "Travel motivation of independent youth leisure travellers", Master Thesis, University of Manitoba, 2007.
24. M Paris, V Teye. "Backpacker motivations: A travel career approach", *Journal of Hospitality Marketing and Management*. 2010; vol. 19: no. 3: pp. 244-259.

25. Mohamad, R M. Jamil. "A preference analysis model for selecting tourist destinations based on motivational factors: A case study in Kedah, Malaysia", *Procedia Social and Behavioural Sciences*. 2012; vol. 24: pp. 20-25.
26. T K. Hsu, Y F. Tsai, H H. Wu. "The preference analysis for tourist choice of destination: A case study of Taiwan", *Tourism Management*. 2009; vol. 30: pp. 288-297.
27. MKumar, SA. Talib, TRamayah. *Business Research Methods*. Shah Alam: Oxford Fajar, 2013.
28. Student Affair Department, "Students statistics report". Student Affair Department, Sintok, 2016.
29. R V. Krecjie, D W. Morgan, "Determining sample size for research activities", *Educational and Psychological Measurement*. 1970; vol. 30: pp. 607-610.

Development of Malaysian Women Fertility Index

Shamshuritawati Sharif¹, Wan AznieFatihah¹, Adzmel Mahmud²

¹School of Quantitative Sciences, College of Arts and Sciences, Universiti Utara Malaysia, Sintok,, Kedah DarulAman; ²National Population and Family Development Board, Kuala Lumpur, Malaysia

ABSTRACT

A fertility rate is a measure of the average number of children a woman will have during her childbearing years. Malaysia is now facing a population crisis and the fertility rate continues to decline. This situation will have implications for the age structure of the population where percentages of senior citizens are higher than percentages of people aged below 5 years old. Malaysia is expected to reach aging population status by the year 2035. As the aging population has a very long average life expectancy, the government needs to spend a lot on medical costs for senior citizens and need to increase budgets for pensions. The government may be required to increase tax revenues to support the growing older population. The falling fertility rate requires proper control by relevant authorities, especially through planning and implementation of strategic and effective measures. Hence, this paper aims to develop a fertility index using correlation and Shannon's entropy method. The results show that Selangor, Johor, and Sarawak are among the states with the highest values of the fertility index. On the other end of the spectrum, Terengganu, W.P. Labuan, and Perlis are ranked in the last positions according to the fertility index. The information generated from the results in this study can be used as a primary source for the government to design appropriate policies to mitigate dwindling fertility rates among Malaysian women.

Keywords: correlation; entropy; fertility; Malaysia

INTRODUCTION

Women fertility is rated by the mean number of children that a woman will have during her childbearing years. Fertility patterns in the world have changed dramatically over the last few decades. Since the 1970s, a large number of developed countries such as United Kingdom, Canada, Denmark, and Germany have seen their fertility rates below replacement level⁶.

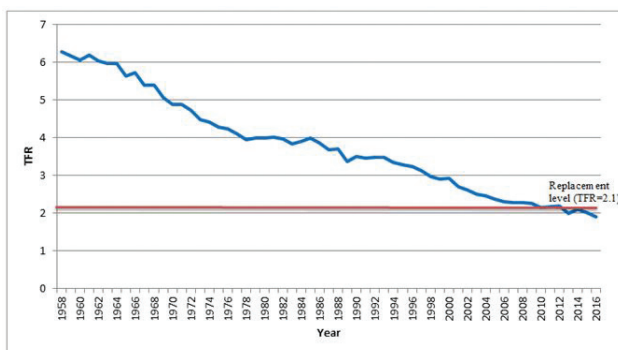


Figure 1: Total fertility rate in Malaysia from 1958-2016

As a developing country, Malaysia had experienced fertility declined over the years. Figure 1 shows the total

fertility (TFR) in Malaysia from 1958 to 2016. Malaysia has recorded a TFR of 6.28 in 1958 and steadily declined to 5.06 in 1969. Afterwards, the TFR had reached 4.09 in 1977 and reduced to 3.13 in 1997. Furthermore, the TFR was at par with the replacement level in 2010 which is only 2.1 children per woman. The lowest TFR ever recorded was in 2016 which is only 1.9 children per woman.

The negative influence of low fertility rate is the main cause to further investigate this topic. In society, low level of fertility rate is one of the economic challenges when the population age structure will be affected. In year 2035, Malaysia is projected to reach the status of aging population where 15 per cent of the total population will be at least 60 years old⁴. This situation presents a major fiscal challenge for the government. Currently, it is a serious problem for governments in terms of what the effects will be on healthcare, care services, and pensions. The increasing age is associated with higher morbidity, higher use of health services i.e. number of visits to doctors and hospitalizations, and greater demand for specialized services. All these factors will lead to an increase in the complexity of

health services required and increased the government expenditure. The government needs to spend a lot on medical costs for senior citizens and also needs to increase budgets for pensions. In order to support the growing older population, the government also required to increase the tax revenue. The falling fertility rate requires proper control by relevant authorities, especially through planning and implementation of strategic and effective measures.

To the best of the authors' knowledge, the official report on the Malaysian women fertility index has not yet been studied. Therefore, in this study, we present the mathematical development for measuring fertility index to discover the ranking of the women population ability to have children. The women fertility index is perform to demonstrate the rank of each state in Malaysia. The fertility index plays an important role to explain the fertility level for each state in Malaysia from "high fertility" to "low fertility", as it may help the government to design appropriate policies aimed at increasing fertility rates among Malaysian women.

For the development of women fertility index, there are several criteria that potentially related to the fertility behavior can be employed in developing the women fertility index based on previous researchers findings. In details, there are seven criteria that were used in this study as a potential determinant in fertility behavior which are place of living (urban or rural), age at first marriage, female tertiary education attainment, number of divorces, female participation in labor force, family planning methods, and female income.

In this study, the total number of children ever born (CEB) per woman was used as a measure of fertility. CEB is regularly used as proxy for fertility in various studies^{12, 3, 11}.

The rest of the paper is structured as follows. The next section defines the methodology which includes the data standardization, weight calculation and index development of the woman fertility for each state. To close the paper, we present the results, and conclusion of the study.

METHODOLOGY

The development of a fertility index requires three main steps; the first involves identification of criteria

related to fertility from comprehensive literature review, the second requires calculation of weighting criteria, which involves application of correlation and Shannon's entropy method, and the final involves building of fertility index using methods of linear combination or weighted arithmetic average⁷.

In this study, the data has been obtained from the Fifth Malaysian Population and Family Survey by the National Population and Family Development Board. The data standardization is performed since the measurement units and scales of seven criteria differ. The standardization is used to transform different scales and units among various criteria into common measurable units to allow for multi criteria comparisons⁵.

Data Standardization: Let and being the elements of data matrix of number of children ever born (CEB) and standardized data matrix, respectively across all criteria. Table 1 provides further information regarding the criteria.

Table 1: Description of the Criteria

No.	Criteria	Description of criteria
1.	URBAN	Number of females living in urban areas by state
2.	AGE	Female age at first marriage (years)
3.	EDU	Number of females tertiary education attainments by state
4.	DIVORCE	Number of divorces by state
5.	EMPLOYED	Number of females employed by state ('000)
6.	PLAN	Number of married couples using family planning methods by state
7.	INCOME	Median monthly female income by state (RM)

In this study, to eliminate anomalies of measurements units and data scales, the data standardization is performed [5] before calculate their weights

$$z_{ij} = \frac{x_{ij}}{\sum_{j=1}^k x_{ij}} \dots(1)$$

Weight Calculation: In Table 2, the structure of the matrix is constructed with *n* number of location (state), *i* against *k* fertility criteria, *j* and *w_j* is the weight of fertility criteria *j*.

Table 2: Structure of the Matrix

	Criteria 1	Criteria 2	...	Criteria k
Location 1	x_{11}	x_{12}	...	x_{1k}
Location 2	x_{21}	x_{22}	...	x_{2k}
⋮	⋮	⋮	⋮	⋮
Location n	x_{n1}	x_{n2}	...	x_{nk}
	w_1	w_2	...	w_k

Since different criteria have different meaning, it is not appropriate to assume that they all have equal weights. Methods for finding weights for each criterion can be classified into two groups which are subjective and objective weights⁵. Subjective weights are determined only according to the preference off decision makers such as rank- based method, pair wise comparison method⁸, Analytic Hierarchy Process (AHP) method, weighted least squares method, and Delphi method¹⁰. The objective methods determine weights for each criterion by solving mathematical models without any consideration of the decision maker’s preferences. The examples of objective weights are correlation method, entropy method, multiple objective programming, and principle element analysis⁵. Subjective weighting may be preferable in the most real problems, since the decision maker’s expertise and judgments are taken into account. However, the use of objective weights is practical when obtaining such reliable subjective weights is difficult⁵. In this study, we proposed to implement correlation and Shannon’s entropy method for determining the criteria weight.

Correlation Method: The weight criteria based on correlation method was introduced by¹³ and is also known as Hellwig method. The method states that the greater the correlation coefficient, the greater the weight for the criteria.

After data standardization, correlation test is performed to test whether the correlations are significant among criteria. If correlations between criteria are significant, the size of correlation between criteria is taken into account in calculating the weights. The weighted value of a criterion, which is estimated by this procedure, is equivalent to the absolute value of the normalized correlation for all criteria, namely

$$w_j = \frac{r_j}{\sum_j r_j}, \quad r_j = \sum_i |r_{ij}| \quad \dots(2)$$

where is the correlation coefficient between the and the criteria.

Entropy Method: The concept of entropy was introduced by in communications theory and the concept is now widely used in many different fields. The concept put forward by Shannon entropy is based on statistical theory. The method of entropy can be used in identifying objective weight which is based on the degree of uncertainty of the information as employed in probability theory^{8, 2}. The entropy measure for the criteria is given by the following formula:

$$E_j = -\frac{1}{\ln n} \sum_{i=1}^n z_{ij} \ln(z_{ij}) \quad \dots(2)$$

Entropy measures the size of uncertainty information contained in a decision characteristics, i.e. the larger the size, the lower the condition. The weight for the criteria is

$$w_j = \frac{1 - E_j}{\sum_{j=1}^k 1 - E_j} \quad \dots(4)$$

Index Development: This step is also known as aggregation method, which involves the process of combining a set of values into a single value. In this study, a linear combination method or weighted arithmetic average is used. Mathematically, the fertility index can be written as follows:

$$FI_i = w_j z_{ij} + w_j z_{ij} + \dots + w_j z_{ij} = \sum_j w_j z_{ij}, \quad \dots(5)$$

$$\sum_j w_j = 1, \quad w_j \geq 0$$

Where,

FI_i = Fertility index for location.

w_j = weight for criteria $j, j = 1, 2, 3, \dots, k$.

z_{ij} = normalized value of location $i, i = 1, 2, 3, \dots, n$, with respect to criteria.

RESULTS AND DISCUSSIONS

Correlations between the factors affecting fertility are presented in Table 3. The correlations indicate that EMPLOYED, PLAN, DIVORCE, URBAN, and EDU have positive relationship with CEB. The relationship between INCOME and CEB are negatively correlated, where high income has less number of children ever born, and vice versa. The increasing in age at first marriage also contributed to low number of children ever born.

Since correlations between variables are significant, the correlation size is taken into account in the weighting criteria, and the weighted value is calculated using Equation 2. The resulted weights are shown in Table 4 and the women fertility index for each state in Malaysia are listed in Table 5.

The criteria of URBAN, EMPLOYED, and PLAN which have highest weight, can be considered as important criteria, followed by DIVORCE, EDU, INCOME, and AGE.

Table 3: Correlation test among variables

	URBAN	AGE	EDU	DIVORCE	EMPLOYED	PLAN	INCOME	CEB
URBAN	1	0.1915	0.8860	0.8259	0.9407	0.8800	-0.2414	0.9068
AGE	0.1915	1	0.4367	-0.1565	0.0014	-0.1043	0.2931	-0.1192
EDU	0.8860	0.4367	1	0.5884	0.7630	0.6448	-0.0789	0.6652
DIVORCE	0.8259	-0.1565	0.5884	1	0.8971	0.9132	-0.1804	0.9228
EMPLOYED	0.9407	0.0014	0.7630	0.8971	1	0.9674	-0.3148	0.9729
PLAN	0.8800	-0.1043	0.6448	0.9132	0.9674	1	-0.3393	0.9689
INCOME	-0.2414	0.2931	-0.0789	-0.1804	-0.3148	-0.3393	1	-0.4077
CEB	0.9068	-0.1192	0.6652	0.9228	0.9729	0.9689	-0.4077	1

Table 4: Initial value, weighted value, and criteria rank for fertility using correlation method

Criteria	Initial value, r_j	Weighted value, w_j	Criteria rank
URBAN	5.8723	0.1766	1
AGE	2.3027	0.0692	7
EDU	5.0631	0.1523	5
DIVORCE	5.4842	0.1649	4
EMPLOYED	5.8573	0.1761	2
PLAN	5.8178	0.1750	3
INCOME	2.8556	0.0859	6
		$\Sigma w_j = 1.0000$	

After the are calculated, the state can be ranked from the highest index to the lowest index. The state with the highest values of index presents better conditions for childbirth and childbearing.

Table 5: Fertility index by state using correlation method

Index	Rank	State
0.1311	1	Selangor
0.1202	2	Johor
0.1035	3	Sarawak
0.0758	4	W.P Kuala Lumpur

Conted...

0.0714	5	Sabah
0.0656	6	Kedah
0.0588	7	Perak
0.0583	8	Pahang
0.0581	9	Melaka
0.0490	10	Negeri Sembilan
0.0486	11	Kelantan
0.0425	12	Pulau Pinang
0.0339	13	W.P Putrajaya
0.0304	14	Terengganu
0.0284	15	W.P Labuan
0.0245	16	Perlis

The results in Table 5 show that the state with the highest fertility index is Selangor, followed by Johor, Sarawak, W.P Kuala Lumpur, and Sabah. On the other end of the spectrum, Pulau Pinang, W.P Putrajaya, Terengganu, W.P. Labuan, and Perlis are ranked in the last positions according to the fertility index. The results in Table 6 show the entropy value, weighted value and rank of each criterion. The criteria of EDU, DIVORCE, and PLAN, which have the highest weight, can be considered as important criteria of fertility, followed by URBAN, EMPLOYED, INCOME, and AGE.

Table 6: Entropy value, weighted value, and criteria rank for fertility using entropy method

Criteria	Entropy value, E_j	Weighted value, w_j	Criteria rank
URBAN	0.9347	0.1802	4
AGE	0.9996	0.0012	7
EDU	0.9156	0.2328	1
DIVORCE	0.9327	0.1857	2
EMPLOYED	0.9401	0.1652	5
PLAN	0.9338	0.1825	3
INCOME	0.9810	0.0524	6
		$\sum w_j = 1.0000$	

The results in Table 7 show that the state with the highest fertility index is Selangor, followed by Johor, Sarawak, W.P Kuala Lumpur, and Sabah. On the contrary, Pulau Pinang, W.P Putrajaya, Terengganu, W.P. Labuan, and Perlis are ranked in the last positions according to the fertility index.

Table 7: Fertility index by state using entropy method

Index	Rank	State
0.1444	1	Selangor
0.1268	2	Johor
0.1051	3	Sarawak
0.0779	4	W.P Kuala Lumpur
0.0701	5	Sabah
0.0651	6	Kedah
0.0587	7	Perak
0.0585	8	Pahang
0.0576	9	Melaka
0.0480	10	Kelantan
0.0476	11	Negeri Sembilan
0.0407	12	Pulau Pinang
0.0297	13	W.P Putrajaya
0.0266	14	Terengganu
0.0235	15	W.P Labuan
0.0197	16	Perlis

For every state in Malaysia, the ranking of fertility index using Shannon’s entropy method is almost similar to the index obtained by the correlation method.

CONCLUSION

The weighted calculation based on the correlation and entropy give different results in terms of rank covariates influencing the fertility. Correlation method listed the number of females living in urban areas, number of females employed, and family planning methods as the three most important criteria that influence fertility in Malaysia. This is very different for the weights obtained through the entropy method in which the weight concentrated on female tertiary education attainments, number of divorces, and family planning methods. We cannot say that one of this weighted calculation methods is the best because it has their own specialty. However, the results of the fertility index based on correlation and entropy method as proposed in this study show that Selangor has the highest fertility index. The reason for the high index in Selangor might be because the state government offer schemes to alleviate lower fertility amongst Selangor women⁹. These schemes includes allocation of RM1500 for newborn babies, parents that are eligible will receive financial help to pay for nursery or daycare centers registered with the Department of Social Welfare amounting to about RM100 every month, and payment aids of RM50 every month for children in pre-school education.

In addressing the problem of low fertility in Malaysia, all parties must play their role. The information generated from the results in this study can be used as a primary source for the government to design appropriate policies to mitigate dwindling fertility rates among Malaysian women. These policies include income supports for families with children, affordable or quality child care and early childhood education, flexible working hours, parental leave, family leave, and reasonable working hours.

The findings from this study make several contributions to the current literature. Based on certain crucial factors that influence the fertility rate in Malaysia, we propose the women fertility index as an indicator for verifying and measuring the degree of ability of the women population in Malaysia to have children. However, we accept that the choice to bear children is personal decision. However, this issue supposed to be taken seriously, with full of responsibility. Thus, it is important for married couples to motivate themselves to have more children with good quality of education as it can enhance the economic productivity in our country.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. C. E. Shannon, "A mathematical theory of communication". *The Bell System Technical Journal*. 1948; 27; 379-423.
2. C. L. Hwang, and K. Yoon, "Methods for multiple attribute decision making", in *Multiple attribute decision making*, Springer Berlin Heidelberg. 1981; pp. 58-191.
3. D. L. Poston Jr, and S. L. McKibben, "Using zero-inflated count regression models to estimate the fertility of US women", *Journal of Modern Applied Statistical Methods*. 2003; 2(2); 10.
4. Department of Statistics Malaysia. "Population Distribution and Basic Demographic Characteristic Report 2010", 2010.
5. F. H. Lotfi, and R. Fallahnejad, "Imprecise Shannon's entropy and multi attribute decision making", *Entropy*. 2010; 12(1); 53-62.
6. J. M. Fernandez-Crehuet, J. I. Gimenez-Nadal, and I. D. del Valle, "The International Multidimensional Fertility Index: The European Case", *Social Indicators Research*. 2016; 1-28.
7. M. Zulkifli, N. Ismail, A. M. Razali, and M. M. Kasim, "Development of car theft crime index in peninsular Malaysia", in *AIP Conference Proceedings*, 1602(1). 2014; pp. 975-982.
8. N. H. M. Desa, A. A. Jemain, and M. M. Kasim, "Construction of a composite hospital admission index using the aggregated weights of characteristics". *Sains Malaysiana*. 2015; 44(2), 239- 247.
9. Program Inisiatif Peduli Rakyat, Kerajaan Negeri Selangor. 2016.
10. R. Ginevičius, and V. Podvezko, "Objective and Subjective Approaches in Determining the Characteristics Weights in Multicharacteristics Models". *Transport and Telecommunication*, 6(1), 2005; 133- 137.
11. T. N. Peng, "Social, economic and ethnic fertility differentials in Peninsular Malaysia", in *IUSSP Conference on Southeast Asia's Population in a Changing Asian Context*, held at the Siam City Hotel, Bangkok, Thailand. 2002; pp. 10-13.
12. V. K. Dwivedi, T. Sediadie, N.O. Ama, "Factors affecting children ever born (CEB) in Botswana: Application of Poisson Regression Model", *Research Journal of Mathematical and Statistical Sciences*. 2016; 4(10); 1-9.
13. Z. Hellwig, "On the Optimal Choice of Predictors", in *Toward a System of Quantitative Indicators of Components of Human Resources Development*. United Nations Educational, Scientific and Cultural Organization. 1968, pp. 10-15.

Role of Brand Love and Brand Commitment in Establishing Word of Mouth Communication

Sri Murni Setyawati¹, Donny Abdul Latief Poespowidjojon², Kristina Anindita Hayuningtias³

¹Faculty of Economy and Business, Universitas Jenderal Soedirman, Indonesia; ²School of Tourism, Hospitality and Event Management, Universiti Utara Malaysia, Malaysia; ³Faculty of Economy and Business, Universitas Jenderal Soedirman, Indonesia

ABSTRACT

This study aims to analyse the influence of brand love on word of mouth with brand commitment as intervening variable. Brand commitment in this research consists of two aspects i.e. affective commitment and continuance commitment. The subjects of the research were the customers of Wardah cosmetic. The respondents of this research were 150 persons taken by using purposive sampling technique. The Structural Equation Modelling is used as the research analysis tool using AMOS 16.0. The result of the analysis proved that brand love positively affected the two aspects of brand commitment i.e. affective commitment and continuance commitment; Brand love positively affected word of mouth; Affective commitment and continuance commitment had a positive effect on word of mouth. Based on these findings, it can be concluded that customer's love and commitment to a brand play an important role in establishing word of mouth communication.

Keywords: *Word of Mouth, Brand Commitment, Brand Love.*

Jel Classification: M12, M39, Y80

INTRODUCTION

Marketing communication is an important factor that must be noticed when a company plans marketing strategies. An effective communication channel will ease company to market their product and service. One of communication channels that should be well managed is Word of mouth communication. *Word of mouth* communication becomes an effective way in creating company's product image, which then establishes positioning in the public (Hasan, 2016).

The result of the research conducted by *Onbee Marketing Research- Octovate Consulting Group* working together with *Swa* magazine suggests that consumers in Indonesia will say something positive to 7 persons if they feel satisfied. In contrast, when they feel dissatisfied, they tend to give negative information to 11 persons (Hidayat¹¹). It proves that people tend to say *negative word of mouth* more than *positive word of mouth*.

Hawkins *et al*¹⁰ describes *word of mouth* as a process that enables consumers to share information and opinion

that makes prospective buyers directly get close or stay away from certain product or service. The concept of *word of mouth* and its influencing factors have been proven empirically by researchers (Carroll and Ahuvia⁵; Albert and Merunka²; Ismail and Spinelli¹³; Maisam and Mahsa¹⁴; Bachman and Wilkins³; Batra *et al*⁴).

Consumer's commitment is one of antecedent factors of *word of mouth*. Commitment represents consumer's desire to maintain relationship with brand (Fullerton⁷). An empirical study conducted by Tuskej *et al*¹⁵ suggests that *brand commitment* has positive effect on *word of mouth*. Improving consumer's commitment to brand will turn to bigger *positive word of mouth*. (Bachman and Wilkins³) in their research suggest that consumers who have affective commitment to a brand will repurchase the brand and spread positive information about the brand from mouth to mouth to convince other consumers to buy the brand of the product.

Albert and Merunka² suggest that *brand love* is the antecedent of *brand commitment*. Consistent with Carroll and Ahuvia⁵ who say that consumers, who love and have emotional bond to a brand, have more commitment to

maintain long-term relationship with the brand and will spread the benefits of the brand to others.

Study on the correlation of *brand love* and *brand commitment* is still relevant thus far; because this study is still looking for appropriate model how brand love affects brand commitment. Several studies found that *brand love* had positive and significant effect on *brand loyalty* and *brand commitment* which belongs to attitude of *brand loyalty* (Carrol and Ahuvia⁵; Hwang and Kandampully¹²; Albert and Merunka²). Meanwhile, other studies found that *brand love* did not have effect on *brand commitment* (Maisam and Mahsa¹⁴).

The phenomenon of inconsistency of relationship between *brand love* and *brand commitment* needs to be studied. Albert and Merunka² clarify in their research that *brand love* had positive effect on *affective* and *continuance commitment*. From conceptual point of view, the result of this research confirms the significance of the effect of the correlation between consumers and brand and suggests the significance of brand love for long-term relationship. Maisam and Mahsa¹⁴ in their empirical study gives suggestion for the next research to examine variable *brand commitment* from two different aspects; *affective* and *continuance commitment*. The argument then becomes the foundation for developing the model of relationship between brand love and brand commitment. In addition, it is expected to be able to explain the gap phenomenon about brand love and consumer commitment.

Based on the explanation above, the hypothesis can be formulated as follows:

H1: *Brand love* has positive effect on *affective commitment*.

H2: *Brand love* has positive effect on *continuance commitment*.

H3: *Brand love* has positive effect on *word of mouth*.

H4: *Affective commitment* has positive effect on *word of mouth*.

H5: *Continuance commitment* has positive effect on *word of mouth*

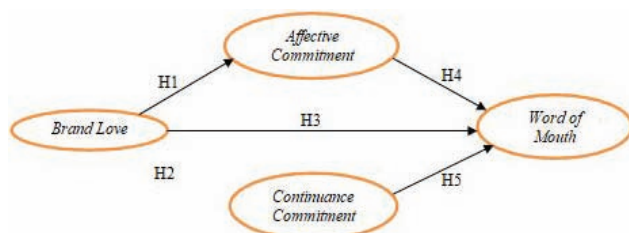


Figure 1: Research Model

METHOD OF THE RESEARCH

Population and Sampling Technique: This research belongs to quantitative research with survey method by asking respondents' conception about the roles of *brand love*, *affective commitment* and *continuance commitment* in establishing *word of mouth* communication. The population of this research was the consumers of Wardah Cosmetics in Purwokerto.

The sampling technique used in this research was *purposive sampling* i.e. those who performed repurchase for the last three months. Total samples of this research were 150 consumers of Wardah cosmetics. Data were collected by administering questionnaire directly and read previous researches relevant to the topic of this study.

Operational Definition of Variable: Operational definition of each variable of this research is as follows: (1) *word of mouth* measures consumer attitude indicated by explaining personal experience about the product and giving positive information about the product and recommending it to others; (2) *Continuance commitment* measures consumer bond to a product continuously due to no other choice proportional to the product and expensive switching cost; (3) *Affective commitment* measures consumer's emotional bond to a product indicated by love feeling to the product, emotionally bond to the product, believing that the product is very important and meaningful, feeling to get involved with the product, and having strong relationship with the product; (4) *Brand love* measures consumer's emotional level who is satisfied to the product indicated by the consumer's conviction that the product has good quality and gives benefits needed by consumers, comfortable feeling felt by consumers when using the product, consumers' willing to always use the product, consumers love to the product and consumer bond to the product.

Data Analysis Technique: This research used *Structural Equation Modeling* (SEM) analysis technique with AMOS 16.0 to analyse causal relationship in the proposed structural model between variable exogenous and endogenous and to examine validity and reliability of the research instrument.

RESULT AND DISCUSSION

Structural equation in Figure 2 depicts that the value of *Chi-square* was 161,813 with *degree of freedom* (df) at 114. It shows the model deserved to use.

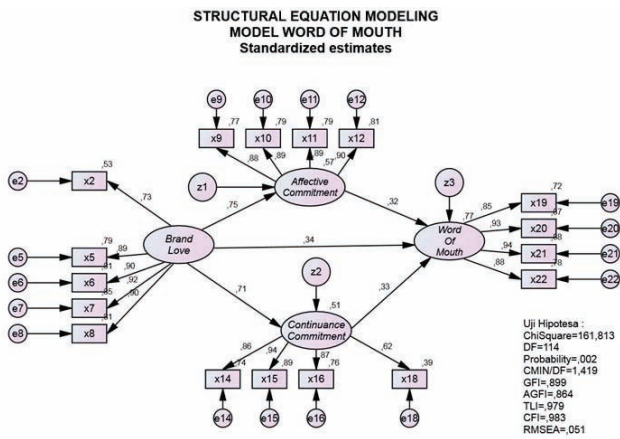


Figure 2: Full Model of SEM

Validity and Reliability Test: Validity test of the questionnaire consisted of convergent and discriminant

validity test. Convergent validity test was carried out in order to know whether or not an indicator could reflect variable by seeing the value of *loading factor* of each indicator higher than 0,5. Meanwhile, discriminant validity test was carried out to know how far an indicator has stronger correlation than the correlation with other variables.

Reliability test was done to know the indicator consistency in measuring a variable. Reliability test could be seen from the value of *construct reliability* and *variance extracted*. Indicator of a variable with the value of *construct reliability* higher than 0,7 and *variance extracted* higher than 0,5 was claimed to be reliable. The result of validity and reliability test can be seen in the following Table 1 and 2:

Table 1: Convergent and Discriminant Validity Test

Construct	Item	Convergent Validity		
		Loading Factor	Construct Reliability	Variance Extracted
Brand Love	x2	0,720	0,940	0,759
	x5	0,893		
	x6	0,902		
	x7	0,923		
Affective Commitment	x8	0,902	0,938	0,791
	x9	0,874		
	x10	0,889		
	x11	0,896		
Continuance Commitment	x12	0,898	0,898	0,692
	x14	0,858		
	x15	0,938		
	x16	0,887		
Word of Mouth	x18	0,604	0,945	0,812
	x19	0,831		
	x20	0,934		
	x21	0,953		
	x22	0,882		

Source: Data processed

Table 2: Correlation between Construct and Variance Extracted

	Brand Love	Continuance Commitment	Affective Commitment	Word of Mouth
Brand_Love	0,759			
Continuance_Commitment	0,510	0,692		
Affective_Commitment	0,635	0,289	0,791	
Word_Of_Mouth	0,619	0,554	0,573	0,812

Source: Data processed

Based on Table 1, it can be seen that *loading factor* of each variable has higher value than 0,5; from 0,720 to 0,953. Thus, it can be concluded that indicator of each variable was valid in convergent. Meanwhile, Table 2 shows the value of *Variance Extracted* 0,692 – 0,812 higher than quadrature value of correlation among variables 0,289 – 0,635. Based on the calculation, it can be concluded that each variable was valid in discriminant.

Reliability test was shown by the calculation result of *construct reliability* which had value higher than 0,7, and *Variance Extracted* was higher than 0,5. Thus, it can be concluded that the indicator was reliable.

Evaluation of Goodness of Fit: A research model is stated to be good, if it can meet minimally five criteria of *goodness of fit* (Ghozali⁸). Overall, the result of goodness of Fit can be seen in the following Table 3:

Table 3: Evaluation of Goodness of Fit Criteria

Goodness of Fit Index	Cut off Value	Analysis Result	Model Evaluation
<i>Chi Square</i> , df = 114		161,813	Good
<i>Significance Probability</i>	≥ 0,05	0,002	Marginal
CMIN/DF	≤ 2,00	1,419	Good
GFI	≥ 0,90	0,899	Marginal
AGFI	≥ 0,90	0,864	Marginal
TLI	≥ 0,95	0,979	Good
CFI	≥ 0,95	0,983	Good
RMSEA	≤ 0,08	0,051	Good

Source: Data processed

Based on Table 3, it can be concluded that the research model can be accepted because it meets more than five criteria of *goodness of fit*. The calculation result of the evaluation model, such as *Chi Square* was 161,813, CMIN/DF was 1,102 smaller than 2,00, TLI was 0,990 and CFI was 0,991 which was both higher than 0,95, and RMSEA was 0,025 which was smaller than 0,08, shows that the model was good and proper to be used. Although, the *probability* value was 0,002 and, GFI and AGFI show marginal value i.e. 0,899 and 0,864, which were smaller than 0,90, it was still in the model under criteria *absolute* and *incremental fit*.

Hypothesis Testing: After meeting criteria *goodness of fit*, the next step was interpreting the research model through hypothesis testing done by analysing the result of the correlation among variables through *regression weights* value.

Table 4: Regression Weights

			Estimate	S.E.	C.R.	P
<i>Affective_Combitment</i>	<---	<i>Brand_Love</i>	,766	,073	10,496	***
<i>Continuance_Combitment</i>	<---	<i>Brand_Love</i>	,488	,068	7,175	***
<i>Word_Of_Mouth</i>	<---	<i>Affective_Combitment</i>	,337	,082	4,125	***
<i>Word_Of_Mouth</i>	<---	<i>Continuance_Combitment</i>	,505	,121	4,180	***
<i>Word_Of_Mouth</i>	<---	<i>Brand_Love</i>	,363	,090	4,026	***

Source: Data processed

Based on Table 4, the *critical ratio* of each variable was higher than t tabel 1,96 and the significance value was smaller than α 0,05. Thus, it can be concluded that the hypothesis, which stated that *brand love* had positive effect on *affective commitment* and *continuance commitment*, was accepted. In addition, the hypothesis, which stated that *brand love* had positive effect on *word of mouth* and *affective commitment* and *continuance commitment* had positive effect on *word of mouth*, was accepted.

DISCUSSION

1. Brand love had positive effect on affective commitment: The result of the research shows that *brand love* had positive and significant effect on *affective commitment*. It indicates that the more consumers love products of Wardah, the higher the consumers' emotional commitment to the product will be. This finding strengthens several previous researches (Albert and Merunka²; Carroll and Ahuvia⁵; Hwang and Kandampully¹²; Drenan et al⁶).

Consumer's love to a brand plays an important role in maintaining relationship with brand, both from functional and affective aspect. Consumers who love a brand will not only use the brand continuously, but also they have emotional bond with the brand (Albert and Merunka²)

2. Brand love had positive effect on continuance commitment: The result of the research shows that *brand love* had positive and significant effect on *continuance commitment*. It indicates that the more consumers love products of Wardah, the higher the consumers' emotional commitment to the product will be. *Continuance commitment* affects consumer attitude to perform continuous purchase, even when the product raises (Aaker¹). Carroll and Ahuvia⁵ prove that consumer love to a brand improves consumer loyalty level. The result of this research is consistent with the previous researches (Albert and Merunka²; Hwang and Kandampully¹²; Drenan et al⁶).

3. Brand love had positive effect on word of mouth: The result of the research shows that *brand love* had positive effect on *word of mouth*. It indicates that the more consumers love products of Wardah, the stronger the consumers' willingness to tell pleasure experience in using the product to their friends and family.

The result of this research was consistent with the previous researches which prove that consumers who love a certain product brand will always tell something positive about the product and recommend it to other people (Carroll and Ahuvia⁵; Batra et al⁴; Ismail and Spinelli¹³; Albert and Merunka²; Maisam and Mahsa¹⁴).

4. Affective commitment had positive effect on word of mouth: The result of the research

shows positive and significant effect of *affective commitment* on *word of mouth*. It proves that the stronger the emotional bond felt by consumers to products of Wardah, the stronger the consumers' willingness to tell something positive about the products and recommend it to other people. This finding also supports several previous researches (Tuskej et al¹⁵; Albert and Merunka²; Bachman and Wilkins³; Maisam and Mahsa¹⁴).

5. Continuance Commitment had positive effect on word of mouth: The result of the research shows positive and significant effect of *continuance commitment* on *word of mouth*. It proves that the bigger the consumers' commitment to maintain long term relationship to product of Wardah, the bigger the consumers' willingness to tell the excellence of the product and recommend it to other people. The result of the research is consistent with several previous researches, which confirm the important role of consumers' commitment in establishing positive communication of *word of mouth* yang positif (Tuskej et al¹⁵; Albert and Merunka²; Bachman and Wilkins³; Maisam and Mahsa¹⁴).

CONCLUSION

Based on the analysis of research data, it can be concluded that: (1) *brand love* had positive effect on *affective commitment*. Consumer's love to brand of Wardah made them bond emotionally to the brand; (2) *brand love* had positive effect on *continuance commitment*. Pleasure feeling felt by consumers when using products of Wardah encourages them to keep using the products; (3) *brand love* had positive effect on *word of mouth*. Consumers of Wardah, who love the benefits of the product, had strong willingness to tell the excellence of product to other people; (4) *affective commitment* had positive effect on *word of mouth*. Emotional bond felt by consumers to products of Wardah made them tell their personal experience with pleasure and gave positive information about the product; (5) *continuance commitment* had positive on *word of mouth*. The stronger the consumers' commitment to maintain relationship with products of Wardah is, the stronger the consumers' willingness to recommend the product to other people will be.

SUGGESTION

The next research should modify the model by adding variable such as personality and repurchase attitude. High consumers' commitment on a brand will increase the intensity of consumers' repurchase. Different personality of consumers can also affect their love to a brand and their willingness to recommend the product to other people.

LIMITEDNESS OF THE RESEARCH

This research has some limitedness. One of them is opened question that was not filled by most of the respondents due to limited time. It is not relevant with the method of collecting data planned by the researchers. Besides that, the researchers could not accompany the respondents one by one in filling the questionnaire so that it enables bias of respondents' answers. The researcher of next study is expected to give more attention to respondents when filling the questionnaire in order to minimize bias.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Aaker D.A. Managing Brand Equity. New York, NY: The Free Press. 1991.
2. Albert, Noel, Merunka, Dwight. The Role of Brand Love in Consumer-Brand Relationships. *Journal of Consumer Marketing*. 2013;30(3):258–266.
3. Bachman, Kristina dan Wilkins, Stephen. Brand Commitment and Consumer—Brand Identification as Determinants of Consumers' Brand Loyalty and Repurchase Intentions. *Research with Plymouth University*. 2014:11-32.
4. Batra, Rajeev, Ahuvia, Aron C, Bagozzi, Richard P. Brand Love. *Journal of Marketing*. 2012;76(2):1-16.
5. Carroll, Barbara .A, Ahuvia, Aron, C. Some Antecedents and Outcomes of Brand Love. *Marketing Letters*. 2006;17(2):79-90.
6. Drenan J, Bianchi, C. Elizondo, Louriero S, Guibert N, Proud, W. Examining the Role of Wine Brand Love on Brand Loyalty: A Multi-Country Comparison. *International Journal of Hospitality Management*. 2015;49:47-55.
7. Fullerton G. The Impact of Brand Loyalty Commitment on Loyalty to Retail Service Brands. *Canadian Journal of Administrative Sciences*. 2005;22(2):97-110.
8. Ghozali, Imam. Model Persamaan Struktural: Konsep dan Aplikasinya dengan Program AMOS 16.0. Semarang: Badan Penerbit Universitas Diponegoro. 2008.
9. Hasan. Word of Mouth Marketing sebagai Bauran Komunikasi Pemasaran. *Jurnal Dinamika Ekonomi dan Bisnis*. 2009;6(2).
10. Hawkins D.I, Best R, dan Coney K.A. *Consumer Behavior: Building Marketing Strategy*, 9th ed. Boston, MA: McGraw-Hill. 2004.
11. Hidayat, Taufiq. Parade Merek Rekomendasi Konsumen. *Majalah SWAsembada*. No. 08/XXV/16-19, hal 30-41. 2009.
12. Hwang, Jiyoung dan Kandampully, Jay. The Role of Emotional Aspects in Younger Consumer-Brand Relationships. *Journal of Product and Brand Management*. 2012;21(2):98–108.
13. Ismail, Ahmed R dan Spinelli Gabriella. Effects of Brand Love, Personality and Image on Word of Mouth. The Case of Fashion Brands among Young Consumers. *Journal of Fashion Marketing and Management*. 2012;16(4):386-398.
14. Maisam, Shirkhodaie dan Mahsa, Rastgoodeylami. (2016). Positive Word of Mouth: Explaining The Roles of Value Congruity and Brand Love. *Journal of Competitiveness*. 2016;8(1):19 – 37.
15. Tuskej U, Golob U, dan Podnar K. The Role of Consumer Brand Identification in Building Brand Relationships. *Journal of Business Research*. 2013;66(1):53–59.

Screening of *Escherichia Coli* O157:H7 Contamination and Nitrate Content on Butterhead Lettuce from Market Outlets

Siti Fairuz Yusoff^{1,2}, Mahmud Tengku Muda Mohamed², Farah Farhanah Haron³

¹Agricultural Science Department, Faculty of Technical and Vocational, Universiti Pendidikan Sultan Idris, 35900, Muallim, Perak, Malaysia; ²Crop Science Department, Faculty of Agriculture, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia; ³Genebank and Seed Centre, Malaysian Agricultural Research and Development Institute (MARDI), MARDI Headquarters, 43400 Serdang, Selangor, Malaysia

ABSTRACT

Escherichia coli O157:H7 is classified as biological hazard that can produce a bloody diarrhea due to its toxins. While nitrate in vegetables is classified as a chemical hazard if ingested greater than limit and risk getting gastrointestinal cancer and methemoglobinemia. A study was conducted to obtain the information on *E. coli* O157:H7 contamination and nitrate content in Butterhead lettuce from local suppliers. The number of colonies *E. coli* O157:H7 from the lettuce was enumerated using standard plate count and the nitrate content was measured using nitrate meter. From the experiment, it was found that *E. coli* O157:H7 contamination of Butterhead lettuce in Malaysia is still within the safe limit for the consumers while the nitrate content was distributed differently between leaf structures; midrib, outer adult leaf blade and young leaves. Lettuce midrib and outer adult leaf blade had a higher concentration of nitrate compared to the young leaves.

Keywords: *Escherichia coli* O157:H7, nitrate, Butterhead lettuce

Jel Classification: L65, L66, L72

INTRODUCTION

Food safety is monitored through scientific practices during production, processing and storage of food to prevent food poisoning (Satin³⁷). This is to assure that the consumer can eat the food safely when served. Thus, food safety is a discipline responsible to protect consumers from highly dangerous health risks due to biological, chemical and physical hazards (FAO/WHO¹⁹).

Chemical hazards contaminate food through water, air and soil pollutions, for example, dioxins and toxic metals. The hazards also contaminate through the fashion applications of various chemicals, such as fertilizers, pesticides, animal drugs and other agrochemicals (WHO⁴⁵). Nitrate comes from manure, decaying vegetation, fertilizers and other organic waste. According to Chan⁷, high nitrate content in vegetables in the human diet could increase the risk of methemoglobinemia. In another study, ingested high level of nitrate content tend to have a stomach cancer (Bryan et al⁶)

Nitrate in vegetables is classified as a chemical hazard if ingested greater than acceptable daily intake (ADI); however, the exceeding of the ADI limit has occurred frequently in daily human life (Boink and Speijers⁵). European Union (EU) Scientific Committee for Food (SCF)¹⁸ established ADI for nitrate as 0-3.7 mg.kg⁻¹ bodyweight. In order to protect public health in response the SCF's considerations regarding nitrate in food, European Member States agreed a EC Regulation to set limits for nitrate in lettuce (EC Regulation No. 563/2002, 2002).

Maximum Nitrate Limit (MNL) in fresh lettuce harvested on 1 October to 31 March was 4500 and 4000 mg.kg⁻¹ FW for crops grown under cover and open air, respectively. While MNL of the fresh lettuce harvested on 1 April to 30 September was 3500 and 2500 mg.kg⁻¹ FW for crops grown under cover and open air, respectively. However, in the United States, no MNL was fixed but in China, the MNL in vegetables is 3100 mg.kg⁻¹ (Zhou⁴⁸). In Poland, the nitrate limit in tubers was 183 mg.kg⁻¹ FW and Germany was less than 200 mg.kg⁻¹ FW (Cieslik and Sikora¹¹).

De Martin and Restani¹³ stated that leafy vegetables can accumulate nitrate up to 6000 mg.kg⁻¹ FW. Wang et al⁴⁴ reported that nitrate accumulation in lettuce was 123-2678 mg.kg⁻¹ FW, and Santamaria³⁵ classified lettuce as 'very high' in nitrate when the content is greater than 2500 mg.kg⁻¹ FW. This level was exceeded the maximum nitrate limit and harmful to human health.

A biological hazard can be defined as the probability of a biological agent contaminating food during any step of food production, which if ingested by consumer can cause health disorder. Luning²⁸ classified viruses, molds, parasites that produce naturally occurring toxins, yeasts and disease-causing bacteria as biological hazards. Instead of at the field and harvesting stages, microbial contamination is also possible during processing, transportation, distribution, preparation and retail display at market outlet (Gorny²⁰).

The governments all over the world are concerned about this problem and trying to overcome the increasing number of foodborne illnesses intensively by improving food safety management (Codex Alimentarius Commission¹²). *E. coli* O157:H7 is one of the pathogen involved in outbreaks of foodborne illness (Scallan et al³⁸) associated with the lettuce (Islam et al²³).

Sánchez et al³⁴ reported that the greatest natural reservoirs for *E. coli* O157:H7 was from cattle and other ruminants that play a significant role in the epidemiology of human infections. During September and October 2006, United States is a main multi-state disease outbreak related to appearance of *E. coli* O157:H7 in fresh, bagged spinach. *E. coli* O157:H7 on leafy vegetables is a biological hazard if the colonies are more than maximum recommended limit (MRL), 8 log₁₀ CFUg⁻¹ (Debevere¹⁴). The strain *E. coli* O157:H7, a Shiga-toxin producing, is the most predominant in North America, Japan and the United Kingdom (IFT²²). In New Zealand, 2004, 32% cases of serious complications were reported as a consequence of this strain infection. The long term effects of this infection were kidney problems, neurological deficits, haemolytic uremic syndrome (HUS) and in a few cases the disease can be fatal.

The data from overseas, including Greece (Dontorou et al¹⁵), Norway (Johannessen et al²⁵), Spain (Soriano et al⁴¹) and the United Kingdom (Sagoo et al³³) reported no detection of *E. coli* O157:H7 in leafy vegetables. In a review by Beuchat⁴, the environmental factors were the

main differences in microbial loading. This is confirmed by Chigor et al⁹ who studies on the persistence of *E. coli* O157 in irrigation water and Siti Fairuz et al³⁹ who studies on *E. coli* O157:H7 colonies in different production systems of lettuce.

However, information on nitrate and prevalence of serotype O157:H7 in Malaysia, especially lettuce, are still lacking. In addition, awareness among the Malaysians on the food safety aspects is on increased especially on raw eaten vegetables. A meticulous laboratory study should be carried out to determine the nitrate and *E. coli* O157:H7 contaminations in fresh lettuce. Therefore, the objective of this study was to determine the nitrate and *E. coli* O157:H7 contaminations in Butterhead lettuce available in the local market.

MATERIALS AND METHOD

Sample Collection: Butterhead lettuce, from four different producers encompassed three conventional and one organic, were purchased from market outlets in Selangor. The lettuce heads were brought immediately to Postharvest Laboratory, Department of Crop Science, Faculty of Agriculture, Universiti Putra Malaysia (UPM), Serdang, Selangor. The outer damaged leaves of each head were discarded, and uniform sized heads (150-200 g each) were selected. The lettuce heads were washed using running tap water to remove dirt, and other foreign matter, then allowed drying under ambient temperature before further analysis.

Determination of *E. coli* O157:H7 Contamination

a. Preparation of Hicrome EC O157:h7 Selective

Agar: Agar powder (31.85 g) was suspended in 990 ml distilled water. The medium was completely dissolved by boiling gently and cooled to 50 °C. One vial of HiCrome ECO157:H7 Selective Supplement (Fluka 44931, Sigma Aldrich) was added aseptically. The mixture was mixed thoroughly and poured into sterile petri plates. The prepared media was stored below 8 °C and protected from direct light.

HiCrome EC O157:H7 agar was based on the formulation in table 1 described by Rappaport et al³². The medium contains sorbitol and a proprietary chromogenic mixture instead of lactose and indicator dyes, respectively. The chromogenic substrate is specifically and

selectively cleaved by *E. coli* O157:H7 resulting in a dark purple to magenta coloured moiety.

Casein enzymic hydrolysate provides carbonaceous, nitrogenous and growth nutrients. Sodium chloride maintains osmotic equilibrium. Addition of HiCrome EC 0157:H7 selective supplement makes the medium selective (Zadik et al⁴⁷). Potassium tellurite selects the serogroups and inhibits *Aeromonas* species and *Providencia* species. Novobiocin inhibits gram-positive bacteria.

Table 1: Composition of HiCrome EC 0157:H7 Selective agar

Ingredients	Gram/Liter
Casein enzymic hydrolysate	8.0
Sorbitol	7.0
Bile salts mixture	1.5
Sodium lauryl sulfate	0.1
Chromogenic mixture	0.25
Agar	15.0

b. Determining *E. coli* o157:H7 Contamination:

The lettuce head was shredded and only 10 g was weighed and transferred into a sterile conical flask containing 90 mL sterile distilled water. The sample was homogenized using a stomacher bag for two min at 230 rpm. Serial dilutions of 10-fold up to 10⁻⁵ for each homogenized sample, was made and surface spread (100 µlplate⁻¹) in triplicate onto a selective media (Hicrome *E. coli* O157:H7). The plates were incubated at 36 °C for 18 to 24 h (Zadik et al⁴⁷). After incubation, the number of colonies was estimated using the standard plate count method and the data were transformed into log₁₀ before analysis of variance.

Determination of Nitrate Content: Lettuce extract were obtained from three different leaf parts on each lettuce; four young leaves from the inner leaf layers, four adult leaf blades from the outer leaf layers and four midribs from each outer adult leaf blades. Each part was chopped separately and only 20 g from chopping lettuce was weighted and grounded finely using a pestle and mortar. The paste was filtered through cotton wool to get the cell sap.

Nitrate content of the cell sap was determined using a nitrate meter (Cardy Twin Nitrate Meter, Spectrum Technologies Inc., USA) as described by Hochmuth²¹. The

glass electrode of the meter was calibrated with buffers at 2000 and 150 mg.kg⁻¹ NO₃ before use. After calibration, the glass electrode was washed with distilled water and wiped with a soft tissue paper. Three drops filtrate of cell sap was dropped on the electrode of nitrate meter and a stabilized nitrate reading was recorded. The concentration of nitrate was expressed in mg.kg⁻¹ of fresh weight (FW).

Experimental Design And Statistical Analysis: The experimental design was a completely randomized design with four replications. The data were analyzed using analysis of variance and the significant means separated by least significant difference (LSD) test at P≤0.05 (SAS 9.4).

RESULTS AND DISCUSSION

***E. coli* O157:H7 Contamination In Butterhead Lettuce:**

E. coli O157:H7 counts in P2 was significantly higher than P3 and P4 (Figure 1). However, the number of *E. coli* O157:H7 from P1 was not significantly different from P2 and also between P1 and P3. Solomon et al⁴⁰ indicated that *E. coli* O157:H7 can survive on edible portion of harvested lettuce for an extended period. *E. coli* O157:H7 can be present at the point of sale, thus illustrating the importance of understanding the behavior of this pathogen under processing and consumer storage conditions.

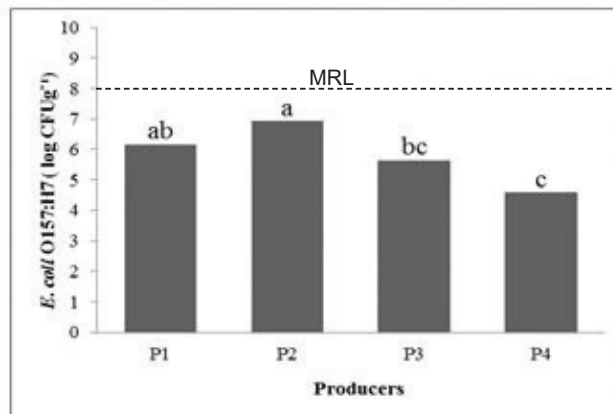


Figure 1: *E. coli* O157:H7 contamination on Butterhead lettuce from four producers (P1-P4). Mean values followed by the same letter are not significantly different

MRL = Maximum recommended limit (Debevere¹⁴).

CFU = Colony forming unit.

During mid-1990’s, fresh produce was considered as a significant vehicle for *E. coli* O157:H7. According to Rangel et al³¹, lettuce is the single most implicated

commodity associated with fresh produce outbreaks. In 1998 to 2005, the US Center for Disease Control and Prevention attributes 20 outbreaks and 634 cases of illness to consumption of lettuce contaminated with *E. coli* O157:H7 (Lynch²⁹). *E. coli* O157:H7 is recognized as an important cause of foodborne disease, with outbreaks reported in United States America, Canada and United Kingdom (Doyle and Erickson¹⁶). The illnesses caused by *E. coli* O157:H7 appears to occur throughout much of the world. However, none case regarding severe illness caused by *E. coli* O157:H7 has been reported specifically in Malaysia.

The bacterial colonies on Butterhead lettuce in Malaysia were still in the range indicated by several previous reports where counts in unprocessed and minimally processed lettuce were between 5 to 7 log₁₀ CFUg⁻¹ (Khan et al²⁷; Nguyen-the and Carlin³⁰; Jacques and Morris²⁴; Ahvenainen¹; Babic et al³; Kaneko et al²⁶). Overall, the contamination with *E. coli* O157:H7 of Butterhead lettuce from all producers was still below microbial recommended limit, 8 log₁₀ CFUg⁻¹ or 10⁸ CFUg⁻¹ as proposed by Debevere¹⁴.

Nitrate Content In Butterhead Lettuce: The nitrate content in young leaves of Butterhead lettuce obtained from all producers (P1, P2, P3 and P4) were below the MNL and over 50% lower if compared with nitrate content in the midribs (Figure 2). The nitrate content in midribs of lettuce from P2 was significantly different with those obtained from P3 and P4. The nitrate content in leaf midribs of lettuce, from P1, P3 and P4, were not significantly different. The nitrate content in leaf midribs of lettuce from P2 was significantly higher than those from P3 and P4. The nitrate content in leaf midribs of lettuce from P3 and P4 almost reached the MNL. Leaf midribs of lettuce from P1 and P2 exceeded the MNL. As for the outer adult leaf blades, only lettuce from P1 exceeded the MNL.

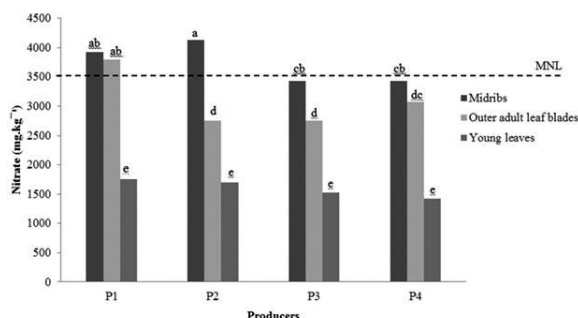


Figure 2: The nitrate content of Butterhead lettuce in leaf midribs, outer adult leaf blades and young leaves from four local producers (P1-P4)

Mean values followed by the same letter are not significantly different. MNL = Maximum nitrate limit for the European Commission (2002).

In general, nitrate content in midribs and outer adult leaf blades of Butterhead lettuce sampled showed significant differences with the young leaves. These results indicated that nitrate accumulation was different between the leaf structures. Yosoff et al⁴⁶ also found that the nitrate content was different in various plant structures. The difference in nitrate accumulation within plant organ or structures might be related to their position and nitrate distribution. Normally, in Butterhead lettuce, the adult leaf blade is at the outer layer and young leaves at the inner layer of each head. The plant roots absorbed the nitrate from the growth medium and transported it to the leaves through the xylem.

The nitrate ions should pass the midribs and outer adult leaf blades before being distributed to the young leaves. Therefore, the nitrate content would be higher in leaf midribs and outer adult leaf blades compared with the young leaves. Wang et al⁴³ identified that there is a specific gene in nitrate remobilization from old leaves to the young leaves. Santamaria et al³⁶ also found that heads of chicory and lettuce accumulate lesser nitrate in inner leaves than outer leaves while in parsley and spinach, leaf blades accumulate less nitrate than petioles. In 'Rocket' leaf lettuce, the nitrate content in the leaf petiole was double that of the leaf lamina (Elia et al¹⁷), the difference was as high as 6.6 fold in spinach (Umar et al⁴²). However, the nitrate concentration was lowest in the roots of leafy vegetables such as rape, cabbage and spinach, and the petiole-stem was higher than in the leaves (Chen et al⁸). Besides, nitrate supply has a significant effect on nitrate distribution both in the metabolic and storage pools of leaf blades.

Most of the large lettuce producers in Malaysia grow their lettuce under cover using hydroponic and aeroponic planting systems. Both systems provide luxurious consumption of nitrate. Applying nitrogen fertilizer increases nitrate concentrations in the xylem but has virtually no effect on concentrations in the phloem (EFSA²). Therefore, leafy crops especially lettuce, showed increasing concentration of nitrate in response to nitrogen fertilizer, except in the young leaves, while storage organs of plants that are fed by the

phloem tended to show little effect (Alexander et al²). Thus, the accumulation of the nitrate content depends on the plant organ.

The MNL varied according to season, with higher nitrate levels permitted in crops grown in winter compared with those grown in the summer. However, Malaysia is a tropical region which makes it possible to maintain the same fertilizer practices all over the year. Thus, season does not influence the excessive nitrate accumulation in local lettuce. It was the contrary in Europe where the concentrations of nitrate in vegetables are higher in winter than during other seasons of the year (Alexander²). However, this difference was not observed in a study conducted in Korea. Chung et al¹⁰ suggested that the disparity in data could be due to different environmental conditions and use of fertilizers in summer by Korean farmers.

CONCLUSION

The nitrate content in Butterhead lettuce, in Malaysia, was distributed differently between leaf structures; midrib, outer adult leaf blade and young leaves. Lettuce midrib and outer adult leaf blade had a higher concentration of nitrate compared with young leaves. In this study, the result showed that the nitrate content could be considered as 'high' because it ranged within 1000 - 2500 mg.kg⁻¹ FW. Thus, more studies need to be conducted to get the optimum fertilizing techniques, harvesting stage and storage duration that can reduce the nitrate content.

E. coli O157:H7 contamination of Butterhead lettuce, in Malaysia, is still within the safe limit for the consumers. However, only contamination of *E. coli* O157:H7 from two producers, P1 and P2, 6.95 and 6.65 log₁₀ CFUg⁻¹, respectively, were approaching the MRL. If left unchecked, it could cause out-break of serious diseases associated with this bacteria. Hence, some interventions are necessary in order to reduce this contamination besides hygienic practices, which should be mandatorily applied at every point of the production chain to ensure safe consumption by consumers.

ACKNOWLEDGMENTS

The authors would like to acknowledge the Pathology Laboratory, Faculty of Agriculture, Universiti Putra Malaysia for providing the infrastructural facilities used for this research.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Ahvenainen R. New approaches in improving the shelf life of minimally processed fruit and vegetables. *Trends Food Science Technology*. 1996;7: 179–187.
2. Alexander J, Benford D, Cockburn A, Cravedi J, Dogliotti E, Di Domenico A, Fernandez-Cruz M, Fink-Gremmels J, Fürst P, Galli C, Grandjean P. Opinion of the scientific panel on contaminants in the food chain on a request from the European commission to perform a scientific risk assessment on nitrate in vegetables. *EFSA Journal*. 2008;689:1-79.
3. Babic I, Roy S, Watada A.E, Wergin W.P. Changes in microbial populations on fresh cut spinach. *International Journal of Food Microbiology*. 1996;31:107–119.
4. Beuchat L. R. Ecological factors influencing survival and growth of human pathogens on raw fruits and vegetables. *Microbes and infection*. 2002;4(4): 413-423.
5. Boink A, Speijers G. Health effects of nitrates and nitrites. *Acta Horticulturae*. 2001;563:29-36.
6. Bryan N.S, Alexander D.D, Coughlin J.R, Milkowski A.L, Boffetta P. Ingested nitrate and nitrite and stomach cancer risk: an updated review. *Food and Chemical Toxicology*. 2012;50(10), 3646-3665.
7. Chan T.Y. Vegetable-borne nitrate and nitrite and the risk of methaemoglobinaemia. *Toxicology letters*. 2011;200(1):107-108.
8. Chen B.M, Wang Z.H, Li S.X, Wang G.X, Song H.X, Wang X.N. Effects of nitrate supply on plant growth, nitrate accumulation, metabolic nitrate concentration and nitrate reductase activity in three leafy vegetables. *Plant Science*. 2004;167(3):635-643.
9. Chigor V, Umoh V, Smith S. Occurrence of *Escherichia coli* O157 in a river used for fresh produce irrigation in Nigeria. *African Journal of Biotechnology*. 2010;9:178–182.

10. Chung S.Y, Kim J.S, Kim M, Hong M.K, Lee J.O, Kim C.M, Song I.S. Survey of nitrate and nitrite contents of vegetables grown in Korea. *Food Additive and Contaminants*. 2003;20(7):621-628.
11. Cieslik E, Sikora E. Correlation between the levels of nitrates and nitrites and the contents of potassium, calcium and magnesium in potato tubers. *Food Chemistry*. 1998;63:525-528.
12. Codex Alimentarius Commission (CAC). Recommended International code of Practice General Principles of Food Hygiene. 2003;CAC/RCPI-1969.
13. De Martin S, Restani P. Determination of nitrates by a novel ion chromatographic method: Occurrence in leafy vegetables (organic and conventional) and exposure assessment for Italian consumers. *Food Additives and contaminants*. 2003;20(9):787-792.
14. Debevere J. Criteria en praktischemethodenvoor de bepaling van de houdbaarheidsdatum in de etikettering. *Etikettering, houdbaarheid en bewaring (voedingsmiddelen en recht 2) Die Keure: Brugge*. 1996;37- 64.
15. Dontorou C, Papadopoulou C, Filioussis G, Economou V, Apostolou I, Zakkas G, Salamoura A, Kansouzidou A, Levidiotou S. Isolation of *Escherichia coli* O157:H7 form foods in Greece. *International Journal of Food Microbiology*. 2003;82:273-279.
16. Doyle M.P, Erickson M.C. Summer meeting 2007. The problems with fresh produce: an overview. *Journal Application Microbiology*. 2008;105:317-330.
17. Elia A, Conversa G, Gonnella M. Dosi di azoto, produzione e accumulo di nitrati di lattuga allevata in idrocoltura. *Atti V Giornate Scientifiche SOI, Sirmione*. 2000;229-230.
18. EU Scientific Committee for Food. Opinion on nitrate and nitrite. Expressed on 22 September 1995. European Commission DG III, Brussels. Annex 4 to document III/56/95, CS/CNTM/NO3/20-FINAL. Brussels: European Commission DG III. 1995.
19. FAO/WHO. Codex Alimentarius: General requirements (Food hygiene). Volume 1B (Vol. 1). FAO. 2001.
20. Gorny J.R. Microbial contamination of fresh fruits and vegetables. In : Sapers, G.M., Gorny, J.R. and Yousef A.E. (Eds). *Microbiology of Fruits and Vegetables*. USA: CRC Press. 2006;3-32.
21. Hochmuth G.J. Efficiency ranges for nitrate-nitrogen and potassium for vegetable petiole sap quick tests. *Horticulture Technology*. 1994;4(3): 218-222.
22. Institute of Food Technologists (IFT). Emerging microbiological food safety issues: Implication for control in the 21st century. Chicago: IFT. 2002.
23. Islam M, Doyle M.P, Phatak S.C, Millner P, Jiang X. Persistence of enterohemorrhagic *Escherichia coli* O157: H7 in soil and on leaf lettuce and parsley grown in fields treated with contaminated manure composts or irrigation water. *Journal of food protection*. 2004; 67(7):1365-1370.
24. Jacques M.A, Morris C.E. Bacterial population dynamics and decay on leaves of different ages of ready-to-use broad-leaved endive. *International Journal Food Science Technology*. 1995;30:221-236.
25. Johannessen G.S, Loncarevic S, Kruse H. Bacteriological analysis of fresh produce in Norway. *International Journal of Food Microbiology*. 2002;77:199-204.
26. Kaneko K, Hayashidani H, Takahashi K, Shiraki Y, Lim a-wongpranee S, Ogawa M. Bacterial contamination in the environment of food factories processing ready-to-eat fresh vegetables. *Journal Food Protection*. 1999;62:800-804.
27. Khan M.R, Saha M.L, Kibria A.H.M.G. A bacteriological survey of ready to eat salad with special reference to coliform and non-lactose fermenters. *Bangladesh Journal Botany*. 1994;23:47-51.
28. Luning P. A, Devlieghere F, Verhé R. Safety in the agri-food chain. Wageningen: Academic Publication. 2006.
29. Lynch M. *Escherichia coli* O157:H7 outbreaks due to raw leafy green vegetables. Memorandum by the US Center of Disease Control and Prevention. 2007.
30. Nguyen-the C, Carlin F. The microbiology of minimally processed fresh fruits and vegetables.

- CRC Crit. Rev. Food Science Nutrition. 1994;34:371–401.
31. Rangel J.M, Sparling P.H, Crowe C, Griffin P.M, Swerdlow D.L. Epidemiology of Escherichia coli O157:H7 outbreaks, United States, 1982–2002. *Emerging Infectious Disease Journal*. 2005;11, 603–609.
 32. Rappaport F, Henig, E. Media for the isolation and differentiation of pathogenic Esch. coli (serotypes O 111 and O 55). *Journal of Clinical Pathology*. 1952;5(4):361–362.
 33. Sagoo S.K, Little C.L, Mitchell R.T. The microbiological examination of ready-to-eat organic vegetables from retail establishments in the United Kingdom. *Letters in Applied Microbiology*. 2001;33:434-439.
 34. Sánchez S, García-Sánchez A, Martínez R, Blanco J, Blanco J. E, Blanco M., Dahbi G, Mora A, de Mendoza J.H, Alonso J.M, Rey J. Detection and characterisation of Shiga toxin-producing Escherichia coli other than Escherichia coli O157:H7 in wild ruminants. *The veterinary journal*. 2009;180(3):384-388.
 35. Santamaria P. Nitrate in vegetables: Toxicity content, intake and EC regulation. *Journal of the Science of Food and Agriculture*. 2006;86:10-17.
 36. Santamaria P, Elia A, Gonnella M, Parente A, Serio, F. Ways of reducing rocket salad nitrate content. *Acta Horticulture*. 2001;548:529–537.
 37. Satin M. *Food Alert! The Ultimate Source book for Food Safety*. Facts on File Inc. 2nd ed. 2008.
 38. Scallan E, Hoekstra R. M, Angulo F. J, Tauxe R. V, Widdowson M. A, Roy S. L, Jones J.L, Griffin P. M. Foodborne illness acquired in the United States—major pathogens. *Emerging infectious diseases*. 2011;17(1):7.
 39. Siti Fairuz Y, Mahmud T.M.M, Ahmad S.H, Harizul A, Farinazleen M.G. Screening of Escherichia Coli O157:H7 From Hydroponic and Organic Butterhead Lettuce After Aqueous Ozone Treatment and Its Effect on Postharvest Quality. *Acta Horticulturae*. 2013;1012:745-753.
 40. Solomon E.B, Yaron S, Mathews K.R. Transmission of Escherichia coli O157:H7 from contaminated manure and irrigation water to lettuce plant tissue and its subsequent internalization. *Application Environment Microbiology*. 2002;68:397-400.
 41. Soriano J.M, Rico H, Molto J.C, Manes J. Incidence of microbial flora in lettuce, meat and Spanish omelette from restaurants. *Food Microbiology*. 2001;18:159-163.
 42. Umar S, Iqbal M, Abrol Y.P. Are nitrate concentrations in leafy vegetables within safe limits?. *Current science*. 2007;92(3):355-360.
 43. Wang Y. Y, Hsu P. K, Tsay Y. F. Uptake, allocation and signaling of nitrate. *Trends in plant science*. 2012;17(8):458-467.
 44. Wang Z.H, Tian X.H, Wei Y.S, Li S.X. Nitrate accumulation and its regulation by nutrient management in vegetables. In: *Balanceable Fertilization and High Quality Vegetables Continual Production*. Beijing: China Agricultural University Press. 2000.
 45. World Health Organization (WHO). *Food Safety, Chemical Risks in Food*. Website <http://www.who.int/foodsafety/chem/en/> . Retrieved 2 May 2017. 2012.
 46. Yosoff S.F., Mohamed M.T.M, Parvez A, Ahmad S.H, Ghazali F.M, Hassan H. Production system and harvesting stage influence on nitrate content and quality of butterhead lettuce. *Bragantia*. 2015;74(3):322-330.
 47. Zadik P.M, Chapman P.A, Siddons C.A. Use of tellurite for the selection of verocytotoxigenic E.coli O157. *Journal of Medicine Microbiology*. 1993;39:155-158.
 48. Zhou Z.Y, Wang M.J, Wang J.S. Nitrate and nitrite contamination in vegetables in China. *Food Reviews International*. 2000;16:61-76.

Effect of ESSZONE Establishment on Maritime Security and Economic Activity: A Case Study of Tawau District

Abdul Rahim Anuar¹, RusdiOmar¹, Laila Suriya Ahmad Apandi¹, Dewi Natasha Rasid²

¹*School of International Studies,* ²*School of Government, Universiti Utara Malaysia, Malaysia*

ABSTRACT

Non-traditional security (NTS) threats—trespassing, kidnapping, and smuggling—which repeatedly occur in Sabah (Malaysia) have threatened the country’s sovereignty and security. The National Security Council of Malaysia has declared the east coast of Sabah as Eastern Sabah Security Zone (ESSZONE) to inhibit NTS threats and increase security in the east coast of Sabah. However, the implementation of ESSZONE, such as curfews, may affect the maritime economic activities of the local people. Therefore, this paper examines the impact of ESSZONE toward security and maritime economic activity in Tawau.

Keywords: *Non-traditional security threats, maritime, Tawau, ESSZONE*

INTRODUCTION

Non-traditional security (NTS) threats, such as maritime piracy, kidnapping, smuggling, and human trafficking, often occur along the coastal regions of east of Sabah. The year 2013 marked a tragic event, when Sulu militants invaded Lahad Datu thereby threatening the sovereignty of the country—triggering a host of security concerns to the public in Malaysia, and Sabah in particular. This has brought a negative impact on the tourism and maritime industry in the region because of the ongoing security threats in Sabah’s east coast

In realizing the fact that the frequency of NTS threats were increasing in the eastern part of Sabah, on 7 March 2013, the federal government had declared the region as a Special Security Area (SSA) to safeguard the sovereignty and security of the state’s east coast. During the early establishment, the SSA only covers the districts of Kudat, Tawau, Kunak, Sandakan, and LahadDatu. On 25 March 2013, the federal government established the Eastern Sabah Security Zone (ESSZONE), covering 10 districts in eastern Sabah with an area of 1,734 kilometres from Kudat to Tawau. The associated regions include Kudat, Kota Marudu, Pitas, Beluran, Sandakan, Kinabatangan, LahadDatu, Kunak, Semporna, and Tawau. In the same year, the central government also established the Eastern Sabah Security Command (ESSCOM), which is a new “security enforcement agency” for ESSZONE and created specifically to protect the sovereignty and

security of the east coast, following the intrusion of Sulu terrorist in LahadDatu. Additionally, at the international level, security cooperation protocols with neighbouring countries, particularly Philippines, were implemented to combat terrorism and cross-border crime.

Following the frequency of kidnappings and attacks on tourist areas within the ESSZONE, a curfew had been enforced on 16 July 2014 covering six districts of Sandakan, Tawau, Kunak, LahadDatu, Semporna, and Kinabatangan. However, until today, the curfew still continues to be enforced involving all ESSZONE and territorial waters of the country, following the kidnapping and illegal immigration activities. Accordingly, this paper examines the impact of the establishment of ESSZONE on the east coast of Sabah regarding maritime safety and economic activities in Tawau.

LITERATURE REVIEW

The issue of maritime security at state level in Sabah was studied by Wan and Ramli (2009). They were of the view that the issue of security in Sabah occurs on a large scale and creates a safety concern to the country. Two of the six aspects of NTS threats occur in Sabah, namely cross-border crime and illegal migration. Cross-border crime is often the case occurring in Sabah, such as smuggling, piracy, robbery, and kidnapping, which may not be a new issue in Sabah, but nevertheless, it has become a national issue and requires urgent action

from the government. The continual influx of illegal immigrants (“pendatangtanpaizin” – PATI) into Sabah is due to its geographical location, where it is exposed to two neighbouring countries, the Philippines and Indonesia. NTS issues has increased the national financial allocation to Sabah. Following the incident at Pandananand Sipadan, Malaysia spent nearly RM6 billion to enhance security in the east coast of Sabah. This happened again in 2013 following attack on Sabah by Sulu militants and the government spent more by setting up ESSCOM and improving border defence technology to protect the security of the country’s territorial waters from foreign elements and NTS threats.

Rasid et al¹⁸ stated that social, political, and economic issues are characteristically cross-border in nature and consequently would have a negative impact on the security of neighbouring countries. This is clear with the political, social, and economic disorder in the southern Philippines that has affected the security of Sabah with the influx of illegal immigrants, smuggling of controlled and prohibited goods, piracy in local waters, and kidnapping of tourists. The findings by Rasid et al¹⁸ also showed that the security issue of coastal areas has given an impact on the socio-economic viability of the communities.

In a study by Mak¹¹, it was shown that Malaysia had faced the issue of NTS threats for more than 20 years ago, with the repeated occurrence of piracy, smuggling, and robbery in the Straits of Malacca and the Sulu Archipelago. In particular, Mak¹¹ identified important stakeholders in the local waters from the aspects of economy and safety, namely the fishing trawlers in Peninsular Malaysia, the barter trade between the Philippines-Sabah, and piracy in the Straits of Malacca and Sumatera, Indonesia. Another issue that was highlighted is the problem of differing border water maps between neighbouring countries. This has led to dispute over maritime boundary that is not resolved and complicate control of operations and safety by the authorities of the respective countries.

Meanwhile, some of the issues of NTS illegal migration was discussed by Arvin and Nurfazlina². The illegal immigrant problem in Sabah this decade has given concern to the government and local communities because immigrants have led to high crime rates and threaten security in Sabah. Sabah waters are spacious and very porous, where its openness has led to the existence

of many “backdoors” that have been favourable to outsiders to discretely enter Malaysia.

Ramli and Ahmad¹⁵ studied the main economic activity in Tawau (Sabah), which is barter trade. There is a strong barter trade relationship between traders from Tawau-Kalimantan-Mindanao. They also identified the issue of trade relations between Sabah-Mindanao and Sabah-East Kalimantan, namely smuggling. Ramli and Ahmad¹⁵ also identified other NTS issues such as influx of illegal immigrants from Indonesia and the Philippines, and Malaysia-Indonesia and Malaysia-Philippines conflicts particularly on maritime border. Illegal migration, mainly from the Philippines and Indonesia, has an impact on the socio-economic development of the people in Sabah.

From economic perspective, Abdul Rahim¹ in his study on the development of cross border economy in Tawau (Malaysia) and Nunukan Island (Indonesia) found that the development concept in the border areas of these two countries are characteristically traditional securities. Malaysia and Indonesia consider the issues of defence and security are more pertinent than issues of economic development. Poverty, which is among the NTS issues, is higher in Nunukan Island as compared to Tawau and becomes a push factor for Nunukan residents to find employment in Tawau. In addition, most of the people of Tawau and Sebatik Island depend on maritime economy for their living. Thus, any security threat in the east coast can jeopardise the economy of local residents, including Tawau and Sebatik Island.

Meanwhile, Ramli and MohdZambri¹⁶ discussed the role of ESSCOM in maintaining security of Sabah, especially in the east coast of Sabah. For the locals in Sabah, ESSCOM can be said to have failed in their duties, based on the number of crime incidents, like maritime border kidnappings, which lately have occurred frequently.

In light of improving security, Ruhanas¹⁹ elaborated on the improvement of security cooperation between Malaysia and neighbouring countries: Sabah-Indonesia, Sabah-Philippines, Sabah-Brunei and Peninsular Malaysia-Thailand. However, he did not discuss much regarding the impact and consequences on the lives of local communities in Malaysia because of NTS threats faced by the country. Discussion on security policy implementation was focussed more on efforts

by Malaysia and its neighbours in building defences at national borders, both on land and maritime, with the assumption that this defence itself is a sufficient security measure to protect local communities.

Meanwhile in Peninsular Malaysia, the study by Inderjit¹⁰ also discussed maritime crime occurring in the Straits of Malacca, which is an important maritime route to international traders. However, this maritime route has received many NTS threats, such as piracy and robbery. He found that there is the issue of foreign intervention that tries to increase security in the Straits of Malacca. The Malaysian, Indonesian and Singaporean governments, which are the stakeholders in maintaining the security and sovereignty of these waters, did not agree with the intervention of a third party. The challenge to Malaysia in overcoming maritime crime has gained the attention of the United States, China, and Japan. They wanted to get involved in protecting the Straits of Malacca from NTS threats to keep their respective economic interests, as they are the largest user of those commercial shipping routes. However, Inderjit¹⁰ was in view that security cooperation between the countries that share the waters of the Straits of Malacca is important because interference from foreign countries or third parties would not lead to a complete solution to the issue of security in the Straits of Malacca. In fact, Inderjit¹⁰ purported that allowing third parties to be involve would cause problems and can lead to Malaysia, Singapore, and Indonesia to lose authority in the respective fields of maritime power.

NTS and security issues in Sabah have gained attention among local analysts. This is because the frequency of cross-border crime and the threat of NTS in the east coast of Sabah has risen, even though the government has taken certain safety plans, such as creating ESSZONE and ESSCOM.

RESEARCH FRAMEWORK

This investigation was characteristically a qualitative study using interviews and secondary data. Interviews were based on open-ended questions, conducted on stakeholders to analyse the impact and implementation of ESSZONE the impact on NTS threats related to the security and maritime economic activities in Tawau. Field work and observations were also made on economic activities of the community in that region.

Eight selected respondents were interviewed, namely a barter-trade trader in Tawau, representative from Sebatik Island Fishermen's Association (Tawau), representative from Tawau District Fishermen's Association, Superintendent of District Fisheries Office, General Manager of the Fishermen's Association Tawau (Tawau PKN), the Sabah Secretary of National Security Council, Commissioner of Police Staff, the Consulate of the Republic of Indonesia Tawau, Tawau Vice-Consulate of the Republic of Indonesia. All respondents were selected based on their function and their role in the issue under review.

Primary data sources were obtained from interviews with the National Security Council (NSC), Tawau Royal Malaysian Customs, the Immigration Department of Malaysia (Sabah), Tawau Area Fishermen's Association (PNK), Department of Tawau Fisheries District Office, Consulate of the Republic of Indonesia (Tawau), and barter-trade traders and Tawau fishermen representatives from Tawau and Sebatik Island.

Secondary data related to the maritime economy were also collected for supporting the information obtained from primary sources. Secondary data were obtained from the Department of Statistics, which publishes Annual Statistics of Sabah and Sabah External Trade Statistics. Sources of information about NTS threats to the east coast of Sabah were obtained from mainstream media and websites, especially Eastern Sabah Security Command portal (<https://esscom.gov.my/>, n.d.).

NON-TRADITIONAL SECURITY THREATS IN SABAH

Many NTS threats occur repeatedly along the east coast of Sabah, especially in ESSZONE territory. The ESSZONE establishment on 25 March 2013 was due to the intrusion by Sulu militants in Sabah. ESSZONE covers 10 districts in Sabah's east coast between Kudat and Tawau: Kudat, Kota Marudu, Pitas, Beluran, Sandakan, Kinabatangan, Lahad Datu, Kunak, Semporna and Tawau with a beach area spanning 1,734 kilometres. Regulatory agencies face the challenge of maintaining security in the region as cross-border crimes often occur in the waters off the east coast of Sabah. Even the British government advises its citizens to be careful in Sabah, thus giving a negative impression to international tourists that the level of security in Malaysia is not guaranteed (United Kingdom Government, n.d.).



Figure 1: ESSZONE Area

Sulu Militants: The Sulu militant incident attack is one of the most critical NTS threat to Malaysia in dealing with terrorism at the regional level, in addition to the Malaysia-Indonesia confrontation at the start of the 1960s. Malaysia had to use all military assets to defeat the Sulu militant groups.

The Sulu militant aggression was carried out by the heirs of the sultanate of Sulu, JamalulKiram III, on 11 February 2013 in the Tanduo village in LahadDatu, Sabah. The militant group that performed the intrusion in LahadDatu was headed by AzzimudieKiram, who claimed that they were not militants but they are Royal Security Forces of the Sultanate of Sulu and North Borneo attempting enforce the Sulu people's right to recover Sabah Malaysiakini¹².

This incident led to casualties on both sides. On the Malaysian side, nine members of the Malaysian defence fell in the field of battle, while a total of 68 members of the Sulu militants were killed in clashes with security forces. The Sulu conflict in Sabah ended in March 2013 and was followed by the establishment of the legal basis to establish ESSZONE and ESSCOM Bernama⁷.

Kidnapping: Prior to the terrorist attacks by Sulu militants, maritime security threats that are often found include piracy in the waters off the east coast of Sabah. Piracy or better known as "mundu" by the local people of Sabah is a cross-border crime that often occurs despite increased security efforts in the ESSZONE region. In fact, piracy not only involves assault or armed robbery by pirates on local boats, they can take more aggressive action by attacking police stations and grand scale robbery, such as in the town of Semporna in 2010 Ramli¹⁷. Kidnapping incidents also occurred on 15 November 2013, when there was an ambush by Filipino pirates on BomBom Island that killed Hsu Li Min, a

Taiwanese citizen, and Chang Ai Wei was held hostage and released in December 2013 (The Star²⁴. Then on 2 April 2014, Chinese tourist Gao Hua Yuan and Filipino resort worker Marcy Darawan were kidnapped in Singamata Reef Resort Semporna, and released on 30 May the same year, while a second incident occurred on 6 May of the same year, this time the victim was Yang Zai Lin, a 34-year old Chinese national, kidnapped in PulauBaik, LahadDatu. The victim was rescued after 65 days and found in the forest area of Patikul, in the Jolo archipelago that is also a stronghold of the Abu Sayyaf splinter group UtusanMalaysia²⁵.

On 16 June 2014, this kidnaping incident involved cage fish breeding centre owner, Chan Sai Chiun, 32 years old, and a Filipino worker in his 20s, both of whom were released on 9 December 2014 SinarHarian²². The victims were abducted by two armed men in KampungSapang Air, Kunak. On 12 July 2014, the marine police force in Mabul Island, Semporna were ambushed by kidnapers in the ESSZONE, involving Constable ZakiaAliep as the new kidnaping victim by group.

The victim was then released on 7 March 2015 after a negotiation was conducted by the government and the kidnapers, but not before fellow police officer Corporal Ab. Rajah Jamuan, 32 years old, was shot dead in the incident BeritaHarian⁶.

Repeated kidnappings in Sabah occurred on 14 May 2015 when two local people were abducted by the Abu Sayyaf in Ocean King Restaurant, Sandakan. The victim was a woman who is the manager at the restaurant, ThienNyuk Fun, 50, and a son, Bernard Ghen Ted Fen, 39, who is an electronics consultant in Cambodia (Astro Awani, May 25, 2015). Thien was released 9 November 2015, however, Bernard Ghen was beheaded on 17 November 2015 Sinar²¹. The mastermind behind the kidnapping in ESSZONE and four abduction cases was believed to be by the "Muktadir Brothers" The Star²³.

Smuggling: Sabah's geographical position, which is near Mindanao (Philippines) and Nunukan Island (East Kalimantan, Indonesia), have led to the occurrence of smuggled goods. For example, on 2 October 2015 Malaysian Maritime Enforcement Agency ("AgensiPenguatkuasaMaritim Malaysia" – APMM) foiled an attempt to smuggle gas and oil to neighbouring countries through the waters Tawau (My News Hub, October 2, 2015). Smuggling of subsidised items

from Malaysia to neighbouring countries, particularly Kalimantan (Indonesia), has become more frequent and widespread. Subsidised items such as cooking gas, petrol and diesel, rice, sugar, flour, eggs, and chicken are items that are often smuggled out of the country because in this country these items can be found at a cheaper price Astro Awani³. On 16 January 2015, the Royal Malaysian Customs Department seized 26 kilograms of “syabu” or cocaine worth nearly RM5 million in Tawau airport BeritaHarian⁵. In 2014, a total of 480 cases of smuggled cigarettes and 103 cases of other smuggled goods occurred in the ESSZONE waters during the January-June period, as was recorded by the Sabah Customs Department SinarHarian²⁰.

Illegal Immigrants in Sabah: The number of illegal immigrants in Sabah is not known because there is no official data recorded by the government. However, the data related to the number of illegal immigrants deported from Sabah can be used as an indicator of the number of illegals in Sabah. For the period 2014 to May 2016, 54,941 illegal immigrants in Sabah were deported to their country of origin. ESSCOM also improved the operations of hunting illegal immigrants in the area—Tawau, Semporna, Kunak, LahadDatu, Kinabatangan, Sandakan, and Beluran—and since 2015 until 4 May 2016, it has carried out a total of 1,823 ESSCOM enforcement operations and successfully detained 11,688 illegal immigrants Bernama⁸.

CURFEW IN ESSZONE

The curfew was implemented on 19 July 2014, which is a security policy established by the government especially for the ESSZONE region (Agensi Penguatkuasa Maritim Malaysia Tawau, 2015). The curfew conditions are;

- Individuals, except security personnel and exempted individuals, can be in a predetermined area from 6.00pm to 6.00am.
- Individuals exempted from the curfew include “Yang DiPertuanAgong”, “Raja”, “Yang DiPertuaNegeri”, and any members of the Malaysian Navy, Airforce, and Army who are on duty (according to Section 31(3) Police Act 1967).
- Individuals other than the authorities that want to enter or pass through the curfew region need to obtain a Curfew Exemption Permit from the Head of Police in the respective region.

- Any individual found in areas that have been declared during the established times can be detained without a warrant and can be put on trial in court.
- The enforcement members can obtain a mandate to arrest any individual that do not adhere to the curfew in Section 31 (2) Police Act 1967.
- The enforcement members are allowed to use firearms in accordance to the requirements and provisions of law.

The curfew was extended by the Sabah Polis Commissioner to 17 April 2016 and had entered the 40th phase Harian Metro⁹. The extension was prompted by kidnappings that recently occurred frequently, in addition to maintaining the level of security in the waters that can be guaranteed.

ANALYSIS AND FINDINGS

Analysis of interviews with stakeholders was divided into the community involved in the maritime economic activities, and the government that runs the security policy. The study results are divided into two perspectives, i.e., (i) barter-trade and security measures, and (ii) local and national security.

Barter-Trade and Security Measure Perspective: According to a bartertrade trader with more than 20 years of experience in the industry, the government’s proposal to embargo the barter-trade activities in Sabah-Mindanao and Sabah-Kalimantan to combat repeating cross-border crime should be reevaluated. However, from the government’s perspective, it is a proactive step in addressing smuggling and kidnapping that occur in the ESSZONE.

Bartertrade in Sabah’s east coast is carried out in the port of Sandakan and Tawau, which act as the main entrance for merchants from Mindanao and east Kalimantan. Sabah’s major imports are from Indonesia and the southern Philippines, such as cigarettes, high value marine products, timber, counterfeit brand goods, kitchen utensils, and others because they are relatively cheaper. Bartertrade provides a very high positive impact on socio-economic development of the people in the three countries because it creates economic activity in marginalised and rural areas in the respective countries. Among bartertrade traders, this step has a negative impact on the business of bartertrade in Sabah.

Bartertrade business has improved bilateral relations of Sabah-Mindanao and Sabah-Kalimantan. In fact, the spill-over effects of bartertrade economy is clearly observed in the creation of new jobs and business opportunities related to the maritime industry in Tawau.

Table 1 shows the barter trade business in favour of Sabah with an average trade surplus for the period 2011-2015 of RM124 million (Sabah-Indonesia) and RM25 million (Sabah-Philippines).

Table 1: Sabah Barter-Trade with Indonesia and Philippines through Tawau Port, 2011-2015 (RM million)

Year	Indonesia			Philippines		
	Import	Export	Trade Balance	Import	Export	Trade Balance
2011	26.0	190.0	164.0	0.1	31.0	31.1
2012	31.0	251.0	220.0	20.0	11.0	31.0
2013	2.8	0.0	-2.8	0.0	0.6	0.6
2014	30.7	114.0	83.3	0.0	25.3	25.3
2015	28.9	184.9	156.0	0.1	35.7	35.8
average (2011-2015)	23.9	148.0	124.1	4.0	20.7	24.7

Source: Royal Malaysian Customs Department, Tawau

Cross-border crimes, such as smuggling in Sabah's east coast waters, are done by unscrupulous individuals who intend on earning huge profits without paying taxes to the government of Malaysia. Smuggling is done alone without involving of the actual bartertrade traders.

Bartertrade is controlled by the Royal Malaysian Customs and the exchange of export and import goods is carried out in a special area called the Tawau Goods Exchange Centre adjacent to the Tawau port. If any ships from foreign countries (Indonesia and Philippines), that carry trade products, are not anchored in Tawau Goods Exchange Centre, then they will be charged as smugglers under the Malaysian Trade and Barter Trade laws. However, wet and perishable items such as fish and other marine products are exempted from anchoring at the Tawau Goods Exchange Centre and allowed to berth at the fishery jetties in Tawau.

Increased security measures undertaken by the government in fact does not affect the bartertrade activity. Instead, a bartertrade ban would affect trade and barter activities which is detrimental to Sabah. Therefore, the government should identify the real cause of cross border crime along the east coast of Sabah.

This views by the barter-trade representative with experience of more than 20 years was shared by the representative of TawauSebatik Island Fishermen. Following the implementation of security and curfew, the fishermen are not allowed to enter other regional fishery zones and can only catch fish in their own zones, namely Zone A (Tawau).

NTS threat to the Tawau district is less than in other regions, especially Semporna, Kunak, LahadDatu, and Sandakan, which is often referred to as the Hot Zone. Therefore, the lack of NTS threat does not affect the maritime economic activities in Tawau. Conversely, security measures and curfews imposed on all areas do affect maritime economic activities in Tawau. The curfew from 6am to 6pm was enacted on 16 July 2014 covering six districts of Sandakan, Tawau, Kunak, LahadDatu, Semporna, and Kinabatangan.

There are 1,515 fishermen in Tawau and of that number, 98% are Malays (Persatuan Nelayan Kawasan Tawau, 2016). Curfews have a significant impact on the income of fishermen because they cannot get out during the time of curfew and cannot fish in other zones, except for their own designated zone. Due to the increasing number of complaints from fishermen in ESSZONE, the government has given an allowance of RM300 per month to a small fishing operation and RM250 per month for trawlers, as well as reduce accident insurance with a deduction of RM100 a year. In addition, the Fishermen's Area Association also provides assistance in terms of repairing damaged equipment and improving the infrastructure of fishermen.

Concerns expressed by the representative of Tawau Fishermen's Association were also raised by representative of Sebatik Island Fishermen Association that has 626 members Persatuan Nelayan Pulau Sebatik¹⁸. Curfew security implementation from 6am to 6pm every

day has affected the income of fishermen, who are also low-income earners and can be categorised as poor. They hoped that the government can quickly resolve security problems in the coastal waters of east Sabah to enable them to catch fish as usual.

However, Tawau waters are in a situation that is more secured, especially for the maritime economic activities. This is unlike in Semporna, Kunak, Lahad Datu, and Sandakan, areas which form the Hot Spot of the criminal activities including kidnapping, piracy, robbery, threats of Sulu attacks, weapons and illicit goods smuggling, and other cross-border crimes. Thus, the economic activity in those areas are affected by the emergence of these NTS threats.

In recapitulation, the security policy implemented by the government in Sabah's east coast has a negative impact on maritime economic activities in Tawau. Concerns were raised by bartertrade traders and representative of the Association of Fishermen (Tawau and Sebatik), both of whom are in agreement with representatives of the Tawau Area Fishermen's Association (PNK Tawau) and Superintendent of Tawau District Fisheries Office. Both of the latter agencies also assisted fishermen in the form of financial aid to continue with their daily lives. However, in terms of policy implications, the government must re-evaluate security measures in Tawau waters, and the curfew regulations in particular, because the NTS threat is lower and more manageable than in Sandakan, Tawau, Kunak, Lahad Datu, Semporna, and Kinabatangan, which form the hot spot area.

Local and National Security: The view adopted by the business community involved is in very stark contrast to the government's view. The government would prioritise security and sovereignty. If this can be maintained, then it acts as a platform for developing the economy of the country and people. This is because political stability is closely related to the country's development.

From the government perspective, especially the National Security Council, the abolition of bartertrade is associated with wooden boat carrying goods from Mindanao-Sandakan and East Kalimantan-Tawau to trade, but they also took the opportunity to smuggle prohibited goods such as drugs, firearms, and human trafficking. In other words, irresponsible individuals perform cross-border criminal activities under bartertrade activities.

This has prompted the government to embargo the business of bartertrade with a view of combating cross-border crime. However, bartertrade traders who comply with the law are also affected by the security measures taken by the government. Though, the government is ready to hold dialogue sessions with bartertrade traders to resolve their problems and predicament. At the same time, the agency at the Sabah state level like the State Economic Planning Unit, Sabah Economic Development and Investment Authority (SEDIA), the Fisheries Development Authority, Federal Agricultural Marketing Authority (FAMA), and the Department of Agriculture should collectively take the initiative to assist the target groups affected by the security measures implemented by the government.

From the view point of the government of the Republic of Indonesia (RI), bilateral trade relations of Sabah-East Kalimantan and bartertrade are important from the very beginning, which led to the signing of several important agreements, namely the Border Trade Agreement 1970 and Border Cross Agreement 2006. RI also supports Malaysia in the implementation of measures to improve security in the waters off the east coast of Sabah with the view to combat cross-border crime. This also assists merchants from East Kalimantan to enable them to do bartertrade activities with Tawau dealers formally and without hindrance in the future.

However, RI focuses more on taking care of the welfare of Indonesian workers (TKI) employed in Sabah and Sarawak, when compared to barter-trade activities. This is because Tawau-Nunukan bartertrade traders comply more with the barter-trade rules and regulations, than the Filipino Sandakan-Mindanao traders that take advantage of barter-trade activities to perform cross-border crime.

The Indonesian government consulate in Tawau is also aware that the implementation of security measures in ESSCOM and ESSZONE would affect the Tawau-Nunukan bilateral trade and the revenue from bilateral trade has declined. However, the positive effect is even greater in the long-term, where the trade routes in the east coast of Sabah, including Tawau, can be monitored safely for NTS threats, such as smuggling of illegal goods such as drugs, and weapons, and human trafficking.

In short, for the Malaysia government gave priority to the security over economic interests in view of the

uncertain security environment which could affect the sovereignty and national security in the long term. However, for the communities involved in the maritime economic activities, the economic welfare takes precedence in order to maintain their living standards.

CONCLUSION

On the whole, ESSCOM has managed to increase the level of security in the waters off the east coast of Sabah, especially in Hot Spot areas. Cross-border crime has been reduced significantly. In the long-term this can regenerate economic activity when the level of security in the maritime waters can be fully guaranteed. However, economic activity in Tawau, which is a region that faced less NTS threats, is affected by the security measures implemented by the government, especially the curfew. Income of fishermen in Tawau and Sebatik decreased due to the curfew that controlled the time and fishing zones. However, a plan to help them has been implemented by the agencies concerned with the welfare of the fishermen. The government must prioritise security, while the community give priority to economic activities for their livelihood. Therefore, the government should consider appropriate measures to balance the objectives of security and economic interests, depending on the level of NTS threat zones.

ACKNOWLEDGMENTS

The authors like to thank Universiti Utara Malaysia for providing funding to do the study on Towards A Pre- And Post-Model of Third Party Intervention In Peacebuilding Process: The Role of Malaysia In Bangsamoro Conflict (#13145).

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Abdul Rahim Anuar. Rubri kpeban gunanpe kansempadan Malaysia-Kalimantan: Tawau-PulauNunukan. *Journal of Borneo Social Transformation Studies (JOBSTS)*. Universiti Malaysia Sabah. 2015; Vol. 1: No. 1:16.
2. Arvin Tajari & Nurfazlina Affendi. Illegal immigrant and security crisis in Sabah (Malaysia). *E-Proceeding of the International Conference on Social Science Research (ICSSR)*, Melia Hotel Kuala Lumpur Malaysia. 2015; 8-9 June 2015.
3. Astro Awani. KDN. memerlukan ask anusaha pencegahan penyelu dupan Sabah dan Sarawak. (July 1, 2013). Retrieved from <http://www.astroawani.com/>
4. AstroAwani. Duain dividu diculi klelaki ber senjata di Sandakan. (May 5, 2015). Retrieved from <http://english.astroawani.com/>
5. BeritaHarian. Kastam Tawau rampas yabubernilai RM4.9 juta. (January 20, 2015). Retrieved from <http://www.bharian.com.my/node/30462>
6. BeritaHarian. Lans Koperal Zakiah Alepdibebaskanhariini. (March 7, 2015). Retrieved from <http://www.bharian.com.my/node/39136>.
7. Bernama. Pencerobohan Lahad Datu catat sejarah hitam negara. (December 16, 2013). Retrieved from <http://www.sinarharian.com.my/>.
8. Bernama. Over 50,000 illegal immigrants in Sabah deported between 2014 and May 2016: Zahid. (May 16, 2016). Retrieved from <http://www.nst.com.my/>
9. Harian Metro. Perintah Berkurung masuk fasa ke-40. (April 1, 2016). Retrieved from <http://www.hmetro.com.my>
10. Inderjit Singh Tara Singh. Safeguarding the Straits Of Malacca against maritime crime: Issues amongst states on security responsibility. *International Journal of Humanities and Social Science*. 2012; Vol. 2 No. 2: 111-119.
11. MakJoon Num. Pirates, barter traders, and fishers: Whose rights, whose security? *User Conflicts and Maritime Non-traditional Security in Malaysian Waters*. 2009; 19-28. Retrieved from file:///C:/Users/Dell/Downloads/02_Joon.pdf.
12. Malaysiakini. Kronologi pencerobohan kumpulan bersenjata di Lahad Datu. (March 2, 2013) Retrieved from <https://www.malaysiakini.com/news/>.

13. mStar. Perintah berkurang di Sabah dilanjutkanehingga21 Oktober. (October 5, 2014)Retrieved from <http://www.mstar.com.my/>.
14. My News Hub. APMM patahkan penyelu dupan gas, minyak di Tawau. (October 2, 2015)Retrieved from <http://www.mynewshub.cc/>
15. RamliDollah, Ahmad Mosfi Mohamad. Perda gangantuk arbarang Malaysia-Indonesia: potensidancabaran. Jati. 2007; Vol. 12:83-106.
16. Ramli Dollah & Mohd Zambri Suharani. Fungsi danperananess comdalammen jaminke lamatan Sabah: Satuper banding anperse psiant arakomuniti 'luar' dankomunitiESSZONE. JurnalKomunikasi Borneo. 2015; Bilangan .2: 1-28. Retrieved from <http://jkob.cseap.edu.my/index.php/journal/full/2-1.pdf>.
17. RamliDollah. Lanunataumundu Di Sabah. Jati. 2004; Bilangan9:171-188. Retrieved from <http://repository.um.edu.my/>.
18. Rasid Mail, Baszley Bee Basrah Bee, Saat Ag Damit, Ab Nasir Roslan. (2016). Isukeselamatanperairan pantaitimur Sabah: kelangsungansosioekonomisarakatpesi sir. Seminar SASSREC 1: Sempadan & Keselamatan Sabah, 25-26 Februari 2015, Pusat Pengajian Strategikdan Keselamatan Sabah (SASSREC), Unit Kajian Remote Sensing dan GIS (CERGIS), Pusat Penyelidikan Pulau-Pulau Kecil (SIRC), Dewan Bankuasi UMS.
19. Ruhanas Harun. Pening katank eselamatan bersamamela luikerjasa maduahala Malaysia dannegara-negarajiran. Jebat. 2009; 36:16-40.
20. Sinar Harian 480 kespe nyeludu panrokok di Sabah bagi Jan-Jun. (August 11, 2014). Retrieved from <http://www.sinarharian.com.my/>
21. Sinar Harian Kepaladijumpai di Jolosahmilik Bernard Then. (December 19, 2015). Retrieved from <http://www.sinarharian.com.my/>
22. SinarHarian Mangsaculik: Jangan kacauisterisaya. (June 16, 2014). Retrieved from <http://www.sinarharian.com.my/>
23. The Star Muttadirkin mastermind behind kidnaps? (June 22, 2014). Retrieved from <http://www.thestar.com.my/news/nation/>
24. The Star Claims of ransom payout for captive. (December 23, 2014).Retrieved from <http://www.thestar.com.my/news/nation/>
25. Utusan Malaysia Memburu vpenculik Kumpulan Abu Sayyaf. (May 3, 2016). Retrieved from <http://www.utusan.com.my/>
26. United Kingdom Government (n.d). Safety and security: Local travel – Sabah. Retrieved from <https://www.gov.uk/foreign-travel-advice/malaysia/safety-and-security>
27. Wan Shawaluddin&RamliDollah. Isukeselamatan Sabah danimpakkepada Malaysia. Jati. 2008; Bilangan 13:49-63.

Sustainable Property Development: A Challenge

Mohd Nazaruddin Yusoff¹, Hooman Abadi¹, Azlizan Talib¹, Mohd Nasrun Mohd Naw²,
Nurul Azita Salleh², Md Azree Othuman Mydin³

¹College of Law, Government and International Studies, ²School of Technology Management and Logistics, Universiti Utara Malaysia, 06010 Sintok Kedah; ³Cluster of Technology, School of Housing, Building and Planning, Universiti Sains Malaysia, 11800, Penang, Malaysia

ABSTRACT

Sustainability development is a continuous economic development approach strategy which needs to conserve local surrounding and enhance quality of life. Sustainable development will enable the economic progress and the natural quality achieved the goals of continuous human welfare. If the sustainable development strategies had been practiced seriously, it will able to preserve the environment, saving the resources, increasing the local business growth and making the community less vulnerable to the pollution threats. This paper recommends the need for all parties involved to develop plans and practice in sustainability concept and design in property development in this country as a whole.

Keywords: Sustainability; Construction Industry; Property Management

Jel Classification: L74, L80

INTRODUCTION

Sustainable development is a challenge to mankind as it balances the use of natural resources, industrial products, energy, food, transportation, shelter, and waste management with the obligation of preserving and protecting environmental quality and natural resources for future development. This concept is a long-term need of human being, but will be impossible unless the Earth's natural physical, chemical and biological systems are preserved and conserved UNEP²³.

At present, the world community has begun to take a proactive action by implementing sustainable aspects in the design and construction. This application will ensure the comfort of occupancy, improve energy efficiency thus, saving real estate maintenance costs in the long term. In addition, the greenhouse gas emissions (GHG), concerns with the fact that almost 40% come from the development and operation of real estate's (Kibert, 2005) that has to do with global warming. This initiative is expected to reduce the impact of GHG.

Sustainable development is an ongoing strategy of economic development approach that should make the most of the local environment and quality of life. Sustainable development will enable economic development and environmental quality to achieve the goals of human welfare continuously. Sustainable

development strategies if practised seriously will save the environment, conserve resources, increase local business growth and make people less vulnerable to the threats of pollution.

Sustainable development is a concept that has been adopted since the 1972 Conference on Human Environment in Stockholm. In that conference, the environmental concerns related to the world have been emphasized. These efforts continued until its peak in 1987, in a pilot report entitled World Commission on Environment and Development that was submitted (also known as the Brundtland Report). 'Our Common Future' was another Brundtland Report that has highlighted the definition of sustainable as 'meeting the needs of the present generation without compromising the ability of future generations to meet their own needs'. This report proves that this matter has become a catalyst for the global movement for sustainable development, followed in 1992, in the World Summit in Rio de Janeiro when the governments and members of major sectors in the community are required to sign an effort towards sustainable development which was also known as Agenda 21.

There are three elements in the concept of sustainability (Wiles, 2008):

- Environment - environmental issues like global warming and initiatives to reduce and adaptation to those issues.

- Economy - highlighting the development of policies, strategies, and practice that will allow continued economic growth but at the same time ensuring that resources are not reduced.
- Social - highlighting the world's population growth, lifestyle, use of resources, ecological site carbon, carbon and water.

To date, the world community has begun to take proactive action to implement sustainable aspects in the design and construction. This application will ensure the comfort of occupancy, improve energy efficiency, thus conserving the maintenance cost for real estate in the long run. In addition, greenhouse gas emissions of nearly 40% which came from the development and operation of real estate's (Roaf, 2005) that have been proven to be the cause of global warming are expected to be reduced.

Buildings are said to be the primary cause of urban air quality pollution problems that contribute to climate change. An estimated 49% of the production of sulphur dioxide, 25% nitrous oxide production, and 10% dust production in cities can all damage the air quality. The buildings are producing between 35% and 50% of greenhouse gases, especially CO₂, or carbon dioxide Gray⁶. In practice, conventional building practices have not really considered the aspects of the relationship between a building with other buildings, its components, its surroundings and its inhabitants Reffat¹⁷. Conventional building constructions usually consume more natural resources than needed and produce a lot of waste. This will have a negative impact on the environment, and generate a large amount of waste Reffat¹⁷.

The concept of green buildings which is introduced in real estate development is not only related to the design, but consideration of various aspects in terms of the environment is also necessary to reduce its impact on the environment. Among the benefits of green building include energy saving, controlling the ecosystem, increasing the values of real estate and reducing health problems to occupants (USBGC, 2007). According to Shiers²⁰, energy consumption in buildings has resulted in 50% carbon dioxide gas emissions in the United Kingdom which affect the greenhouse effect, while the process of building materials has resulted in energy consumption of 29% in the construction industry. Thus, for the realization of sustainable real estate development, appropriate assessment must be made from different perspectives such as, the effects of heat, ozone layer depletion, biodiversity, lifetime of usage and recycling.

THE CONCEPT OF SUSTAINABILITY

There are three main problems which are fundamental and which can influence the overall issues of sustainability in the built environment. Firstly, there is the increase in world population. In the 1850's, the world's population was around 1 billion people. However, at present, the world's population has increased, exceeding more than 7 billion people and is estimated to reach about 10 billion people by the year 2050 Williams²⁵. The U.S. Census Bureau projections show that the world population growth will continue into the 21st century, but its growth is slower. The world population is estimated to increase from 6 billion people in 1999 to 9 billion people by the year 2045, which is an expected increase of 50% within 46 years U.S. Census Bureau²². This increase will affect economic activities in developing countries. Malaysia is one of the four most populous countries following China, India and Indonesia, with many of them boasting off population growth around 100,000 people every day Torrance²¹.

The second thing underlying the issue of sustainability is the global economic growth. When the world's population reached 1 billion people in the 19th century, the majority (80% majority) population will live in the city and the rest live in rural areas. After more than a century of industrial activities and urbanization, it is forecasted that the majority of the world's population will see 10 times more people living in urban areas than those living in rural areas. At the same time, the population will increase the quality of life in addition to the increase in the per capita income as well as lifespan Torrance²¹.

Thirdly, the world climate is never really stable. This situation continues since the days of cold and heat up since the last ice age (ice-age). The minimum sea level also shows a significant difference. We now have to be in the middle of the heating period. Human activities are actually accelerating the global warming process Torrance²¹.

The sustainability issues began to be addressed since the early 70's. A group of industrial entrepreneurs who call themselves the Club of Rome, from Massachusetts Institute of Technology (MIT) in the U.S. have created the first computer that can generate simulations and trends related to the influence and change to the world's resources. In 1972 a report known as "Limits to Growth"

was published. Although the content of the report is just a mere approximation, the content of the report is an initial information for the government and relevant agencies on the use of resources. Energy savings forecast and its impact presented in the report have been very surprising.

However, the “Limits to Growth” report was regarded too pessimistic, mainly due to its troublesome calculating system. In the meantime, a pioneering idea has led to the Optimistic Model. It is about a set of boundaries which is more subjective, yet flexible, produced by Herman Kahn and his colleagues in their book ‘The Next 200 Years: A Scenario for America and the world “in 1976. Their conclusion is that technology can solve all problems that arise:

‘200 years ago, almost everywhere human beings were comparatively few, poor and at the mercy of the forces of nature. 200 years from now, we expect, almost everywhere they will be numerous, rich and in control of the forces of nature’.

Continuous warning was made by Meadows et al¹³, in his argument about food shortages caused by climate change and increased pollution and toxins in the soil, which are partly due to the acidity in the atmosphere that causes acid rain around the world. The sequence of this, in March 2005 a comprehensive global study was launched by the Millennium Ecosystem Assessment (MEA). This study is an extreme comprehensive assessment of ecosystem health of the world. This study is the result of four years’ worth of work by 1,300 scientists from 95 countries. This assessment is the first attempt to examine the global health world in 24 different areas of ecosystem services (May and Caron¹².

As a result, the environmental quality of the planet/earth is found to be deteriorating and developing countries are the most affected. Only four of 24 examined ecosystems will be able to enhance their ability to harness the human population in terms of food production May and Caron¹². Food production is a good aspect for the growth of population within 40 years.

From the remaining ecosystem services which are examined, it is found that 15 services record a decrease, whilst another 5 are stable. The declining services include the provision of fresh water, fisheries, air and water purification. Ecosystem changes that occur have an impact on people due to problems such as the emergence of new diseases, the continuous spread of diseases such

as malaria, changes to the water supply and shortages of fishery resources. Not a single country, even the rich ones, is able to combat the declining ecosystem. The interactive relationship between man and nature are inseparable. However, there is good news that we can avoid this problem in the future if we implement the changes from now.

At the global level, coordination between trade and environment occurs via negotiations. At the national level, government policies need to ensure that market prices reflect the value of ecosystem services, such as actual costs for energy, water and land. Results of previous studies show that price is an effective mechanism to force people to change and become more efficient in the use of resources. Furthermore, at the local level, citizens must take responsibility for being active participants in making resource management decisions. Experience has shown that, ecotourism and sustainable harvesting of forest products are more effective when the native citizens are involved in the decision making process.

ISLAMIC PERSPECTIVE ON SUSTAINABILITY

The environment from an Islamic perspective is based on the revelation of the Qur’an, the existence of a close relationship between man and nature and God. Mankind and nature are bounded by a divine nature, that all beings receive sustenance from Him. There is no separation between humans or nature from God (Abubakar, 1997).

Allah said “And to Allah belongs whatever is in the heavens and whatever is on the earth. And ever is Allah, of all things, encompassing...” (4:126)

Islamic ethical attitude towards the environment is due primarily to the fact that Islam is not just a set of beliefs, but is a way of life, manhaj of life (as defined by As SayyidQutub, a leading Islamic scholar of the 20th century). Islam comes to reinforce the belief in one God, and clearly aims to create a new community (ummah) from among individuals who would be better creatures, who submit fully to God and accept the moral code of ethics and behave in compliance with Islam. The Regulations cover all the actions, whether that is expected to be adopted by members of the community or of any regulation that limits it Mawil¹¹. Clearly, the important thing is that this responsibility is generally a part of Islam.

In formulating the development of the country, a designer must be able to plan spiritual values which result from the integration of three relationships that serve as the main basis, which are:

- i. The relationship between human and his Creator
- ii. The relationship between human and other humans
- iii. The relationship between human and the environment.

The resulting relationship is an accurate form of civilization Nor Aishah¹⁵. Human relationship with nature is a form of manifestation in which mankind as an administrator on this earth is responsible to exploit and prosper the earth. Humans have a role as a builder, decorator and saviour to the environment and not bring damage and destruction Nor Aishah¹⁵. This explains human's heavy responsibility, whereby apart from developing the country, they are also responsible to always preserve the earth so that it is not polluted.

THE IMPACT OF THE DEVELOPMENT TO THE ENVIRONMENT

According to Roaf et al. (2005), the building construction activities are the main contributors in the world's carbon cycle, due to the fact that the activities greatly make use of fuel to;

- i. produce construction materials;
- ii. support transportation activities; and
- iii. Generate the energy of buildings.

As much as 50% of carbon dioxide has been processed to generate the energy in buildings Anderson et.al², whereas 25% more is produced from transportation activities. The irony lies in the fact that, the greenhouse effect is the result of gas release, consequently leaving a disastrous impact on the global climate change.

In building constructions, it is estimated that 3 billion tonnes of materials have been used for a year, and they have produced 10% to 30% solid waste remnants thrown into main rivers and other water sources in most countries. Buildings in the world have made use of 40% natural resources/materials and also 30% of energy from them Rees¹⁶. The materials produced in factories are in need of a lot of fossil fuels, and as the result, a lot of raw materials have to be mined.

As an example, for 1 tonne of cement, 2 tonnes of mined raw materials are needed, almost 1 tonne of carbon dioxide and approximately 6kg of nitrous oxide will be produced, further providing an impact to greenhouse gas refilling. This shows that buildings serve as an important contributor towards the affected world ecology and the impact on the greenhouse Graham⁵.

Graham⁵, has further identified the existence of four categories of effects to the buildings and to the environment, which are:

- Resource depletion;
- Physical disturbances;
- Pollution; and
- Social and cultural effects.

RESOURCE DEPLETION

Matters concerning resource depletion refers to the building and the construction operation process. Normally, these resources are fossil materials, mineral materials and wood. It is difficult to replenish these resources as it is simply too time-consuming for these resources to be reproduced. As an example, the timber wood that comes from the fell tree needs to be replaced. To get this back, these trees need to be replanted. These trees may need to be replaced in 40-50 years to come Graham⁵.

The effect of building construction can also be seen on the ecology of systems like the forests, rivers, swamps, clean water and this should be considered as early as at the planning stage. Planning should also take into account this resource depletion at the stage of constructing the building, after the construction and the operations that take place in reused buildings Wood²⁸. The wood, for instance, can be reused and recycled as the resource can be planted, but the felling of forest trees has destroyed a large part of the ecosystem contained in the forests and the replacement would take a long time.

FOREST ERADICATION

The main consequence for forest eradication would be the climate change. The change to the environment resulting from forest eradication happens in many ways. First off, there has been a drastic temperature change in nearby areas. This is because, the functions of the forests lie in their cooling property as air moisture can be maintained Wood²⁷.

Secondly, we have to face a long changing process of the global climate. As aforementioned, forest eradication has contributed to the global heat or its corresponding process when the weather becomes hotter if the sun glare penetrates right into the atmosphere (Kay, 2002).

The ozone layer is a mass of oxygen or the ozone particle (O₃) that acts a shield in the atmosphere against the hazardous ultra-violet rays that originate from the sun. The layers comprise of oxygen particle that reacts with carbon monoxide. This reaction will make use of the oxygen particle. This happens when the gas of carbon monoxide enters the atmosphere, where the ozone will react and the volume of oxygen will be reduced, causing the ozone layers to gradually erode Kay⁸.

The third effect to the environment would be the natural underground springs. The springs is the common resource of drinking water for people who live in areas surrounding the forests. There will be more underground springs when it is raining as the roots of the trees will naturally hold the water. Therefore, water absorption into the ground will add to the already existing seepage water. Imagine what will happen when we run out of forests? When it rains, the water will directly flow right into the soil without it staying on the surface of the soil. This also prevents the water from evaporating. Direct evaporation into the soil will also cause the well to dry up.

PHYSICAL DISTURBANCE

The physical consequences that happen during the construction process are only evident after the building is complete and occupied. Such environmental damage is due to the maintenance, refurbishment and demolition activities, as these processes are consistently carried out throughout the lifespan of the building. Apart from that, Sayce¹⁹ also identifies the three main environmental issues that serve as the outcome from the effects of the construction to the environment namely:

- i. The loss of land productivity:** The land used for the buildings will lose its productivity from various aspects like the loss of habitat for both flora and fauna.
- ii. Disturbance due to building constructions:** As the activity is carried out the environment will be undergoing pollution like land erosion that can pollute the river, also causing flash flood in the surrounding areas.

- iii. Reduced and loss of biodiversity:** Happens when natural resources are explored like the felling of timber, oil mining etc., and this further ruins the ecosystem. This also means that the surrounding will suffer too from pollution.

POLLUTION

Pollution will take place due to the resource productivity and the building operations that not only give an impact to the environment, but also the architecture as a whole. The widespread use of synthetic materials, mechanical ventilation, added with the blunder of selecting the resources will definitely lead to a dangerous internal environment to human health. The internal air quality is integral to our health White et.al²⁴. Internal air pollution due to toxic materials/resources are detrimental to the occupants' health as well as interfering the work environment. This phenomenon is known as the 'building sick syndrome'.

This syndrome is contributive to coughing, asthma and fatigue. One of the factors behind cases of asthma would be the dust or pest easily collected on our carpets, blinds and so on. Interior designers should consider certain specifications to mitigate this problem.

Apart from that, another pollution would be coming from synthetic materials. It is a possibility that the construction sites have already been polluted with chemical substances leading to the construction workers and occupants to contract diseases after they have settled in the building.

EFFECTS TOWARDS SOCIAL AND CULTURE

It is rather difficult to detect the effects of construction to both aspects of social and culture as compared to other factors, especially in surroundings that have already remained strong and stable. Rapid and drastic development will leave a great mark on social and cultural activities of the locals. The development that is to be done should ultimately place great importance on the local people's sentiment and sensitivity.

As an example, constructions that have caused great disturbances to historical buildings and the obtainment of ownership of lands belonging to the locals need to be addressed accordingly. Also, the society also needs

to be informed of the impacts resulted from using toxic materials and matters pertinent to energy use. Buildings can also affect the visual factor, either negatively or positively and the effect to the community is also worth considering. Early planning with a close look at the aspects mentioned will make it easier on the future construction activities planned.

CONCLUSION

Humans are always on the lookout for the best approach to address the issue of natural resource use. Various alternatives have been explored and discussed. A wide array of discussions and initiatives at the global level has often been organised. Developed countries have often pointed fingers at the developing countries for the consequences and factors that contribute to the issue at hand. Nevertheless, an absolute solution is yet to be realised. Thus, the challenge that the world has to rise to is to inculcate the green-building practice as to offer an opportunity to design eco-environment-based buildings using the design integration approach with sustainable requirements. Sustainable building development encourages resource maintenance, including energy efficacy and renewed energy, water conservation characteristics, consideration over the effect to the surrounding and the reduction of waste towards creating a healthy and comfortable environment. Sustainable development also affects the way people live. The existence of development has brought about a significant intervention to the ecosystem of the Earth. Nonetheless, the society has conducted and launched various kinds and approaches of sustainable development for the benefit of mankind.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Al-Quran. An-Nisa. 4(126).
2. Anderson J. The green guide to specification: an environmental profiling system for building materials and their components. 2002.
3. Goodwin D. Global Warming: For Beginners. Hannover: Steerforth Press. 2008.

4. Gore A. An inconvenient truth: The planetary emergency of global warming and what we can do about it. Rodale. 2006.
5. Graham P. Building ecology: first principles for a sustainable built environment. 2003.
6. Gray D. The Green Website Guide for Better Living. London: Southbank Pub. 2008.
7. Henson R. The rough guide to climate change. Dorling Kindersley Ltd. 2011.
8. Kay J. J. Some implications for construction ecology. Construction ecology: Nature as the basis for green buildings. 2002;72.
9. Kibert C. J. Sustainable construction: green building design and delivery. John Wiley & Sons. 2016.
10. Lynas M. Six degrees: Our future on a hotter planet. National Geographic Books. 2008.
11. Mawil Y.I.D. Etikaislamdalamsekitar. DalamFazlun, M. K (Ed.), Islam danekologi (hlm.32-43). London. Gassell Publishers. 1997.
12. May E., Caron Z. Global warming for dummies: New York: John Wiley & Son. 2009.
13. Meadows D. H, Meadows D. L, Randers J, BEHRENS W. The Limits to Growth (London: Pan). Google Scholar. 1972.
14. Murray P. E, Cotgrave A. J. Sustainability literacy: the future paradigm for construction education?. Structural Survey. 2007; 25(1): 7-23.
15. Nor AishahYahaya Doktrinperancangansejagat: Antarateoridanpraktikal. (Abu Bakar Yang, Ed.), Islam danpembangunan habitat di Malaysia, Kuala Lumpur: IKIM. 2005.
16. Rees W. E. The built environment and the ecosphere: a global perspective. Building Research & Information. 1999; 27(4-5): 206-220.
17. Reffat R. Sustainable construction in developing countries. In Proceedings of First Architectural International Conference, Cairo University, Egypt. 2004, February.
18. Roaf S, Crichton D, Nicol F. Adapting buildings and cities for climate change: a 21st century survival guide. Routledge. 2009.

19. Sayce S, Walker A, McIntosh A. Building sustainability in the balance: Promoting stakeholder dialogue. *Estates Gazette*. 2004.
20. Shiers D. E. "Green" developments: environmentally responsible buildings in the UK commercial property sector. *Property Management*. 2000; 18(5): 352-365.
21. Torrance J.V, Hussin M. The Impact of the Built Environment upon Sustainability. Proceeding at the First International Building Control Conference, ISM, Kuala Lumpur. 2005; 26&27 April 2005.
22. U.S Census Bureau. Retrieved From (2010 January 3) from <http://www.census.gov/ipc/www/idb/worldpopgraph.php>.
23. UNEP (2006). Sustainable Building & Construction Initiative. Information note. Retrieved from (2008 October 12) <http://www.unep.fr>
24. White A, Cannell M. G, Friend A. D. Climate change impacts on ecosystems and the terrestrial carbon sink: a new assessment. *Global environmental change*. 1999; 9: S21-S30.
25. Williams L.D. Environmental science demystified. McGraw Hill Professional. 2005.
26. Wines J. Green architecture. Köln. 2000.
27. Wood B. Intelligent building care. *Facilities*. 1999; 17(5/6): 189-194.
28. Wood B. Approaching the care-free building. *Facilities*. 2003; 21(3/4): 74-79.

Effective Leadership as the Mediator between Emotional Quotient and Teachers' Work Performance: A Study in National Secondary School in Northern States of Peninsular Malaysia

Azizi Abu Bakar¹, Siti Nur Zahirah Omar¹

¹Kolej Perniagaan, Universiti Utara Malaysia, Sintok, Kedah

ABSTRACT

This study investigates the direct relationship between emotional quotient (EQ), teachers' work performance and effective leadership. This study follows the quantitative paradigm and used cross sectional research method to identify the factors that influence teachers' work performance. This study's sample comprised of teachers of National Secondary Schools (SMK) in the northern states of peninsular Malaysia. Cluster and random sampling were used to choose the samples from the study's population. The results of this study shows that EQ has a positive and significant relationship with teachers' work performance. In the meantime, the results of the regression analysis show that effective leadership plays a partial mediating role in the relationship between EQ and teachers' work performance.

Keywords: Teachers' work performance, emotional quotient, effective leadership.

INTRODUCTION

Malaysia aspires to become a developed nation by 2020. In this endeavour, one of the key field that has been identified to contribute to a developed nation is education. In this regard, the Government Transformation Programme (GTP) was initialised by the Prime Minister in 2009 and education is one of the main National Key Resource Area (NKRA) (Ministry of Education, 2009). Therefore, increasing the excellence of the national education system is an ongoing process that needs to be undertaken and this requires adaptiveness among teachers so that they can illustrate effective work performance for the best of the students' interests, and in return, improving the status of education in Malaysia. These progressive changes are in line with the Education Development Master Plan (PIPP) (2006-2010) which is aimed to develop a world class education system to fulfil the aspiration for Vision 2020. This calls for teachers' and school administrators' perpetual commitment in executing all of the education development policies and improving their work performances so that the goals of education can accomplish.

PROBLEM STATEMENT

The literature review conducted shows that there a few past researches that focused on the relationship

between emotional quotient (EQ), effective leadership and work performance. First, a review was done to investigate the relationship between EQ and work performance. Past studies shown that there is a positive and significant relationship between EQ and work performance Rahmasari²⁰; Salmiah²¹; Trihandini²³. On the other hand, these researchers were not focused on work performance in the context of education. Therefore, there is still a gap that needs to be fulfilled to look at the extents of the influence of such relationship on work performance among teachers. This statement is supported by Mehmood, Qasim, & Azam¹³ and Nurul Hudani et al¹⁶. In line with Malek Shah & Nor Shah¹² and Nurul Hudani et al¹⁶, which stated that EQ can influence employees' work performance. Besides that, Noriah et al¹⁵, stated that studies on EQ are in abundant in the western world, however, the number is still very limited in Malaysia.

Second, the review of literature indicate that there are a few researches conducted on the relationship between leadership and work performance. Such studies include Pradeep dan Prabhu¹⁹, which focused on the public and private sectors while Thamrin²² focused on the shipping industry. Both findings show that there are link between leadership and work performance. Furthermore, there are various studies which focused on education, including Jay¹⁰; Adejumobi & Ojikutu²; Paracha et al¹⁸;

Adeyemi³ and Duze⁷. All of these studies have shown that there is a relationship between leadership and work performance. Finally, past empirical studies show that effective leadership can play a mediating role in the relationship between emotional quotient and teachers' work performance. Therefore, to measure the role of the mediating variables in the relationship, a systematic and scientific approach need to be taken in this study. In this regard, this study focuses on the relationship between these three variables to thoroughly understand how EQ process influence teachers' work performance.

Research Question

1. Does emotional quotient has a positive and significant relationship with teachers' work performance?
2. Does leadership have a positive and significant relationship with teachers' work performance?
3. Does effective leadership mediate the relationship between emotional quotient and teachers' work performance?

LITERATURE REVIEW

Emotional quotient (EQ) and teachers' work performance: Emotional quotient is an important aspect in cultivating a productive work environment. Past researches show that EQ has a significant relationship with work performance Rahmasari²⁰; Salmiah²¹; Trihandini²³. All of these three researches show that EQ has positive relationship with work performance. However, these studies are not focused on the relationship between EQ and teachers' work performance in the education field. Therefore, there is still a gap in investing the extents of such relationship on teachers' work performance.

Emotional quotient (EQ) and effective leadership: Emotional quotient is a play a significant role in determining an individual's actions and behaviour. Past studies such as Barling et al⁵, Batool⁶, Harms & Crede⁹, Nurul Hudani et al¹⁶, Palmer et al¹⁷, Wang & Huang²⁴, dan Weinberger²⁵ found that emotional quotient is linked to effective leadership. Based on the literature review of past researches, this study posits that effective leadership also influence teachers' work performance. To test the hypothesis that proposes the presence of such relationship, a hypothesis was developed to determine the predicted outcome.

Effective relationship and teachers' work performance: Effective leadership, according to Goetsch (2005) is one's ability to inflict and provide inspiration to other individuals, give commitment voluntarily to fulfil the predetermined organisational objective. Meanwhile, Abdul Ghani Abdullah¹, Nurul Hudani et al¹⁶, Pradeep & Prabhu¹⁹ dan Thamrin²² stated that effective leadership can increase work performance. This is further supported by Akhbar et al⁴ who believe that leadership is the main administration function that can maximise workers' efficiency. Furthermore, researches stated that empirical researches conducted by Abdul Ghani Abdullah¹ in the context of leadership among principals in 151 daily secondary school in three states, Perlis, Kedah and Penang. The finding shows that transformational leadership among principals is capable to improve teachers' work performances. From the literature review and empirical study conducted by past researchers, the researcher believes that efficient leadership also influence teachers' work performance.

RESEARCH METHODOLOGY

Research Design: This study is a quantitative study which adopted the cross sectional survey based on the questionnaire responses from the study's respondents. The study population comprises of teachers in national secondary school (SMK) in the northern states of peninsular Malaysia.

Study Sample: The study's population comprised of teachers of national secondary school (SMK) working in the education sector in the northern states of peninsular Malaysia. The study's locations are the states of Perlis, Kedah, Pulau Pinang dan Perak which consist of 44,028 teachers and the study samples comprise of 380 teachers. This study adopted cluster sampling which divides the population into non-overlapping areas or clusters. These clusters are then divided into a set of new clusters depending on the random selection process. As a result of this procedure, Perlis JPNP, PPD Kota Setar in Kedah, PPD Seberang Perai Utara in Pulau Pinang and PPD Batang Padang in Perak were chosen as the study clusters which comprise of teachers' representatives from every national secondary school in every district under the jurisdiction of the state's education department.

Measurements: To measure teachers' work performance, this study adopted the questionnaire by Muhammad

Amin et al¹⁴, while Goleman⁸ was used for emotional quotient, finally, the questions for effective leadership was adopted from Bass & Avolio (1995)'s (*Multifactor Leadership Questionnaire, MLQ*).

RESULTS AND ANALYSIS

The reliability analysis for the variable teachers' work performance shown an alpha value was $\alpha=.760$, meanwhile for EQ, the alpha value was $\alpha=.709$ and the alpha value for effective leadership was $\alpha=.724$. All of the data obtained were analysed using the *IBM SPSS Statistics Version 22* software.

Variables	Number of Items	Cronbach's Alpha
Teacher's Work Performance	25	.760
Emotional Quotient	27	.709
Effective Leadership	28	.724
<i>Note: N = 324</i>		

Table 1 displays the results of the Cronbach's Alpha for the teacher's work performance, emotional quotient and effective leadership were above the suggested threshold of 0.70, except for participation which was slightly below (Chua, 2012). Table 1 summarizes the reliability coefficients of the measures.

Table 3: Linear regression between emotional quotient (EQ) with teachers' work performance

Dependent Variable	β Coefficient	T value	P value	VIF value	Result
Emotional Quotient	0.850	13.974	0.000***	1.000	Supporting

R²: 0.378

Adj. R²: 0.376

F-statistic: 195.272

Note: *** significant at 0.01

** significant 0.05

- a. Predictor (constant), Emotional quotient (EQ)
- b. Dependent variable: Teachers' work performance

Table 3 illustrates a significant, positive relationship between EQ and teachers' work performance, as shown by the correlation value of $r^2=0.378$ and r^2 adjusted =0.376. R² showed that 37.8% of teachers' work performance are explained by EQ. Meanwhile the remaining (100%-37.8%= 62.2%) are explained by other factors that were

RESEARCH FINDING

The relationship between emotional quotient, effective leadership and teachers' work performance.

Table 2: Result of correlation test

Variable	Effective leadership	Teachers' work performance	P value
Emotional Quotient	0.403**	0.614**	0.000
Effective Leadership	1	0.511**	0.000

**Correlation is significant at 0.01; * Correlation is significant at 0.05;

Dependent variable: Teachers' work performance

Based on Table 2, correlation analyses were conducted to determine the relationship between EQ (emotional quotient), effective leadership and teachers' work performance. The study found that there is a significant and positive link between emotional quotient, effective leadership and teachers' work performance, where the correlation values were ($r=0.614$; $p<.01$) and ($r=.511$; $p<.01$). Meanwhile, there is a mediate relationship between emotional quotient and effective leadership with the correlation value ($r=.403$; $p<.01$).

not investigated in this study. Meanwhile the Anova test found the F statistic (1,322) =195.272, $p<0.01$ was bigger than the F-critical value =6.63. Therefore, EQ is significantly positive ($\beta= 0.850$, $t=13.974$, $p<0.01$) and contributes to teachers' work performance.

Table 4: Linear regression between effective leadership with teachers’ work performance

Dependent Variable	β Coefficient	T value	P value	VIF value	Result
Effective leadership	0.362	10.678	0.000***	1.000	Supporting

R²: 0.261

Adj. R²: 0.259

F-statistic: 114.018

Note:

*** significant at 0.01

** significant 0.05

- a. Predictor (constant), Effective leadership
- b. Dependent variable: Teachers’ work performance

Table 4 shows the significant and positive relationship between effective leadership and teachers’ work performance. This is illustrated through the finding of $r^2=0.261$ and r^2 adjusted =0.259. R²value shows that 26.1% of teachers’ work performance were explained by SQ. Meanwhile, the balance (100%-26.1%=73.9%) were explained by factors that were not discussed in this research. Next, the Anova test found that the value of Fstatistic (1,322) =114.018, $p<0.01$) indicating that the F value is bigger than F-critical = 6.63. Therefore, SQ is significantly positive ($\beta=0.362$, $t=10.678$, $p<0.01$) and contribute to teachers’ work performance.

Table 5: Summary model, Anova and coefficient motional quotient, effective leadership and teachers’ work performance

Dependent Variable	Model 1		Model 2		Model 3		Model 4	
	Coefficient BBBB	t	Coefficient	t	Coefficient	t	Coefficient	t
EQ	0.85	13.974***	0.789	7.910***	0.362	10.678***	0.674	10.880***
EL							0.223	7.025***
R ²	0.378		0.1630		0.261		0.460	
Adj. R ²	0.376		0.1600		0.259		0.457	
F-statistic	195.27		62.565		114.02		136.97	

Note:

*** significant at 0.01

** significant at 0.05

- a. Predictor (constant), emotional quotient(EQ), effective leadership (EL)
- b. Dependent variable: Teachers’ work performance

Table 5 shows the results of the analyses conducted involving the EQ, effective leadership and teachers’ work performance in reference to the model specification table, Anova and coefficient. The first model analysis shows that there is a significant positive relationship between EQ and teachers’ work performance ($\beta=0.850$, $t=13.974$, $p<0.01$). Meanwhile, in testing the second model, which is the relationship between EQ and effective leadership, the finding also showed that there

is a positive, significant relationship ($\beta=0.789$, $t=7.910$, $p<0.01$). Furthermore, the third model analysis showed that effective leadership has a relationship with teachers’ work performance ($\beta=0.362$, $t=10.678$, $p<0.01$).

For the final step, identifying the role of effective leadership as a mediating variable, was conducted simultaneously on teachers’ work performance. The finding from these analysis would indicate that whether the relationship is significant enough to be the basis in

determining the role of effective leadership as the either the partial or complete moderator of the relationship. The results of the analyses conducted found that EQ has a significant relationship ($\beta=0.674$, $t=10.880$, $p<0.01$) with teachers' work performance after the leadership factor was simultaneously tested. However, the strength of this relationship is relatively weak compared to the direct relationship with teachers' work performance ($\beta=0.850$, $t=13.974$, $p<0.01$). Therefore, it can be concluded that effective leadership play a role as a moderating factor as part of the relationship between emotion quotient and teachers' work performance.

DISCUSSION

The study findings in relation to EQ and work performance are parallel to the studies by Rahmasari²⁰, Salmiah²¹ dan Trihandini²³, which in general, found that in general, there is a significant relationship between EQ and work performance among teachers. Besides that, the study findings had proven that effective leadership play a moderating role in the relationship and teachers' work performance. In general, the study's findings show that EQ plays an important role in increasing the work performance among SMK teachers from the northern states of peninsular Malaysia, therefore, EQ and effective leadership is considered as a crucial element that can propel education excellence among teachers.

SUMMARY

In all, emotional quotient play plays an important role in determining teachers' excellence and this can be illustrated through its relationship with teachers' work performance. Besides that, effective leadership also plays a moderating role in the relationship between EQ and teachers' work performance.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Abdul Ghani Abdullah. *Kepimpinan Transformasi Pengetua Dan Penggantian Kepimpinan Sebagai Penentu Komitmen Terhadap Organisasi Dan Perlakuan Warga Organisasi Pendidikan.*

- Malaysian Journal of Educators and Education. 2005; 20: 53–68.
2. Adejumobi F. T, Ojikutu R. K. School climate and teacher job performance in Lagos State Nigeria. *Discourse Journal of Educational Research.* 2013; 1(June): 26-36.
3. Adeyemi T. O. Principal's leadership styles and teacher's job performance in senior secondary schools in Ondo State, Nigeria. *Current Research Journal of Economic Theory.* 2011; 3(3): 84-92.
4. Akhiar Pardi, Shamsina Shamsuddin dan Muhamad Kushairi *jusoh Asas Kepimpinan & Perkembangan Profesional Guru.* Penerbitan Freemind Horizons Sdn. Bhd. 2012.
5. Barling J, Slater F, Kelloway E. K. Transformational Leadership and Emotional Intelligence: An Exploratory Study. *Leadership & Organization Development Journal.* 2000; 21(3): 157–161.
6. Batool B. F. Emotional Intelligence and Effective Leadership. *Journal of Business Studies Quarterly.* 2013; 4: 84–94.
7. Duze C. O. Leadership styles of principles and job performance of staff in secondary schools in Delta State of Nigeria. *An International Journal of Arts and Humanities Bahir Dar, Ethiopia.* 2012; 1(2): 224-245.
8. Goleman D. Emotional Intelligence: Issues in Paradigm Building. *The Emotionally Intelligent Workplace.* 2001; 1–13.
9. Harms P. D, Crede M. Emotional Intelligence and Transformational and Transactional Leadership: A Meta-Analysis. *Journal of Leadership & Organizational Studies.* 2010; 17(1): 5–17.
10. Jay A. The principals' leadership style and teacher's performance in secondary schools of Gambella Regional State. (Unpublished doctoral thesis, Jimma University). 2014.
11. Kementerian Pendidikan Malaysia. *Pelan pembangunan pendidikan malaysia 2013-2025. program transformasi kerajaan (GTP) bidang keberhasilan utama negara (NKRA) bagi mempertingkatkan pencapaian pelajar.* Diakses dari <http://buletinkpm.blogspot.com/2012/04/program-transformasi-kerajaan-gtp.html>

12. Malek Shah M. Y, Nor Shah M. Peningkatan prestasi di tempat kerja. *Jurnal Pengurusan Awam*. 2004; 1–20.
13. Mehmood T, Qasim S, Azam R. Impact of emotional intelligence on the performance of university teachers. *International Journal of Humanities and Social Science*. 2013; 3(18): 300-307.
14. Muhammad Amin, Rahmat Ullah Shah, Muhammad Ayaz, Malik Amer Atta Teacher's job performance at secondry level in Khyber Pakhyunkhwa, Pakistan. *Gomal University Journal of Research*. 2013; 29(2).
15. Noriah M. I, Ramlee M, Siti Rahayah A, Syed Najmuddin S.H. Kecerdasan emosi dan hubungannya dengan nilai kerja. *Jurnal Teknologi*. 2003; 39(E): 77-84.
16. Nurul Hudani M. N, Marof R, Noor Hisham M. N. Pengaruh aspek kecerdasan emosi terhadap tingkah laku kepemimpinan transformasi dalam kalangan pemimpin pendidik sekolah. *Akademika*. 2013; 83: 3-11.
17. Palmer B, Walls M, Burgess Z, Stough C. Emotional intelligence and effective leadership. *Leadership & Organization Development Journal*. 2000; 5–10.
18. Paracha M. U, Qamar A, Mirza A, Hassan I, Waqas H. Impact of Leadership Style (Transformational & Transactional Leadership) on Employee Performance & Mediating Role of Job Satisfaction” Study of Private School (Educator) In Pakistan. *Global Journal of Management and Business Research*. 2012; 12(4): 54-64.
19. Pradeep D. D, Prabhu N. R. V. The Relationship between Effective Leadership and Employee Performance. *International Conference on Advancements in Information Technology*. 2011; 20: 198–207.
20. Rahmasari L. Pengaruh kecerdasan intelektual, kecerdasan emosi dan kecerdasan spiritual terhadap kinerja karyawan. *Majalah Ilmiah Informatika*. 2012; 3(1).
21. Salmiah M. A. Hubungan antara kompetensi pekerja dan prestasi kerja di kalangan kakitangan agensi kerajaan elektronik. (Thesis Ph.D tidak diterbitkan, Universiti Utara Malaysia). 2004.
22. Thamrin H. M. The Influence of Transformational Leadership and Organizational Commitment on Job Satisfaction and Employee Performance. *International Journal of Innovation, Management and Technology*. 2012; 3(5): Retrieved from <http://www.ijimt.org/show-39-520-1.html>
23. Trihandini R. F. M. Analisis pengaruh kecerdasan intelektual, kecerdasan emosi, dan kecerdasan spiritual terhadap kinerja karyawan (Studi kasus pada Hotel Horison Semarang) (Thesis Ph.D tidak diterbitkan, Program Pascasarjana Universitas Diponegoro). 2005.
24. Wang Y.-S, Huang T.-C. The relationship of transformational leadership with group cohesiveness and emotional intelligence. *Social Behavior and Personality: An International Journal*. 2009.
25. Weinberger L. A. An Examination of the Relationship Between Emotional Intelligence and Leadership Style. 1151-1158. University of Minnesota. 2004; 1151–1158.

Developing a Telehealth Readiness Assessment Framework and Tool for Least Developed Countries: A case of Yemen

Abdulrahman A Al-Fadhli¹, Marini Othman¹, Hussein M Abu Al-Rejal², Bassam A Al-Jamrh³

¹College of Computer Science and Information Technology, Universiti Tenaga Nasional, 43650 Bandar Baru Bangi, Selangor, Malaysia; ²Knowledge Science Research Lab, School of Technology Management & Logistic, University Utara Malaysia, 06010 Sintok, Kedah, Malaysia; ³Faculty of Economic and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

ABSTRACT

Healthcare in Least Developed Countries is poor. Telehealth has the potential to improve healthcare. Assessing the readiness is important for a successful adoption of Telehealth. Therefore, the aim of this paper is to develop a framework to assess the readiness of health organizations in least developed countries in regard to the adoption of Telehealth. Due to the difficulty to study all countries Yemen has been chosen as a case study in this study. Therefore, Yemen Telehealth Readiness Assessment Framework (YTRAF) has been developed to assess the readiness. Meanwhile, Yemen Telehealth Readiness Assessment Tool (YTRAT) has been developed for collecting data. YTRAF and YTRAT have been used to assess the readiness of the Ministry of Public Health in regard to adoption of Telehealth in Yemeni health system. A qualitative approach including interview, focus group and observation have been used. The outcomes of the interviews revealed that the Ministry of Public Health is in need for considerable efforts to raise the level of its readiness in several areas to be ready for successful adoption of Telehealth. Furthermore, the interviewees have released the potential of Telehealth to improve the current healthcare in rural areas in Yemen and they have accepted to use Telehealth to do their duties.

Keywords: Health Information Technology, Telehealth, Readiness, Least Developed Countries

INTRODUCTION

Least Developed Countries (LDCs) are the countries with low indicators of socio-economic development in accordance with the United Nations organization and the lowest ranked in accordance with the human development index in the world. A country is classified among the countries with the least development according to three criteria which are per capita income, human resources and economic vulnerability UNCTAD³¹.

In this time, 49 countries are involved in the classification of least developed countries UNCTAD³¹. LDCs, with a total area of 20,818,177.5 sq. km. 34 countries are located in Africa, 8 countries are located in Asia, 5 countries are Islands and one is located in the Caribbean. LDCs have a population around 954 million, representing around of 13% of world populations, spread in urban and rural areas and islands IBRD-IDA¹¹.

LDCs suffer from poor healthcare systems, especially in the rural and underserved areas UNCTAD³². In fact,

these areas represent the most areas of it. Furthermore, a largest share of LDCs people live in these areas (Herrmann et al., 2011).

Despite international efforts to improve the situation of the least developed countries the economic and social situations are deteriorated which in turn increased the gap between them and the developing countries, not to mention developed countries. In addition, the number of LDCs is increased from 24 countries in 1971 to 49 in 2015 UN³⁰. According to report UNCTAD³² the country's health system is important factor to the development of productive capacities, which in turn helps to achieve the economic growth of the country. Consequently, economic development helps to make the next generation better healthier and thus improve the economy and society. Therefore, this is the call to study the potential opportunities to improve the healthcare systems in the LDCs taking into account LDCs setting such as the readiness for new solutions.

Telemedicine has the potential to improve the healthcare system Bashshur et al²; Yellowlees³⁵. The terms of Telemedicine and Telehealth can be used interchangeably Bashshur et al². Therefore, this paper proposed Telehealth as a solution for improving the LDCs' healthcare systems. Reid²⁷ has defined Telehealth as "Telehealth is the use of advanced telecommunication technologies to exchange health information and provide healthcare services across geographic, time, social and cultural barriers".

Yemen is a geographically diverse country located in the southern part of the Arabian Peninsula with total area of 527,970 km² and total population of 24 million Kandeh and Kumar¹⁶.

Yemen is one of the least developed countries UNCTAD³². Therefore, this paper has selected Yemen as a case to conduct this study due to the difficulty of studying all the least developed countries. There is a lack of research in using technology to improve the Yemeni health system. However, this paper is the first study in the adoption of using Telehealth to improve the Yemeni health system, especially in rural and underserved areas. This paper is started with introduction and briefly stated the problem. This study also proposed Telehealth Readiness Assessment Framework (YTRAF) and shows the result followed by the discussion and conclusion.

METHODOLOGY

A qualitative approach including interview, focus group and observation has been used. To assess Telehealth readiness, this study has designed tool that contain four steps, which start by reviewing official documents as well as international reports and assessments related to Yemen. Furthermore, review the existing Telehealth readiness assessment frameworks. The second step used observation method to investigate the current health status. The third step used the focus group method to develop and approve the Yemen Telehealth Readiness Assessment Framework (YTRAF) and Yemen Telehealth Readiness Assessment Tool (YTRAT). As for the final step, interviews are used to assess the readiness of the Ministry of Public Health in regard to the adoption of Telehealth in the Yemeni health system.

A total of forty two semi-structured interviews were conducted among selected key informants who have experience in Telehealth, ten interviews with health

professionals, ten interviews with policy makers and the rest of the interviews with others (i.e., social workers, independent health researchers and health professionals from international health institutions).

Thematic analysis was utilized to analyze the collected data.

Developing a Yemen Telehealth Readiness Assessment Framework (YTRAF): With regard to the adoption of Telehealth in Yemen to enhance the current health status, the Yemeni Ministry of Public Health needs to prepare a set of factors to be ready for the anticipated change brought by the use of Telehealth. Therefore, a framework has been developed to identify these factors. Four sources of information were utilised to develop the framework, which are the same three sources of information utilised by Khoja et al¹⁹, namely literature review, existing scales and expert opinion and this study added observation method.

It is a widely held view that the failure in the implementation of Telehealth would cause great losses in terms of time, money and effort. Therefore, an assessment of Telehealth readiness in rural areas is crucial prior to implementation Jennett et al¹³. Moreover, the failure of Telehealth implementation could be avoided by examining and mitigating the barriers that influence implementation Oak²³. Similarly, Jennett et al¹⁵ indicated that a successful introduction of e-health requires the examination of political, social, organisational and infrastructure factors and revealed that the assessment of e-health readiness can reduce the risk of failure after introduction.

From the foregoing, the introduction of Telehealth in Yemen requires framework and tool capable of assessing Telehealth readiness and appropriate for Yemen, which is one of the least developed countries.

Based on the extant literature review, there are many Telehealth readiness assessment frameworks and tools that focus on developed and developing countries, but not for least developed countries. According to Khoja et al¹⁹ there is a big difference between developed countries and developing countries. Therefore, they developed a framework in assessing e-health readiness to be adapted for developing countries. Furthermore, the result of Al-Huneiti¹, study revealed that there is a gap between developing countries and developed

countries in regard to e-Health. Moreover, Alliance for Building Capacity (2002) report suggested that, when assessing e-health readiness, the constructs that need to be investigated should be relevant and put in the context of the study undertaken. Hence, this calls for developing a new framework in assessing Telehealth readiness to be adapted for the least developed countries.

Telehealth readiness is measured by assessing the status of the government in areas most important to adopt of programmes using ICT Khoja et al¹⁹. However, this paper assessed Telehealth readiness in the Ministry of Public Health because it is responsible for the Yemeni health system. Cultures, health needs and health readiness are different among countries. Therefore, developing a framework for assessing the readiness of the country regarding successful adoption of Telehealth is important.

According to Coleman and Coleman⁷, there are currently six assessment frameworks that are commonly used for assessment which are Campbell et al⁵; Demiris et al⁸; Jennett et al¹⁴; Khoja et al²⁰; Overhage et al²⁵; Wickramasinghe et al³⁴.

Jennett et al¹⁵ utilised a qualitative approach to explore the readiness of the rural community for the implementation of Telehealth services. They conducted 16 semi-structured telephone interviews. In addition, they held two communities' awareness sessions followed by five focus groups. Finally, they conducted two in-depth interviews. However, after the analysis, they suggested four types of community readiness: Core, engagement, structural and non-readiness. The result of this study created a framework that can be used to investigate the rural and remote communities in terms of Telehealth readiness to improve the opportunity of a successful implementation.

Wickramasinghe et al³⁴ developed a preparedness framework to assess a country's preparedness in regard to the adoption of e-health. It consists of grids that are able to assess the preparedness of any e-health system. Low, medium and high are identified as the levels of preparedness. In addition, their framework has four prerequisites, which are ICT infrastructure, standardised policies, governmental regulations and user accessibility. Furthermore, four main impacts of these prerequisites include IT education, global economic standing, cultural impacts and impact of

morbidity or disease load. Finally, their framework uses the prerequisites and their impacts to assess the preparedness.

Khoja et al²⁰ stated that the use of e-health has benefits and also risks. Moreover, to avoid the risks, the governments must assess and prepare themselves before the change and adoption of the system that requires the use of ICT. They added that there is a big difference between developed and developing countries in terms of access to ICT. So, they created a conceptual framework that can be used for developing e-health readiness assessment tools for healthcare institutions in developing countries.

Li et al²¹ developed a framework for e-Health readiness assessment from a pandemic perspective. They noted that the readiness assessment must be carried out so as to understand and mitigate the challenges that are likely to appear during the e-health implementation. Also, they pointed out that the readiness assessment will minimise the chances of failure and maximise the hope among healthcare professionals of achieving the desired goals.

Sharma and Schober²⁹ developed a conceptual framework to assess the organisational readiness for implementing nutrition program. Structural and external factors, staffs attributes and other psychological factors were the constructs of the conceptual model. They have chosen it based on the literature. Finally, they have validated their conceptual framework through data collected in focus groups conducted among ECE centre staff members.

For more clarification, there are many assessment frameworks such as: A framework for assessing ehealth readiness for public and private healthcare institutions in Pakistan Khoja et al¹⁸; a framework for Assessing ICT readiness for Tele-cardiology Chattopadhyay et al⁶; a framework to assess the needs and readiness for ehealth in developing countries Durrani et al⁹; a framework to investigate the readiness of community for Tele-psychiatry Pabst²⁶; a framework for assessing the ehealth readiness in developing countries Oio et al²⁴; a framework for e-health readiness assessment (Kgasi and Kalema¹⁷; a conceptual framework for investigating organizational factors that affect adoption of Telehealth by hospitals Gagnon et al¹⁰; and a framework for assessing ehealth readiness in Iran Rezai-Rad et al²⁸.

During the observation, some important facts to develop the Yemen Telehealth readiness assessment framework have emerged, such as: The seven enablers of COBIT5 are appropriate as factors to cover all aspects of the Ministry of Public Health. Thus, COBIT5 has a great potential to solve problems that may arise from using ICT. Furthermore, this paper takes into account the governance and management levels which are included in COBIT5 principles. Moreover, COBIT5 defines seven enablers to support the implementation of a comprehensive governance and management system for enterprise IT ISACA¹².

An expert committee has been formed. It consists of a group of members from the Ministry of Public Health, the Faculty of medicine, Sana'a university, Al-Qahera hospital, Yemen's National Malaria Control Programme,

International health institutions, ICT experts and independent members. The role of the committee is to guide, provide feedback and supervise the process of developing the framework and then approve the developed framework. There are four ways of contact between the members of the committee such as face to face, e-mail, social media and phone. Purposive sampling technique (based on their knowledge of Telehealth) and snowball technique were utilised to select the members of the committee Morgan²².

From the forgoing, this research has developed a framework to assess the readiness of the Ministry of Public Health in regard to the adoption of Telehealth in the Yemeni health system, namely Yemen Telehealth Readiness Assessment Framework (YTRAF).

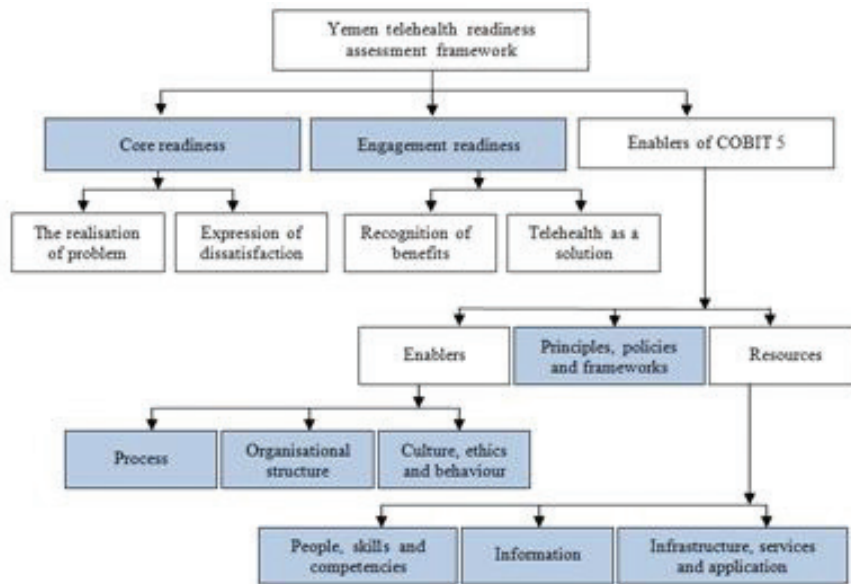


Figure 1: Yemen Telehealth Readiness Assessment Framework (YTRAF)

YTRAF contains nine constructs, which are core readiness, engagement readiness and seven enablers of COBIT5, as shown in the Fig. 1.

Developing a Yemen Telehealth Readiness Assessment Tool (YTRAT): YTRAT is derived from YTRAF. Based on YTRAF constructs, questions were designed to examine the opinions of policy makers and health professionals about the readiness of the Ministry of Public Health's adoption of Telehealth in the Yemeni health system. The questions were tested and validated by an expert committee and then have been translated

into the country's official language, which is Arabic, to be understood by the informants.

RESULT

Data Analysis of the Focus Groups: After several contacts and meetings, one focus group has conducted with expert committee members. The aim of this discussion is to approve the YTRAF and YTRAT. Semi-structured questions were utilized in the discussion. Thematic analysis Braun and Clarke³ was utilized for analyzing the transcription of the focus groups. The

result was that all participants approved the Yemen Telehealth readiness assessment framework and tool.

Table 1: Thematic themes for the Interviews
Thematic Groups and Sub-topics

Thematic Group 1: Core Readiness	
Sub-topic 1	Realization of problem
Sub-topic 2	Expression of dissatisfaction
Thematic Group 2: Engagement Readiness	
Sub-topic 1	Recognition of benefits
Sub-topic 2	Telehealth as a solution
Thematic Group 3: Policies and Framework Readiness	
Sub-topic 1	Existing and new policies
Sub-topic 2	Framework
Thematic Group 4: Organizational Structure Readiness	
Sub-topic 1	Organizational Structure
Thematic Group 5: Processes Readiness	
Sub-topic 1	Internal processes
Sub-topic 2	International process
Thematic Group 6: Information Readiness	
Sub-topic 1	Information
Thematic Group 7: Culture, Ethics and behavior Readiness	
Sub-topic 1	Cultural/social factors
Thematic Group 8: Services, Infrastructure and Application Readiness	
Sub-topic 1	Services
Sub-topic 2	Infrastructure
Sub-topic 3	Applications
Thematic Group 9: People, Skills and Competencies	
Sub-topic 1	People, Skills and Competencies
Sub-topic 2	The well*
Sub-topic 3	Training and Awareness*

* New themes have been explored

Data Analysis of the Observation: Observation has been conducted for investigate the healthcare status in rural areas and to assess the needs of rural health facilities for using Telehealth. Thematic analysis was utilized for analyzing the transcription of the observation. A part of the result supports the use of seven enablers of COBIT5 in the development of YTRAF.

Data Analysis of the Interviews: Thematic analysis was utilized to analyze the interviews data. The researcher has utilized the constructs of the YTRAF as basic

themes. For the purpose of exploration, the informants allowed them to express freely and add new information Buabbas⁴. Consequently, new themes were explored. Results were presented by addressing each of the topics of the table. These explored themes have been added to the basic themes, as shown in Table 1.

Table 1 shows the thematic themes for the Interviews, it presents 9 thematic group and 17 sub-topics.

The Result of the Interviews as Follows

Realization of Problem: All informants agreed that there are serious health problems in Yemeni healthcare system, in particular in rural areas. Some of them said “People are forced to travel a long distance from the village to urban cities to obtain healthcare services sometimes more than 50 kilometers, 10 hours due to bad transportation, also sometimes they could not find the vehicle or there is no road especially in the rainy season, where the roads are destroyed”. Another one said “health facilities are not open 24/7 in our area”. Also, another one added “Rural people can’t easily find a car to travel to urban cities seeking for health services especially at night”. Most of them agreed that beside the healthcare services fees in urban, rural people have to pay other costs like travel fees, transportation fees, food fees and resident/housing fees in urban. Moreover, they agreed that rural residents are in need of life-saving healthcare services. Overall, all informants strongly agreed that there are problems in the current healthcare system in the provision of health care services in particular in rural and underserved areas.

Expression of Dissatisfaction: All informants agreed that there are difficulties for health recipients to obtain good healthcare services. Also, most of informants agreed that there are difficulties for health professionals to consult each other. In addition, it is impossible to continue education and enhance skills. Therefore, all informants are dissatisfied of the current health status. One of them said “Health professionals are forced to travel a long distance for consulting others, or to obtain information and/or upgrade skills”. Overall, all informants are dissatisfied of the current health status.

Recognition of Benefits: Opinions are varied among informants from rejection to approval that Telehealth has the potential to enhance rural health care system. Most of the informants have weighed the benefits of Telehealth because they have recognized the benefits of

Telehealth. It is noticed that approvers are divided into two types, those who have experience in the field of Telehealth and those who have read or/and heard about it before. Meanwhile, most of the rejecters were graduated more than twenty years ago and did not recognize the benefits of Telehealth. On the other hand, the approvers share the same words “We can continue studying and enhance skills while we are working in rural areas. Even that, we can consult and access the internet for learning the newest knowledge related to our field”. The director of communicable disease control program stressed that Telehealth is useful for us. He said “The system can facilitate the control and mitigate the spread of epidemic diseases by sending reports to the Ministry to take the necessary action to control the spread of the disease”. One informant said “There are numerous expected benefits from the use of Telehealth in poor countries especially in their rural areas”. Finally, all informants have weighted the benefits of Telehealth.

Telehealth as a Solution: A few informants disagreed that Telehealth is the best solution for the current rural health problems. Moreover, they asserted that the solution is to increase the number of health facilities and hiring more health professionals. But their proposed solution is not suitable due to economic crisis and limited resources of Yemen. On the other hand, the majority of informants agreed that Telehealth is the best solution due to the potential of Telehealth and limitation of resources in Yemen. Three of informants said “Some of the policy makers did not accept Telehealth as a solution due to limited knowledge about technology, fear to use it and the resistance to change”. The majority of informants said “Telehealth is the best solution in these days due to the current situation in Yemen”. Furthermore, they accept the use of Telehealth to do their duties.

Existing and New Polices: All informants agreed that one of the most critical issues in the Ministry of Public Health is that no policies which organize, control, or even mention the adoption of Telehealth. To confirm the previous sentence, they said that “the Ministry has established two centers of telemedicine at Al-Thawra hospital and Al-Kuwait hospital, but it didn’t work due to lack of plans and policies”. All informants agreed that there are no national Telehealth strategy or policy, interoperability requirements and standards for Telehealth services. Moreover, there is no national coordination mechanism for Telehealth, legislation and regulatory frameworks which exist for sharing health information and data protection. Some informants

pointed that the importance of issuing a policies which regulate the use of ICT and Telehealth prior the adoption of Telehealth. There are no appropriate policies related to health information system. Also, there are available regulations but not enforced. Informants suggested developing a new policy and framework for ICT and Health Information Systems. Overall, most of the informants agreed that Yemen remains in the early stages of using ICT in the delivery of health care services. Moreover, all informants endorsed the need to advocate and develop a national policy and strategy on using ICT and Telehealth.

Framework: From the information gathered, there is an obvious absence of any sort of guidelines, procedures and documents which could be referred to as a Telehealth framework.

Organizational Structure: The Ministry of Public Health has branches and offices across the country. Most informants praised the organizational structure of the Ministry of Public Health and they added that the structure is ready to adopt the system; however, it needs some improvement. Furthermore, they revealed that there are two extant components related to Telehealth in the current organizational structure of the Ministry of Public Health which are Health Policy unit and Health Planning and Development sector. Overall, the majority of informants have emphasized that structure of the Ministry of Public Health will need to be revised before it can manage and organize new technology such a Telehealth.

Internal Processes and International Process: The Ministry deals with two basic types of health processes. Processes which is applied to health facilities and processes that is applied at the national level. At the local level (i.e., inside the health facilities), most of the informants have agreed that the majority of hospitals have utilized processes which fit with the implementation of Telehealth. These processes can be categorized as Administrative processes, Laboratory processes, Radiology processes, Pharmacy processes, Clinical documentation processes and Reporting processes. The Ministry does not enforce hospitals to follow a certain type of categorization of processes but hospitals define its own categorization of processes according to their environment and capacity. Overall, all informants agreed that Telehealth will be appropriate with the health processes mentioned above.

At the international level, there are identified processes which feed the Ministry with health information that needed for the decision makers to create and establish new plans and policies, these processes can be categorized as: Demographic indicators; alerts of diseases; and reports related to the Shortages of health facilities, health professionals and health equipment, the availability and quality of healthcare services and the whole current health status monitoring. Director of the Malaria control program said” We have information system to gather information about the affected areas of malaria and issuing alerts in case of dangerous rates. But, this system is not linked to a unified data base; therefore it is preferred to use Telehealth to link all health facilities in Yemen”. Overall, all informants agreed that Telehealth will facilitate the national processes.

Information: All informants agreed that health information represents a great importance to the Ministry. The analysis of transcripts of the interviews revealed that health and statistical information are needed by the Ministry to complete its activities. The result of interviews pinpointed that there is no unified mechanism that is utilized by health facilities to gather and transmit the data from districts (i.e., rural) to governorates and then to the Ministry. Moreover, there is no tool that measures the credibility of these data after processing and analyzing the received data and then using it to issue the annual report. Overall, Most of the informants agreed that Telehealth will support the Ministry activities.

Cultural, Ethics and Behavior: It is believed that Islam rules are the most important factor that may affect on adopting new thing such as a technology in our country. All informants have emphasized that if the new behavior conflicts with Islam’s rules, it will be rejected by the government and people. Norms play an important role in determining behavior. The following are some of the informants’ opinions: “We will accept to do something new, if does not conflict with our customs and traditions”. “Some basics of Telehealth system must be translated from English into Arabic, such as entries and queries. This is because most nurses and managers who cannot deal with the English language”. “It must hold awareness sessions on Telehealth for both health recipients and health professionals in order to increase their knowledge that Telehealth does not conflict with the teachings of Islam or with customs and traditions”. “It must treat cautiously with some customs and traditions such as confidentiality and privacy”. “It must treat cautiously

with women. In our country, women resist to diagnosis their cases by a man. Moreover, resist taking a picture and using video conferencing. Therefore, it must inform them that it is normal, safe and confidential”. “There is no culture of use of information for decision making among the health professionals”. Overall, Telehealth must not conflict with Islam rules.

Services: Informants placed a large emphasis on improving the health situation in rural areas. Using Telehealth is a must to provide some electronic services by health facilities such as video conferencing, consulting, continuing education and managing health information.

Infrastructure: Analysis of the transcripts of the readiness assessment interviews revealed that, the components required for Telehealth implementation in Yemen are available at the governorates level and at the national level such as hardware, software, network, Internet, etc, but it is not appropriate in term of capacity, speed and modern. Moreover, the infrastructure of the Ministry of Public Health needs to be improved. Furthermore, the Ministry of Public Health has the basic of ICT that was distributed in some of the rural health facilities such as telephone lines and computers. Also, the informants asserted that this ICT infrastructure could be using it to connect the Internet and run the Telehealth as a first step. Furthermore, the interviews revealed that, the electricity problem in Yemen must be taken as a serious matter. Overall, serious steps must be taken to improve the level of Infrastructure.

Applications: Analysis of the transcripts of the readiness assessment interviews revealed that the Ministry does not have unified health information system, unified database, electronic health record and Telehealth system. Also, most of the informants asserted the need of developing unified health system and national data repository with all relevant data and reports. Finally, others suggested developing a national data warehouse and improving a unified health information system and harmonize its data. The Director General of Information and Research Department said “Despite the improvement efforts, the health system remains underdeveloped. That’s due to low allocated budget and poor planning. I think using ICT will solve this problem”. Overall, serious steps must be taken to improve existing systems and develop new applications.

People, Skills and Competencies: The interviews with informants confirmed that the Ministry of Public Health has adequate capacity in ICT such as trained staff with great skills. In addition, the Ministry has distributed ICT trained staff across all governorates and one-third of rural areas. In spite of above information, the Ministry cannot provide technical support to all governorates and rural areas due to financial and logistics constraints. Director General of Information and Research Department said “We have assessed the human resources and we found out that the Ministry of Public Health has health professionals who are having skills and experience in using ICT and health information systems”. The result shows that the health professionals are ready to use Telehealth system to meet their needs. Moreover, they expressed some concerns privacy and confidentiality of their data. Summary of all above, most of the informants agreed that Ministry of Public Health has sufficient human resources to use ICT and Telehealth.

The Will: The interviews revealed that willingness is one of the most important factors that affect in succeeding projects. It is noteworthy that most of the initiatives that have failed because of the lack of willingness by the leadership of the Ministry in order to make it work.

Training and Awareness: Telehealth is a new technology for most of health professionals in Yemen. It requires changing the way of delivering health services from traditional mode to newest mode. So, it can be expected that it will be resisted by those who do not yet understand it. For this reason, it is necessary to give the health professionals and recipients training courses and awareness sessions about Telehealth in order to understand the Telehealth.

DISCUSSION

Readiness is an important predictor of successful change implementation Weiner³³. Moreover, it becomes an essential requirement prior to Telehealth implementation Jennett et al¹³. Therefore, the readiness should be assessed before successful implementation of Telehealth.

This paper proposes a validated Yemen Telehealth Readiness Assessment Framework (YTRAF) to assess the readiness of the Ministry of Public Health to successfully adopt Telehealth in Yemen. In the line to achieve this,

YTRAF framework has been used to develop a validate Yemen Telehealth Readiness Assessment Tool (YTRAT) which is a useful and necessary tool for collecting data to help a country to identify and thus addresses areas require further attention in order to undertake a successful Telehealth initiative Wickramasinghe et al³⁴. Furthermore, it facilitates and used as guidelines for assessing the readiness by the researcher, policy-makers and health professionals.

Much works are required for Yemen to be ready for adopting Telehealth. In addition, more emphasis is needed on identifying the deficiencies which cause unready situations. In fact, Yemen is in need to use Telehealth due to its potential to address diverse problems by increasing the quality, accessibility, deliver health services at a distance and cost reduction Bashshur et al²; Yellowlees³⁵. Therefore, the Ministry of Public Health should be assessed in order to have a clear understanding of what is expected when they are implementing Telehealth.

Discussing the Telehealth readiness assessment result revealed that the Ministry of Public Health is in need great efforts to raise the level of its readiness in several areas to be ready for successful and sustainable adoption of Telehealth. Moreover, to assess the Telehealth readiness there are several factors should be taking into account due to their effect on the adoption of Telehealth such as realization of problem, expression of dissatisfaction, recognitions of benefits, Telehealth as a solution, existing and new policies, framework, organization structure, internal process, international process, information, cultural, ethics and behavior, services, infrastructure, application, the will, people, skills and competencies and awareness and training.

CONCLUSION

Three contributions have been made by this paper which are Yemen Telehealth Readiness Assessment Framework (YTRAF) has been developed to investigate the readiness of health institutions in regard to adoption of Telehealth; Yemen Telehealth Readiness Assessment Tool (YTRAT) has been developed for collecting data to investigate the readiness of health institutions in regard to adoption of Telehealth; and this is the first research that studies adopting Telehealth deeply in order to improve the current healthcare system in Yemen.

The limitations are: The scarcity of studies on Telehealth readiness for Yemen; the researchers have got important official documents, reports and assessments about the current Yemeni health system, but it was not used for research purposes because it is classified as a secret (i.e., not allowed for publishing); and some interviewees had given too much information, while, others have concealed the important information.

Yemen is one of the least developed countries. Due to the great similarities in settings between Yemen and the rest of the least developed countries, findings can be generalized and, YTRAF and YTRAT can be used for the least developed countries.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Al-Huneiti R. Towards a new framework for nursing education and training in developing countries. PhD Theses, Brunel University School of Engineering and Design. 2014.
2. Bashshur R.L, T. G Reardon, G.W Shannon. Telemedicine: A new health care delivery system. *Annual Rev. Public Health.* 2000; 21: 613-637.
3. Braun V, V Clarke. Using thematic analysis in psychology. *Qualitative Res. Psychol.* 2006; 3: 77-101. <http://www.tandfonline.com/doi/abs/10.1191/1478088706qp063oa>
4. Buabbas A. Investigation of the adoption of telemedicine technology in the Kuwaiti health system: Strategy and policy of implementation for overseas referral patients. Brunel University, School of Information Systems, Computing and Mathematics. 2013.
5. Campbell J.D, K.D Harris, R Hodge. Introducing telemedicine technology to rural physicians and settings. *J. Family Pract.* 2001; 50: 419-419. PMID: 11350706
6. Chattopadhyay S, J Li, L Land, P Ray. A framework for assessing ICT preparedness for e-health implementations. Proceedings of the 10th International Conference on e-Health Networking, Applications and Services, Jul. 7-9, IEEE Xplore Press. 2008; pp: 124-129.
7. Coleman A, M.F Coleman. Activity theory framework: A basis for e-health readiness assessment in health institutions. *J. Commun.* , 2013; 4: 95-100. <http://www.krepublishers.com/02-Journals/JC/JC-04-0-000-13-Web/JC-04-2-000-13-Abst-PDF/JC-04-2-095-13-081-Coleman-A/JC-04-2-095-13-081-Coleman-A-Tt.pdf>
8. Demiris G, D Oliver, D Porock, K Courtney. Home telehealth: The Missouri telehealth project: Background and next steps. *Home Health Care Technol. Rep.* 2004; 1: 55-57.
9. Durrani H, S Khoja, A Naseem, R Scott, A. Gul et al. Health needs and eHealth readiness assessment of health care organizations in Kabul and Bamyan, Afghanistan. *East Mediterr Health J.* 2012; 18: 663-70. PMID: 22888626
10. Gagnon M.P, L Lamothe, J.P Fortin, A Cloutier, G Godin et al. The impact of organizational characteristics on telehealth adoption by hospitals. Proceedings of the 37th Annual Hawaii International Conference on System Sciences, Jan. 5-8, IEEE Xplore Press. 2004; pp: 10-10. Herrmann, M., J. Guzman, S. Juran and D. Schensul, 2011. Population dynamics in the least developed countries: challenges and opportunities for development and poverty reduction.
11. IBRD-IDA, 2016. The world bank, least developed countries: UN classification. <http://data.worldbank.org/region/LDC>
12. ISACA, 2012. COBIT 5: A business framework for the governance and management of enterprise IT. ISACA.
13. Jennett P, M Gagnon, H. Brandstadt,. Preparing for success: readiness models for rural telehealth. *J. Postgraduate Med.* 2005a; 51: 279-285. PMID: 16388170
14. Jennett P, A Jackson, K Ho, T Healy, A Kazanjian et al. The essence of telehealth readiness in rural communities: An organizational perspective. *Telemed. J. e-Health.* 2005b; 11: 137-145.
15. Jennett P, A Jackson, T Healy, K Ho, A. Kazanjian et al. A study of a rural community's readiness for telehealth. *J. Telemed. Telecare.* 2003; 9: 259-263.

16. Kandeh J, L Kumar. Developing a relative ranking of social vulnerability of governorates of Yemen to humanitarian crisis. *ISPRS Int. J. Geo-Inform.* 2015; 4: 1913-1935.
17. Kgasi M.R, B.M Kalema. Assessment E-health readiness for rural South African areas. *J. Indust. Intell. Inform.* 2014; 2: 131-135.
18. Khoja S, R Scott, S Gilani. E-health readiness assessment: Promoting “hope” in the health-care institutions of Pakistan. *World Hospitals Health Serv.* 2008; 44: 36-38. PMID: 18549033
19. Khoja S, R Scott, M Mohsin, A Ishaq, A Casebeer. Developing a conceptual-framework for e-health readiness assessment tools for developing countries. *Int. Hospital Federat.* 2007a.
20. Khoja S, R.E Scott, A.L Casebeer, M Mohsin, A. Ishaq et al. e-Health readiness assessment tools for healthcare institutions in developing countries. *Telemed. e-Health.* 2007b; 13: 425-432.
21. Li J, P Ray, H Seale, R MacIntyre. An e-health readiness assessment framework for public health services--pandemic perspective. *Proceedings of the 45th Hawaii International Conference on System Science*, Jan. 4-7, IEEE Xplore Press. 2012; pp: 2800-2809.
22. Morgan D.L. *The SAGE Encyclopedia of Qualitative Research Methods.* 1st Edn., SAGE Publications, Inc., ISBN-10: 1412941636. 2008; pp: 1072.
23. Oak M. A review on barriers to implementing health informatics in developing countries. *J. Health Inform. Develop. Countries.* 2007; 1: 19-22. www.jhidc.org/index.php/jhidc/article/view/4
24. Oio S, O Olugbara, G Ditsa, M.O Adigun, S. Xulu. Formal model for e-healthcare readiness assessment in developing country context. *Proceedings of the 4th International Conference on Innovations in Information Technology*, Nov. 18-20, IEEE Xplore Press. 2007; pp: 41-45.
25. Overhage J.M, L Evans, J Marchibroda. Communities’ readiness for health information exchange: The National Landscape in 2004. *J. Am. Med. Inform. Assoc.* 2005; 12: 107-112.
26. Pabst A, Assessing community readiness for telepsychiatry in rural Oregon: A focused descriptive study. PhD Thesis, Oregon Health & Science University. 2012. <http://digitalcommons.ohsu.edu/etd/916/>
27. Reid J. *A telemedicine primer: Understanding the issues.* Innovative Medical Communications, Montana. 1996.
28. Rezai-Rad M, R Vaezi, F Nattagh. E-health readiness assessment framework in Iran. *Iran. J. Public Health.* 2012; 41: 43-51. <http://ijph.tums.ac.ir/index.php/ijph/article/view/2500>
29. Sharma S.V, D.J Schober. A conceptual framework for organizational readiness to implement nutrition and physical activity programs in early childhood education settings. *Prevent. Chronic Disease.* 2014; 11: 140166-140166.
30. UN, List of least developed countries. 2016. http://www.un.org/en/development/desa/policy/cdp/ldc/ldc_list.pdf
31. UNCTAD, The least developed countries report, growth with employment for inclusive and sustainable development. 2013. Geneva. http://unctad.org/en/Publications_Library/ldc2013_en.pdf
32. UNCTAD, The least developed countries report, transforming rural economies. Geneva. 2015. http://unctad.org/en/PublicationsLibrary/ldc2015_en.pdf
33. Weiner B.J. A theory of organizational readiness for change. *Implement Sci.* 2009; 4: 67-67.
34. Wickramasinghe N.S, A.M Fadlalla, E Geisler, J.L Schaffer. A framework for assessing e-health preparedness. *Int. J. Electronic Healthcare.* 2005; 1: 316-334.
35. Yellowlees P.M. Successfully developing a telemedicine system. *J. Telemed. Telecare.* 2005; 11: 331-335.

Does Rural People Socially Mobile? Evidence from Northern Region of Malaysia

Zalina Zainal¹, Mukaramah-Harun¹, Siti Hadijah Che Mat¹

¹*School of Economics, Finance and Banking UUM COB, Universiti Utara Malaysia, 06010 UUM Sintok, Kedah Darul Aman, MALAYSIA*

ABSTRACT

Inspired by the idea of promoting equality opportunities across individuals can enhance economic growth through the allocation of human resource based on their best use, we examine the extent of inter-generational social mobility in Northern region of Malaysia. Using both descriptive and Ordinary Least Square (OLS) estimation, we analyze the possibility of income and occupation change of the poor households in rural areas. The findings demonstrate that both level of education and type of occupation reflect a significant improvement of inter-generational social mobility. Interestingly, the findings also indicate that social mobility in Malaysia is relatively higher than in other countries where more space and equal opportunities are enjoyed by all walks of life in the nation.

Keywords: *Intergenerational social mobility, poverty, income*

INTRODUCTION

Since independence, Malaysia economy has grown rapidly and greatly enriched Malaysians. In merely 57 years, Malaysia has transformed from a backward society rife with poverty into a country with one of the lowest poverty rates in Asia, poverty incidence at about 1.0 percent of population in 2014. However, the significant reduction in poverty is not accompanied with significant reduction in income inequality. Shows by the Gini coefficient which remains high at 0.41 in 2014 (World Bank, 2015). According to Mukaramah, SitiHadijah and Zalina¹⁴, Malaysia Gini coefficient has decreased only slightly from 0.51 in 1970 to 0.41 in 2014. Income disparity ratio between ethnic groups is still high where the income of the Chinese is more than one and a half times the income of the Malays and the income of the Indian is more than one times the income of the Malays in the 2000s. More significantly, rural-urban disparities seem to have risen. Income disparity between rural and urban households deteriorated from 1:1.81 in 1999 to 1:2.11 in 2013. The rural-urban income disparities in 2013 are found to be almost at the same level as in 1989.

Hence, income inequality is still regarded as one of the major problems in Malaysian economy. However, measures of income inequality are like snapshots that

cannot tell anything about lifetime income or mobility. They just reflect differences in income at a specific point in time, but not whether those at the top or bottom of the income distribution are moving up or down or expect to do so.

Therefore, intergenerational social mobility is an issue of concern; from a social justice perspective; a society where the children of the poorest families continue to be among the poorest, and the children of the wealthiest families continue to be the richest, should be undesirable. A branch of economics literature has developed models where initially, a society is divided into a group of rich and a group of poor people. Richer group invests in human capital and therefore has higher labour income within skilled formal sector and bequeaths resources to their descendants' education. With decreasing fertility rates, rich dynasties maintain and perpetuate their status. The second group invests insufficiently in human capital, works in the unskilled sector and generation after generation leaves less inheritance to their children. Greater fertility rates associated with this group helps to uphold poverty conditions. If there is neither intergenerational mobility between the generations nor public policies to promote it, the initial distribution of "rich" and "poor", associated fertility rates and many other variables determine if this society converges to a situation of inequality or more equality.

Within the context of Malaysia, there are many reasons why the issue of intergenerational mobility should be examined. Intergenerational mobility may improve equity by reducing economic inequality, promoting social justice and achieving a more equitable allocation of resources. The extent of intergenerational mobility may thus be seen as a measure of equality of opportunity. Intergenerational mobility may also be an instrument for achieving greater economic efficiency. If inequality is found to arise from lack of social mobility, this may have serious policy implications. A revisit on the educational policy, early childhood investment and health care policy seems very important as these policies could affect the extent to which the social and economic position of individuals in a society is determined and inherited. This to ensure that the social and economic position of individuals in a society is determined by their skills and ambitions rather than by inherited advantage or disadvantage. The ways resources are allocated across generations may influence overall social welfare defined over the entire income distribution of different generations (Atkinson¹). Indeed, in all present actions, past and future generations are inherently represented: past generations, because current actions embody their legacy, and future generations, because current decisions affect their well-being through the various endowments that they will inherit.

In Malaysia, it is crucial to measure the 'equality' of society more along the lines of economic social mobility rather than purely through the income or wealth measures. The idea is to have people begin at more or less the same starting point, then proceed in accordance to their own ability and willingness to work. Economic mobility in this sense means that whatever your personal circumstances, you can reach the top of the social and economic ladder. Therefore, instead of focusing on inequality, economists should examine a more comprehensive measure of social mobility which provides a better measure of changing opportunities than do traditional measures of inequality.

Therefore, in this study, we propose to measure and analyse the existence and the extent of intergenerational social mobility in Malaysia by focusing on the phenomenon of rural people getting out of the poverty circle. The analysis is based on a survey of the rural households in the northern region of Malaysia, comprising the states of Kedah, Perlis, Pulau Pinang and

Perak in 2015. Hence, this paper is organized as follows; in the next part, the literature review and methodologies were discussed. Then the researchers report empirical results and conclusions of the study and discussion of further policy implications are discussed in the last part of the paper.

LITERATURE REVIEW

The issue of social change and transformation of rural communities in Malaysia has been the subject of study in earlier landmark works by Ungku Aziz in the 1960s and Ishak Shaari in the 1980s. However, specific studies in the intergenerational social mobility are very few in Malaysia. Among them are (Lillard and Willis¹²; Lillard & Kilburn¹¹; Solon¹⁶).

Lillard and Willis¹² explored evidence concerning the relationship between parents' and children's education using the Second Malaysian Family Life Survey (MFLS-2), which contains information on the education of as many as four generations within a given family. These data allow the authors to study the spread of education in Malaysia over much of this century by examining the educational attainment of birth cohorts from 1910 to 1980. More significantly, the authors used these data to study the effects of parental education on the progress of their children through elementary, secondary, and post-secondary school within a sequential discrete-time hazard model, which allows for correlations among unmeasured family and individual-specific components. For a subset of the cohorts, the authors were able to introduce time-varying covariates to measure a family's economic circumstances, the quality of its environment, and the composition of the subset at the time a given decision is made. Lillard & Kilburn¹¹ estimated a value of 0.26 for Malaysia's elasticity, meaning that, one percent increase in parent education affects 26 percent increase in the education of children. In other words, an increase of approximately one level of parent education will lead to education of children increased by two levels. Based on this study it was found, that educational upgrading between generations was a core influence for improving mobility.

A burgeoning literature has estimated the extent of intergenerational earnings mobility for other countries. Blanden⁴ used data for Britain, the United States, West Germany, Canada, Sweden, Norway, Finland, and

Denmark, and concluded that “America and Britain have the highest intergenerational persistence (lowest mobility)”. Conversely, the Nordic countries and Canada are the most mobile. Moreover, Jänttiet *al*^P compared mobility in Finland, Denmark, Norway, Sweden, the United States and United Kingdom using mean regression procedures and transition matrices. The results show that Denmark is the most mobile country (with an intergenerational elasticity of earnings of 0.071), followed by Finland (0.173), Norway (0.155), Sweden (0.258), United Kingdom (0.306) and the United States (0.517).

Meanwhile, Orsetta Causa, Sophie Dantan and Åsa Johansson (2009) provided a comparable estimate of intergenerational wage and education persistence across 14 European OECD countries based on a new micro data from Eurostat. The empirical estimates show that the relationship between parental or socio-economic background and offspring’s educational and wage outcomes is positive and significant in practically all countries. Intergenerational wage persistence is relatively high in southern European countries, as well as in the United Kingdom. Likewise, intergenerational persistence in education is relatively high both in southern European countries and in Luxembourg and Ireland. In contrast, both persistence in wages and education tends to be lower in the Nordic countries. Intergenerational social mobility is measured by several different indicators since no single indicator provides a complete picture.

In his analysis, Corak⁸ noted the large cross-country differences between on the one hand Denmark, Norway, Finland, Australia and Canada where the elasticity is less than 0.20, and the United States, United Kingdom and Italy, where the estimated elasticity is higher than 0.40. For example, an elasticity value of 0.50 - as in Italy or the United Kingdom - implies that 50% of the relative difference in parental earnings is transmitted, on average, to their children. An elasticity of 0.15 (as in Denmark) implies that 15% of the difference in parental earnings is transmitted to their children.

Chetty *et al*⁷ presented new evidence on trends in intergenerational mobility in the United States using administrative earnings records. They found that percentile rank-based measures of intergenerational mobility have remained extremely stable for the 1971-1993 birth cohorts. For children born between 1971 and 1986, they measured intergenerational mobility

based on the correlation between parent and child income percentile ranks. For more recent cohorts, they measured mobility as the correlation between a child’s probability of attending college and her parents’ income rank. They also calculated transition probabilities, such as a child’s chances of reaching the top quintile of the income distribution starting from the bottom quintile. Based on all of these measures, they found that children entering the labour market today have the same chances of moving up in the income distribution (relative to their parents) as children born in the 1970s.

The literature reveals a general consensus regarding the importance of education to the capacity of people to be upwardly socially mobile. Lochrie (2004) discussed the connections between parental education with child poverty, low educational attainment, family dysfunction and social exclusion in the United Kingdom. He also discussed how educational opportunities for the whole family can transmit the motivation to succeed to children. Lillard & Kilburn¹¹ showed that education regimes where access to education is unfavourable to lower income families adversely affect intergenerational mobility. Solon¹⁶ theoretical model reveals that a more progressive public investment in human capital tends to increase mobility. Another theoretical model by Davies, Zhang and Zeng (2004) affirms that “starting from the same inequality, mobility is higher under public than under private education”. However, an empirical study of Britain by Blanden, Gregg and Machin (2005) found that “the big expansion in university participation has tended to benefit children from affluent families more and thus reinforce immobility across generations”.

Chusseau, Hellier and Ben-Halima (2014) reviewed the economic literature on the impacts of several dimensions of education upon intergenerational inequality persistency. They stated that the critical increase in the population education level in all countries has not come with lower inequality. The basic tools of education and intergenerational mobility modelling are subsequently exposed education functions, education decision making etc. In the theoretical review section, they analysed the cases in which education leads (i) to human capital convergence in the long term and (ii) to social stratification with the emergence of under-education traps. A simple modelling of both cases is proposed for two types of educational decisions, one based on the family expenditure on education and the other on the time spent for education. The

factors that generate social stratification and under-education traps are especially underlined. Next, the empirical literature on the determinants of educational attainment and intergenerational mobility is reviewed. The review reveals the crucial impact of family backgrounds on educational attainment in all countries. It also demonstrates huge and lasting differences across countries in terms of intergenerational mobility.

Louw, Berg and Yu (2006) investigated the role that parents' education plays in children's human capital accumulation. The study analyses patterns of educational attainment in South Africa during the period 1970-2001, asking whether intergenerational social mobility has improved. It tackles the issue in two ways, combining extensive descriptive analysis of progress in educational attainment with a more formal evaluation of intergenerational social mobility using indices constructed by Dahan and Gaviria (2001) and Behrman, Birdsall and Szekely (1998). Both types of analysis indicate that intergenerational social mobility within race groups improved over the period, with the indices suggesting that South African children are currently better able to take advantage of educational opportunities than the bulk of their peers in comparable countries. However, significant racial barriers remain in the quest to equalise educational opportunities across the board for South African children.

A recent study conducted by researchers from the London School of Economics and Political Science (LSE) concludes that part of the reason for the decline in mobility in Britain has been the increasing relationship between family income and educational attainment - "this was because additional opportunities to stay in education at both age 16 and age 18 disproportionately benefited those from better-off backgrounds. The research also shows that "family income in the childhood years does make a genuine difference to educational outcomes, rather than reflecting other aspects which differ across families."

Azevedo and Bouillon (2010) stated that while intergenerational education mobility have improved in recent decades, which may increase income mobility for younger cohorts, overall, the Latin American region still presents lower intergenerational social mobility. Previous studies suggest that these results might be associated to social exclusion, low access to higher education, public policies and labour market discrimination. Joseph Rowntree Foundation (JRF 2005) found that class

origins were the key to children's occupational outcome but that having economic assets in the home, and having a highly qualified mother were also very important.

According to d'Addio (2007) parental background can influence their offspring's wages in various ways. In very general terms, parental background can affect these wages by boosting both the offspring's labour productivity and their successful insertion in the labour market. One way in which children's productivity, and hence their future incomes, can be enhanced is through the ability of parents to invest in their offspring's human capital. However, wealth and assets passed on from one generation to another, the inheritance of traits that are important for economic success, such as propensities to undertake education, work ethics and risk-related behaviours, as well as local conditions such as growing up in advantaged neighbourhoods are other important factors explaining the transmission of income across generations.

Based on a cross-country comparison, Esping-Andersen (2004) concluded that it is the social and cultural capital that parents are able to pass onto their children that might explain a lack of change in social mobility in many European and North American countries during the post-war period, despite a comprehensive schooling system.

Eberharter (2013) used data from the German Socio-Economic Panel (SOEP), the Panel Study of Income Dynamics (PSID), and the British Household Panel Survey (BHPS) to analyse the hypotheses that the extent and the determinants of intergenerational income mobility and the relative risk of poverty differ with respect to the existing welfare state regime, family role patterns, and social policy design. The empirical results indicate a higher intergenerational income elasticity in the United States than in Germany and Great Britain, country differences concerning the influence of individual and parental socio-economic characteristics, and social exclusion attributes on intergenerational income mobility and the relative risk of poverty.

Causa and Johansson⁵ noted that public policies such as education and early childcare play a role in explaining observed differences in intergenerational social mobility across countries. In addition, their study also found a positive cross-country correlation between intergenerational social mobility and redistributive policies.

Causa, Dantan and Johansson⁶ examines the potential role of public policies and labour and product

market institutions in explaining observed differences in intergenerational wage mobility across 14 European OECD countries. Their empirical results show that education is one important driver of intergenerational wage persistence across European countries. There is a positive cross-country correlation between intergenerational wage mobility and redistributive policies, as well as a positive correlation between wage-setting institutions that compress the wage distribution and mobility.

METHODOLOGY

Data: This study involves four states in the north Peninsular Malaysia which are Perlis, Kedah, Penang and Perak. All respondents are located in the rural areas. The sampling frame was obtained from the Statistics Department, Kuala Lumpur. From originally 400, only 333 samples were suitable for analysis after undergoing data refining process. All these respondents met the study criteria which is a father who is 50 years old and above and had at the very least one son who is working. Based on the respondents' profile, we conclude "father" as head of household even though it may include mother as a head of household, so the term of "father" is used to simplify the respondents' terms.

To achieve the study objectives, we employ the descriptive analysis and the regression model. In the descriptive analysis part, we first examine the extent of the inter-generation social mobility by looking at the social mobility indicators of the respondents (fathers) and their son.

Explanatory Variables: Based on literature review, we included nine independent variables which are Father education level (Edu_Father); Father attitude (Att_Father); Father community involvement (Inv_Community); Asset ownership in the family (Asset); Existence of a university in vicinity of the respondent's house (Avaialbe_Uni); Distance of respondent's house to town centre (Near_Town); Distance of respondent's house to highway (Near_highway); Distance of respondent's house to bus station (Near Bus Station) and Location of respondent's house to tourism centre (Near_TourismLoc).

As our interest in this research is to investigate the influence of father's education on social mobility, the variable Father education (Edu_Father) is included to examine whether a father's level of education will give an

impact on the probability of occurrence of social mobility or not. Here, dummy variable is used for the father's level of education. We assign the value of one (1) to fathers who have primary school education level, the value of two (2) to fathers who have secondary school education level and the value three (3) to fathers who have tertiary education level. The preliminary expectation of the study is Father education level will positive significantly affect the occurrence of social mobility.

Besides Father education level, Father attitude (Att_Father) and Father involvement in the community (Inv_Community) are also expected to influence the probability of occurrence of social mobility. Father's attitude or more accurately the self-spirit of the father while bringing-up his children probably influence their educational attainment.

Father's attitude is measured using a likert scale for a few constructed items. In this study, the chosen items to measure the father's self-spirit are hardworking, willingness to learn new things, willingness to take risk, and not easily discouraged. The respondents are requested to state the level of their spirit for each given item from highly disagreed; value one (1) to highly agreed; value five (5). All answer choices will be summed up and then transformed into percentages. The study expects that there will exist a positive relationship between fathers' attitude or self-spirit (Att_Father) and the probability of occurrence of social mobility.

Furthermore, we are also interested in investigating the effect of fathers' involvement in the community (i.e. how active the parent is within the community) on the probability of occurrence of social mobility. In the study, we categorised local community activities into four as follows: Parents-Teachers Association (PTA); Village Sub-Committee; MosqueCommittee and Neighbourhood Watch Activities.

The respondents were asked whether they are involved in these activities or not and the extent of their involvement. There are three involvement level categories listed in the survey questionnaire: not involved, occasionally, and frequently.

For analytical purpose, respondents' involvement result score will be summed up and then transformed into percentages form. The study expects that the more active the respondent or the higher score that he obtains

show how active a respondent is and the study expects that there exists a positive relationship between fathers' involvement and the occurrence of social mobility.

Moreover, the government's role in development which is the space and opportunity provided by the government is also expected to influence the probability of occurrence of social mobility. Five government development elements are used in the study namely Existence of a university in the vicinity of respondent's house (Available_Uni); Distance of respondent's house to town centre (Near_Town); Distance of respondent's house to highway (Near_highway); Distance of respondent's house to bus station (Near Bus Station) and Location of respondent's house to tourism centre (Near_TourismLoc).

These development elements are measured using Likert Scale (1-5) based on the contribution and influence of their existence to the respondents, from the value one (1) highly not contribute to the value of five (5) highly contribute. The likert values obtained are summed up and then we uses percentage scale for estimation purpose. The study expects there exists a positive relationship between all five elements with the probability of existence of social mobility.

Next, the study also considers asset ownership (Asset) factor in influencing the probability of occurrence of social mobility. There are five (5) asset items considered, namely shares/savings, land area, house ownership, rented house and machine ownership. It is expected that the higher the number of assets owned, the higher the probability of occurrence of social mobility.

Descriptive Analysis: The descriptive analysis focuses on the education and job profiles of the fathers and their son as a core assessment on the reality of empirical facts in understanding the extent of the occurrence of social mobility between generations that is, fathers who live in the rural areas and their son.

Regression Model: Based on the definition, "social mobility is the ability of individuals or groups to move upward or downward in status based on wealth, occupation, education, or some other social variable". Based on the literature, there is no strong evidence that support the best indicator for social mobility. Therefore, in some empirical studied such as Lillard and Willis¹², the relationship between parents' and children's' education is estimated to measure the extent of social mobility.

Causa, Dantan and Johansson⁶ for example, estimate of intergenerational wage (wage outcomes of children) and education level (parental background) as a proxy of intergenerational social mobility.

Then, in this study we measure the extent of social mobility by estimating the intergenerational earnings elasticity between fathers and their son. In a perfectly mobile society, there will be no statistically significant relationship between the earnings of fathers and their son, while in an entirely immobile society, fathers and their son will occupy precisely the same positions in the earnings distribution. As a proxy for fathers' earnings, we use educational attainments. Based on the previous studies, parents' education plays an important role in determining children human capital accumulation. Family income in the childhood years does make a genuine difference to children educational outcomes. These studies suggest the higher level of parents' education the higher the opportunities of their children to have higher outcomes.

The theoretical model of Becker and Tomes^{2,3} allows estimation of intergenerational income mobility through the following equation:

$$\ln Y_{i,t} = \alpha + \beta \ln Y_{i,t-1} + \varepsilon_{i,t}$$

where $Y_{i,t}$ is the children's permanent income when they are adults (t indexing the generation and i the family) and $Y_{i,t-1}$ is the permanent income of parents (generation $t-1$), α is the average income of the children (generation t) when adults, $\varepsilon_{i,t}$ captures unobserved components and β reflects the relation between the income of individuals and that of their parents.

This "intergenerational elasticity" expresses the fraction of relative income differences that is transmitted, on average, across generations; positive values imply generational persistence means that higher incomes of the parents will lead to higher child's incomes, while negative values imply generational reversion of income (i.e. higher parental income leads to lower child outcomes). In general, the empirical evidence suggests a parameter $0 \leq \beta \leq 1$.

FINDINGS

Social Mobility through Education: Table 1 shows information about the formal education possessed by the respondents who are fathers and the respondents'

son. The level of formal education is divided into four classifications, which are no schooling, primary school, lower secondary school (SRP/PMR), higher secondary school (SPM), tertiary education (diploma/degree).

This study examines the highest level of formal education attained between two generations, that is, the education level of parents and children. As shown in Table 1, the level of educational attainment by two generations, that is between parents (the new era of independence) and child (around 25-30 years earlier) shows a significant improvement. In accordance with the life in the new era of independence with rampant deprivation and limited access to education, 32.1 percent of the fathers have never received any formal education. Moreover, only 67.9 percent of the fathers have gone through a formal education system where 39 percent have attained secondary education level and 1.5 percent have tertiary education.

There is a noticeable increase in the level of education obtained by the sons where almost 100 percent of them have received formal education. Moreover, only 0.3 percent have never received any formal education while 1.8 percent have received primary education. Almost 98 percent of them have secondary level of education and above. In fact, almost 40 percent of the son has received a tertiary education.

Generally, the study has found that there has been a transformation in terms of mobility in rural communities based on the educational aspect that is achieved by the two generations under study, the generations of parents and children. Mobility by level of education is recognized in importance as a key prerequisite for achieving a better life for the rural communities. This reflects that people have become more aware of the importance of formal education in life. In addition, through the well-organised national education system, rural people are able to obtain formal education.

Table 1: Level of Education of Father and Son

Level of Education	Father		Son	
	Frequency	Percent	Frequency	Per cent
No Education	107	32.1	1	0.3
Primary School	91	27.3	6	1.8
Secondary School	130	39.0	198	59.5
Tertiary (College and University)	5	1.5	128	38.4
Total	333	100	333	100

Social Mobility through Occupation: A key feature that is often synonymous with rural communities is their dependence of their economic resources on agriculture. This section examines whether these communities still rely entirely on being a farmer, or have experienced occupational mobility between the generations of parents and sons.

Generally, the results show that there has been a substantial shift of employment between fathers and sons. The occupation as a farmer for a major source of income has been less interesting for the next generation. Occupation with the private and government sectors is more appealing and has increased in percentages for the current generation or the respondents' sons.

Table 2 and 3 show the types of employment and categories of occupation, respectively, for both fathers and sons. Most of the fathers are employed in the agricultural sector (48.35 percent) and most of them

are self-employed (70.27 percent). They are mainly involved in agricultural activities such as being rubber tappers, paddy-field farmers, coconut pickers, carpenters and fishermen. This is followed by 14.71 percent who do small-scale business. Meanwhile, of the respondents who work for a fixed salary 7.81 percent work in the private sector and 21.7 percent are in the public sector. The types fathers' occupation categorised as public and private employment category are professional (3 persons), technician (1 person), clerk (4 persons) and sales and services worker (3 persons).

Although there are sons who remain working in the agricultural sector, the number is significantly lower where only 15.3 percent of them are working in this sector. Another occupational category or labourers also shows a decline between the fathers and sons generations, from 22:52 percent to 15.92 percent. Similarly, participation in business shows an increase between fathers and sons, from 7:51 percent to 14.71 percent.

In contrast, social mobility in terms of public and private employment shows significant improvement between fathers and sons with an increase from 7.81 and 7.21 percent to 28.23 and 20.42 percent, respectively. This implies that economic activities in Malaysia are oriented towards the non - agricultural sector.

Job categorised as professionals also shows an interesting finding that is the percentage of sons in this category are significantly higher than the percentage of fathers. Since most of the sons are highly educated, it is expected that their occupation level would also be relatively high as compared to their fathers.

Table 2: Types of Employment of Father and Son

Type	Father		Son	
	Frequency	Percent	Frequency	Per cent
Employer/business	49	14.7	25	0.3
Government worker	24	7.2	68	1.8
Private sector worker	26	7.8	94	59.5
Self-employed	234	70.3	127	38.4
Total	333	100	333	100

Table 3: Categories of Occupation of Father and Son

Categories	Father		Son	
	Frequency	Percent	Frequency	Percent
Managers	0	0	0	0
Professionals	3	0.9	47	14.1
Technicians and associate professionals	1	0.3	27	8.1
Clerical support workers	4	1.2	44	13.2
Service and sales workers	3	0.9	10	3
Market-oriented skilled agricultural and livestock workers	0	0	0	0
Market-oriented skilled forestry, fishery and hunting workers	0	0	0	0
Subsistence farmers, fisherman hunters and gatherers	161	48.4	51	15.3
Craft and related trades workers	2	0.6	0	0
Plant and machine-operators and assemblers	16	4.8	40	12.0
Elementary occupations	75	22.5	53	15.9
Armed forces occupations	1	0.3	14	4.2
Businessman	53	15.9	34	10.2
Total	333	100	333	100

Regression Analysis to Examine the Extent of Social Mobility: Observation based on the descriptive analysis (Table 1 to 3) indicates that a change in economic returns has occurred for the latter generation as proven by the diversity in their level of education and types of work compared to the previous generation. While the descriptive analysis has explained about the changing patterns of education and employment of children against their parents, the question is how far can a child change without being influenced by the economic status of their parents? In other words, does a child who has a father having low economic status, able to increase

his economic status than those who have a father with higher economic status? From another dimensional angle, the question that may arise is whether the son of a wealthy person will continue to be wealthy in his generation? If equal space and opportunities are given to the father, regardless of whether they have low or high economic status, the possibility of the occurrence of a change in economic status to the sons' generation is the same. Therefore, to analyse the overall size of the mobility that occurs, the correlation coefficient values between the generations are investigated to demonstrate the possibility of change between income classes.

The results of the OLS estimation analysis in Table 4 shows that the level of education of sons is affected by the father’s education level, the attitude of the father, and the government’s role in the development of the area which is the existence of a university in the area. We expect the existence of development in the local area can help the process of social mobility that occurs for example, the establishment of a university, in addition to generating employment opportunities, can also provide spillover effect in terms of awareness of the importance of education to the locals. Therefore, the development could contribute positively to the respondents in that area.

Based on Table 4, the coefficient Edu-Father value is used to measure the possibility of mobility between generations and the finding indicates that the level of education of the father (Edu_Father) is positive and significant in influencing the sons’ level of education at the 1 percent significance level. The estimated intergenerational correlation coefficient is 0.12 that shows the former generation is able to transfer its economic status to the next generation.

Furthermore, the correlation coefficient value (0.17) is lower than the result obtained by Lillard and Kilburn¹¹ who estimated a value of 0.26 for Malaysia’s elasticity.

This result also confirmed Solon’s survey in 1999 which found that Malaysia as a developing country is more mobile than developed countries. Thus, it also supports previous finding that found the estimated elasticities are higher for developed countries, such as Corak⁸ noted that the estimated elasticity of the United States, the United Kingdom and Italy is higher than 0.40. Meanwhile, Jäntti⁹ found that estimated elasticity of the United Kingdom and the United States are at 0.306 and 0.517, respectively.

The findings reflect that social mobility in Malaysia is higher than in other countries where more space and equal opportunities are enjoyed by all walks of life in the nation’s development. In other words, there is a change in the economic status of in the children’s generation (sons’ education level is higher) even though they may have a father who has low economic status (low level of education). For example, the education level of the father is only at primary school or do not attend school, but the education level of the son is found to have changed to a higher level (up to tertiary level). The results based on the value of the correlation coefficient between generations has strengthened the research findings based on the descriptive analysis which shows that there exists an increase in the son’s level of education regardless of the educational status of the parents.

Table 4: Determinants of Son’s Education Level in Malaysia

Dependent Variable Son’s Education Level	Son’s Education Level (primary school, secondary school (1-3), secondary school (4-5), college/diploma/stpm, university (first degree), Masters and above)		
Independent Variable	Coefficient	Standard Error	P Value
Constant	0.485	0.782	0.536
Edu_Father	0.167	0.054	0.002
Att_Father	0.280	0.121	0.021
Inv_Community	-0.025	0.171	0.885
Asset	0.001	0.010	0.910
Avaiable_Uni	0.175	0.053	0.001
Near_Town	-0.014	0.063	0.829
Near_Highway	-0.026	0.065	0.682
Near_Bus Station	-0.020	0.030	0.513
Near_TourismLoc	0.041	0.048	0.399

CONCLUSION

Overall, the study shows there has been a change between the fathers’ generation who live in the rural areas and children that reflects the transformation of society from one social position to a better social position. Our

finding indicates that there is a change in the economic status of in the children’s generation (sons’ education level is higher) even though they may have a father who has low economic status (low level of education). Therefore, changes in the mobility form should be seen within the framework of a multi-causal or multi-factoral

analysis. For social mobility to occur, the person needs a combination of the driving factors, in particular, the factors of education, occupation, attitude and the role of government simultaneously through the effect of some development infrastructure in that area. Those that are in the high mobility position are fathers who have strong spirits and internal ability compared with fathers who experienced decreased mobility. Strong internal ability is seen through high self-regard to change. Moreover, the existence of the university near the respondents' area is perceived as one of the main factors that influence social mobility.

Ethical Clearance: Taken from the committee

ACKNOWLEDGMENT

"The research was funded by the Ministry of Education under the Fundamental Research Grant Scheme"

Conflict of Interest: NIL

REFERENCES

1. Atkinson A.B. The measurement of economic mobility. In A.B. Atkinson (Eds), *Essays in Honor of Jan Pen*, Reprinted in *Social Justice and Public Policy*. Brighton: Wheatsheaf Books. 1981;9-24.
2. Becker G.S, Tomes N. An equilibrium theory of the distribution of income and intergenerational mobility. *Journal of Political Economy*. 1979;87(6):1153-1189.
3. Becker G. S, Tomes N. Human Capital and the Rise and Fall of Families. *Journal of Labor Economics*. 1986;4(3):S1-S39.
4. Blanden J. *Essays on intergenerational mobility and its variation over time, place and family structure*, PhD Thesis, University of London. 2005.
5. Causa O, Johansson Å. (2010). Intergenerational social mobility in OECD countries. *OECD Journal: Economic Studies*. 2010;Volume 2010.
6. Causa O, Dantan S, Johansson A. Intergenerational social mobility in European OECD countries. *OECD Economics Department Working Paper No. 709*. 2009.
7. Chetty R, Hendren N, Kline P, Saez E. Where is the land of opportunity? the geography of intergenerational mobility in the United States. NBER Working Paper No. 19843, National Bureau of Economic Research, Inc. 2014.
8. Corak M. Do poor children become poor adults? lessons from a cross country comparison of generational earnings mobility, IZA Discussion Paper No. 1993. 2006.
9. Jäntti M. B, Bratsberg K, Roed O, Raaum R, Naylor E, Österbacka A, Björklund T, Eriksson. American exceptionalism in a new light: a comparison of intergenerational earnings mobility in the Nordic countries, the United Kingdom and the United States. IZA Discussion Papers, 2006;No 1938, IZA-Bonn.
10. Levine D. I, Mazumder B. Choosing the right parents: changes in the intergenerational transmission of inequality between 1980 and the early 1990s. Working Paper No. 2002-08, Federal Reserve Bank of Chicago. 2002.
11. Lillard L. A, Kilburn R. M. Intergenerational earnings links: sons and daughters. *RAND Working Paper Series 95-17*. 1995.
12. Lillard L.A, Willis R. J. Intergenerational educational mobility: effects of family and state in Malaysia, *Journal of Human Resources*. 1994;29(4):1126-1166.
13. Mayer S.E, Lopoo L.M. Has the intergenerational transmission of economic status changed? *Journal of Human Resources*. 2005;40(1):169-185.
14. Mukaramah-Harun, SitiHadijah, Zalina-Zainal. Foreign direct investment and human capital: evidence from developing countries. *The Journal Developing Areas*, 49(4), Fall. 2015.
15. Ng I.Y.H, Shen X, Ho K.W. Intergenerational earnings mobility in Singapore and the United States. *Journal of Asian Economics*. 2009;20(2):110-119.
16. Solon G. Intergenerational Mobility in the Labor Market. In Ashenfelter, O. C., and Card, D. (Eds) *Handbook of Labor Economics*, Amsterdam: North-Holland.1999;3A:1761-800.
17. Solon G. Cross-country differences in intergenerational income mobility. *Journal of Economic Perspectives*. 2002;16(3):59-66.
18. Solon G. (2004). A Model of Intergenerational Mobility Variation over Time and Place. In M. Corak (Eds.), *Generational Income Mobility in North America and Europe*. Cambridge, UK: Cambridge University Press. 2004;38-47.

The Preceding Role of Social: Innovation, Knowledge, Capital and Entrepreneurship as Mediating Effects in Building Malaysian SME Business Performance

Jamal Mohammed Esmail Alekam¹, Shahrina Othman², Mohd Rizam Md Ladin³, Ahmad Said Alshuaibi⁴

¹PhD, Marketnig, Senior Lecturer, School of Business Management SBM, University Utara Malaysia UUM, 06010, Sintok, Malaysia, Ministry of defense Yemen; ²School of Business Management (SBM), UUM College of Business, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia; ³School of Human Development & Techno communication, University Malaysia Perlis, 01000 Kangar, Perlis, Malaysia

ABSTRACT

This piece aims to examine the outcome of number of factors on the business performance among SMEs Malaysia. A sampling survey was shared to 500 identified respondents in Malaysia. A total number of 207 valid responses were obtained. Results show significant relationship between each of the two (out of three) independent variables and SME business performance. Social capital emerged as the most germane factor controlling the SME business performance. This component is followed by social innovation. Results also indicated that social capital and social innovation have notable influence on the SME business performance. This research paper is perhaps of the first to investigate SMEs involvement in social entrepreneurship activities particularly leading to improve the business performance using comprehensive set of variables through RBV Theory, Social entrepreneurship and SME growth Performance model in investigating their influence on SMEs business performance.

Keywords: Social Entrepreneurship, Innovation, Knowledge, Malaysia, SME, Performance

INTRODUCTION

Malaysian New Economic Model (NEM) clamour for inclusiveness of all social strata in economic activities, including underprivileged groups who are typically the beneficiaries of Social Entrepreneurship activities. There is a growth of the microfinance industry throughout the world which now reaches more than 100 million customers worldwide Alekam et al¹; Alekam et al²; Rhyne 2010). Social entrepreneurship is having profound hints in the economic system: creating new industries, validating new business models, and shifting resources to abandon societal issues.

Ashoka's Founding CEO, William Drayton, who is recognised with creating the term "social entrepreneurship" Alekam et al¹; Hsu, 2005; Sen, 2007) and Bornstein (2004) considers that Asoka definition of social entrepreneurship is the most inclusive. Praszkiel, R., and Nowak, A¹⁵ reported that Asoka's definition of social entrepreneurship is new creative idea for solving a critical social matter, with an entrepreneurial behaviour,

visioning broad social impact of design and possess an unquestionable ethical thread.

The pure definitions of social entrepreneurship slash through fields and notions, indicating that the phenomenon exists in some dimensions. The central dimensions of social entrepreneurship are identified: social mission, social innovation, social change, entrepreneurial skills and personality.

Social entrepreneurship can be seen as a plan which is developed by a person or groups of people coming together to generate, dispense, and sustain or disseminate social or environmental value in a new way through enterprise operations, such as social enterprise, non-profit, private or public institution Granados et al., 2011; Lan, & Zhu¹²; Zahara, & Wright²⁰.

Underpinning theory: Resource-based Theory: The Resource Based Theory initiated from the design of the industrial organization firm standpoint (Russo & Fouts, 1997). Many theorists of resourced-based theory advocate that the triumph of the firm is determined by

both internal and external factors (Dierickx & Cool, 1989; Prahalad & Hamel, 1990; Wernerfelt, 1984). Organization attains sustained competitive benefits through the implementation of strategies exploiting their internal power by means of responding to their environmental opportunities while simultaneously dealing with external threats and keeping clear of internal weaknesses (Barney, 1991). Hence, the resource-based view studies the relationship between the organization's internal characteristics and its organizational performance as well as its capacity to maintain profitability. The theory suggests that every organization has clear resources and capabilities, that provide the essential for the organizational strategy and is the principal foundation of the organization's competitive advantage (Barney, 1991; Grant 1991). The thesis emphasizes on the resources as a component that is not easily-duplicated within other firms in an attempt to obtain competitive advantage Grant, 1991; Kim, Song, & Triche¹⁰.

The attributes and behaviour of the entrepreneur may be considered as a firm's resource that offers internal and/or external benefits. Khan and Anjum (2013) describe that leadership could create competitive advantage by cheering creativity and innovation in the organization. In their empirical study, they proved that leadership firmly influences competitive advantage of an organization. In addition to that, Mahmood and Hanafi (2013) have empirically shown that leaders that have the elements of adventure, innovativeness and pro activeness, which is deemed as the characteristics of the social entrepreneurs' act, positively influence competitive advantage as well as organizational performance. The characterises and act of the entrepreneur in terms of social entrepreneurial behaviour and entrepreneurial leadership may also lead to the enhancement of the industry's critical point in the competitive market through the provision of resources and simultaneously upgrading organizational performance.

Resource-based View Theory for SME Performance:

In this piece, theoretical framework (Figure 1) laid on the resource-based view (RBV) theory of the industry (Masakure, Henson, & Cranfield, 2009; Lockett & Thompson, 2001; Barney, 1991) by Jay Barner, Progenitor of Modern resource-based view. This theory is a body of thought in strategic management, which has been applied to the analysis of SMEs in developing nations and also applicable for this research. The work of Penrose (1959), discovered this theory (RBV), who stated that unyielding is a collection of the productive resources of a wide range of strategic management topics

Alekam et al²; Kang & Park, 2012. Its focus is explained the differences in a solid performance by recommending that there can be heterogeneity of firm-level differences among firms, thereby leading to sustenance of competitive advantage among them (Lavie, 2004). More so, this theory (RBV) perspective is to insist on strategic choice that will charge the firm managerial performance with the germane task of identifying, deploying and growing key resources to maximise the available resources. There exists a possibility of firms to generate, attain and sustained a competitive advantage as suggested by Ricardian, especially when the firms 'resources are valuable, rare, imitable, and organised (VRIO, formerly known as VRIN; non-substitutable) (Kang & Park, 2012; Lavie, 2004; Peteraf, 1993; Barney, 1991; Conner, 1991). Also, SMEs do not have the required power on resources, this is because of the distinctive product available to lots of them (financial or nonfinancial) that can produce and hold on to competitive advantages. Hence, only a few of the many possible resources are capable of generating and able to sustain competitive advantage (Wade & Hulland, 2004). The growth process of a firm requires various patterns of resolution and strategies. SME growth viewed as a series of phases or stages of expansion through which the business may pass in an enterprise cycle. It is essential to be able to demonstrate more substantial long-term sight and strategic intent amongst owner-managers.

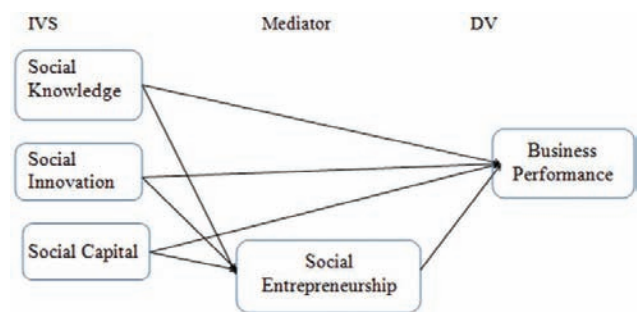


Figure 1: Theoretical Framework

HYPOTHESES

- H1: Social knowledge having notable involvement on social entrepreneurship
- H2: Social innovation having notable involvement on social entrepreneurship
- H3: Social capital having notable involvement on social entrepreneurship
- H4: Social entrepreneurship having notable involvement on business performance

H5: Social knowledge having notable involvement on business performance

H6: Social innovation having notable involvement on business performance

H7: Social capital having notable involvement on business performance

H8: Social entrepreneurship mediate the relation between social knowledge and business performance

H9: Social entrepreneurship mediate the relation between social innovation and business performance

H10: Social entrepreneurship mediate the relation between social capital and business performance

RESEARCH METHODOLOGY

Sampling and Instrument: SMEs from Selangor, Malaysia area constitute the population of interest. An individual with the managerial position of each company selected to complete the questionnaire. About 500 companies that had been selected at randomly are also registered with the Malaysia Small and Medium Development Council. Investigators distribute 500 questionnaires and manage to collect 207 from the targeted respondents (41% responses). In the study, a 5-point. Like scale was used, as it is also commonly used in marketing research and tested time and again in marketing and social science fields (Garland, 1991; Morgan & Hunt, 1994; Luck & Rubin, 1987; Tan &Teo, 2000; Alekam et al¹; Alekam et al² and Shih & Fang, 2004).

RESULTS

Composite Reliability: The standardized factor loadings that are obtained from the current revised structural model gave the computations of composite reliability based. Below summation is the composite reliability and it goes thus:

$$\text{Composite reliability} = \frac{(\sum \text{Standardized loading})^2}{(\sum \text{Standardized loading})^2 + \epsilon \sum j}$$

Studies of composite reliability Table 1 of all exogenous latent constructs are well above 0.60 except for customer fulfilment (below 0.60) – (Teschan, Nunnally, Bourne, Hamel et. al 1979).

In this study, all the Cronbach’s alpha Table 1 is higher than 0.6. Its shows that, all variables are acceptable to prove the instrument’s reliability. Nonetheless, all composite reliability values are higher than 0.7. All this support rule of thumb Hair et al (2010) which value CR 0.7 or higher is good reliability. For example, Cronbach alpha for business performance (SME) is 0.808 but composite reliability for the same variable is 0.98336. This indicates that composite reliability gives more accurate reliability reading than Cronbach alpha.

Table 1: Composite reliability (CR) and Cronbach’s Alpha (CA)

Variable	Composite Reliability (CR) CR>0.6	Reliability (CA) Cronbach’s Alpha = 207
Business Performance	0.98336	0.808
Social Entrepreneurship	0.91753	0.628
Social Knowledge	0.91574	0.807
Social Intension	0.90402	0.780
Social Capital	0.94656	0.736

Discriminant Validity: In order to substantiate discriminant validity Table 2, and Table 3, there was a comparison between the average variance extracted (AVE) and correlation squared of the interrelated variables of concerned (Fornell and Larcker, 1981). The AVE derived from the computation of variance extracted using the following equation:

$$\text{Variance extracted} = \frac{\sum (\text{Standardized SMC})}{\sum (\text{Standardized SMC}) + \sum \epsilon_j^2}$$

Table 2: Summary Table of Average Variance Extracted (AVE)

			Estimate	Correlation Squared
Business_Performance	<-->	SE	-0.056	0.003136
Business_Performance	<-->	SK	-0.098	0.009604
Business_Performance	<-->	SC	-0.053	0.002809
SE	<-->	SK	0.97	0.9409
SE	<-->	SC	0.985	0.970225
SK	<-->	SC	1.417	2.007889

Table 3: AVE Table Matrix of Exogenous Variables

Variable Name	1	2	3	4	5
Business Performance (1)	1.000				
Social Entrepreneurship (2)	(1+2)/2=1.2105	1.000			
Social Knowledge (3)	(1+3)/2=1.139	(2+3)/2=1.133	1.000		
Social Intension (4)	(1+4)/2=93.559	(2+4)/2=93.553	(3+4)/2=93.41	1.000	
Social Capital (5)	(1+5)/2=1.02275	(2+5)/2=1.2305	(3+5)/2=1.0875	(4+5)/2=185.9275	1.000

In this research, the variance value extracted for all the constructs explained 50 percent or more of the variance, which met the recommendation that the VE/AVE value should be at least 0.50 for each construct (Thompson Higgins, 1995; Bagozzi Yi, 1991; Holmes-Smith, 2001). To substantiate discriminant validity, the average variance draws (AVE) comparisons to correlation squared of the interrelated variables of concerned (Fornell and Larcker, 1981). For discriminant validity to uphold, the value of AVE must be more than correlation squared. When AVE > correlation squared, thus, discriminant validity is supported. Based on this study, all constructs support discriminant validity.

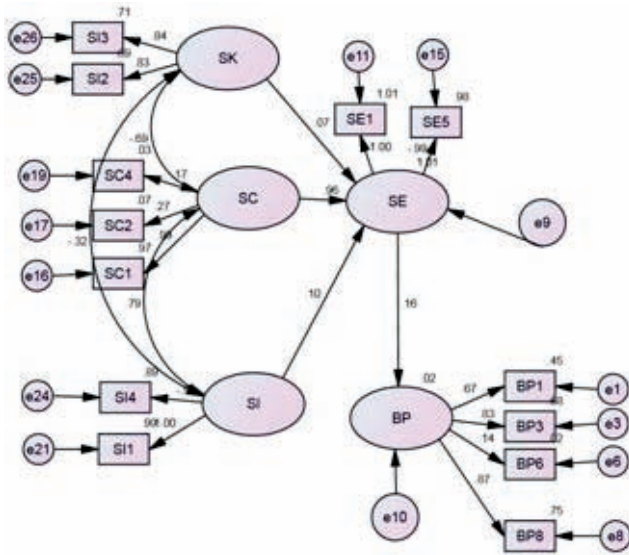
Hypotheses Results

Table 4

	Relationship	Estimate	S.E.	C.R.	P	Decision
H1	SE ← SK	.110	.110	1.676	.094	Not significant
H2	SE ← SI	.086	.044	1.982	.047	Significant
H3	SE ← SC	1.129	.097	11.634	***	Significant
H4	BP ← SE	.081	.081	2.163	.031	Significant

The results indicated that H1: Social knowledge has no significant connections with social entrepreneurship. Due to the relatively recent growth of interest in social entrepreneurship and with the diversity of actors and arenas involved, it is surprising that, terminology is an issue (Bielefeld, 2009; Alekam et al¹; Alekam et al². Also in H2: according to Helm (2007), there exist a positive relationship in social innovation and social entrepreneurship. Social entrepreneurship consists of risk taking, innovativeness and pro-activeness. This is because social innovation contained ‘the hard process of introducing new processes, products, and programs that can profoundly change the normal routines, resource and flows of authority, or social system beliefs in which the innovation occurs’ Alekam et al²; Westley &Antadze, 2010). Knowingly, H3: Social capital has a positive connection with social entrepreneurship. The reason is that social capital involves the relationships created by individuals, either formal or informal during their interactions with others in trying to gain rewards in the market (Woolcock, 2001). Kwon Heflin and Ruef (2013) findings stand in contrast to prevailing themes in the social capital literature on entrepreneurship and suggest

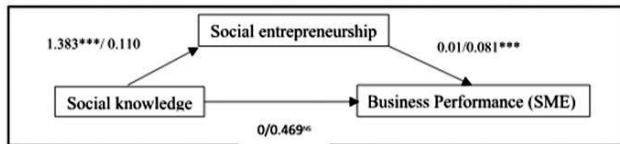
significant externalities are associated with social capital that accrues to the community at large. In addition, H4: Social entrepreneurship has a positive relationship with (SME) business performance. The secret of firm performance has long interested many researchers, most studies focused on large companies while neglecting small companies (Sorooshian, Norzima, Yusif, &Rosnah, 2011). It is a well-known fact that the small and medium enterprises (SME) play a huge role towards the economic performance of countries all over the world (Aziz & Mahmood, 2011). Swanson and Zhang (2010) are scholars who believe that social entrepreneurship as possible in for-profit businesses. They created a model that illustrates how an organization could legitimately pursue two separate objectives in terms of profit and social cause. Rahim &Mohtar (2015) advised a model of extended social entrepreneurship by dividing social entrepreneurship into non-profit and hybrid. The former consists of traditional NGO while the latter furthers divided into social hybrid and economy hybrid. The social hybrid and economy hybrid are organizations that have both social and financial goals; more so they are differentiated by their primary goals, either social or economy.



Revised/generated Model from SEM

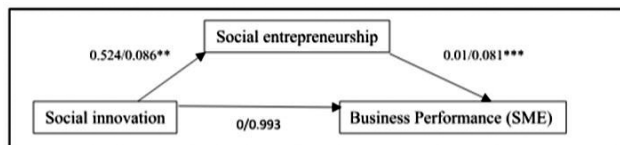
Analysis of Revised Model: Examination of mediating structure begins with checking p-value and CR value on website, factor to threat and from threat to online shopping intention before adding line (direct effect) from website factor to online shopping intention. The directive of thumb said that P-value must be less than 0.05 ($p < 0.05$) and CR value must be more than 1.96 ($CR > 1.96$). Social entrepreneurship is fully mediator between social knowledge and SME business performance Table 5.

Table 5: SE mediator effect between SK and BP



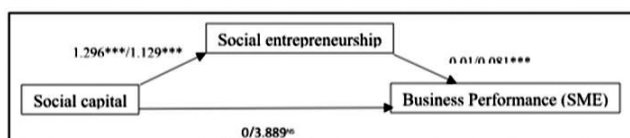
Social entrepreneurship is fully mediator between social innovation and SME business performance Table 6.

Table 6: SE mediator effect between SI and BP



Social entrepreneurship is fully mediator between social capital and SME business performance Table 7.

Table 7: SE mediator effect between SC and BP



CONCLUSION

Finally, about the topic of “The Antecedents and Mediating Effects of Social Entrepreneurship towards Malaysian SME Performance”, the replica has been designed slightly gave the new involvement in terms of antecedents of social entrepreneurship especially social capital and social innovation. A for moderating factor, all three variables indicated social entrepreneurship is fully mediate between the three variables and the business performance. This study faced no germane impact towards the intermediaries. Plainly, gender does not moderate the social capital, social knowledge and social innovation and the business performance.

This research has established four direct impacts: (1) SK and SE; (2) SI and SE; (3) SC and SE; and (4) SE and BP. Perhaps, years to come the combination of theory may be given much germane impact or extended research method would be contributing to new results.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Alekam J. M. E, Nik Mat N. K, Djermani F. The Role of Full or Partial Mediation of Intention between Patriotism, Trust, Government Support through Structural Equation Modeling (SEM) Effect on Actual Purchase toward Malaysia Brand. International Journal of Supply Chain Management. 2017; 6(4): 269-277.
2. Alekam J. M. E, Mat N. K. N, Nur T, Abaidah A. T, Nasirun N, Kamaruddin N. S. (Full, Partial Mediating and Moderating Play A Significant Role in Online Purchase Items in Facebook among Facebook Users.) Proceedings of 9th Annual London Business Research Conference 4 - 5 August 2014, Imperial College, London, UK, ISBN: 978-1-922069-56-6
3. Caulier-Grice J. Davies A. Patrick R. Norman W. Defining Social Innovation. A deliverable of the project: “The theoretical, empirical and policy foundations for building social innovation in Europe” (TEPSIE), European Commission – 7th Framework Programme, Brussels: European Commission, DG Research. 2012.

4. Cukier Wendy, et al. "Social entrepreneurship: a content analysis." *Journal of Strategic Innovation and Sustainability* 7.1 (2011); 99-119.
5. Dacin M. T, Dacin P. A, Tracey P. Social entrepreneurship: A critique and future directions. *Organization Science*. 2011; 22(5): 1203-1213.
6. Hardy Loh Rahim, Shahimi Mokhtar. "Social Entrepreneurship: A Different Perspective". *International Academic Research Journal of Business and Technology*. 2015; 1(1): 2015, Pages: 9-15, ISSN: 2289-8433.
7. Ibrahim Z, Abdullah F, Ismail A. International Business Competence Framework: Internationalized Small and Medium Enterprises (SMEs). In *Proceedings of the ASEAN Entrepreneurship Conference 2014*. Springer Singapore. 2016; (pp. 141-149).
8. Jiao H. "A conceptual model for social entrepreneurship directed toward social impact on society", *Social Enterprise Journal*. 2011; Vol. 7: Iss 2: pp. 130 – 149.
9. Kheng L. K, Minai M. S. The Network Characteristic of Chinese SMEs in Malaysia and Their Performance. In *Proceedings of the ASEAN Entrepreneurship Conference 2014*. Springer Singapore. 2016; (pp. 39-47).
10. Kim M, Song J, Triche J. Toward an integrated framework for innovation in service: A resource-based view and dynamic capabilities approach. *Information Systems Frontiers*. 2015; 17(3): 533-546.
11. Kuratko D. *Entrepreneurship: Theory, process, and practice*. Cengage Learning. 2013.
12. Lan H, Zhu Y, Ness D, Xing K, Schneider K. The role and characteristics of social entrepreneurs in contemporary rural cooperative development in China: case studies of rural social entrepreneurship. *Asia Pacific Business Review*. 2014; 20(3): 379-400.
13. Maria L. Granados, Vlatka Hlupic, Elayne Coakes, Souad Mohamed. "Social enterprise and social entrepreneurship research and theory: A bibliometric analysis from 1991 to 2010", *Social Enterprise Journal*. 2011; Vol. 7: Iss: 3: pp.198 – 218.
14. Moulart F, et al (ed). *The International Handbook on Social Innovation*. Cheltenham, UK: Edward Elgar Publishing Limited. 2013.
15. Praszkie R, Nowak A. *Social entrepreneurship: Theory and practice*. Cambridge University Press. 2011.
16. Raghda El Ebrashi. "Social entrepreneurship theory and sustainable social impact", *Social Responsibility Journal*. 2013; Vol. 9: Iss 2: pp.188 – 209.
17. Salleh M. M, Harun E. H, Adzmi N. A. Factors Affecting Corporate Social Responsibility (CSR) Intention among Owners/Managers of Small and Medium Enterprises (SMEs) in Malaysia: A Proposed Model. In *Proceedings of the ASEAN Entrepreneurship Conference 2014*. Springer Singapore. 2016; (pp. 125-138).
18. Santos F. M. A positive theory of social entrepreneurship. *Journal of business ethics*. 2012; 111(3): 335-351.
19. Wiklund J, Davidsson P, Audretsch D. B, Karlsson C. The future of entrepreneurship research. *Entrepreneurship Theory and Practice*. 2011; 35(1): 1-9.
20. Zahra S. A, Wright M. Understanding the social role of entrepreneurship. *Journal of Management Studies*. 2015.
21. Ziegler R. *An introduction to social entrepreneurship*. Edward Elgar Publishing. 2011.

Examining Level of Spirituality among Malaysian Youth

Nik Safiah Nik Abdullah¹, Abdullah Abd Ghani¹, Selamah Maamor¹, Norazlina Abd Wahab¹,
Mohd Shahril Ahmad Razimi¹, Ahmad Bashir Aziz¹, Nor Hanim Elias¹

¹Islamic Business School, College of Business, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia

ABSTRACT

The aim of this study is to examine the level of spirituality among Malaysian youth. The sample for the study consisted of 4,703 youths through the stratified random sampling method. In this study the spirituality level for the sample were measured. This quantitative research was conducted using a survey method through questionnaires distributed to a total of 4,703 youths age between 15 to 40 years from all races, religions and education backgrounds throughout Malaysia. This study applies a systematic stratified random sampling and the data obtained was analyzed using descriptive statistics, t-test and analysis of variance (ANOVA). The result showed that the level of spiritual among Malaysian youth is relatively high with mean at 8.02 out of 10. The spirituality level of Malaysian youth was also found to differ according to category of gender, religion, ethnic, category of primary school, category of secondary school, highest academic qualification at school level and highest academic qualification. This result implies that the level of spirituality is still have room for improvement and the government, non-government organisation as well as parents should take into consideration all the background of the youth when planning any spirituality development program. These to ensure that the program will be effective to increase their level of spirituality once its suitable with their needs according to their different background.

Keywords: *Spirituality, Mental health, Malaysian youth*

INTRODUCTION

During adolescence, individuals undergo marked changes in body, mind, and social relationships. Faced with these change, many youths seek diligently to find their place in the world by defining who they are and how they Lerner, Roeser, & Phelps¹⁶. Youth search for a self definition about an indentity that enables them to matter to self, family, and society, both in the teenage years and in their future adult life Harter⁹. This search often encourages the young person to overcome a cognitive and emotional focus on themselves Elkind⁷ and to strive to contribute in an important way, valued, and also noble to his or her world.

Spirituality encompasses all aspects of being human and is a way of experiencing life. Islam does not view spirituality separately from daily activities. In Islam, everything is spiritual because all actions must be in line with God's pleasure. Researcher believes that generosity derives from such spirituality, and that such honorable purposes are the essence of spirituality Damon⁶.

Spirituality meant as the presence of a correlation with God that impacts the individual's self-esteem,

sense of meaning and connectedness with nature and others Nasr²². The correlation quality of spirituality indoctrinated to be a core theme of Islam which consists of beliefs, rituals, daily-life behaviors, and knowledge. The correlation quality of spirituality indoctrinated to be a core theme of Islam which consists of beliefs, rituals, daily-life behaviors, and knowledge. Therefore, central beliefs of Islam are lived out daily in spirituality, ways of connecting with God, yourself, nature, and others. Meanwhile in other religion such as Christianity, spirituality is an attachment to the things of the spirit rather than of the world Merriam-Webster¹⁸.

In this study, spirituality level is measured based on three basics elements which are "manners", "believe in God" and "religious practices". These three basics elements are important element in developing positive traits and noble values in order to improve the robust identity among youth.

LITERATURE REVIEW

There are research studies showing that spiritual and religious involvement is an important dimension in

adolescent development. For example, based on the data collected from “The Project Teen Canada”, Bibby (2006) found that 75% of the respondents regarded themselves as members of a religion, 60% viewed spirituality as important, and 48% indicated that they had spiritual needs. In a study based on 112,232 freshmen in 236 colleges and universities in the United States, Astin et al¹ reported that 77% of the students agreed that they were “spiritual beings” and roughly four-fifth of them indicated that they had interest in spirituality and they believed in the sacredness. These findings are consistent with the view of Benson and Roehlkepartain² that “most young people view spiritual development as an important part of their lives”. King and Boyatzis¹³ similarly commented that adolescence “may be a particularly important time period in which to study spiritual and religious development.

Studies on the effect of spirituality on human life have been carried out extensively. Spirituality encompasses all aspects of human being including health eg. Rippentrop, Altmaier, Chen, Found, & Keffala²⁴; Narayanasamy & Narayanasamy²¹; Beuscher & Grando³, business/ entrepreneurship eg. Mitroff & Denton¹⁹; Kamil Al-Kahtani, & Sulaiman¹²; Mohd Sarif, Ismail, & Pairman²⁰, leadership eg. Burack⁵; Pratt²³; Fry⁸, education and training eg. Thompson²⁶; Walker & Dixon²⁷.

With regard to youth development, spirituality is essential for the healthy, positive development of a person’s sense of self and for allowing identity to frame the individual’s pursuit of a life way eventuating in idealized adulthood, that is, an adulthood involving mutually beneficial relations between the individual and his or her social world Lerner, Alberts, Anderson & Dowling¹⁵. According to Shek (2011), “different ecological factors, particularly family and peer influences, were found to influence spirituality”. In Malaysian case, Krauss, Hamzah, Suandi, Noah, Juhari, and Manap¹⁴ noted that, unlike other Muslim countries, particularly those in the Middle East, Malaysia has arguably experienced a smoother transition to modernization, and has tried to balance between proponents of strict secularization and Islamic factions within the country. From the review of the literature, it shows that attempts have been made to measure spirituality and it was evidenced that spirituality affects in almost every aspects of human life. Keeping this perspective in mind, it is therefore essential to investigate the spiritual among Malaysian youth.

METHODOLOGY

The methodology utilized in this study is quantitative method to gather primary data through questionnaire by employing the stratified sampling technique. The population of this study is the Malaysian youth between 15 to 40 years old which comprises of approximately 50% (14 million) of the total Malaysian population (Malaysian Youth Index, 2015). Out of this total, a sample of 6000 youths was selected as the subject of this study. Based on the discussion with the officer at Department of Statistics Malaysia, 750 sampling blocks were selected and each block consists of 8 households. The sampling block covers all 16 states in Malaysia including Wilayah Persekutuan Kuala Lumpur, Wilayah Persekutuan Labuan and Wilayah Persekutuan Putrajaya. Each of the state was divided into two categories, urban and sub-urban. The respondents are youth of the country and they are from different family background, races and education. This study used questionnaire as an instrument. A total of 5,972 questionnaires were distributed. However, only 4,703 questionnaires had completed and fulfil the criteria that researcher need. The data gathered were analysed by using descriptive analysis, t-test and analysis of variance (ANOVA). This analysis is reflect the real situation of Malaysian youth population.

FINDINGS

This section is divided into three parts which are background of the respondents, level of spirituality and differences in the level of spirituality Malaysian youth based on demographics.

Background of the Respondents: According to Table 1 which is the background of the respondents, majority of the respondents are male (55.6%) compared to female (44.4%). Most of the respondents are aged between 21 to 25 years (29.9%), followed by 15 to 20 years (21.1). Meanwhile, in terms of ethnic, Malay has the highest percentage (71.6%), followed by Chinese (12.1%). Most of the respondents are Muslim (77.6%), followed by Buddhist (10.3%). In terms of education background of the respondents, majority of them are from national school (primary) (84.8%), national school (secondary) (87.7%), SPM/ O level for highest academic qualification at school level and diploma holder for category of highest academic qualification (49.1%) at high school or university level.

Table 1: Background of the Respondents (n = 4,703)

Background	Detail	Valid Percent
Gender	Male	55.6
	Female	44.4
Age	15-20 years old	21.1
	21-25 years old	29.9
	26-30 years old	19.9
	31-35 years old	14.1
	36-40 years old	15.0
Ethnic	Malay	71.6
	Chinese	12.1
	Indian	7.0
	Others	9.4
Religion	Islam	77.6
	Buddhism	10.3
	Hinduism	6.1
	Christianity	5.4
	Others	0.7
Category of Primary School	National School	84.8
	Religious School	2.0
	Chinese/Tamil School	12.6
	Self-Learning	0.3
	Others	0.3
Category of Secondary School	National School	87.7
	Private School	2.7
	Religious School	5.8
	Others	3.8
Highest Academic Qualification at School Level	Below UPSR	0.8
	UPSR	1.6
	PMR/SRP	4.6
	SPM/O Level	76.2
	STPM/A Level	16.8
Highest Academic Qualification	Diploma	49.1
	Bachelor	41.9
	Master	7.6
	PhD	1.4

Level of Spirituality: Based on the result shown in Table 2, this study found that the spirituality level of Malaysian youth is acceptably high where the mean score is 8.02 out of 10 points. The highest element of spirituality level is “believe in God” with a mean value of 8.49, followed by “manners” with a mean value of 7.79. In contrast, the lowest mean value is “religious practices” with a mean value of 7.76. Nevertheless, all the elements of

spirituality level for Malaysian youth are considered high.

As referred to Table 2, the highest mean for the items of spiritual level is 8.75 which is item ‘I believe in God and it makes my life meaningful’ in elements of believe in God. It shows that the level of spirituality is really effective to the respondents in aspect believe in God. However, the lowest mean for the items of spirituality level is 7.55 which is item ‘I never miss to pray’ in aspect to religious practices. The result indicates that eventhough the youth have a high spiritual level, especially in the aspect of belief in God but for “religious practices” aspects such as prayer is quite low. This means there are still have room to improve the level of spirituality among Malaysian youth especially in term of religious practice.

Table 2: Items of Spiritual Level, Mean, Standard Deviation and Cronbach’s Alpha Value

No.	Items of Spiritual Level	Mean	Std. Dev.
1.	I am outgoing/warmth	7.64	1.962
2.	I am dutifulness	7.84	1.727
3.	I am compliance	7.84	1.698
4.	I am calm	7.72	1.751
5.	I am open-minded but upholding principle	7.91	1.703
	Mean Score of Manners	7.793	
6.	I believe in God and it makes my life meaningful	8.75	1.685
7.	I believe that God accepts me even if I do wrong	8.61	1.788
8.	I never challenge the teachings of my faith	8.50	2.013
9.	I believe people who are religious have higher level of spirituality	8.08	1.806
	Mean Score of Believe in God	8.486	
10.	I am ready to accept any consequence if I cannot fulfill my responsibilities	8.00	1.917
11.	I never miss to pray	7.55	2.185
12.	I like fasting	7.73	2.303
	Mean Score of Religious Practices	7.757	
	Mean Score of Spiritual Level	8.015	
	Conbach’s Alpha Value	0.904	

Differences in the Level of Spirituality Malaysian Youth based on Demographics: Based on the t-test and ANOVA analysis as shown in Table 3, the results show that there are significant differences based on demographic factors which consists of gender, ethnic, religion, category of primary school, category of secondary school, highest academic qualification at school level, and highest academic qualification towards level of spirituality for Malaysian Youth.

Based on the t-test analysis in Table 3 indicates that level of youth spirituality for female is higher than male which mean score of 8.09 and 7.96 respectively. Then, based on ANOVA analysis indicates that Malay has the highest mean score for level of youth spirituality in term of ethnic (8.13). Meanwhile, in term of religion perspective, the level of youth spirituality has significant difference among this category where Islam is the highest for the level of spirituality (8.14) among youth. Muslim also found to have significant different with buddhism and hinduism.

In term of education background, the level of spirituality is significantly different based on primary

school category. The highest level of spirituality in this category is national school (8.11) and followed by religious school (8.02). The spirituality level for those from national school have significantly different compared to those from Chinese/Tamil School and self-learning. The level of spirituality is also significantly different based on secondary school category. The highest level of spirituality in this category is religious school (8.21).

Meanwhile, the result shows that the level of spirituality is significantly different based on their highest academic qualification at school level. The highest level of spirituality in this category are those who hold SPM (8.05). The spirituality level for those with SPM qualification have significant difference compared to those who have education only UPSR level and below. The results also show that the level of youth spirituality is significantly different based on their highest academic qualification. The highest level of youth spirituality in this category is Master qualification (8.20). However, the spirituality level for those who have master qualification is significantly different at 10% level compared to who have bachelor qualification.

Table 3: Differences based on Demographic Factors, Means, and F/t-value

Item	Sub-item	Mean	t-value/F value	Sig.
Gender	Male	7.960	3.351	0.001*
	Female	8.089		
Ethnic	Malay	8.130	50.008	0.000*
	Chinese	7.434		
	Indian	7.798		
	Others	8.050		
Religion	Islam	8.138	49.691	0.000*
	Buddhism	7.370		
	Hinduism	7.751		
	Christianity	7.935		
	Others	6.758		
Category of Primary School	National School	8.112	44.026	0.000*
	Religious School	8.017		
	Chinese/ Tamil School	7.396		
	Self-Learning	6.601		
	Others	7.701		
Category of Secondary School	National School	8.023	11.162	0.000*
	Private School	8.045		
	Religious School	8.214		
	Others	7.507		

Conted...

Highest School Education	Below UPSR	7.342	6.157	0.000*
	UPSR	7.619		
	PMR/SRP	7.830		
	SPM/O Level	8.050		
	STPM/A Level	7.979		
Highest Academic Qualification	Diploma	8.076	3.970	0.008*
	Bachelor	7.916		
	Master	8.196		
	PhD	8.167		

Note: *The mean difference is significant at the 0.05 level

CONCLUSION

As referred to findings above, this study found that the spirituality level of Malaysian youth is acceptably high. Nevertheless, all the elements of spirituality level for Malaysian youth are considered not extremely high. The highest element of spirituality level is “believe in God” which is item ‘I believe in God and it makes my life meaningful’. This result in line with the World Values Survey Lippman & McIntosh¹⁷ which found that in some countries, 75 percent or more of young adults believe in God and find both God and religion to be important in their lives. In Indonesia, Pakistan, Egypt, and Iran, for example, nearly all young adults said they believe in God. Three-fourths or more of young adults reported that God is important and religion is important in their lives. Many of these countries have a history of an influential dominant religion (e.g., Islam) and a developing economy. However, this study also found “religious practices” as the elements of spirituality is lowest than “manners” and “believe in God” which is item ‘I never miss prayer’. This finding implies that there are still have room to improve the level of spirituality among Malaysian youth through the religious practice. Practicing religious follow religious rules is very important to ensure the level of spirituality of a person will increase. As stated in Al-Quran, the practice of praying will guide the prayer to the right path which is acceptable by God.

Given the importance of spirituality, one of the way to promote youth spirituality through utilizing spiritual programs. For example, Hui and Ho¹⁰ evaluated a forgiveness training program via quantitative and qualitative methods. Although there was no significant

improvement in self-esteem and hope among the participants based on the pre-test and post-test scores, participants showed better conception of forgiveness and had a positive attitude by using forgiveness. They concluded that it was “viable to promote forgiveness as a classroom guidance program”.

Therefore, the researcher recommend that the level of youth spirituality can be enhanced through the participation of youth in programs oriented to spirituality or religious. Through the spirituality development program is expected to build an excellent identity subsequently to produce the youths who adhere to Syariah such as not to leave the prayer, fasting and avoid doing things wrong. The government also should fully accommodate and concern their media channel to promote and embark spirituality development program.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Astin A.W, Astin H. S, Lindholm J. A, Bryant A, Szelenyi K, Calderone S. The Spiritual Life of College Students: A National Study of College Students’ Search for Meaning and Purpose. Higher Education Research Institute, UCLA, Los Angeles, Calif, USA. 2005.
2. Benson P. L, Roehlkepartain E. C. Spiritual development: a missing priority in youth development. *New Directions for Youth Development*. 2008; 118: 13–28.

3. Beuscher L, Grando VT. Using spirituality to cope with early stage Alzheimer's disease. *Western Journal of Nursing Research*. 2009; 31(5): 583-599.
4. Bibby R. W. *The Boomer Factor: What Canada's Most Famous Generation is Leaving Behind*. Toronto, Canada: Bastian Books. 2006.
5. Burack E. Spirituality in the workplace. *Journal of Organizational Change Management*. 1999; 12(4): 280-297.
6. Damon W. What is positive youth development? *Annals of the American Academy of Political and Social Science*. 2004; (591): 13-24.
7. Elkind D. Egocentrism in adolescents. *Child Development*. 1967; 38: 1025-1034.
8. Fry L. Towards a theory of spiritual leadership. *The Leadership Quarterly*. 2003; 693-727.
9. Harter S. The self. In N. Eisenberg, W. Damon, & R. M. Lerner (Eds.), *Hand-book of child psychology: Vol. 3, Social, emotional, and personality development*. 2006; (6th ed., pp. 505-570). Hoboken, NJ: Wiley.
10. Hui E. K. P, Ho D. K. Y. Forgiveness in the context of developmental guidance: implementation and evaluation. *British Journal of Guidance and Counselling*. 2004; 32(4); 477-492.
11. Indeks Belia Malaysia 2015 (IBM'15). Retrieved August 27, 2016, from Institut Penyelidikan Pembangunan Belia Malaysia: http://www.ippbm.gov.my/images/indeksbelia_malaysia2015/IBM2015full.pdf
12. Kamil al-Kahtani N. M, , A H, Sulaiman M. The components of spirituality in the business organizational context: The case of Malaysia. *Asian Journal of Business and Management Sciences*. 2011; 1(2): 166-80.
13. King P. E, Boyatzis C. J. Exploring adolescent spiritual and religious development: current and future theoretical and empirical perspectives. *Applied Developmental Science*. 2004; 8(1):2-6.
14. Krauss S. E, Hamzah A. H, Suandi T, Noah S. M, Juhari R, Manap J. H. et al. Exploring regional differences in religiosity among Muslim youth in Malaysia. *Review of Religious Research*. 2006; 47(3): 238-252.
15. Lerner R. M, Alberts A. E, Anderson P. M, Dowling E. M. On making humans human: Spirituality and the promotion of positive youth development. *Spirituality and Positive Youth Development*. 2005; 60-72.
16. Lerner R. M, Roeser R. W, Phelps E. (Eds.). *Positive youth development & spirituality: From theory to research*. West Conshohocken, PA: Templeton Foundation Press. 2007.
17. Lippman L. H, McIntosh H. The demographics of spirituality and religiosity among youth: International and U.S. patterns. *Child Trends Research Brief*. 2010; (21): 1-15.
18. Merriam-Webster *The Merriam-Webster Dictionary*. New York: Pocket Books. 1974.
19. Mitroff I, Denton E. A. A study of spirituality in the workplace. *Sloan Management Review*. 1999; 40(4): 83.
20. Mohd Sarif S, Ismail Y, Paiman L. H. The Effects of Spirituality on Social Entrepreneurship from Islamic Perspective. Paper Proceeding of the 5th Islamic Economics System Conference (iECONS 2013), organized by Faculty Economics and Muamalat, Universiti Sains Islam Malaysia, Berjaya Times Square Hotel, Kuala Lumpur. 2013.
21. Narayanasamy A, Narayanasamy M. The healing power of prayer and its implication for nursing. *British Journal of Nursing*. 2008; 17 (6): 394-398.
22. Nasr S. H. *Islamic Spirituality*. London: Routledge & Kegan Paul. 1987.
23. Pratt M. G. Building an ideological fortress: The role of spirituality, encapsulation, and sense-making. *Studies in Cultures, Organizations and Societies*. 2000; 6: 35-69.
24. Rippentrop E. A, Altmaier E. M, Chen J. J, Found E. M, Keffala V. J. The relationship between religion/spirituality and physical health, mental health, and pain in a chronic pain population. *Pain*. 2005; 116(3): 311-321.
25. Shek D. T. L. Spirituality as a Positive Youth Development Construct: A Conceptual Review. *The Scientific World Journal*. 2012; 1-8.
26. Thompson W. D. Can you train people to be spiritual? *Training & Development*. 2000; 18-19.
27. Walker K. L, Dixon V. Spirituality and academic performance among African American college students. *Journal of Black Psychology*. 2002; 28(2): 107-121.

Enhancing Construction Health and Safety through the Practices of Reuse and Recycle in Waste Management among Malaysian Contractors

Mohd Nasrun Mohd Nawi¹, Najuwa Mohd Nasir¹, Rahimi Abidin¹, Nurul Azita Salleh¹, Aizul Nahar Harun², Wan Nadzri Osman¹, Md Fauzi Ahmad³

¹*School of Technology Management and Logistics, College of Business, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia;* ²*Department of Management of Technology, Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia, 54100Kuala Lumpur, Malaysia;* ³*Faculty of Technology Management, Universiti Tun Hussein Onn Malaysia (UTHM), Parit Raja, Batu Pahat, Johor, Malaysia*

ABSTRACT

This paper contributes towards an overview of adoption level of reuse and recycles practice in Malaysia construction companies. Reuse and recycles practice includes in the activities of waste management. During the previous decades, waste of construction materials has become a serious issue as it contributes towards harm pollution for environment and human being. However, the practice of reuse and recycle of construction waste in developing countries such as Malaysia still at infancy level. Hence, this study focus to gain a local contractor perspective regarding the current level adoption of reuse and recycle implementation in construction sector. A survey method is employed through quantitative method by target the contractor's organization located in Peninsular of Malaysia as a unit analysis. The findings of this study indicate that majority of the construction companies have awareness towards implementation of policy, method and procedure of reuse and recycle practices. Thus, it shows that the current level of adoption reuse and recycle practice in Malaysia construction companies getting better compared previously.

Keywords: *Reuse, recycle, construction project, waste management, Malaysian construction industry.*

Jel Classification: O32, M11, N75

INTRODUCTION

Do you know that construction industry is the biggest consumer of natural resources and the largest polluters in many countries? According to the latest news, construction industry has contribute 23% of air pollution, 50% of climate change, 40% of drinking water pollution and 50% of landfill wastes (“How does construction impact the environment,”⁶). Whereas, DEFRA³ reported that UK has faces issue of landfill wastes as much 44%, US as much 29% and Australia with percentage 44% of same issue.

The percentage of pollution level is at alarming level. Hence, it is very important for stakeholders in the construction project play their role in minimizing the solid waste and other pollution type through an improvement in waste management. Now days, the need to improve waste management through reuse

and recycle in construction industry is generated by protection laws and regulation. However, awareness among stakeholders towards adoption of reuse and recycle in waste management still under moderate stage and required a full attention towards waste management practice compared with cost and time related issues (Shen & Tam, 2002). Many efforts have been undertaken by government to produce a greener among stakeholder in order to improve waste management practice through reuse and recycle of waste during construction.

Hence, the current adoption level of reuse and recycle practice in Malaysia is important to be finding out through this study to investigate level of awareness among stakeholders towards waste management in Malaysian construction industry. Next section of this paper review previous study about waste management practice and important of stakeholder involvement in minimizing the impact of pollution caused by

construction activities. The third section and fourth section of this paper present about research methodology of this study and finding respectively. The fifth section is discussing about the data finding of the study.

LITERATURE REVIEW

Waste Management Practice in Construction Industry:

A waste in construction industry is described as an unwanted materials or wastes of materials that have no value after the usage Winkler¹⁶. Meanwhile, Koskela⁸, defined waste in difference dimension by claimed waste as a result of inefficiency of activities in the use of equipment, construction materials, human resources or capital in a big scale. Based on previous study, waste in construction has lead into many type of pollution such as sound pollution, air pollution, water pollution and a climatic change in surroundings due to poor of waste management during construction. Meanwhile, waste itself can be classified into solid, liquid and gases Al-Hajj & Hamani². Construction industry is claimed as the worldwide biggest contributor towards pollution include in developed countries such as Hong Kong EPD⁵ and United Arab Emirates UAE Interact¹⁵, with landfill waste as much 23% and 75% respectively. Hence, it is very important to apply waste management in construction industry in minimizing the level of construction waste and impact of the pollution towards environment surroundings.

The practice of waste management in construction industry would help to reduce the non-added value of materials and as an advantage, reduce the cost of waste disposal and restrictive environmental conservation Pitt and Smith¹¹, and also help to improve the quality of human health Agamuthu et al¹. However, the practice of waste management need to be drive by both government and non-government to ensure the success of waste management practice in construction industry through formulating the policy of waste management and spread an educational of the practice in each level of construction organization. Stakeholder's involvement in practicing the waste management also is very important rather than looking into construction costs and time related issues. Malaysia has no exception to faces waste management problem as it becomes prime issues faced by stakeholders of the construction project Saeed et al¹².

Importance of Stakeholder Involvement of Reuses and Recycles Practice: An involvement of stakeholder in waste management practice is very important as it

contribute towards positive impacts to the construction sector towards sustainable development Yuan et al¹⁷. However, there is a lack attention among stakeholders towards the important of waste management and still at low priority for practice Teo&Loosemore¹³. In order to improve the waste management implementation among stakeholders of construction companies, government has put an effort by providing a regulation to improve waste management approach. The mandatory of waste management practices by stakeholders would improve productivity of the companies Tam¹⁴.

Reuse of construction materials is describe by the usage of same material more than once either material used for same purpose Yuan & Shen¹⁷. However, in difference dimension, reuse is defined as a usage of same materials more than once for difference purpose Duran et al⁴. However, there is a material that cannot be applied more than once either for same or difference purpose will either be recycles to become new materials for construction purpose. Through recycles of construction wastes into new materials, it's able to decrease the request for new raw materials, reduce cost of transportation and energy for materials production, reduce the amount of solid waste in landfill and secure the natural environment (Kartam et al⁷; Tam¹⁴, Osman, et al¹⁰; Osman et al⁹. Thus, stakeholders of the construction project should give a high priority towards waste management implementation in Malaysia construction industry by understanding the concept, method and policy of waste management. It is the objectives of this study to provide current level for waste management practices in Malaysia construction companies.

RESEARCH METHODOLOGY

Based on the objectives of the study which seeks to appraise Malaysian contractor's view of the implementation of reuse and recycle of construction materials, several phases were conducted as follows:

- i. **Phase 1:** Literature review on the concept of Malaysian construction industry, reuse and recycle issues and the concept of sustainable construction in the construction industry.
- ii. **Phase 2:** Literature review on the concept of Waste Management specifically on reuse and recycle implementation in the construction industry—to understand those concepts, principles, challenges

and advantages of their application in construction industry and identification of research framework and research hypothesis.

- iii. **Phase 3:** Postal survey - investigate the factors that affecting the systematic implementation of reuse and recycle among Malaysian contractors.
- iv. **Phase 4:** Investigate the factors/causes based - investigate the problems and challenges of application, factors affecting application, explain reasons for current level of practices and recommend ways for improvement.

This research involved collecting the respondents perception based on their experiences in construction industry. This study is a hypothesis testing. The unit analysis is focused on contractor’s organization as representatives to gain their perception regarding the practices of reuse and recycle of construction materials. The respondents consist of project managers, engineers, quantity surveyors and other relevant individual on behalf of the contractor. The targeted company for survey is located in Peninsular of Malaysia.

DATA FINDING

Qualitative data analysis has been carried out in this study with justification through statistical analysis and discussed in this section. The questionnaires were distributed to grade ‘A’ contractors that registered with the Contractor Service Centre (PKK). The respondents consist of engineer, technician assistant, resident engineer, project manager, site supervisor and administration division.

Respondent Working Experience: Each respondent have difference period of working experience. The respondent working experience is reported in Figure 1.

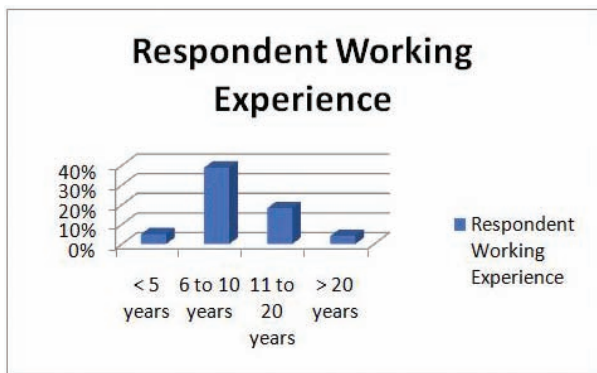


Figure 1: Respondent working experience

Based on the figure above, 5% of the total respondents have working experience for less than 5 years. Whereas, 38.8% of the respondents have 6 to 10 years working experience. Other 18.2% group of respondents have working experience for 11 to 20 years and the least of 4.1% respondents have experience of work more than 20 years. Respondents with working experience 6 to 10 years are the highest population in this study.

Establishment of Company in the Construction Industry:

In term of company establishment, each targeted construction companies has difference period of establishment. It was shown in Figure 2 below:

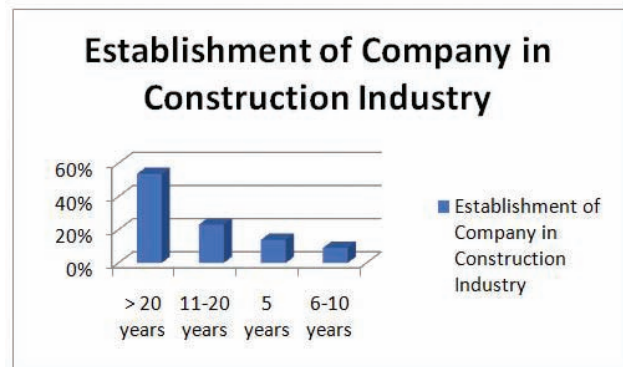


Figure 2: Establishment of Company in the Construction Industry

The longest period of 53.7 % of company establishment in this study is more than 20 years. The second highest are the companies that has been established between 11-20 years, which represent 23.1%. While 14% of the companies involved in the survey had established less than 5 years and the least group of companies of 9.1% were established around 6 to 10 years.

The Implementation Level of Reuse and Recycle Construction Waste Management

The implementation level of reuse and recycle practices is divided into policy application, company objective of reuse and recycle implementation and adoption of reuse and recycle procedure.

Application of Reuse and Recycle Policy in Companies:

As much 62.8% of the respondents mentioned that the policy of reuse and recycle is applied in their company. Whereas, 37.2% of the respondents mentioned that their company has not applied the policy of reuse and recycle of waste during construction. The proportion is summarized in Figure 3 below:

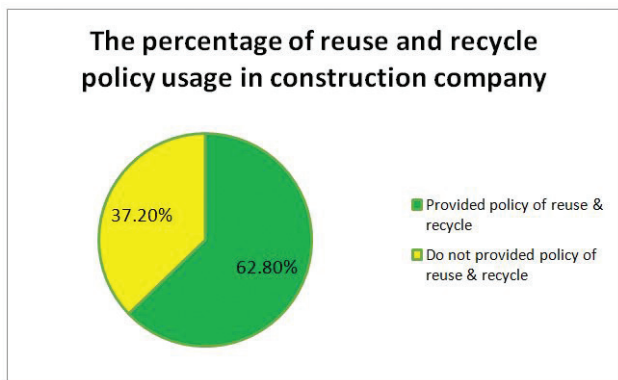


Figure 3: The percentage of reuse and recycle policy usage in construction company

Figure 3 shows that majority of the construction companies with percentage of 62.8% has applied the policy of reuse and recycle of construction waste.

Company objective of reuse and recycle implementation: Based on the analyzed data, 76% of the respondents mentioned that the company represented had an objective to implement reuse and recycle method without policy in the method applied. However, only small population of respondents as much 24% mentioned that company represented do not have objective in implementing reuse and recycle practice for waste management. Figure 4 is shows as per below to summarized the data:

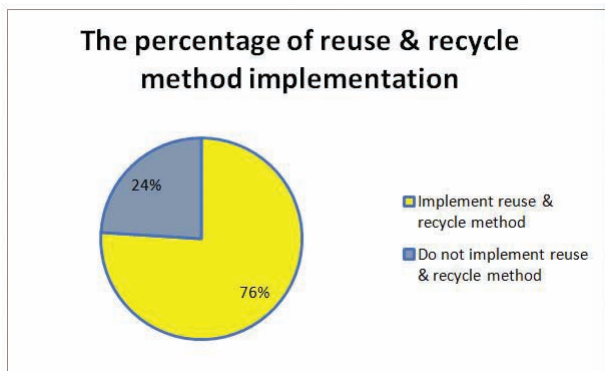


Figure 4: The percentage of reuse & recycle method implementation

The Adoption of Reuse and Recycle Procedure by Construction Companies: The percentage of companies that adopted a procedure of reuse and recycle of construction waste according to the respondents are 66.9%. The remaining 33.1% of the companies according to the respondents mentioned that there is no procedure applied in implementing reuse and recycle of construction waste. Figure 5 summarized the data gained.

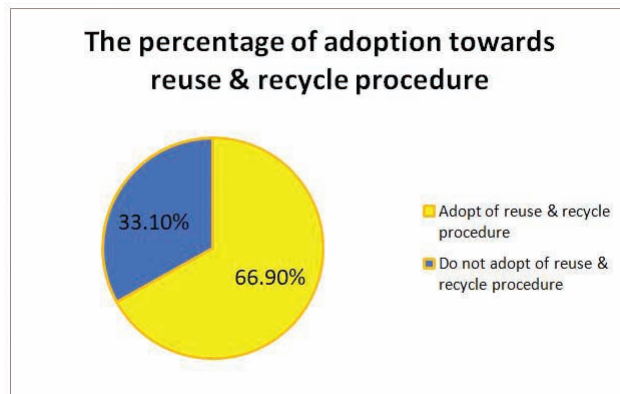


Figure 5: The percentage of adoption towards reuse & recycle procedure

DISCUSSION

Findings of the implementation level of reuse and recycle construction waste management are discussed in this section.

The Implementation of Waste Management (Reuse and Recycle Practice)

Based on the perception of contractors regarding the adoption level of reuse and recycle, the data gained is described through percentage. The level of policy implementation of reuse and recycle practice at level of construction companies indicated that most of the construction companies are concern about the importance of its implementation. Majority of 62.80% construction companies apply the policy compared with 37.20% without policy. However, some companies without policy of waste management still based on the company’s objective to implement the reuse and recycle practice. Data gained reported 76% construction companies is driven through the objective of it implementation. In addition, data also reported that majority of 66.90% of companies which represented by contractors are adopted a procedure of reuse and recycle of construction waste. It clearly shows that the current level of reuse and recycle implementation among Malaysian contractor are at satisfactory level. Awareness among practitioner towards reuses and recycles practice in waste management able to minimizing the environmental pollution in Malaysia.

Reuse and Recycle Practices Among Practitioner:

In a mean time, an understanding of the concept of reuse and recycle is very crucial even though without the policy and procedure application in the construction company. As much 92.60% of respondents practice the

reuse of waste materials to eliminate waste, save costs and other advantages. There is only small population as much 7.4% failed to implement the concept of reuse waste materials.

At a same time, research shows that 53.70% of the companies are practicing the concept of recycle while 46.3% failed for the implementation of recycle concept.

It clearly shows that most of the practitioners agreed with the reuse and recycle practices in local construction industry. It would help in maintaining a balance of construction environment and secure the natural environment (Taylor, 2011). Thus, stakeholder awareness on reuse and recycle practice would help to improve waste management in construction industry.

CONCLUSION

This paper has successfully achieved its aim of appraising the overview of adoption level of reuse and recycles practice in Malaysia construction companies from contractors' perspective. Majority of the construction companies in Malaysia have a good awareness towards implementation of policy, method and procedure of reuse and recycle practices. Established companies for more than 20 years is the highest population used in this study and it shows that implementation of reuse and recycle has earned attention over the last 20 years and it's no longer something new and only few contractors have no policy in its implementation. However, contractors with have no policy still have an objective to implement the process. Based on respondents' views, they are concerned of the basic knowledge related to the implementation of the reuse and recycle approaches at the construction sites.

ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to Universiti Utara Malaysia (UUM) and the Research Innovation and Management Centre (RIMC) of UUM for providing financial support for this paper to be published. This study is financed by the University's Grant (code s/o 13909).

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Agamuthu P, Khidzir K. M, Hamid F. S. Drivers of sustainable waste management in Asia. *Waste Management & Research*. 2009; 27(7): 625-633.
2. Al-Hajj A, Hamani K. Material waste in the UAE construction industry: Main causes and minimization practices. *Architectural engineering and design management*. 2011; 7(4): 221-235.
3. DEFRA. A Rationale for Waste Prevention in England. Department for Environment, Food and Rural Affairs (DEFRA), London. 2013.
4. Duran X, Lenihan H, O'Regan B. A model for assessing the economic viability of construction and demolition waste recycling—the case of Ireland. *Resources, Conservation and Recycling*. 2006; 46(3): 302-320.
5. EPD. Monitoring of Solid waste in Hong Kong – Waste Statistics for 2007, 2008. [available at www.wastereduction.gov.hk/en/materials/info/msw2007.pdf].
6. How does construction impact the environment? Latest news Initiafy: Health and Safety and Contractor Management. Retrieved from 2017: June 21. www.initiafy.com/blog/how-does-construction-impact-the-environment.
7. Kartam N, Al-Mutairi N, Al-Ghusain I, Al-Humoud J. Environmental management of construction and demolition waste in Kuwait. *Waste Management*. 2004; 24(10): 1049-1059.
8. Koskela L. Application of the new production philosophy to construction 1992; Vol. 72: Stanford, CA: Stanford university.
9. Osman W.N, Nawi M.M.N, Saad R, Ismail R. Factors Affecting Systematic Implementation of Reduce and Recycle in Construction Industry, *International Journal of Supply Chain Management*. 2017; 6(1): 270-278.
10. Osman W.N, Nawi M.M.N, Osman N.N. source reduction: Towards improving waste management strategy & sustainability in Malaysia construction industry, *Medwell Journals*. 2016; 11(11): 2783-2786.
11. Pitt M, Smith A. Waste management efficiency at UK airports. *Journal of Air Transport Management*. 2003; 9(2): 103-111.

12. Saeed M. O, Hassan M. N, Mujeebu M. A. Assessment of municipal solid waste generation and recyclable materials potential in Kuala Lumpur, Malaysia. *Waste management*. 2009; 29(7): 2209-2213.
13. Teo M. M. M, Loosemore M. A theory of waste behaviour in the construction industry. *Construction Management & Economics*. 2001; 19(7): 741-751.
14. Tam V. W. On the effectiveness in implementing a waste-management-plan method in construction. *Waste management*. 2008; 28(6): 1072-1080.
15. UAE Interact. 2007; UAE at a Glance [available at www.uaeinteract.com, the official website for the Ministry of Information and Culture in the UAE] [accessed 16 October 2017].
16. Winkler G. *Recycling Construction & Demolition Waste: A LEED-Based Toolkit (GreenSource)*. McGraw Hill Professional. 2010.
17. Yuan H, Shen L. Trend of the research on construction and demolition waste management. *Waste Management*. 2011; 31(4): 670–679.

Readiness for Shared Services in Higher Learning Institution: A Pilot Study

Juraifa Jais¹, Prashalini Naidu¹, Nor Hazlin Nor Asshidin¹, MaslindaMd Yusof²

¹College of Business Management & Accounting, Universiti Tenaga Nasional; ²College of Foundation and Diploma Studies & Chief Business Development Officer Office, Universiti Tenaga Nasional

ABSTRACT

Shared services are known as a great catalyst to drive a positive effect on the efficiency and effectiveness of an organisation. The aim of shared services is to streamline specific services in an organisation whereas those services had previously been managed in more than one of organisation's parts. Nevertheless, there is a limited indication of shared services in Malaysian higher institutions. Using quantitative approach, this paper describes a pilot study undertaken in higher learning institution that implements shared services initiative. The findings reveal that organisational readiness and employee engagement are positively related to employee job satisfaction in shared services implementation. Thus, organisations should diligently incorporate human resource approach in shared services planning.

Keywords: *Shared services, Organizational effectiveness, knowledge sharing, malaysia universities, learning organisation*

INTRODUCTION

The term shared services is quite profoundly used in the business arena. Many organisations, adopt shared services, specifically for support functions such as Finance, Accounting, Human Resource and Information Technology (Bergeron⁶). However, the same concept is still rather unheard, unfamiliar and unknown in higher learning institutions. Given the exception for some universities in the United States and in UK, shared services have yet to be seen proliferated among Malaysian universities. This irony brought about questions such as 'Is shared service only relevant in the corporate industry?' Are universities in Malaysia ready to implement shared service?

Shared services centre (SSC) is a service centre established by combining individual activities from several operational departments/business units (Accenture Consulting Services²). Schulz et al. (2009) cited in Uruthirapathy³⁶ states that shared-services centre offers a merging of processes within the group to prevent redundancies. SSC, a separate organisational unit within the group, delivers support processes associated with external customers as its core competency. SSC should have a clear focus on internal customers with business-like operation.

In Malaysia, the presence of shared services in Malaysian universities is rare (Miskon et al.²⁵). Only a few varsities have shown interest in the concept. Of late, universities are undergoing major stress and challenge due to massive competitions (Kristensen et al.²¹). In higher education industry, competitions emanate from several different levels and areas, such as self-competition to rank-based grading, consciously introduced or spontaneously started, all against all or groups against group (Kristensen et al.²¹). The awareness on shared services assist universities to reduce cost and improve efficiency has not been widely known.

Owing to the benefits of shared services, Universiti Tenaga Nasional (UNITEN) has taken the first step to implement shared services. According to its Vice-Chancellor, Dato' Prof. Ir. Dr. Kamal Nasharuddin Mustapha, UNITEN has embarked on three key strategic plans since 2007 known as UNITEN10, W15E and BOLD2025 (New Straits Times 2018). Its Strategic Direction 2010-2025 aims in becoming a research-led university by 2015, and a leading global energy university by 2025 (News Straits Times, 2018). These strategic plans aim for achievements and efficiency for the future. The latest strategic plan is BOLD 2025 that has devised 3 strategic goals, 10 strategic objectives and 30 strategic

initiatives. Among these 30 initiatives are blended learning, smart campus, global exchange and mobility, shared services, upskilling programs, research partnerships and synergy infrastructure. Through its BOLD 2025 initiative, implementing shared services has been one of its core plans. With reference to shared service, UNITEN shared service is still in its early stage. A research is required to find the best way to manage the new initiative. The main goal of the shared service inception in UNITEN is to increase efficiency and cut cost.

Shared service implementation will be done gradually through UNITEN, starting with the Chief Business Development Officer Office (CBDO office), a department that consists of five business units that are Programme Management Office (PMO), Business Development Department (BDD), Marketing and Corporate Communication Department (MCC), Strategic Planning Centre (SPC) and Office of Stakeholder Management (OSM). Currently, the establishment of CBDO office aims to help university's growth and identify business prospects. Specifically, CBDO office administration structure in UNITEN consists of 5 directors, 4 managers, 19 administrative executives, and 13 administrative assistants. The SSC pilot project will enable UNITEN to review SSC execution strategy and manage concerns prior to full system deployment. Thorough understanding of the implementation stage is crucial to identify the key success factors of SSC.

Among the major concerns in SSC implementation are the organisational readiness and employee engagement during work process restructuring within the organisation. The change process of SSC could create unstable and uncertain environment, which may impact on employee job satisfaction (Knol, Janssen & Sol¹⁹). The decision of forming SSC is often reliant on the long term costs and benefits of economies of scale without addressing and managing the human perspective of change process (Kunz & Kabrt²²). Thus, managers are largely unaware of the difficulties endured when developing and implementing SSC in organisations (Knol, Janssen & Sol¹⁹).

Weiner³⁷ states that organisational readiness for change is a multi-level construct. Readiness is expected to present at the individual, group, unit, department, or organisational level. Contrary to individual readiness for change, there are not many studies conducted on organisational readiness for change and hence has limited

extensive theoretical development or empirical study (Shea et al.³¹). Despite several attempts at measuring organisational readiness, most available instruments are not theory-based and exhibit limited reliability and validity (Shea et al.³¹). Consequently, it is prominent to study organisational readiness in the implementation of SSC. Within this perspective, this study aims to discover the relationship of organisational readiness, employee engagement and job satisfaction in SSC pilot project implementation in UNITEN.

LITERATURE REVIEW

A great amount has been published on shared service centres, generally by consultants, management experts, industry bodies and policymakers, and overwhelmingly from position of great enthusiasm (Elston & Dixon, 2017). In spite of having these many individual documented examples of how shared services have been applied in various organisations, there have been little research on the variables proposed in this study and in an institutional context like the Higher Education sector. More and more higher learning institutions are beginning to adopt shared services and it will be prominent to look at the relationship between organisational readiness and employee engagement towards job satisfaction in the HEI.

Organisational Readiness: The new change within an organisation can bring many challenges. Change management proponents emphasised on the importance of creating organisational readiness for change, suggesting variety of strategy for readiness (Weiner³⁷). The right strategy is accommodating the change process by helping employees with the unfamiliarity environment. The organisational readiness in the implementation of shared service is crucial to ensure employee engagement and job satisfaction.

The manner in which an employee embraces and accepts a particular change will reflect their readiness (Ahmad et al.³). The level of employees' commitment to the change and their perception whether the change can happen have an effect on organisation readiness for change (cited in (Weiner³⁷ cited in Ochurub, Bussin & Goosen²⁸). In short, employees remain a key determinant of organisation readiness to change. However, Ahmad et al.³ proclaims that trust management, communication and commitment are other factors that impact readiness for change in organisation.

Employee Engagement: Apart from organisational readiness, another important element associated to shared service implementation is employee engagement. In this fast pace competitive environment, to have committed employees is considered to be the way to retain people (Gast¹⁵). In the current climate where organisations are expected to stay competitive, driven employees are what employers are looking for. Despite having good times, maintaining a workforce engaged, positive and productive can be cumbersome (Catteuw, Flynn & Vonderhorst⁸). Kompaso and Sridevi²⁰ explains that employee engagement is the emotional commitment employees experience towards their organisation and the actions proceeded by them in ensuring the success of the organization. Care, dedication, enthusiasm accountability and results focus demonstrated are among the parameter to consider an individual as an engaged employees (Wessels³⁸). Abraham¹ further explains that employee engagement is employee emotional connection to the achievements of their organisation, resulting in improved productivity, innovation and retention. Kompaso and Sridevi²⁰ describe employee engagement as a wide construct that revolves human resource management facets. If a human resources issue is not addressed in change management, employees fail to engage with their job (Soni³³). Employee engagement can be associated with how the management and human resource team manages their people (Macey & Schneider²⁴).

Job satisfaction: Job satisfaction concerns employee's expectation towards their job (Abraham¹). Aziri⁵ says that job satisfaction combines both good and bad emotions that workers experience towards their work. Once a worker is employed, he brings with it the needs, desires and experiences which specifies expectations that he has set aside. Job satisfaction denotes the alignment between expectations awards, entailing how individuals enjoy or abhor their job (Rahman, Akhter & Khan³⁰). Abraham¹ states that job satisfaction is the extent to which employees appreciate their job. When an employee becomes satisfied and motivated, it contributes greatly to the productivity and growth of the organisation. Gregory¹⁷ supports this notion by claiming that employee satisfaction is quintessential to the success of any business. Maintaining an employee's satisfaction is directly related to a low number of turnover rate. Therefore, job satisfaction should be utmost importance for every employer. Moreover, employee job satisfaction is crucial to face the vigorous and ever-demanding

challenges of maintaining efficiency through engaged and motivated workforce (Misra & Sehgal²⁶).

Claiborne et al.¹⁰ found a positive relationship between organisational readiness and job satisfaction. It appears that job satisfaction is enhanced when employee perceive that organisational is ready for change. Jain, Kutty and Dani¹⁸ add that organisational change process generates a perceived efficacy by the workers. If a change is not handled effectively, then it impacts the satisfaction level of employees. Furthermore, a low level of readiness may impact negatively on the change process, creating dissatisfaction among employees (Lipińska-Grobelyń & Papińska²³). Thus, we propose:

Hypothesis 1: There is a significant relationship between organisational readiness and job satisfaction.

Additionally, there is a growing evidence that employee engagement enhances job satisfaction (Eldor & Shoshani¹¹). Job satisfaction was highly demonstrated when the employee engagement was high (Alarcon & Edwards⁴). Engaged employees who feel dedicated to their work may reinvest resources into the workplace. These invested resources may visible as job satisfaction (Alarcon & Edwards⁴). Bernburg et al.⁷ add that the positive emotions of engagement would further enhance the feeling of satisfaction. The following hypothesis is proposed:

Hypothesis 2: There is a significant relationship between employee engagement and job satisfaction.

METHODOLOGY

Data collection procedures: In this study, the survey was distributed using both paper-and-pencil questionnaire and online survey. The survey was distributed to 41 staff of CBDO (5 directors, 4 managers, 19 administrative executives, and 13 administrative assistants). CBDO is currently undergoing restructuring due to the implementation of shared services, where administration services of 5 business units (Programme Management Office (PMO), Business Development Department (BDD), Marketing and Corporate Communication Department (MCC), Strategic Planning Centre (SPC) and Office of Stakeholder Management (OSM) are centralised under shared services centre. Out of 41 questionnaires distributed, only 22 responded, which is approximately 53.66% response rate.

Instruments: The first independent variable is organisational readiness adapted from a theory of organisational readiness (Weiner³⁷). It contains 12 items which are divided into two dimensions. The first section (question 1- 5) used to assess change commitment of the respondent. Meanwhile the second section (question 6-12) used to assess change efficacy in order to capture the organisation's ability to respond to problems during the implementation (Shea et al.³¹; Weiner³⁷).

The second independent variable which is employee engagement variable was adapted from Gallup Q12, also known as the Gallup Work Place Audit to measure the employee engagement. Harter, Schmidt, Killham and Agrawal¹³ describes GWA as follows:

In short, the development of the GWA (Q12) was based on more than 30 years of accumulated quantitative and qualitative research. Its reliability, convergent validity, and criterion-related validity have been extensively studied. It is an instrument validated through prior psychometric studies as well as practical considerations regarding its usefulness for managers in creating change in the workplace.

The Q12 is divided into two categories of employee survey items. The first one measures attitudinal outcomes comprise satisfaction, loyalty, pride, customer service perceptions, and intent to stay with the company while the second category measures actionable issues that drive the outcomes mentioned earlier (Harter, Schmidt, Agrawal & Plowman¹²).

Meanwhile, the dependent variable which is job satisfaction was adapted from Job Satisfaction Survey 1994, in which the survey contains 36 set of questions to measure the employee satisfaction at workplace (Spector³⁴).

Data analysis: During the data analysis procedures, the data was coded using SPSS version 22. First, descriptive statistics was conducted. Next, a reliability analysis was conducted to acquire the proportion of systematic variation in a scale by determining the relationship between the scores obtained from different administrations of the scale. The high association in reliability analysis indicates that the scale produces consistent results and hence considered reliable. Lastly, a correlational analysis was done to find out whether there is any significant relationship between organisational readiness and employee engagement toward job satisfaction. This

study applied the Pearson product-moment correlation (Pearson r) to indicate both the direction and the strength of the relationship between variables.

RESULTS

Demographics: The sample of the study composed of 22 staffs who were accessible during the data collection procedure. The information on the participants' characteristics is shown in Table 1.

Table 1: Participants' characteristics

Items	Frequency (n = 22)	(%)
Gender		
Male	11	50.0
Female	11	50.0
Age		
21-38 years old	11	50.0
39-49 years old	6	27.3
More than 50 years old	5	22.7
Education		
SPM	4	18.2
Diploma	3	13.6
Bachelor	4	18.2
Master	8	36.4
PhD	3	13.6
Job Design		
Administrative	20	90.9
Others	2	9.1
Experience		
3 years	5	22.7
4-6 years	4	18.2
7-9 years	1	4.5
10-12 years	2	9.1
More than 12 years	10	45.5

As presented in Table 1, it shows that the study consists of 11 (50.0%) male respondents and 11 (50.0%) female respondents. Out of 22 respondents, 4 (18.2%) are SPM and Bachelor holder, 3 (13.6%) are Diploma PhD holder and 8(36.4%) are master holder. Besides, from 22 respondents, 20 (90.9%) are administrative job design and the rest 2 (9.1%) are others job design. For the work experience, 5 (22.7) have work experience less than 3 years, 4(18.2%) with 4-6 years' work experience, 1(4.5%) with 7-9 years' work experience, 2(9.1%) with

10-12 years' work experience, and the rest 10 respondent (45.5%) have more than 12 years' work experience.

Reliability: The three variables shows Cronbach's alpha values larger than $\alpha=0.7$ (George & Mallery¹⁶), that is a measure of lower bound reliability.

Table 2: Reliability

Variables	Number of items	Cronbach's alpha
Job satisfaction	36	0.891
Organisational readiness	12	0.982
Employee Engagement	12	0.825

According to Cavana, Delahaye and Sekaran⁹, the value of Cronbach's Alpha of greater than 0.7 is considered reliable. Since all the Cronbach's Alpha values were greater than 0.7, then the test items were found to be valid for the study.

Mean and standard deviation: The mean (M) and standard deviations (sd) for all variables are presented in Table 3.

Table 3: Mean and standard deviation

Variables	Mean	Standard deviation
Job Satisfaction	3.282	0.415
Organisational Readiness	2.704	0.767
Employee Engagement	3.609	0.459

As presented in Table 3, the mean for Job Satisfaction, Organisational Readiness and Employee Engagement are 3.282, 2.704 and 3.609 respectively. Meanwhile for standard deviation, the results gained are 0.415, 0.767 and 0.459 for Job Satisfaction, Organisational Readiness and Employee Engagement respectively.

Correlation

Pearson Correlation Coefficients: Pearson correlation coefficients were calculated between Organisational Readiness, Employee Engagement, and Job Satisfaction, allowing the strength of relationships between variables to be calculated (Table 4). Based on the table, Employee Engagement shows a significant relationship with the Job Satisfaction ($r = .728^{**}$, $n=22$, $p < 0.01$). The strongest relationship is between

Organisational Readiness with Job Satisfaction ($r = .738^{**}$, $n = 22$, $p < 0.01$).

Table 4: Correlation

Items	Job Satisfaction	Hypotheses Result
Organisational Readiness	0.738**	Accepted (H1)
Employee Engagement	0.728**	Accepted (H2)

** . Correlation is significant at the 0.01 level (2-tailed).

Based on the result of correlations between independent variable and dependent variable, relationship between organisational readiness and job satisfaction is ($r = .738$), the strength of association is strong, meanwhile for employee engagement and job satisfaction the result is ($r = .728$) which is show the strong association too.

DISCUSSIONS AND CONCLUSION

The current study aims to explore the relationship between organisational readiness, employee engagement, and job satisfaction in the implementation of shared service center. It was hypothesized that organisational readiness (hypothesis 1) and employee engagement (hypothesis 2) would predict job satisfaction. The findings demonstrate significant relationship between organisational readiness and job satisfaction. Given the limited research done in relation to organisational readiness for shared services change, the results of this study hardly compared to similar contextual setting. Nevertheless, this finding is consistent with Lipińska-Grobelny and Papińska²³ finding of a statistically significant relationship between organisational readiness and job satisfaction. In a survey of 102 manufacturing workers, the readiness to change to lean production has positively affected the organisation's human resource attitudes. In another study, readiness to implement evidence based practice and person centered care in university hospitals has generally reported positive job satisfaction (Olsson, Forsberg & Bjerså²⁹).

The current study also demonstrates robustly that employee engagement and job satisfaction are significantly related. Although there are different

understandings of engagement, most research reach a decision that engaged employees have high levels of job satisfaction (Alarcon & Edwards⁴; Shimazu & Schaufeli³²; Taris, Cox & Tisserand³⁵). The engaged employees exert great effort into their work because they identify with it (Kompaso & Sridevi²⁰). The positive experiences related to engagement increases satisfaction to the job (Shimazu & Schaufeli³²).

Undeniably, the findings of this study are beneficial towards the university that was being studied. However, there are few limitations that require attention. First, this study is a cross-sectional pilot study that involved only 22 respondents. Second, the findings of this study cannot be broadly generalised in Malaysia as it focused on only CBDO shared services in UNITEN. Hence, there is concern of results generalisation due to limited scope of study. Future research can be conducted on the same subjects or different shared services setting. The application of diverse samples will make the prediction on the relationship between Organisational Readiness, Employee Engagement, and Job Satisfaction more accurate.

Overall, the current study demonstrates the importance of organisational readiness and employee engagement in ensuring employees satisfaction during the shared services implementation. The research on organisational readiness may broaden our view of vital factors in change management process for shared services. Results of this study also point to significant challenges continuing for shared services in higher learning institutions. If shared services are to be effective, the organisation should be ready and the appropriate employee engagement tools must be identified.

Ethical Clearance: This study does not involve human or animal subjects that requires ethical clearance in Malaysia.

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Abraham S. Job Satisfaction as an Antecedent to Employee Engagement. *SIES Journal of Management*. 2012;8(2): pp. 27-36.
2. Accenture Consulting Services. *Evolution of Shared Services*. 2014.
3. Ahmad M.H, Ismail S, Rani W.N.M.W.M. Wahab, M.H. Trust in management, communication and organisational commitment: Factors influencing readiness for change management in organisation, paper presented to AIP Conference Proceedings. 2017.
4. Alarcon G.M, Edwards JM. 'The relationship of engagement, job satisfaction and turnover intentions', *Stress & Health: Journal of the International Society for the Investigation of Stress*. 2011; 27(3): pp. e294-e8.
5. Aziri B. Job satisfaction: A Literature Review. *Management Research & Practice*. 2011; 3 (4): pp. 77-86.
6. Bergeron B. *Essentials of Shared Services*. John Wiley & Sons, Inc. Hoboken: New Jersey. 2003.
7. Bernburg M, Baresi L, Groneberg D, Mache S. Does psychosocial competency training for junior physicians working in pediatric medicine improve individual skills and perceived job stress. *European journal of pediatrics*. 2016; 175(12): pp. 1905-12.
8. Catteuw F, Flynn E, Vonderhorst J. 'Employee engagement: Boosting productivity in turbulent times', *Organization Development Journal*. 2007;25(2): pp. 151-7.
9. Cavana R.Y, Delahaye B.L, Sekaran U. *Applied Business Reserach: Qualitative and Quantitative Methods*. John Wiley & Sons Australia Ltd: Queensland Australia. 2001.
10. Claiborne N, Auerbach C, Lawrence C, Schudrich WZ, 'Organizational change: The role of climate and job satisfaction in child welfare workers' perception of readiness for change', *Children and Youth Services Review*. 2013; vol. 35: no. 12, pp. 2013-9.
11. Eldor L, Shoshani A, 'Are You Being Served? The Relationship between School Climate for Service and Teachers' Engagement, Satisfaction, and Intention to Leave: A Moderated Mediation Model', *Journal of Psychology*. 2017; vol. 151: no. 4, pp. 359-78.
12. Harter J. K, Schmidt F. L, Agrawal S, Plowman S. K. The Relationship Between Engagement at Work and Organizational Outcomes: 2012 Q12 Meta-Analysis. Omaha, NE: Gallup. 2013.
13. Harter J.K, Schmidt F.L, Killham E.A, Agrawal S. Q12® meta-analysis: The relationship between

- engagement at work and organisational outcomes. Gallup: Omaha, NE.2009.
14. Gallup Organization. A global survey, Gallup Workplace Audit.1992-1999.
 15. Gast I. 'Individual work engagement and team work engagement: (new) antecedents and consequences', 2012;pp. 1-68.
 16. George D, Mallery P. SPSS for Windows step by step: A simple guide and reference 11.0 update (4th ed.). Boston: Allyn & Bacon.2003.
 17. Gregory KS. 'The importance of employee satisfaction', The Journal of the Division of Business and Information Management.2011; pp. 29-37.
 18. Jain M, Kutty R,Dani R. 'Metamorphosis: A Successful Organizational Change Management Pattern', Proceedings of the 1st Asian Conference on Pattern Languages of Programs,2010;pp. 5:1--5:9.
 19. Knol A, Janssen M, Sol H. 'A taxonomy of management challenges for developing shared services arrangements', European Management Journal.2014; vol. 32, no. 1: pp. 91-103.
 20. KompasosM, SrideviMS. 'Employee engagement: The key to improving performance', International Journal of Business and Management.2010;vol. 5: no. 12, pp. 89-97.
 21. Kristensen F, Troeng O, Safavi M,Narayanan PR. Competition in higher education—good or bad?. Dept. of Electrical and Information Technology, Lund University, Lund.2015.
 22. Kunz A,Kabrt R. Shared services centers: Understanding key drivers for success, Everest Group.2015.
 23. Lipińska-Grobelny A, Papińska E. 'Readiness for change and job satisfaction in a case of lean management application — A comparative study', International Journal of Occupational Medicine and Environmental Health.2012; vol. 25: no. 4, pp. 418-25.
 24. Macey WH, Schneider B. 'The meaning of employee engagement', Industrial and organizational Psychology.2008; vol. 1: no. 1: pp. 3-30.
 25. Miskon S, Bandara W, Fielt E, Gable GG. 'An exploration of shared services types in higher education'.2011.
 26. Misra B, Sehgal S. 'A Study of Employees' Job Satisfaction and Its Impact on Their Performance', paper presented to International Conference on Recent Innovations in Science, Agriculture, Engineering and Management.2017.
 27. New Straits Times. 'A Bold New Future for UNITEN ', New Straits Times, 5 March.2018.
 28. Ochurub M, Bussin M, Goosen X. 'Organisational readiness for introducing a performance management system', SA Journal of Human Resource Management.2012; vol. 100,no.1: pp.1-11.
 29. Olsson C, Forsberg A,Bjerså K. 'Safety climate and readiness for implementation of evidence and person centered practice - A national study of registered nurses in general surgical care at Swedish university hospitals', BMC Nursing.2016; vol. 15: pp. 1-12.
 30. Rahman KU, Akhter W, Khan SU. 'Factors affecting employee job satisfaction: A comparative study of conventional and Islamic insurance', Cogent Business & Management,2017; vol. 4, no. 1: pp. 1-15.
 31. Shea CM, Jacobs SR, Esserman DA, Bruce K, WeinerBJ. 'Organizational readiness for implementing change: a psychometric assessment of a new measure', Implementation Science.2014; vol. 9, no. 1, pp. 1-15.
 32. Shimazu A, Schaufeli WB. 'Work engagement: An emerging concept in occupational health psychology', BioScience Trends.2008; vol. 2, no. 1: pp. 2-.
 33. Soni BS. 'Employee Engagement—A Key to Organizational Success in 21st Century', Voice of Research.2013; vol. 1, no. 4: pp. 51-5.
 34. Spector PE. Job satisfaction: Application, assessment, causes, and consequences Sage publications.1997.
 35. Taris T, Cox T, Tisserand M. 'Engagement at work: An emerging concept', Work & Stress.2008; vol. 22, no. 3: pp. 185-6.
 36. Uruthirapathy AA. ' Job Design for IT-Shared Services Organizations ', Carleton University.2011.
 37. Weiner BJ. 'A theory of organizational readiness for change', Implementation Science.2009; vol. 4, no. 1: p. 67.
 38. Wessels C. 'Getting Engaged: It's more than saying "Yes" to your Organization'. 2012; no. September 2012: pp. 1-118.

Doctrine of Good Faith in Contracts: A Comparison between Conventional and Islamic Laws

Yusuf Sani Abubakar¹, Ahamad Faosiy Ogunbado², Mpawenimana Abdallah Saidi³

¹Islamic Business School, College of Business, Universiti Utara Malaysia (UUM) Sintok Kedah, Malaysia;

²Faculty of Islamic Development Management Universiti Islam Sultan Sharif Ali (UNISSA), Brunei,

Darussalam; ³Universiti Malaysia Sarawak (UNIMAS), Sarawak, Malaysia)

ABSTRACT

The doctrine of good faith is a vital issue amongst the contractual issues of this period. It is considered a main goal of every recognized law of contract system to be promoting good faith as well as fair dealing in forming and performance of contracts. Basically, it has been a common argument in supporting the notion of good faith that it helps in addressing bad faith manner in a clear and direct conduct, allow the law to safeguard the realistic anticipations of women and men as well as encourage a philosophy of contractual collaboration that would lead to economic efficiency. This study looks into the concept of good faith from both the conventional law and Islamic law (Shariah) to find to what extent both laws comply with each other. The study is doctrinal which utilizes descriptive approach of qualitative research methodology which relies on secondary data in form of text books, journals, newspapers, related websites etc. The study found that both the conventional law and Islamic law support the principle of good faith. Shariah recognized the principle of good faith as it asks the parties in a contract to abide by the requirement in various stages of the contract, especially sale contract. Thus, the concept of good faith should have the same application in both Islamic and conventional jurisdictions.

Keywords: *Good Faith, Islamic law (Shariah), Contract, Canon law, Rules of equity.*

INTRODUCTION

The doctrine of good faith is a vital issue amongst the contractual issues of this period Harrison¹⁴. It is considered a main goal of every recognized law of contract system to be promoting good faith as well as fair dealing in forming and performance of contracts (Johan 2004). Basically, it has been a common argument in supporting the notion of good faith that it helps in addressing bad faith manner in a clear and direct conduct, allow the law to safeguard the realistic anticipations of women and men as well as encourage a philosophy of contractual collaboration that would lead to economic efficiency Brownsword⁴.

Historically, the origin of the good faith concept goes back to Roman law. Just similar to equity of the English law, the limits of a recognized procedure in Roman law were overcome by actions taken by those given the responsibility of the administration of justice. Roman law was an example of the first legal system to adapt through the impact of equitable concepts Schermaier³⁰.

The ancient and famous procedure in the Roman law was later termed as legisactio (act or sue according to the law) Mousourakis²².

As for the history of good faith in the medieval *ius Commune*, certainly, the *ius commune* strengthened its established status as a part of Christian culture of Europe by the 14th century. The said scenario led to religion as well as law to be thoroughly linked in the late medieval writing Stein³¹. Actually, the medieval jurists who learnt canon and Roman laws clearly accepted the notion of good faith and equity in contract (Gordley).

The development of good faith in the English law is undoubtedly credited to Court of Chancery. This is a result of importation of the principles of good faith concept which are natural in the canon law in the early ecclesiastical chancellors into the Court of Conscience Baker³.

The aforementioned discussion is on the concept of good faith from the conventional view point. This study looks into the concept of good faith from both the

conventional law and Islamic law to find to what extent both laws comply with each other.

METHODOLOGY

This is a qualitative research where data was gathered from textbooks, journals, websites etc. In analyzing the data, content analysis approach was adopted. Thus, the researchers were able to systematically analyze large amount of textual information.

CONCEPT OF GOOD FAITH PRINCIPLE

The doctrine of good faith is a vital issue amongst the contractual issues of this period Harrison¹⁴. It is considered a main goal of every recognized law of contract system to be promoting good faith as well as fair dealing in forming and performance of contracts (Johan 2004). Basically, it has been a common argument in supporting the notion of good faith that it helps in addressing bad faith manner in a clear and direct conduct, allow the law to safeguard the realistic anticipations of women and men as well as encourage a philosophy of contractual collaboration that would lead to economic efficiency Brownsword⁴.

The main aim of the principle of good faith is allowing the injured party to limit, as much as possible, the damage he suffers due to the unjust rights and obligations as a result of the agreement Kolb²⁰. This can be performed by imposing the contract law standards of justice fairness and decency in legal transactions, complementing the provisions of other contract law principles and creating the precedence to overcome these provisions when needed if a strict obedience to them would lead to biased results. According to Robert Summers: "Without the principle of good faith, a judge might, in particular case, be unable to do Justice at all, or he might be able to do it only at the cost of fictionalizing existing legal concepts and rules, thereby snarling up the law for future cases" Brownsword⁴.

The National European legal systems have not provided a constant definition of the principle of good faith. However, the US legal system provided the definition as: "faithfulness to an agreed common purpose and consistency with the justified expectations of the other party" Tetely⁴⁹; Kolb²⁰. The jurists believe there are two different views of good faith which are subjective and objective good faith (Strine et al 2009).

The former refers to the subjective status of the mind of a contracting party (psychological condition) (Tetely 2010) while the latter which is the objective of good faith concept refers to the terms of the agreement, by matching between rights and obligations of the parties involved in the contract Nebbia²⁵. Based on those two elements, good faith has some meanings, which are: Fayyad⁹ (1) the normative meaning reflects the contractual justice enforced on the contracting parties to balance their legal relation. According to this meaning, the doctrine of good faith necessitates the party to act fairly, so as to protect justified expectations rising from their agreement; (2) the contextual meaning indicates the practical anticipations of the contracting parties in accordance with common standards utilized at the place of making the agreement. According to this meaning, good faith means the expectation of every contractor as the other party will fairly and honestly perform his contractual duties in a satisfactory manner to trade community; Powers²⁶(3) the essential meaning indicates the prevailing least standards of honesty at the time of making legal transactions Wightman³⁵.

Based on the aforementioned three meanings, good faith may be defined as an honest behavior, that both parties involved in a contract are expected to observe in their dealings, and even with third parties, who can be involved or afterward implicated; it is a negative action that needs each contractual party to consider the genuine interests and expectations of the counterparty, by means of restricting the own pursuit of self-interest.

According to Article (32) of the European Proposal, a term is considered as unfair if, by opposing the requirement of concept of good faith, it leads to a major disparity related to the parties' rights and obligations to the disadvantage of the consumer. In the valuation of the test of the concept, the negotiating situation of the parties involved in the contract has to be considered. The supplier or seller can fulfill the requirements of the doctrine by dealing with the consumer fairly and this may be performed through showing respect to the genuine interests as well as expectations of the customer Howells¹⁷. In line with the preamble of the proposal: "This requires contract terms to be presented to consumers fairly, reasonably transparent and do not operate so as to defeat the reasonable expectations of the consumer". The preamble of the said proposal explained that good faith shall be understood in both its objective and subjective sense. This may be done through observing

whether the consumer has given his free consent to the agreement as well as whether the supplier or seller considered the legitimate expectations and interests of the consumer when forming the contract Cuijpers⁷; Teubner³². In evaluating this scope, the conditions and entire terms and conditions of place of the contract as well as the nature of the goods and services of the contract must be taken into account.

Objective of good faith is manifested by looking at the balance of positions as well as rights and obligations between the parties involved in the contract. This balance occurs prior to entering into the agreement and also when performing contractual obligations (substantive good faith). Conversely, pre-contractual good faith is to enable the parties involved in the contract to be in a like position concerning awareness of the data as well as information of the agreement. This can be done by disclosing these data to each other. It indicates the just positions of the parties involved in the contract before signing the agreement; it investigates how contract terms are used and how they are presented to the consumer. This base transacts with the consumer right of information and choice. Substantive concept of good faith deals directly with the term in question; it looks into the impacts of the contract terms and concentrates in knowing to what extent the terms may be relied on to attain the interest of the consumers. According to this, a term is said to be against good faith if its end result will create disparity of rights and obligations amongst parties involved in the contract Whittaker³⁴. In accordance to this, notion of good faith may be extended to contain some forms of exclusive liabilities that may create imbalance amongst the contracting parties as well as entire cases in which one party abuses his powers Alpa²; Hondius 1997).

Imbalance of contract term is an indicator to judge that the principle of good faith has been breached; As provided by article (32/1) of the proposal, a term creating a major imbalance, by definition, contradicts the principle of good faith Roppo²⁸. Contractual imbalance between the contracting parties is the result where a contractor deals with the other party in bad faith; this balance must be detected before and after making the agreement. The first imbalance occurs where there is a disparity of awareness between the contracting parties concerning the entire data as well as information of the agreement; it may be overcome by disclosing these data amongst the parties involved in the contract. The second

imbalance occurs where there is a substantial imbalance relating to rights and obligations among the contracting parties; it may be overcome by focusing on the interests of the counter party when drafting the terms of the agreement Collins⁵; Teubner³².

In this approach, the proposal states dual lists of common used terms, indicative in addition to black lists, to measure this imbalance. According to both lists, this balance can be measured by the following factors: (1) the liability of the consumer is looked at in combining the liability of the seller or supplier "Exclusion clauses". This occurs where contract terms permit the seller or supplier who wants to retain sums paid by the consumer, where the latter chooses to cancel the contract. In contrast, a consumer may not be entitled to be compensated of the same amount from the seller or supplier if the latter cancels the contract Whittaker³⁴. In this form, the term may exclude all liability for a certain thing that might happen, or may exclude some specific kinds of liabilities; (2) a consumer does not have similar rights to a supplier or seller, or a consumer cannot respond in some way to rights that are exercised to a seller or supplier (penalty clauses" Heiderhoff¹⁶. This occurs where the term authorizes the seller or supplier to transfer his rights and obligations under the contract. In contrast, a consumer right of guarantee is reduced, without the latter's agreement Hughes¹⁸. This sort of terms enables the contracting party to impose an extremely unreasonable compensation upon the other party where the latter does not perform, or delay to perform, his obligations. In contrast, the latter does not have the same advantages where the former breaches his obligations; (3) the seller is authorized to control the legal relation (contract terms) without taking into consideration the will of the counter party "variation clauses". It occurs where the term enables the seller to terminate a contract of unspecified period devoid of realistic notice; despite not having serious grounds to do so Nebbia²⁵.

GOOD FAITH PRINCIPLE IN ISLAMIC LAW

According to Zahidet al³⁷, both the conventional law and Shariah support the principle of good faith. Shariah provides the principle of good faith and asks the parties in the contract to abide by the requirement in various stages of the contract, especially sale contract. Thus, the concept of good faith should have the same application in both Islamic and conventional jurisdictions.

According to Islamic law, a valid trade has to always make sure that benefits are always exchanged between the contracting parties by avoiding imposing unlawful pressure and all elements that will vitiate the free consent of a contracting party such as fraud, undue influence, coercion etc. Hazeem¹⁵. There are various guidelines in the Islamic jurisdiction that organize the principle of good faith; the rules refer to behaviors that Muslims need to observe in their dealings Abd El-Khalek¹; Marganee²¹. The rules deal with the internal belief of Muslims and reflected by observing the principles of good faith in transactions Salem²⁹. The rules contain particular legal sanctions which can create the basis of ruling out the usage of unfair terms Yoseef³⁶. This may be seen from the principles provided by El-majalla which dated back to 1876 which was derived from the Islamic law. For example the El-majalla provided several legal principles of contract involving the principles of good faith such as: “a private injury is tolerated in order to ward off a public injury” (Article (26) El-majalla); “severe injury is removed by lesser injury” (Article 27 El-majalla); “in the presence of two evils, the greater is avoided by the commission of the lesser” (Article 28 El-majalla); and “repelling an evil is preferable to securing a benefit” (Article 30 El-majalla) .

Another rule in support of the good faith concept is the system of (Hisbah) which according to the Muslim jurist Al-Mawardi is: “a system of enjoying what is just and right if it is found to be neglected or disregarded and to forbid what is unjust and indecent if it is found to be practiced” (Khan et al¹⁹; Cook⁶. The main functions of Hisbah are the protection of market rules against violation; protection of the honour of people and ensuring public safety. The function of hisbah is taken from the letter of the Caliph (Ali) to his governor (El-Ashter El-Nakee) telling him how to deal with behaviors of traders that may harm good faith dealings, where he said: “strictly address the greed of traders, their monopoly, anticomparative actions and their control of market transactions. These actions have bad effects and disadvantages to the detriment of the interests of the society and individuals. Prevent the monopoly, because prophet (Mohamed) recommended so, rule the fairness of market transactions, do not prejudice the rights of the seller and the buyer and punish the party who breaches these instructions without injustice or exceeding” Fayyad¹¹. According to Many jurists, the role of this system comprises merchant’s obligations of dealing with

consumers in a just and fair manner and commending the fulfillment of the trust and prohibition of all evils and offense mainly lying and dishonesty Kantakgee²⁸.

Based on the contemporary Arab scholars, the good faith notion is applicable in Islamic law in some aspects i.e. Radowan²⁷: concept of good faith in performing of the contract (corresponding in part to the principle of *pacta sunt servanda*); notion of good faith at the conclusion of the contract and the systems of options (*khiyarat*); concept of good faith in the termination of the contract, either voluntary or as a consequence of *force majeure*; the concept of (Riba) or usury and the notion of uncertainty (*gharar*).

The good faith notion has to be observed prior to entering into the agreement (The pre-contractual concept of good faith concept). The pre-contractual concept of good faith concept refers to the status of the parties involving in a contract prior to signing the contractual agreement. According to the Islamic law, the contracting parties are obliged to inspect and investigate the terms of the contract before signing it. The Islamic law requires Muslims to verify and probe any statement before taking a decision or action on it. The Prophet (saw) said: “a person does not believe until he prefers for his brother what he prefers for himself”. This requires the contracting parties to ascertain the permissibility or prohibition of dealing on the product as well as to examine the terms and conditions of the agreement Radowan²⁷.

Secondly, Islamic law forbids all kinds of fraudulent contracts both before and after the conclusion of the agreement. In a hadith the Prophet (saw) was reported to have passed by a heap of eatables (corn). He pushed his hand in that heap and his fingers were moistened. He said to the seller of the heap of eatable (corn) “what is this? These have been drenched rainfall”. He (the prophet) remarked “why did not you place this drenched part of the heap over other eatables, so that people could see it? He who deceives is not my follower”. The second caliph, Umar Ibn Al Khattab objected to diluting milk with water. He did so not because the milk was not suitable for drinking, but because the buyer would not be aware of relative quantities of milk and water before making the agreement Fayyad¹¹.

Third, any attempt of concealing the real features of a product in a sale contract is unlawful under the Islamic law (Ṣahīh Muslim 459). Thus, the seller is

required to disclose all relevant facts in the product to the buyer Fayyad¹⁵. Ibn al- AsqaWāthilah, a Muslim scholar, narrated a story where he said Fayyad¹¹: I bought a camel from a seller and when leaving the place of contract, OqbaibnNafī followed me and said: “The camel seems fat and healthy, did you buy it for meat or travel? I said for travel (hajj). He said: Its toe has a hall, and it is not appropriate for your travel. Are you looking to rescind the agreement? The seller asked Oqba. Oqba responded: I heard Prophet Muḥammadpbuh say that the contracting parties have the choice” (Al-Bukhārī 3/67).

Finally, El-majalla provides a specific topic as contracts of honesty (Aqd Al- Amana) “where acceptance is based on information that he receives from the other party. The theory of these contracts are based on the fact that the buyer trusts the seller to tell him the real price without the need to prove it by taking the oath or procuring evidence. It is therefore necessary that such contracts should be guarded against any dishonesty or the possibility of dishonesty” (<http://www.alriyadh.com>).

The Holy Qur’an calls the Muslim nation a balanced nation. Allah (swt) said: “Thus, have we made of you an (Umma) nation justly balanced” (The Holy Qura’n 01:143). And “the Firmament has He (God) raised high and He has set up the Balance (of Justice)” (The Holy Qura’n) 55:07); “in order that ye may not transgress (due) balance” (The Holy Qura’n 55:08). This balance can be extended to include the behaviors of this person with himself. A consumer is expected to act reasonably when satisfying his needs, by observing a balance between his needs and his consumption actions. The balancing principle in the (Qura’n) is that: “Those who, when they spend, are not extravagant and not niggardly, but hold a just (balance) between those (extremes)” (The Holy Qura’n 25:67).

Thus, Islamic law does not deal with action only in determining the balance but it also pays attention to the significances of the action itself that may create imbalance (Dawwas 1993). Furthermore, Islamic law orders parties in a contract to inform one another in case if one of them intends to dissolve the contract.

CONCLUSION

The study reveals that the conventional law requires parties involved in a contract to observe good faith in their dealing. The doctrine of good faith is a vital

issue amongst the contractual issues of this period. It is considered a main goal of every recognized law of contract system to be promoting good faith as well as fair dealing in forming and performance of contracts. The main aim of the principle of good faith is allowing the injured party to limit, as much as possible, the damage he suffers due to the unjust rights and obligations as a result of the agreement. This can be performed by imposing the contract law standards of justice fairness and decency in legal transactions, complementing the provisions of other contract law principles and creating the precedence to overcome these provisions when needed if a strict obedience to them would lead to biased results. According to Robert Summers: “Without the principle of good faith, a judge might, in particular case, be unable to do Justice at all, or he might be able to do it only at the cost of fictionalizing existing legal concepts and rules, thereby snarling up the law for future cases”.

Likewise, the Islamic law requires observance of the principles of good faith and asks the parties in a contract to abide by the requirement in various stages of the contract, especially sale contract. Thus, the concept of good faith should have the same application in both Islamic and conventional jurisdictions. According to Islamic law, a valid trade has to always make sure that benefits are always exchanged between the contracting parties by avoiding imposing unlawful pressure and all elements that will vitiate the free consent of a contracting party such as fraud, undue influence, coercion etc. There are various guidelines in the Islamic jurisdiction that organize the principle of good faith; the rules refer to behaviors that Muslims need to observe in their dealings.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Abd El-KhalekA. “The Regulatory Framework of the Defect of Fraud in Islamic Law”. *Arab Law Quarterly Review*. 1986; 3: 237.
2. AlpaG. “The Implementation of the EC Directive on Unfair Contract Terms in Italy”, *European Review of Private Law*. 1997; 5:181.
3. Baker J. *An Introduction to English Legal History*, 3rd, Oxford University Press. 1990.

4. BrownswordR. Positive, Negative, Neutral: the Reception of Good Faith in English Contract Law in Roger Brownsword. 1999.
5. Collins.Good Faith in European Contract Law, Oxford Legal Studies. 1994.
6. CookM. Forbidding Wrong in Islam, Cambridge university press, Cambridge. 2003.
7. CuijpersC. “How Fragmentation in European Law Undermines Consumer Protection: the Case of Location- Based Services”, European law review Journal. 2008; 33/6: 883.
8. DawwasA. “Abuse in the Exercise of Rights in Islamic Law and the Civil Codes of Arab Countries”. Japanese Comparative Law Review Journal. 1993; 27/1: 2.
9. Fayyad M. The legislative consumer protection of the Use of Unfair Terms in Palestine: A Comparative legalStudy with the European Directive (13/93) on Unfair Terms in Consumer Contracts.(Free University of Brussels: PhD Thesis). 2010.
10. Fayyad M. “Measures of the Principle of Good Faith in European Consumer Protection and Islamic Law, a Comparative Analysis”,Arab Law Quarterly. 2014; 28, 205-230.
11. Fayyad M. I. Good faith principle in European and Islamic law: why doesn't it incorporated into Arab consumer protection Regimes? 2013; <https://www.researchgate.net/publication/294823922>. Accessed on 23/07/2018
12. GordleyJ. The Philosophical Origins of Modern Contract Doctrine, Oxford University Press, Oxford. 1991.
13. GordleyJ. ‘Good Faith in Contract Law in the Medieval Ius Commune’ in Zimmermann and Whittaker. https://www.legiscompare.fr/web/IMG/pdf/13_CH_5_Good_faith.pdf, Accessed on 31/07/2018.
14. Harrison R. Good Faith in Sales, Sweet and Maxwell, London. 1997.
15. HazeemA. “The theory of Fraud in Islamic Law”. Islamic law Journal. 1986; 28.
16. HeiderhoffB. “The Commission’s 2007 Green Paper on the Consumer Acquis: Deliberate Deliberation?” European Law review Journal. 2007; 32/5: 743.
17. Howells G. “The Implementation of the EC Directive on Unfair Terms in Consumer Contracts: Some Unresolved Questions”,Journal of Biblical Literature. 1995; 209.
18. HughesP. Directors’ personal liability for cartel activity under UK and EC law - a tangled web, European Commercial Law Review. 2008; 632: 29-11.
19. Khan K, AftabS. “Consumer Protection in Islam: the Case of Pakistan”,Australian economic paper. 2000; 39/4:495.
20. Kolb R. “Principles as Sources of International Law (With Special Reference of Good Faith)”, Netherlands International Law Review. 2006; 20.
21. MarganeeM. “Options in Islamic Fiqh and Law”, Islamic law Journal. 1993; 229.
22. MousourakisG. A Legal History of Rome, Routledge, London. 2007.
23. Muhammad bin Ismail, Al-Bukhārī, Ṣahīh al-Bukhārī, The Book of Buying and Selling, “If the door between the matters which did not advice”, 3/67.
24. Muslim bin Hajjah. Ṣahīh Muslim, Book of Faith. “The Door of the Directory that the qualities of faith that he loves for his Muslim brother what he loves for himself of good”. No. 459.
25. NebbiaP. Unfair Contract Terms in EC Law,Hart publications, London. 2007.
26. Powers P. J. “Defining the Indefinable: Good Faith and the United Nations Convention on the Contracts for the International Sale of Goods”, Journal of law and Commerce. 1999; 18.
27. RadowanA. “Justice and Fairness in Islamic Law, a Comparative Legal Study between Law and Islamic Fiqh”,Colombia law Review. 1992; 261.
28. RoppoV. The definition of unfairness: the application of Article 3 (1), 4 (1) - and of the annexes of the Directive, Acts of the Brussels conference, Luxembourg, Office of official publications of the European 141. 1999.

29. Salem S, "Consumer Protection in Islamic Fiqh between Policies and Practices", *Islamic Legal Studies*, 21.
30. Schermaier M. 'Bona Fides in Roman Contract Law' in Reinhard Zimmermann and Simon Whittaker (eds), *Good Faith in European Contract Law*. 2000.
31. Stein P. *Roman Law in European History*, Cambridge University Press, Cambridge). 1999.
32. Teubner G. "Legal Irritants: Good Faith in British Law or How Unifying Law Ends up in New Divergences", *The Modern Law Review Journal*. 1998; 16/1:17.
33. The formal translation of the terms of (El-Majalla) to English is available at the following link: http://www.iiu.edu.my/deed/lawbase/al_majalle/index.html. Visited on 22/12/2006, translated by the ministry of Justice of Malaysia
34. Whittaker S. "Assessing the Fairness of Contract Terms: the Parties' "Essential Bargain", its Regulatory Context and the Significance of the Requirements of Good Faith". *Zeitschrift für Europäisches Privatrecht law journal*. 2004.
35. Wightman J. 'Good faith and Pluralism in the Law of Contract' in R. Brownsword, N. J. Hird and G Howells, *Good faith In Contract: Concept and Context* Dartmouth publishing company limited, London. 1998.
36. Yoseef M. *The contract of (Mustarsal) in Islamic Fiqh*, ElAzhar University Publications, Cairo. 2005.
37. Zahid A, Shapiee R, Mukhtar S, Munawar Shah S. M. *Good faith in international commercial contracts under UN sale convention and Islamic law: a brief comparison*, *ij a b e r*. 2016; vol. 14: no. 13.
38. Zimmermann R, Whittaker S. 'Good Faith in European Contract Law: Surveying the Legal Landscape' in Zimmermann and Whittaker. 2000.

Wireless Based Human Health Monitoring and Fall Detection Using GSM

S. Vaishnodevi¹, S. Mathankumar², G. Ramachandran³, A. Malarvizhi³

¹Assistant Professor, ²Associate Professor, Department of Biomedical Engineering, ³Assistant Professor, Department of Electronics and Communication, Vinayaka Mission's Kirupananda Variyar Engineering College, Vinayaka Mission's Research Foundation (Deemed To Be University), Salem-636308, Tamilnadu, India

ABSTRACT

Some WSN (wireless sensor network) by a lot of immobile node and with the limited energy and without further charge of energy. Whereas extension of many sensor nodes and their operation. Hence it is normal. Inactive nodes miss their communication in network, hence split the network. For avoidance split of network, we proposed a fault recovery corrupted node and Self-Healing is necessary. This paper presents a wireless distributed sensor system for tracking and identifying multiple humans based on their body heat radiation. Many intelligent environments and secure systems demand collectable, stable and reliable behavioral biometrics to identify individuals and track their actions based on their behavioral attributes. The behavioral biometrics (e.g., gait and habitual trajectory) are advantageous in their capability of recognition at a distance under changing environmental conditions, despite subjects' varying physical appearances. However, establishing identity and tracking actions from distances or in crowded scenes through behavioral biometrics are complex problems due to the intrinsic challenges associated with sensing modalities and feature selections.

Keywords: *Self-Healing, Biometrics, Sensing modalities, Healthcare professionals*

INTRODUCTION

Health is the level of functional or metabolic efficiency of a living organism. In humans, it is the general condition of a person's mind and body, usually meaning to be free from illness, injury or pain (as in "good health" or "healthy")¹. Health is one of the global challenges for humanity. According to the constitutions of World Health Organization (WHO) the highest attainable standard of health is a fundamental right for an individual. Heart rate measurement is one of the very important parameters of the human cardiovascular system. The heart rate of a healthy adult Healthy individuals also reduce pressure on the already overwhelmed hospitals, clinics, and medical professionals and reduce workload on the public safety networks, charities, and governmental (or non-governmental) organizations. To keep individuals healthy an effective and readily accessible modern healthcare system is a prerequisite. A modernized healthcare system should provide better healthcare services to people at any time and from anywhere in an economic and patient friendly manner. In the traditional approach the healthcare professionals

play the major role. They need to visit the patients for necessary diagnosis and advising. ECG is an expensive device and its use for the measurement of the heart rate only is not economical. Low-cost devices in the form of wrist watches. Heart beat sensor is used to measure the pulse rate of the heart in digital output. when a finger is placed on it. LED is used to detect the heart rate² A smart healthcare surveillance and fall detection system for elderly people provides a flawless security and a support for the elderly people³

There are two basic problems associated with this approach. Firstly, the healthcare professionals must be on site of the patient all the time. And secondly, the patient remains admitted in a hospital, wired to bedside biomedical instruments, for a period of time. In order to solve these two problems the patient oriented approach has been conceived. In this approach the patients are equipped with knowledge and information to play a more active role in disease diagnosis, and prevention. Thus a patient can be monitored from a remote location. Existing and widespread mobile phone networks can assist in this regard. Recently, mobile networks are considered

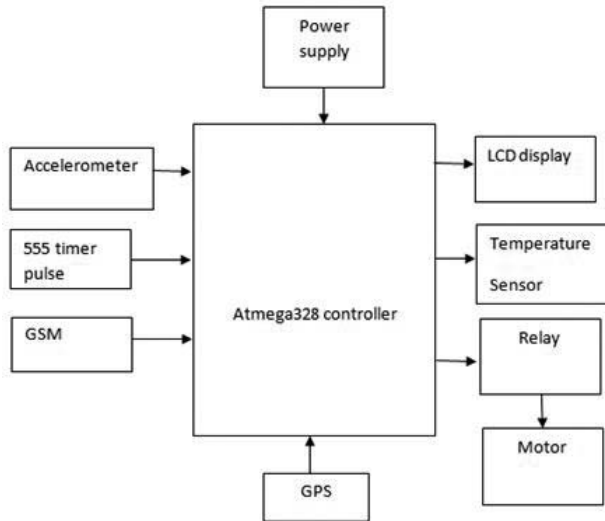
critical for solving future global health challenges. With the global market penetration of the mobile phones the mobile healthcare system (i.e., mHealth) is a matured idea now. By using the mobile phone healthcare system can be made available for people, who are living in remote areas without much access to other types of communications. Even a simple mobile phone can become a powerful healthcare tool now. Text messages and phone calls can quickly deliver real-time and critical information of a patient to a remote location. Thus the patients, living in remote areas, can reduce unnecessary back-and-forth travel to the far located healthcare centers. This will help the children of elderly to monitor the physiological condition of their parents from their working sites⁴ The data exchanged between the patient monitoring system and the microcontroller will be of a string format containing individual vital patient parameters like heart beat etc. separated by a delimiter⁵.

However, mobile devices have become “smart” now to do more rather than simply transmit medical information and advice⁶. Smartphone, supported with high speed data services, has revolutionized healthcare by playing the role of a powerful medical device for monitoring the patients’ health. Heart disease and diabetics monitoring and controlling systems are very much common now. Normally it is difficult to keep track on abnormalities in heartbeat count for patient itself manually. The average heartbeat per minute for 25-year old ranges between 140- 170 beats per minute while for a 60-year old it is typically between 115-140 beats per minute and body temperature is 37degree Celsius or 98.6 Fahrenheit. Patients are not well versed with manual treatment which doctors normally use for tracking the count of heartbeat. So there must be some device which would help patient to keep track on their health by themselves. There are various instruments available in market to keep track on internal body changes. But there are many limitations regarding their maintenance due their heavy cost, size of instruments, and mobility of patients. Zigbee Connection Buzzer Heart bit t/p p 3.2. To overcome these limitations a device use to keep track on heartbeat count of patient should be easy to use, portable, light weighted, small size etc so that it give freedom of mobility for patient. The devices which can be carried everywhere to keep track on patient’s health. This device that is a heartbeat sensor would help them to keep track on heartbeat counts of a patient and check

for any abnormalities. If any varied change takes place it is notified. This notification would help to take an appropriate action at an instance of a time. This would save patients from the future health problem which would arise. This would also help patient’s concern doctor to take an appropriate action at proper time. The e-healthcare systems have primarily been developed for observing the physiological parameters like body temperature, oxygen saturation level, heart rate, blood glucose level etc. However, with evolution of wireless technologies there has been a manifold variation and enhancement in the e-healthcare systems⁷

For a human, experiencing a fall unobserved can be doubly dangerous. The obvious possibility of initial injury may be further aggravated by the possible consequences if treatment is not obtained within a short time. For example, many elderly individuals can suffer accidental falls due to weakness or dizziness— or, in general, their diminished self-care and self-protective ability. Since they tend to be fragile, these accidents may possibly have serious consequences if aid is not given in time. The extensive usage of mobile technologies and their user-friendly applications related to health nowadays have given a rise to a new healthcare paradigm of eHealth, known as m-Health. According to the International Telecommunication Union there are now more than 5 billion mobile phone subscriptions in the world, with over 85% of the world’s population now covered by a commercial wireless signal. The growing sophistication of these networks Offering higher and higher speeds of data transmission alongside cheaper and more powerful handsets are transforming the way health services and information are accessed, delivered, and managed. With increased accessibility comes the possibility of greater personalization and citizen-focused public health and medical care ⁸The e-healthcare and now its mobile version, m-healthcare, system basically include wireless body sensor networks (WBSN) or/and wireless personal area networks (WPAN) for providing higher-quality medical services and more efficient medical responses and treatments to patients. In such an e-healthcare/ m-healthcare systems, the sensors placed around atients’body gather the vital parameters (e.g. heart rate, pulse rate, oxygen saturation level, sugar level and many more) and report them to remote healthcare service provider and/ or physician immediately for real-time and long-term monitoring of patients⁹.

BLOCK DIAGRAM



ATMEGA164: ATMEGA164/324/644 is a low power CMOS 8 bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATMEGA164/324/644 achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed

555 Heart Beat Sensor: The 555 timer IC is an integrated circuit (chip) used in a variety of timer, pulse generation, and oscillator applications. The 555 can be used to provide time delays, as an oscillator, and as a flip-flop element. Derivatives provide up to four timing circuits in one package.

Temperature sensor: National Semiconductor's LM35 IC has been used for sensing the temperature. It is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in °C). The temperature can be measured more accurately with it than using a thermistor. The sensor circuitry is sealed and not subject to oxidation, etc

Acceleration for Fall Detection: The main research on the principles of fall detection focuses on the changes in acceleration that occur when a human is falling.

DC MOTOR: In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field.

LCD display: LCD stands for Liquid Crystal Display. LCD is finding wide spread use replacing LEDs (seven segment LEDs or other multi segment LEDs).

Arduino: Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software⁷. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments. Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators.

Power Supply: The present chapter introduces the operation of power supply circuits built using filters, rectifiers, and then voltage regulators. Starting with an AC voltage, a steady DC voltage is obtained by rectifying the AC voltage, then filtering to a DC level, and finally, regulating to obtain a desired fixed DC voltage.

Relays: A relay is an electrically controllable switch widely used in industrial controls, automobiles and appliances. The relay allows the isolation of two separate sections of a system with two different voltage sources.

CONCLUSION

The design of a low-cost microcontroller based device for measuring the heart rate, temperature and also the human fall detection has been described. The device has the advantage that it can be used by non-professional people at home and also in remote areas to monitor the patient easily and safely.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. M.Sherwin Nayanar, Pandimurugan V, Gowri V. Hindustan University, Department of Information and Technology, Zig-bee based wearable health Monitoring system. International Journal of Computer Science and Mobile Computing. ISSN 2320-088X. 2014 February; 3(2): 158–169.
2. Gayathri S, Rajkumar N, Vinothkumar V. Human Health Monitoring System Using Wearable Sensors. International Research Journal of

- Engineering and Technology (IRJET). ISSN: 2395 -0056. 2015 Nov; 02(08):
3. Dedeepya J, Ishwariya P, Padmapriya Dr.S, Famitha S. Department of Computer Science and Engineering Prathyusha Engineering College. A Smart Healthcare Surveillance and Fall Detection System for Elderly People. *International Journal of Engineering Science and Computing*. 2017 April;7.
 4. Manigandan S, Suresh R. Norman. SSN College of Engineering, Fall Detection System for Elderly Person Monitoring Using GSM Network. *International Journal of Advances in Engineering*. ISSN: 2394-9260 (printed version). ISSN: 2394-9279 (online version). 2015; 1(2):78-83.
 5. Purnima, Neetu Rout, Rahul Tiwary, Renuka Bhandari. Army Institute of Technology. Zigbee and gsm based patient health monitoring system. *International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering*. ISSN (Print):2320 -3765. 2014 January;3(1).
 6. Amna Abdullah, Asma Ismael, Aisha Rashid, Ali Abou-ElNour, Mohammed Tarique. Electrical Engineering. Ajman University of Science and Technology. Real Time Wireless Health Monitoring Application Using Mobile Devices. *International Journal of Computer Networks & Communications (IJCNC)*. 2015 May; 7(3).
 7. Rahul K. Kher electronics and Communication Engineering Department, G H Patel College of Engineering. Mobile and E-Healthcare: Recent Trends and Future Directions. *Journal of Health & Medical Economics*. ISSN 2471-9927. 2(3):10.
 8. mHealth New horizons for health through mobile technologies. Global Observatory for eHealth series – 2011;3. http://www.who.int/goe/publications/goe_mhealth_web.pdf
 9. Shen X, Kato N, Lin X. Wireless Technologies for e-healthcare. *IEEE Wireless Communications*. 2010;10-11.

Traditionalist and Pro-Tajdid Method of Argument in the Ahlus Sunnah Wal Jama'ah School of Thought in Malaysia

ShukriAhmad¹, Mohd Akram Dahaman¹, SobihatunAbdul Salam², Mohamad Khadafi Rofie³,
KamarudinNgah⁴

^{1,3}School of Language, Civilisation and Philosophy, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia; ²School of Multimedia Technology and Communication, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia; ⁴School of Government, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia

ABSTRACT

The Islamic faith involves beliefs, emotions, practices and behavior. The Islamic creed is more than emotions because it involves certain confidence of reward and punishment in the hereafter. It is also becoming the backbone of Islam. Clinging to the Islamic faith means to maintain the belief system about the concept of God, which is very virtuous and straight. Talking about the divinity that is pure and lawful in order to understand Islam from the sectarian context cannot run away from discussing the Ahlus Sunnah Wal Jama'ah. This approach is prevalent in the Muslim world since the early days of Islam. The two approaches which are dominant now within the group of Ahlus Sunnah wa al-Jama'ah in Malaysia are the Traditionalist and the Pro-Tajdid groups. Both groups are representing the Asyairah and the Pro-Tajdid. Yet, both of these sects sometimes are at disagreement when it comes to strengthening and extending their influence in Malaysia. Based on that, this paper seeks to analyze the method of argument from both groups. The paper highlighted its findings based on the methodology and arguments and based on deductive and inductive argument in the ahlus Sunnah Wal-Jama'ah school of thought in Malaysia. The methodology used in the study is qualitative with emphasis on content analysis. The data were also collected through interviews. The findings show that the difference in the methods of the two groups is small. The argument methods of both groups are based on deductive and inductive methodology of logic. Traditionalists used a deductive method, while Pro-Tajdid utilized an inductive method. This study presents a way of understanding the methods of both parties in an effort to avoid the blaming of both parties against each other.

Keywords: *Islamic faith, Ahlus Sunnah wa al-Jama'ah, the Traditionalist movement, Pro-Tajdid movement and Malay ethnic.*

INTRODUCTION

Islamic faith is a virtue that is significant to the Muslim's society because it can provide various effects either to an individual or to the Muslim community. The effects on individual faith are like positive emotions, good practices and conduct. (Shukri⁴). In fact, the impact of the Islamic faith also involves a belief system over rewards and punishments from God. In addition, belief in Allah also gives a great impact on the Muslim community for their unity and brotherhood. This is because the Islamic faith will bring unity to the believers, and of course, in the context of Islam, the faith of Islam will unite the Muslims who believe in one God. However, the differences of faith can also trigger hostility, misunderstanding and conflict. Many conflicts

are caused by the differences in terms of faith. In fact, the conflict also occurs within the believers due to the differences in approach and in understanding the content of such religion. However, many other factors are also contributing to the conflict in the society nowadays. It is such as an economic, social and oppression factors. For Muslims, faith is considered very important. The most popular group in Islam is the Ahlus Sunnah sects. This popular sect is practiced by most of the Muslims all over the world and has become a great contribution to the unity and harmony of the Muslims society over the years.

There are two main divisions that claim to represent the Ahlus Sunnah Wal Jama'ah school of thought which both are on many occasions have debated this concept

and seems to go against each other. In Malaysia, both are so dominant in representing ahlu Sunnah Wal Jamaah. They are called the Traditionalist and the Pro-Tajdid groups. These groups seem to represent previous sects in Islamic schools of thought, which both of them claimed that their teaching is based on the Quran and al-Sunnah (Abdul Fatah¹). The Traditionalists are representing the Al-Ash'ari (260H/873M-324H/935M) and al-Maturidi (870H/1465M-944H/1537M) schools of thought. While the Pro-Tajdid movement represents the Pro-Tajdid schools of thought. The former group is still influential in Malaysia nowadays and has resided in the most states of Malaysia. It was established in the Malay world since the 15th century. While the latter sect of Sunni is growing up in Malaysia and resided in Perlis, despite of not having a strong influence in the Malay Archipelago before. The Pro-Tajdid movement began to influence in Malaysia since the Saudi government adopted the Muhammad Abdul Wahhab school of thought. Then, after several centuries it started to encroach into Muslim minds in Malaysia through the educational system and modern technologies. In Malaysia, some opponents of this group named them as Wahhabism.

The different approach of interpreting Islamic theology between both parties often drags them in criticizing each other. The discussion of attribution of God is the most significant aspect that creates criticism from both sides. Analyzing the conflicts that exist in both parties, the composition of this paper is performed to study the rules and procedures that cause the differences of opinion, especially in Malaysia. In addition, this paper will also outline the results of the study related to the difference of thought from both groups. Later on, this paper will describe briefly a methodology in shaping the standards for setting the underlying conflict between the two groups. With that, it is hoped that any concerned parties can benefit from this study in evaluating the status of both groups in Malaysia.

THE DIVINE ISSUE

The divine issue is the core aspect of the difference between two groups of the Ahlu Sunnah Wal-Jamaah. However, both of them have the same fundamental beliefs about God. Firstly both parties acknowledge that Allah is the creator of all creatures and possesses the substance and nature of worthiness for him. They believe that all the attributes of God are perfect and infinite. While the Qur'an and al-Hadith explain the traits of perfection. Secondly the two sects admit that God is totally different from the beings. In other words, there is no equality of God with the same beings.

METHODOLOGY

The methodology used in this paper was based on a qualitative approach with an emphasis on content analysis. The data was also collected through interviews in detail on a small group of respondents which is based on sampling method aims. In addition, it also used some other instruments such as unstructured interviews and observation. Brain storming as well as formal and informal medium, method of "Triangulation" was fully utilized to improve the reliability of the study.

FINDINGS

Based on the overall fundamentals of the ASWJ methodology, there are similarities and differences between the Traditionalists and the Pro-Tajdid groups. The similarities and differences are presented in the form of mapping matrices in the diagram below. The diagram below shows there are 11 basic ASWJ methodologies as shown in Table 1. There are only a few differences in both groups in the aspect of Sufi practice and divine aspects. These differences do not come to the level of infidelity. Traditionalist strives to explain the attributes of God in allegorical interpretation {Ta'wil) in order to avoid indescribable mistake and blunder about the attributes of God and the similarities with His creatures. While Pro-Tajdid takes the approach of glorifying Allah by giving up and setting the true meaning of the verses about the nature of Allah (mutasyabihat) to Allah.

Table 1: Basic Mapping of ASWJ Methodologies and Differences

Mapping Matric of Methodology ASWJ		
Principle Methodology	ASWJ (Tradisionalist)	ASWJ (Pro-Tajdid)
Prioritize Al-Quran dan Al-Sunah	✓	✓
Interpreting al-Quran with al-Quran	✓	✓
Interpreting al-Quran with al-Hadis or al-Sunnah	✓	✓
Focus on the opinions and words from <i>al- sahabat</i> and <i>al-tabi'in</i>	✓	✓

Conted...

Ijma' ulama	✓	✓
Prioritizes the Arabic rules and the use of its own 'uslub'.	✓	✓
Understanding the al-Quran on the meaning or intentional meaning which cannot be transferred to another but with proof.	✓	✓
To familiarize the (sacred) al-Tanzih and al-Taqdis with the interpretation of his verses, showing the likeness and equality of Allah with the attributes of the beings	✓	✗
Become familiar with Isbat's opinion of the verses which reveal it, showing the likeness and equality of God with the attributes of the creature	✗	✓
Soul purification is through the concept of akhlaq	✓	✓
Soul cleaning is through the concept of akhlaq and tasawuf	✓	✗

Deductive Argument of traditionalist versus Inductive Argument of Pro-Tajdid: Deductive argument, also deductive logic, is the process of reasoning from one or more statements (premises) to reach a logically certain conclusion (Sternberg⁵). It differs from inductive argument. Inductive argument (as opposed to deductive reasoning) is reasoning in which the premises are viewed as supplying strong evidence for the truth of the conclusion (Copi, Cohen, and Flage³). If we examine the method of argument used by both parties, the Traditionalist and Pro-Tajdid, we determined that both groups use their argument based on either deductive or inductive reasoning. The Traditionalist groups that support Ashairah and Maturidiyah emphasize deductive methods which are based on logical philosophical argument. The use of the science of law or the law of reason becomes the core argument of this trend. In other words, the use of the method is more on the logical premise. The traditionalist started from the premises of logic, which begin from the esoteric or metaphorical interpretation (ta'wil) in order to align with the text which is on the bottom (see Figure 1). Any verse or text of the Qur'an and Hadith regarding the attribute of Allah that can cause misunderstanding about the nature of Allah and the beings must be aligned with the premise of reason. To put it in other words, the use of reason must be preceded by the deductive method of logical philosophy.

On the other hand, the second group has used the inductive methods in reinforcing the concept of divinity. The inductive argument determines that the nature of God is stated in the Qur'an and al-Hadith and it is strong. This method is based on the premise of the message of authenticity, reliability and strong evidence, especially from the Qur'an and al-Sunnah. The inductive method

actually was used by Imam Malik (d. 179H) whenever he was asked about "how did Allah make *istiwa'* on the throne". Imam Malik has used the reliability of the Quranic statement about the attribute of Allah in order to support his argument. Imam Malik replied, "Istiwa' is not unknown (*ghayru majhul*), the modality of it, is inconceivable in the mind, but belief in it is obligatory, and inquiring about it is a heretical innovation (Anas²). So that, the method of argument used by Iman Malik was relying on the reliability of evidence.

Both of these sources are really the strongest authorities that must be believed by all Muslims. Clearly, the nasal texts are inductive arguments concluded to achieve the truth. Hence, the use of logic is no longer considered valid in understanding the nature of God. These groups may be considered using the top-down method (see Figure 1). They accept the text of the prophecies about the nature of God without any description of logic or reason. They used logic arguments just for strengthening the idea of the text. The model below illustrates the position of both groups and the method used.

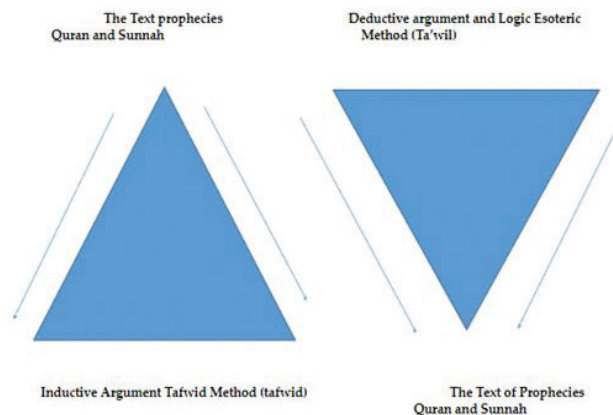


Figure 1: Top-down method

Towards a Model of Ahlus Sunnah Wal Jamaah in Malaysia: Based on the data that was collected through some literatures, interviews and observation, it can be summed up the differences between both groups is a matter of misunderstanding about using the method of argumentation. There are two main sources used by both parties, namely the logic and the text argument. Those who follow the logic school utilize metaphorical interpretation, while the other group leave problematic texts uninterpreted, believing that the reality of their meaning should be left to the one who told them, implying their unknowability. Both of these sources are important and acknowledged by each of them. The traditionalist uses the Jawi books in aqidah, which is more on logical argument. Their influence is more on the students of the traditional Islamic institution. While the pro-tajdid groups are mostly using the textbook and more influence in the Islamic School and the higher learning institution. Both are considered as the Ahl Sunnah Wal Jamaah groups, even both sides used to denounce each other. The model below shows the differences and the similarities of both groups (see Figure 2).

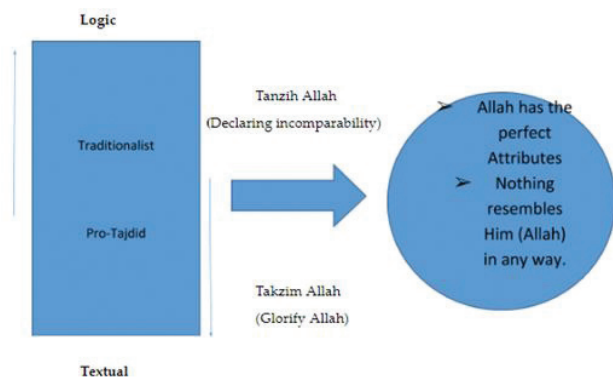


Figure 2: Differences & Similarities of both groups

CONCLUSION

There are two main divisions that claim to represent the Ahlus Sunnah Wal Jama'ah schools of thought which both of them are on many occasions have debated and seems to be against each other. In the 20th century, within the Malay-Muslim community in the Malay peninsula there were two schools of thought in Sunnis movement and popularly have been called the Traditionalist and the reformist. Today, these groups are

called the Traditionalist and the Pro-Tajdid groups. It is admitted that the Traditionalist and Pro-Tajdid groups are representing the Sunnah Wal Jamaah group. Both groups have never rejected the nature of God and claim that God does not resemble any creature in the totality. The differences between these two groups are only the corners of the method of submitting. In many cases, they have the same of characteristics and criteria as the Sunnah Wal Jamaah.

ACKNOWLEDGMENTS

The title of this paper is a part of the findings of the research grant "FRGS" S/O code: 13060, under the title "Membina Rujukan Piawaian Terhadap Ahlus Sunnah Wal Jamaah(ASWJ) Dan Penerapan Dalam Pembinaan Sahsiah Jati Diri"

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Abdul F H I. Aqidah Ahli Sunnah Wal Jama'ah dan Kebatinan (Aqidah Ahli Sunnah Wal Jama'ah and Mysticism). Kuala Lumpur: Percetakan Nasional Malaysia Berhad. 2003.
2. Anas B. Sifat Istiwa Allah di Atas Arsy (Characteristic of Allah Istiwa on Arasy). 2008. Retrieved from <https://muslim.or.id/56-sifat-istiwa-allah-di-atas-arsy.html>
3. Copi I M, Cohen C, Flage D E. Essentials of Logic (2nd ed.). Upper Saddle River. NJ: Pearson Education. 2007.
4. Shukri A. Pengaruh Pemikiran Ulama di Semenanjung Malaysia Akhir Abad ke 20 (The Influence of Islamic Thought in Peninsular Malaysia at the End of the 20th Century). Sintok: Penerbit Universiti Utara Malaysia. 2011.
5. Sternberg R J. Cognitive Psychology. Belmont, CA: Wadsworth. 2009.

Vocational Schools Leadership Reinforcement Model

Jumintono¹, Suyatno¹, Muhammad Zuharty¹, Hamdan Said²

¹Magister of Vocational Education, Universitas Ahmad Dahlan Yogyakarta Indonesia, Jalan Pramuka No. 42, Sidikan, Umbulharjo Yogyakarta (55321); ²Department of Education Foundations, Universiti Teknologi Malaysia, 81310 Johor Bahru, Malaysia

ABSTRACT

Al-Qur'an is the main source and guideline in every worship and Muslim prayer. Similarly, how Islam provides basic understanding and concepts of leadership. In addition, vocational education is predicted to reduce unemployment among school graduates. Secondary vocational schools were blamed for failing to prepare students for the skilled workforce and eliminate the gap between the requirement of the industries and the competencies taught at school. This study examines school leadership reinforcement model for vocational secondary schools located in the Province of East Nusa Tenggara. This qualitative descriptive study employed development model for data collection. The observations and in-depth interviews were applied as prime data collection methods involving three (3) private and three (3) public vocational high schools. A total of 20 principals and senior school teachers participated in the study. The application of the school leadership reinforcement model requires the principals to have a clear vision in producing ready-to-work graduates. These supporting institutions can provide valuable inputs to enable schools to produce appropriate output that matched with the requirements of the industries. Strengthening the school leadership can be in the form of understanding of the local culture, benchmarking other schools, providing professional training, instilling good ethics and building strong character with high integrity.

Keywords: Leadership; Teacher; East Nusa Tenggara; Integrity; Holy Quran

INTRODUCTION

In the Qur'an the leadership uses the word Caliph, Ulu al-Amri, Imam and Malik. The Caliph has a functional connotation of someone who is appointed as leader and ruler on the face of the earth carrying out certain functions and tasks. Ulu al-Amri is the owner of affairs or the owner of power. The priest is as everyone who can be followed and shown in the future in various problems. Whereas Malik means someone who has the authority to order something and forbid something in relation to a government. The Qur'anic argument about leadership is stated as say (O Muhammad s.a.w.): "O Allah s.w.t.! Possessor of the kingdom, You give the kingdom to whom You will, and You take the kingdom from whom You will, and You endue with honour whom You will, and You humiliate whom You will. In Your Hand is the good. Verily, You are Able to do all things (Al Quran3: 26).

In contrast, there are several research reports and articles about vocational education predicted to reduce unemployment among school graduates.

Central Statistics Agency (CSA) data shows that open unemployment in exist among graduates, with 17.26% from secondary vocational schools, 14.31% high school graduates, 12.59% graduates of universities, 11.21% diploma holders, 9.39% from secondary schools and 4.57% from primary schools. Secondary vocational schools were blamed for failing to prepare students for the skilled workforce and eliminate the gap between the requirement of the industries and the competencies taught at school. The quality of school leadership is nowadays directly associated with better academic success and higher achievement for every student (Sumintono, Sheyoputri, Jiang, Misbach, & Jumintono²⁸). Leadership is a critical component of the organization's culture because leaders can create, maintain, or change the culture (Hinkin & Schriesheim¹³).

There are 188 Vocational High Schools (VHS) located in East Nusa Tenggara province. With a total number of 49,515 students and 6,665 teachers, with the ratio of 7.43 between students and teachers (Ditpsmk⁸).

This ratio is very far from the normal ratio determined by the National Standard of Education (NSE) i.e. 15-20 students for vocational schools. It needs an outstanding principal to run the school very well. This research focuses on the model for development of school leadership with reinforcement in vocational schools: a case study in East Nusa Tenggara Indonesia (developing countries context). As Widodo³¹ presented that VHSs were not managed and led well to prepare the future of their students. The public needs quality VHS graduates who can face the challenges of the competitive working environment. Most of the VHS principals still face obstacles in maximizing human resources and other school resources. One of the reasons is weak leadership and low managerial capacity of the principal himself/herself. In general, the principal of the school is a key determinant in improving school quality. The principal of the school is the central point in increasing the high achievement and good performance (Leithwood et al.¹⁹). Strong school leadership is one of the keys to the success of the institution in achieving, maintaining, and improving school performance (Pont, Nusche, & Hunter²⁵).

Central Statistics Agency (CSA) data shows that open unemployment for the year 2009 indicated that 17.26% were graduates of VHS, 14.31% were high school graduates, 12.59% were university graduates, 11.21% graduates of diploma, 9.39% were graduates of SMP, and 4.57% from primary schools. Even in the year 2012, unemployment in Indonesia reached 7.2 million people, mostly graduated from Vocational High School. Based on the level of educational qualification, unemployment among graduates of VHS was the highest in the country (9.87%), followed by graduates from Senior High School (SMA) (9.6%), graduates from Junior High School (7.76%), graduates from Diploma I / II / III (6.21%), graduates from university (5.91%), and from Primary School (3.64%) (BPS²). A school principal is a decisive factor in developing a high performing school. Principal effectiveness is crucial to improving student achievement, second only to classroom instruction among all the school-related factors contributing to what students learn at school (Nettles & Herrington²⁴).

One of the formal studies on school leadership was conducted by Analytical and Capacity Development Partnership (ACDP) in 2013. The samples of this study were selected from the relevant populations in some regions of Indonesia: Sumatra, Java, Kalimantan, Nusa Tenggara, Sulawesi, Maluku and Papua. The result was a

number of key issues emerged from the analyses of school principal competency. Specific competency indicators in the study shows that rural and remote school principals generally rate their competency lower than urban or semi-urban principals including in East Nusa Tenggara. Thus, it is very important to conduct a study focusing on rural and remote school principal competency

The study is significant because the results of the study can be used by the relevant parties and authorities including the central and local office of education, school principals, and teachers to reinforce the quality of school leadership in rural and remote schools. In the past, despite the presence of ideas to revitalize rural schools, the relevant people were still in confusion as to where they could start the reinforcement process from. The research will hopefully provide the list of actions that should be undertaken by the relevant authorities to accelerate the process of reinforcement school leadership in rural and remote school. The list will also highlight the actions that should be given priority.

The significance of this research also lies on the impact it can give to a wider rural and remote community especially to those who have a great interest in rural and remote education, particularly in Indonesia. One of the biggest impact is that this research is able to identify and inform the society and the relevant authorities regarding the actual conditions of vocational schools in Indonesia including the problems faced by these schools where action need to be taken urgently. Such important information can be used later as the means to formulate appropriate strategies to accelerate the process of reinforcement school leadership in rural and remote school. The result shows that this research, at the same time, can give benefits to those affiliated with vocational schools such as rural and remote students. One of the significant benefit is that they have the opportunity to access quality education (as long as the problems concerned can be dealt well by the relevant authorities).

Theoretical Overview: Leadership: The concept of leadership stated in Al-Quran where men are the protectors and maintainers of women because Allah has made one of them excel over the other, and because they spend out of their possessions (to support them). Thus righteous women are obedient and guard the rights of men in their absence under Allah's protection. As for women of whom you fear rebellion, admonish them, and remain apart from them in beds, and beat them. Then if

they obey you, do not seek ways to harm them. Allah is Exalted, Great (Al-Quran 4:34). The men is chosen as the qawwam or qayyim where is a person responsible for administering and supervising the affairs of either an individual or an organisation, for protecting and safeguarding them and taking care of their needs. Thus, with the terminology of imamah that highlighted, and We made from among them leaders guiding by Our command when they were patient and (when) they were certain of Our signs (Al-Quran 32:24).

In addition, school leadership reinforcement in the ASEAN region, such as Malaysia, Thailand, and Vietnam, are supported by the World Bank. Each country developed a national body for principals training and development since in the 1990s (Ndiga, Mumiukhacatherine khakasa, Flora, Ngugi, & mwalwa²³) school managers need to appreciate the new policies and laws that guide school management, namely Children's Act and Basic Education Act. Management of resources while ensuring accountability and integrity to the public is equally crucial. The reforms emanate from the Education changes brought about by the new constitution dispensation and the devolved system of Government. The managers of schools need to appreciate the new policies and laws that guide the management of schools such as: Education being a basic human right, therefore being free and compulsory and schools being disability friendly. There is also the element of participation which is important. Management of resources while ensuring accountability and Integrity to the public is equally crucial. Sessional Paper No 1 of 2005 emphasizes improving quality completion rates both at the primary and secondary school level of education (MOE: 2005). This national body has subsequently trained thousands of school principals. Several empirical studies reported the complexities of these issues which informed on the diversities about what they taught or not taught in the training (Hess & Kelly¹²) the role of the governments (Thody, Papanoum, Johansson, & Pashiardis³⁰) or even question about purpose and responsibility (Cowie & Crawford³). This shows the essential aspects of preparation for training before is appointed as a school principal, and the context of different cultures should also be taken into account (Yan & Ehrich, 2009). Following the preparation for training, the school principals, like other professions, have to undergo a leadership professional development program that helps them to become effective school leaders and improve

their practice from time to time (Cowie & Crawford³). The quality of program design, delivery, recruitment and retention in these professional 3 development activities must match the needs of the individuals (Hess & Kelly¹²) So the professionalism and reinforcement of the school management and leadership qualities are prerequisites before teachers are appointed to hold this position, including in all the provinces and districts in Indonesia.

Education and Principal Study in Indonesia: In the 1980s, the central government, who appointed public school principals throughout the country, introduced preparation training programs for school principal candidates. This preparation training program lasted for one week although it was not compulsory. The content of the training program was mostly about public administration and management which was provided by the education province office staff. Before taking office, most of the public secondary school principals held posts as vice 4 principals and were chosen for posts by their school principals. Some of them had administrative training but not necessarily about school leadership.

A drastic change of managing education that was practiced in a centralistic manner since the colonial era occurred in 1998 when the New Order collapsed. The new government stipulated the autonomy law, where starting in 2001, the education sector was managed at the district level (Kristiansen & Pratikno¹⁷). This situation also is marked the beginning of an era of educational reform which was the enactment of the New Education System Law in 2003 (Raihani²⁶). This was followed by the implementation of several new policies, such as school committee and education council (Sumintono et al.²⁸), school operational support that does not differentiate between public and private school (Fitriah, Sumintono, Subekti, & Hassan⁹), teacher certification program, and international standard school (Sumintono & Subekti²⁹).

From the year 2001, the appointment of public school principals was devolved to the district level (either a city or a regent), as part of an active system of decentralization. Many education districts sought help from the central government or local universities to train future school principals. However, in most cases, they just appointed teachers based on their personal preferences. This action is not surprising as a longitudinal study by Hofstede (Hofstede¹⁴) Geert Hofstede proposed four dimensions on which the differences among national cultures can be understood: Individualism, Power Distance, Uncertainty

Avoidance and Masculinity. This volume comprises the first in-depth discussion of the masculinity dimension and how it can help us to understand differences among cultures. The book begins with a general explanation of the masculinity dimension, and discusses how it illuminates broad features of different cultures. The following parts apply the dimension more specifically to gender (and gender identity regarding Indonesia society cultural model found that higher hierarchical powers can decide anything they like).

Because of this situation and the fact of widening capacities of district governments, starting from the year 2009, the Ministry of Education released a regulation (number 6/2009) stating that before becoming a principal, school leadership training was required (MoNe²²). As a result, a national agency name as Agency for School Principal Empowerment and Development(LP2KS) was established to provide this training(LP2KS²⁰). This training program is called the Development of Principal Managerial Skills. The syllabus for the training contains areas includes student management, human resource management, curriculum development, school development planning, monitoring and evaluation, and information and communication technology in school. This training is supposed to be in line with the Ministry of Education decree number 13/2007 regarding principal standards, where a school principal in Indonesia has to be competent in five areas, which are personality, managerial, entrepreneurship, supervision and social (MoNE, 2007). The first stage of the training is seven days training at the LP2KS (70 hours), located in Solo, Central Java; followed by three months (equal to 200 hours) on the job learning (OJL) (apprenticeship) in two schools (his/her own school and another school in his/her district) where participants are asked to prepare an action plan for change and improvement. The last stage of the process is three days training (30 hours) in the LP2KS which mostly consists of completing a portfolio of the activities undertaken during on the job learning and the presentation of the portfolio. Total time of this program is 300 hours lesson. Once principals have successfully completed all the training and assessment in LP2KS, the candidate will be awarded with a unique number of school principals' registration numbers (Nomor Unik Kepala Sekolah), which makes them eligible to be appointed as school principals by the mayor in their respective districts (LP2KS²⁰).

There are several reports discussed on school principals that appeared in the international literature which portrayed and reflected the situation of post-1998.

It is interesting to note that even the minister of education in 2002, stated that “the Indonesian government less educate the school leaders to be independent in many aspects of school administration” (Sofa, Fitzgerald, & Jawas²⁷). Further, from their study, Jones and Hagul (Jones & Hagul¹⁶) found that “school principals have little authority in running the school or in resource allocation, nor are they usually trained to manage or lead a school well”. This situation is also captured in Bjork's (Bjork¹) study which indicates that local authorities, which include school principals to district government, do not have enough capacity in terms of expertise and experience. Therefore they rely on a bureaucratic manner to handle challenges and opportunities of education autonomy. The result of this situation is that good practice such as shared-decision making and the empowerment of teachers most of the time did not happen as expected. In most cases, the school principals relied on their autocratic leadership's style (Sofa et al.²⁷). In addition, one indication by Lee and Hallinger (Lee & Hallinger¹⁸) based on PIRLS research, found that Indonesian school principals have less time in terms of practicing leadership role in their schools, which affirms that their main emphasis is on school management as previously stated.

An empirical qualitative study by Raihani (Raihani²⁶) which was based on successful school leadership perspectives, provided unique findings. With the involvement of three school principals from Yogyakarta, he found that all embraced “Islamic and cultural beliefs and values that underpinned their leadership...which were articulated in the school leadership and strategies” (p. 481). Raihani²⁶ developed An Indonesian Model of Successful School Leadership (AIMSSL). According to Raihani²⁶, “propositions about successful school leaders are drawn in that they demonstrate ability in analysing the school contexts and situations both internal and external to school; visioning and setting strategies; having strong personal and professional values and respecting and aligning others' personal and professional values; developing strong teaching-learning characteristics including curriculum and instruction; fostering professional development of themselves and staff through methods such as intellectual stimulation, providing individualized support and modeling; redesigning the organization including identifying and creating and/or changing the school cultures and modifying organizational structures; and building collaborative cultures in which the high involvement of the school's other stakeholders in the decision-making processes is exercised”.

Two further quantitative studies were conducted in Sumatra, they are Lampung and Padang which have revealed new findings^{25, 26}. The Lampung study found that teacher’s job satisfaction improves if the school principals’ decision-making style practice is rational, less dependent, and avoid intuitive, avoidant and spontaneous (Hariri et al.¹¹). Meanwhile, Damanik’s⁵ study emphasized that the leadership behaviours of the school principals and its influence on elements of the school climate are important for school improvement, in this case, teacher self-efficacy, in the context of education reform.

In another study conducted by Jawas¹⁵ in Malang, East Java, using the mixed-methods approach on instructional leadership, she found that there are four areas of improvement (curriculum, teachers’ professionalism, learning facilities, and students’ learning outcomes). In this regard, he found that instructional leadership actually supports the practices of managing, promoting, improving and assessing instruction by the school principals. However, this study found that the perception of principals and teachers were found to be different, and they do not necessarily lead to the increased frequency of practices that influence instructional improvement. The above study indicated that the spectrum of educational leadership practices happened in contemporary Indonesian schools. However, there has not been a single study done in the context of school principal preparation; thus, this study endeavors to fill in the gap.

RESEARCH METHODOLOGY

The study is based on research and development model by Gall, Borg, and Gall’s (Gall, Gall, & Borg¹⁰). A total of 20 respondents ranging from principal (P), vice-principal (VP) and senior teachers (ST) with 5–40 years of teaching experience were involved in the interview session. The interviews were conducted in approximately 30-45 minutes after the school hours.

The collected data were transcribed, coded and categorized following the emerging themes, and interpreted using inductive and deductive methods. This study will be conducted in the form of interpretive research where “the researcher is interested in understanding how participants make meaning of a situation or phenomenon, this meaning is mediated through the researcher as an instrument, the strategy is inductive, and the outcome is descriptive” (Merriam²¹).

This study took place in three districts in East Nusa Tenggara province, there are Kabupaten Timor Tengah Selatan, Kabupaten Timor Tengah Utara and Kabupaten Kota Kupang. The researchers selected three public vocational school principals and three private vocational school principals located at three different places in East Nusa Tenggara. The schools were being selected based on the number of student populations and their achievements. The office of education located in those districts will be consulted in selecting the schools. The samples of this study consisted of a purposive sampling of 20 people the profile is shown in Table 1. The researcher collected data using three different techniques: interviews, observations and document analysis. The three different instruments were adopted to ensure that rich data and information can be obtained in this research (Creswell⁴).

All the participants (except the students) were be individually interviewed at the time and place convenient to both the researchers and participants. The questions posed to the participants are meant to find answers to the research questions. All the interviews were be recorded using a digital tape recorder.

Table 1: Respondent’s Profile

	Demographics	Frequency	Per cent
Gender	Male	10	50
	Female	10	50
Profession	Principals	6	30
	Senior teachers	14	70
School location	City	12	60
	Rural	8	40
Age	Under 34 years	3	15
	35 - 39 years	2	10
	40 - 44 years	3	15
	45 - 50 years	4	20
	51 - 55 years	6	30
	more than 55 years	2	10
Tenure as principal	Under 2 years	2	10
	2 - 4 years	2	10
	5 - 8 years	6	30
	more than 8 years	10	50
Highest Education	Diploma IV	0	0
	Undergraduate	12	60
	Master’s	8	40
	Doctorate	0	0

Conted...

Training	Agency for School Principal Empowerment and Development (LP2KS)	5	25
	Center for the Development and Empowerment of Educator and Staff (P4TK)	5	25
	Education Quality Assurance Agency (LPMP)	2	10
	Others	8	40

RESULTS

The description of research data presented here is based on findings of interviews with involving twenty respondents from principals and senior teachers. Some school principals describe the model of school leadership strengthening that is applied in their respective vocational schools, as the respondent explained:

In this case under the provincial government, the Department of Education play the vital role as the principal of direct superior. The principal should work closed together and communicate with the teachers and parents in order to produce students who are able to perform well both in education and morals (P1). Similarly, another senior teacher from the different school stated:

The education office as the policy maker and the school community is only the executor (ST1).

The conclusion of the interview result is that all existing systems in schools are centralized from the provincial principal and teachers perform their duties that support student achievement and morals. Other school principals stated that the model of strengthening the school leadership is applied as follows:

The parents of the students and industries give feedback input to the principal who is the primary and public-facing representative for the school in assisting with admin, teachers, to process input from industries and parents in order to achieve the vision and mission (P2).

The senior teacher stated that: Vision and mission the school is made more focused and implemented in supporting the teacher’s duties and teacher’s role (ST3).

The other senior teacher stated that: A clear vision of vision mission will make the school work program more focused on quality of graduation (ST5).

The above statements highlight that principals have some traits of leadership, such as democratic and visionary leadership as well as collegial leadership. The parent has a role involving school programs. The role of the parents is not solely to send their school going children to be trained in school but also have a responsibility to their children at school. The most important from this interview is that the school’s leader must have an established direction of the employability issue of the graduate students. Producing ready-to-work graduates is a clear vision of the principal.

In other perspectives, other principals expressed their experiences of strengthening principal leadership as follows: The principal is the main leader and have a responsibility in the school. In carrying out his duties, he or she is assisted by the vice principal, admin and other teachers in running the school show to ensure the vision and mission goal delivered (P4).

Other principal point of view mentioned that the model of strengthening the school leadership is good management skills in all the lines of their respective duties which can positively impact productivity of the school performance (P6).

The teacher stated the existence of togetherness and teamwork enable all the work programs to be implemented properly (ST7). The other teacher concludes that a good relationship and teamwork as well as clear vision and mission will result in an innovative program in educating the students and able to advise each other by giving soft reminder without conflict of interest and able to be professional to improve the school management (ST6).

It is concluded that the model of the principal above is the democratic leadership. Vice principal, administration and senior teachers are an important component in assuring quality in the school programme.

Related to the training and other program enhancing school leadership, most of the respondents give good comments on the training methods: The training conducted by the government are relatively useful; it makes us know more how to become a good leader, and also we understand the duties of a principal in many situations (P8).

Mostly the training that I follow can improve our competency in managerial and leadership, especially in the internship section (ST9).

The training is effective because they taught everything that I need to become a principal (P1).

These findings highlight how important the principal's leading professional training is in building school leaders. This is in line with international research findings that reinforce how being in a deputy role can significantly influence the subsequent leadership practice and behavior of future principals (Day, Sammons, & Gu⁷).

The findings indicated that school employs many leadership models. The application of these models depended on the influence of the existing situation. The application of the school leadership reinforcement model requires the principals to have a clear vision in producing ready-to-work graduates. The school leaders must set up creative and innovation institutions to support and produce output in accordance with the steady plan. These supporting institutions can provide valuable inputs to enable schools to produce appropriate output that matched with the requirements of the industries. Strengthening the school leaders can be in the form of understanding of the local culture, benchmarking other schools, providing professional training, instilling good ethics, and building strong character and high integrity.

In line with many studies of successful school leadership, the principal's leadership in this study was reinforced by a set of personal beliefs and values (Day, Harris, & Hadfield⁶; Raihani²⁶). As the respondents said,

As a school principal, I don't know what I will be, but this is an "amanah"(trust) and given from God that I am responsible in my "akherat" (future) (P6).

Other principal said,

The principal is only a job position but also a trust given in my career path (P5).

Senior vice principal described his principal,

I know very well how my principal holds this vital position, he or she is very amanah (trusted) particularly in managing the money (VP4).

These statements, the beliefs, and values reinforces the importance of leadership of the principal in running the school.

DISCUSSION

From the description and field data obtained will enable to assist how strengthening the leadership

of the principal can be formulated. The formula for strengthening the headmaster model is clearly how a leader can ensure the direction and motion of organisational behavior toward a very clear goal. The purpose of a vocational high school is how to ensure graduate students are ready for the work market. The ability to obtain good work for himself and for others. The models of school leadership reinforcement in East Nusa Tenggara can be described in Figure 1.

From the Figure 1 explained the principal plays its role in a central way. The principal is appointed in a special institution who is responsible for designing, formulating and describing the qualifications of graduates demanded by the market consistently in the school system. The fulfillment of school qualifications is monitored directly by National Working Competency Standard of Indonesia (SKKNI) and Indonesia National Qualifications Framework (KKNI) to ensures that the educational stage is carried out correctly.

How does the principal strengthen his leadership? In the picture is clearly mentioned some research findings that provide strengthening of leadership. Strengthening school leadership is a local understanding of local culture, benchmarking, professional training, increased trust, strong character, and high integrity. The reinforcement received by the school will have an impact on the school's organizational system to design the needs of school graduates from the market demand, to determine postgraduate qualifications with the qualities and preparation of specific graduates before entering the workforce. The findings of models in remote areas, such as in the province of East Nusa Tenggara, became embryos for broader and more detailed developments because the number of students and understanding the needs of employees in world education.

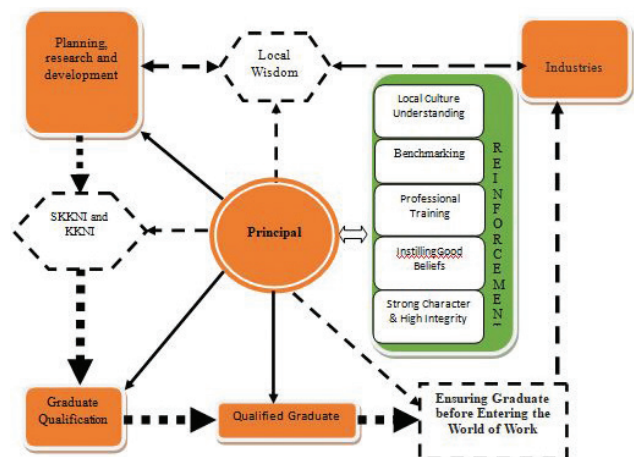


Figure 1: Model of school leadership reinforcement in East Nusa Tenggara

CONCLUSION

In this study the principal leadership is found by using several models of leadership. The application of this model depends on the influence of the existing situation and conditions. In implementing the model of school leadership strengthening requires the principal to have a clear vision in producing graduates who are ready to work. School leaders can establish similar institutions of planning, research and development institutions to support and produce appropriate outputs of the Vocational High Schools (VHS) vision and mission. These supporting institutions can provide valuable inputs to enable schools to produce output that meets the requirements of the industries.

ACKNOWLEDGMENTS

The authors wish to thank the Direktorat Riset dan Pengabdian Masyarakat for funding this research and Universitas Ahmad Dahlan (UAD) for supporting this research.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Bjork C. Indonesian Education: Teachers, Schools, and Central Bureaucracy. New York: Routledge. 2005; Retrieved from <https://books.google.com.my/books?id=-GIKCAAQBAJ>
- 2, BPS. Tingkat Pengangguran Terbuka (TPT) sebesar 5,13 persen, Rata-rata upah buruh per bulan sebesar 2,65 juta rupiah. 2018; Retrieved June 7, 2018, from <https://www.bps.go.id/pressrelease/2018/05/07/1484/februari-2018--tingkat-pengangguran-terbuka--tpt--sebesar-5-13-persen--rata-rata-upah-buruh-per-bulan-sebesar-2-65-juta-rupiah.html>
3. Cowie M, Crawford M. Principal preparation - Still an act of faith? *School Leadership and Management*. 2007; 27(2): 129–146. <https://doi.org/10.1080/13632430701237198>
4. Creswell J. W. Educational research: Planning, conducting, and evaluating quantitative and qualitative research. *Educational Research*.

- Lincoln: Pearson. 2012. <https://doi.org/10.1017/CBO9781107415324.004>
5. Damanik E. Transformational Leadership and Its Impact on School Climate and Teacher Self-Efficacy in Indonesian Schools Enceria Damanik. Unpublished PhD Thesis. Curtin University of Technology. 2014; Retrieved from https://espace.curtin.edu.au/bitstream/handle/20.500.11937/391/200089_Damanik2014.pdf?sequence=2
6. Day C, Harris A, Hadfield M. *Leading Schools In Times Of Change*. United Kingdom: McGraw-Hill Education. 2000; Retrieved from <https://books.google.com.my/books?id=VXDIAAAQBAJ>
7. Day C, Sammons P, Gu Q. Combining Qualitative and Quantitative Methodologies in Research on Teachers' Lives, Work, and Effectiveness: From Integration to Synergy. *Educational Researcher*. 2008; 37(6): 330–342. <https://doi.org/10.3102/0013189X08324091>
8. Ditpsmk. Direktorat Pembinaan Sekolah Menengah Kejuruan. 2018; Retrieved June 1, 2018, from <http://datapokok.ditpsmk.net/>
9. Fitriah A, Sumintono B, Subekti N. B, Hassan Z. A different result of community participation in education: An Indonesian case study of parental participation in public primary schools. *Asia Pacific Education Review*. 2013; 14(4): 483–493. <https://doi.org/10.1007/s12564-013-9275-8>
10. Gall M. D, Gall J. P, Borg W. R. *Educational Research: An Introduction*. Boston: Pearson. 2007.
11. Hariri H, Monypenny R, Prideaux M. Principalship in an Indonesian school context: Can principal decision-making styles significantly predict teacher job satisfaction? *School Leadership and Management*. 2012; 32(5): 453–471. <https://doi.org/10.1080/13632434.2012.723617>
12. Hess F. M, Kelly A. P. Learning to Lead: What Gets Taught in Principal-Preparation Programs. *Teachers College Record*. 2007; 109(1): 244–274.
13. Hinkin T. R, Schriesheim C. A. Leader reinforcement, behavioral integrity, and subordinate outcomes: A social exchange approach. *Leadership Quarterly*. 2015; 26(6): 991–1004. <https://doi.org/10.1016/j.leaqua.2015.10.006>
14. Hofstede G. H. Culture's consequences: international differences in work-related values.

- Cross-Cultural Research and Methodology series. SAGE Publications. 1980. <https://doi.org/10.5465/AME.2004.12689661>
15. Jawas U. Instructional Leadership In Indonesian School Reform: Local Perceptions And Practices. Kansas State University. 2014; Retrieved from http://www.canberra.edu.au/researchrepository/file/ded16a8c-1fb6-4b12-81d7-bf6eb7e5e4d4/1/full_text.pdf
 16. Jones G. W, Hagul, P. Schooling in Indonesia: Crisis-related and longer-term issues. *Bulletin of Indonesian Economic Studies*. 2001; 37(2): 207–231. <https://doi.org/10.1080/00074910152390892>
 17. Kristiansen S, Pratikno. Decentralising education in Indonesia. *International Journal of Educational Development*. 2006; 26(5): 513–531. <https://doi.org/10.1016/j.ijedudev.2005.12.003>
 18. Lee M, Hallinger P. National contexts influencing principals' time use and allocation: economic development, societal culture, and educational system. *School Effectiveness and School Improvement*. 2012; 23(4): 461–482. <https://doi.org/10.1080/09243453.2012.678862>
 19. Leithwood K. a (University of T, Jantzi D, Dimmock C, Goh, J. W. P, Mulford B, Kendall D, ... Hadfield M. Jossey-Bass. *Jossey-Bass Reader on Educational Leadership (3rd Edition)*. Somerset, NJ, USA: John Wiley & Sons, 2013. ProQuest ebrary. Web. 29 September 2015. Copyright © 2013. John Wiley & Sons. All rights reserved. *Educational Management Administration & Leadership*. 2012; Vol. 42. <https://doi.org/10.1080/13603120500483672>
 20. LP2KS. Lembaga Pengembangan dan Pemberdayaan Kepala Sekolah. 2016; Retrieved September 24, 2016, from <http://lppks.kemdikbud.go.id/>
 21. Merriam S. B. Case studies as qualitative research. *Qualitative research and case study applications in education*. San Francisco: Jossey-Bass. 1998.
 22. MoNe. Peraturan Menteri Pendidikan Nasional nomor 13 Tahun 2007 tentang Standar Kepala Sekolah. Jakarta, Indonesia. 2009.
 23. Ndiga B, Mumiukhacatherine khakasa C, Flora F, Ngugi M, mwawala shem. Principals' Transformational Leadership Skills in Public Secondary Schools: A Case of Teachers' and Students' Perceptions and Academic Achievement in Nairobi County, Kenya. *American Journal of Educational Research*. 2014; 2(9): 801–810. <https://doi.org/10.12691/education-2-9-15>
 24. Nettles S. M, Herrington C. Revisiting the importance of the direct effects of school leadership on student achievement: The implications for school improvement policy. *Peabody Journal of Education*. 2007; 82(4): 724–736. <https://doi.org/10.1080/01619560701603239>
 25. Pont B, Nusche D, Hunter M. Improving School Leadership VOLUME 1: POLICY AND PRACTICE (Vol. 1). Paris: OECD PUBLICATIONS. 2008; Retrieved from www.oecd.org/publishing/corrigenda
 26. Raihani. An Indonesian model of successful school leadership. *Journal of Educational Administration*. 2008; 46(4): 481–496. <https://doi.org/10.1108/09578230810882018>
 27. Sofo F, Fitzgerald R, Jawas U. Instructional leadership in Indonesian school reform: Overcoming the problems to move forward. *School Leadership and Management*. 2012; 32(5): 503–522. <https://doi.org/10.1080/13632434.2012.723616>
 28. Sumintono B, Sheyoputri E. Y. A, Jiang N, Misbach I. H, Jumintono. Becoming a principal in Indonesia: possibility, pitfalls and potential. *Asia Pacific Journal of Education*. 2015; 35(3): 342–352. <https://doi.org/10.1080/02188791.2015.1056595>
 29. Sumintono B, Subekti N. B. Teacher in-service training and re-training in Indonesia. In K. G. Karras & C. C. Wolhuter (Eds.), *International Handbook of Teacher Education Nicosia: Studies and Publishing*. 2014; pp. 255–272. Retrieved from http://eprints.um.edu.my/14227/1/International_handbook_contents_Indonesia_Bambang-Nanang.pdf
 30. Thody A, Papanoum Z, Johansson O, Pashiardis P. School principal preparation in Europe. *International Journal of Educational Management*. 2007; 21(1) 37–53. <https://doi.org/10.1108/09513540710716812>
 31. Widodo J. Kepemimpinan Pendidikan Transaksional dan Transformasional di SMK Non Teknik. *Jurnal Pendidikan Ekonomi*. 2008; 3(1): 123–138.
 32. Yan W, Ehrlich, L. C. Principal preparation and training: A look at China and its issues. *International Journal of Educational Management*. 2009. 23(1): 51–64. <https://doi.org/10.1108/09513540910926420>

Estimating Optimal Resource Capacities in Emergency Department

Ireen Munira Ibrahim¹, Choong-Yeun Liong², Sakhinah Abu Bakar³, Norazura Ahmad⁴,
Ahmad Farid Najmuddin⁵

^{1,5}Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Perak Branch, Tapah Campus, Tapah Road, 35400 Perak, Malaysia; ^{1,2,3}School of Mathematical Sciences, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia; ^{3,4}School of Quantitative Science, College of Arts and Sciences, Universiti Utara Malaysia, 06010, Sintok, Kedah DA, Malaysia

ABSTRACT

This study discussed the computer simulation model development for Green Zone (GZ) of an Emergency Department (ED) using discrete event simulation approach. Due to the delay in getting treatment that contributed to patients overcrowds issue and long waiting time, the ED management needs a tool that can be used to analyze the current operation and understand their resource capacities to improve the services' quality. Any imprecise decision made to overcome this problem may lead to a more serious problem towards the future. The developed simulation model was used to test an increase in level of demands and how it will affect the performance of GZ. The computer simulation model development is based on 24 hours collected data for a month period. The results from the simulation runs are evaluated and discussed with the ED management for possible areas of improvements. The OptQuest functionality in Arena software was used to find the optimal number of resources required based on demands. The improvement model is developed based on the results of the optimization process and its conclusive findings show the enhanced model significantly improves ED's performance in term of the total average patients' waiting time and the utilization rate of staffs.

Keywords: *emergency department, simulation-optimization model, optimal resource*

INTRODUCTION

Emergency Department (ED) is a main entrance to the hospital that serves critical and non-critical patients in need 24 hours daily, where respectable and timely performance could save lives. However, with the increase in population every year, the number of ED visits may increase as well, and this will cause overcrowding and long waiting time issues. These issues are commonly faced by ED around the globe. ¹ stated that the EDs utilization rate in public hospital has increased in five years, and the GZ utilization rate is the highest as compared to other zones. Although, the GZ is for treating non-critical patients, long waiting time and overcrowding continually be an issue as the number of patients is always high for this zone². It may cause dissatisfaction among patients since they must spend more time to get the required service and the staffs also must work for a very long hour.

Previous studies have shown that the problem arises due to limited number of resources available in the department, where having a proper planning and reallocation of the resources are seriously important^{3,4,5,6}. ED management has implemented various actions to deal with these issues. Adding and reallocating the resources directly into current system are the common ED management decisions to overcome the problem and mostly being done manually by trial and error basis. In some cases, the outcomes of such decision may lead to even serious scenarios. Any decisions with uncertain implications will only risk the whole operation of ED, thus the management need to study every detail of the operation before the final decision being made.

The ED understudy has their own Key Performance Indicator (KPI) to measure the GZ performance. The main concern of the ED management is to find the optimal resources required in the zone when the number of patients increased without increasing the acceptable waiting time level as stated in the KPIs.

Computer Simulation is one of the tools that can be used to analyze the current problem. It has been widely used in many operations, such as healthcare industry, logistics and transportations, military operations and manufacturing to examine the processes involved and product flows⁷. Numerous studies have applied operational research methods to find solutions towards problems in healthcare domains⁸ but computer simulation is among the most popular method⁹. Computer simulation is suitable to study or modeling a complex system like ED. The embedded animation features in simulation model help the ED management to further understand their model easily, since they do not have a sufficient time to study methods that involved complex numerical equations⁵. Besides, the simulation model can assist the management to identify unforeseen bottlenecks, to avoid over or under utilization of resources and optimize system performance¹⁰. Simulation also able to evaluate the existing system and proposed tested alternatives without affecting the actual system.

Discrete Event Simulation (DES) is one of the simulation approach that is not time consuming, cost saving and proven to be the most effective tool for decision maker to analyze complex system¹¹ and to amend the system without affecting current operations¹⁰. Previous studies have used DES in improving the performance of ED by several scenarios such as to decrease patients' waiting time and length of stay^{12, 13, 14}, to analyze resource utilization and allocation of resources^{15, 16, 17}, to find an optimal number of resources^{18, 19} and to determine or predict number of patient load²⁰. Single implementation of DES is not sufficient because simulation model can only provide estimates value and not exact values⁵. Therefore, some other research had combined DES with other optimization techniques such as Data Envelopment Analysis (DEA), Particle Swarm Optimization (PSO), Ant Colony Optimization, Data Mining, Agent Based Optimization, Genetic Algorithm and others. Those methods used to study patients' flow²¹, to find optimal scheduling of staffs^{22, 23}, to determine resources allocation²⁴,²⁵ and to analyze system performance²⁴.

Therefore, the aim of this study is to develop a computer simulation model capable of depicting the current operation of the ED and the results obtained from the simulation model will be used to determine the optimal resources required based on the demand by using optimization approach.

This paper is organized into four sections; in section 2, the materials and methods used for the simulation

development process is discussed. In section 3, the results obtained from the simulation and optimization model are discussed. Lastly, conclusions and future work will be discussed in section 4.

MATERIALS AND METHOD

Based on the above issues of the current situation in ED's GZ, it seems necessary for the management to find more efficient optimal resources utilization to handle increasing level of demand. A simulation model is developed in this study to be utilized for assessment and strategic planning of ED. The objectives of this study are summarized as follows; to model the ED GZ actual system using simulation model, to examine the performance of the system when the number of patients increased and to determine the number of resources required (such as staffing and physical capacities) to improve the ED performance. This is to ensure that the service capacity is match to the patient demand.

System Description: The ED understudy operates 24 hours daily with total average of 2977 patients per week. It is divided into three zones; GZ for non-critical patient, Yellow Zone for semi-critical patient and the Red Zone for critical patient. The patients who arrived at the ED will be triaged first and will be attended for treatment according to the established target time of the ED understudy as shown in Table 1.

Table 1: Patient's triage system and established target time

Triage Zone	Case	Target Time
Red	Critical	Immediately
Yellow	Semi-Critical	Within 30 minutes
Green	Non-Critical	Within 2 hours

In this study, we only focused on GZ because based on patient arrival statistic recorded by the ED understudy, more than 70% of patients per week are from GZ. Besides, based on our previous study¹¹, it shown that the average patients' waiting time for GZ is the highest as compared to other zones. Therefore, the ED management attempt to improve more on GZ operation. Currently, the GZ operates with 4 consultation rooms handled by 4 doctors and 4 nurses for each shift. There are 2 medical assistants (MA) for triage process and 2 MAs for laboratory tests. Work schedule for doctors, nurses and MAs is shown in Table 2. Figure 1 shows the general flow of patient (from arriving until they are discharged or admitted) and the processes involved in GZ.

Table 2: Staff’s work schedule

	Shift 1	Shift 2	Shift 3
Doctor	10.00 am – 5.00 pm	5.00 pm – 12.00 am	12.00 am – 10.00 am
Nurse	7.00 am – 2.00 pm	2.00 pm – 9.00 pm	9.00 pm – 7.00 am
MA	7.00 am – 2.00 pm	2.00 pm – 9.00 pm	9.00 pm – 7.00 am

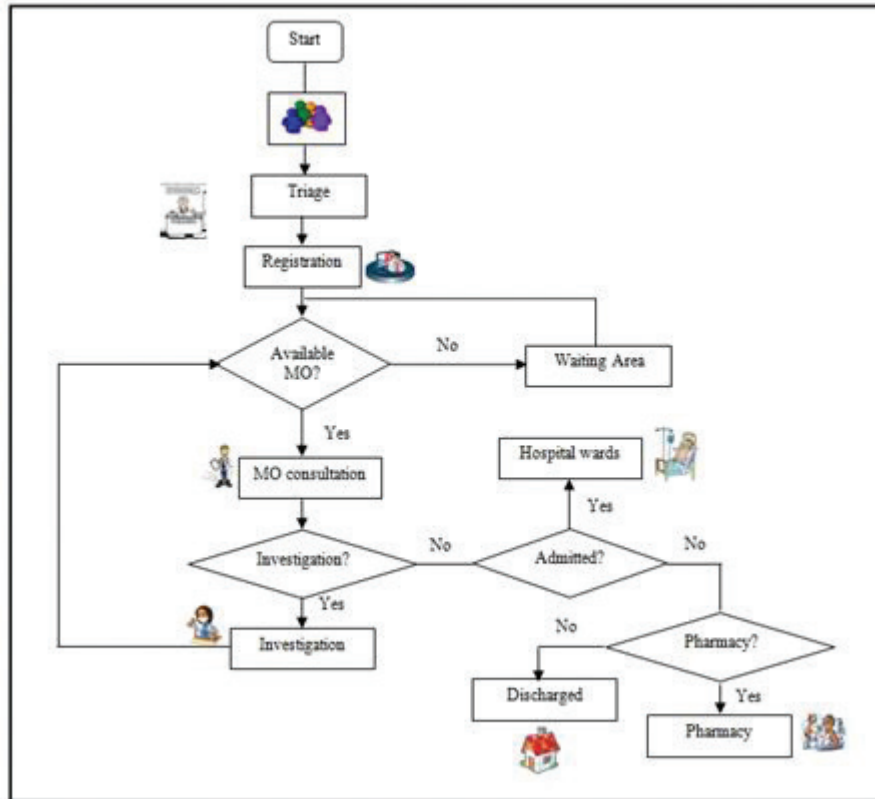


Figure 1: The general flow of patients at GZ

Patients usually arrives at ED’s GZ either by walk-in or by any means of transportation (personal or public transport). Once arrived, the patient will have wait for the triage process. Normally for this process, MA will check the vital signs and other patient’s conditions. After that, the patient is required to register at the designated registration counter and then they will have to wait at the waiting area until being called for treatment. Each patient may encounter different waiting time depends on the consultation rooms availability. After receiving consultation from the doctors, the patient are informed for further tests (lab tests, CT-scan, x-ray or else) if required. Results from the investigation tests are reviewed by the doctor and the decision for further tests will be made (if any). Otherwise, the patient will be discharged or admitted to the ward. According to the ED manager’s experience, about 80% of green zone patients will be discharged. Therefore, this study excluded the process of waiting to be admitted. Also, about 2% of patient will be temporarily observed at yellow zone

before being discharged. This process is also excluded in the simulation model. Medicine will be prescribed for discharged patients, where it can be collected at the pharmacy counter before leaving the system.

Process of Data Collection: To develop a reliable simulation model, the data is collected by interviewing the ED management including doctors, nurses and medical assistants. This process involved ED’s documents review and direct observations of ED operation. ED understudy is lack of some data especially the processing time for each treatment experienced by the patients. Most of the data is manually recorded in log books. Therefore, in this study, the data is collected and recorded manually through observations. The data collection process is being performed by an appointed team for a month duration. Then, the data are converted into the distribution functions to be used in the simulation model development process.

Development of Simulation Model: The first phase of this study is to develop a simulation model. The GZ simulation model was developed using Arena 14.1. Arena software is chosen as it is a flexible tool for modeling the ED. This software has an animated feature that tend to ease the understanding of ED management⁵ towards their system. The development of this model starts by investigating and analyzing the actual system. This process includes analyzing and observing the GZ layout, the flow of patient, the relationship between processes and available resources involved. This investigation helps to provide better understanding of the operation of this zone. It also helps us to identify the constraints to the flow, which to be included in the development process.

The data collected from the previous phase is inserted into Arena Input Analyzer to determine the suitable distributions. Those distributions are inserted into six connected modules (arrival, triage, register, consultation, investigation and pharmacy) and executed for 24 hours with 12 replications each to get average and accurate results. The completed simulation model is verified and validated to make sure that it successfully replicates the actual system operations. The model is executed and reviewed by ED management for errors. Once the verification is completed, the validation test took place. This is to ensure that the simulation results are as expected and represent the real system¹². Then, the results are presented to the ED management to confirm the validity of the model based on their knowledge and experience. Additionally, the validation test is also being performed using the mathematical formula as follows:

$$\text{Difference (\%)} = \frac{|\text{Simulation output} - \text{Actual data}|}{\text{Actual data}} \times 100\%$$

The results from the simulation model will be compared with the actual collected results and the resulting difference must be less than 10% for it to be considered as valid and achieved the accuracy level²⁶. To determine the optimal number of resources based on the number of patients, the embedded optimization tool in Arena software, named OptQuest, was used. For this optimization model, we used our previous model as discussed in⁷ and some modification made to the constraints part. The results from the optimization model were applied to the GZ model and the average patients' waiting time and the staff's utilization rate will be evaluated.

RESULTS AND DISCUSSIONS

Validation Results: For this validation test, the total number of patients, and number of patients went to pharmacy for the simulation model are compared to the actual 7 days data collected previously are shown in Table 3. This calculation is based on the mathematical formula stated in the previous section. The validation percentage between simulation model output and the actual data for the number of patients exit the system is 1.61% which is under the acceptable level of accuracy. Also shown in the table, the validation percentage for the total number of patients at pharmacy process, which is also in the acceptable range, 2.75%. Therefore, the simulation model is concluded as valid and acceptable to be used for decision making process.

Table 3: Validation results between simulation model and actual data

Item	Simulation Output	Actual data	Validation (%)
Total number of patients	2620	2663	1.61
Total number of patients for pharmacy	1519	1562	2.75

Simulation Results: There are 3 outputs monitored in this model for performance measures purposes as follows; total number of patient being treated in the system, total average patients' waiting time and staffs' utilization rate. The results are shown in Table 4 below. The average utilization rate for doctors, nurses and medical assistants are still in acceptable range of good utilization rate of a service sector, which is between 70% to 80% as stated in⁶. As we can see from the table, the total average of patients' waiting time is 264.78 minutes (almost 5 hours) which is quite high, and this is the reason why overcrowded situation occur and it also might cause dissatisfaction among patients.

Table 4: GZ simulation model's results

Item	Simulation Results
Total number of patients (per day)	377 patients
Total average patients' waiting time	264.78 (minutes)
Average Utilization Rate	
Doctor	71 %
Nurse	70 %
Medical Assistant	64 %

From the above results, the ED management needs to know the consequences if the number of patient increased than usual. This is to help them to understand how resource availability will affect the performance of the GZ. Table 5 illustrates the percentage of demand increase based on the discussion with ED management (the increase percentage is based on their

past experiences). From the table, the simulation model shows that when the number of patient increased, the total average patients' waiting time will also increase up to 7 hours (402.15 minutes) and the utilization of staffs also increase to almost 90%, which exceeds the acceptable range of 70% to 80% as stated before.

Table 5: Changes in number of patients, total average patients' waiting time and staffs' utilization rates

% Increase in number of patients	Number of arrival	Total average patients' waiting time (minutes)	Average utilization rate (%)		
			Doctor	Nurse	Medical Assistant
0 (GZ model)	377	264.78	71	70	64
5	396	281.78	75	73	69
12	422	298.37	80	78	74
15	434	323.35	85	84	78
21	456	365.74	88	86	81
23	464	389.44	91	89	85
30	490	402.15	93	90	87

Improvement Model: Several modifications to the GZ model are suggested and discussed with the ED management to determine the optimal resources required to cater the mentioned problem. The optimization model from our previous study was modified based on the current situation and the objective was set to "minimize total average patients' waiting time". Lower and upper bound for the resource constraints are set by the ED management. Table 6 shows the optimal number of resources suggested to serve the increase in number of patient obtained from the OptQuest function in Arena software. It shows that, number of resources needs to be added to the system to meet the number of demand.

Lastly, the simulation improvement model (IM) was constructed by altering related capacity based on the optimal results obtained from the previous phase. This improvement model is run similar as GZ model with 12 replications and the results are shown in Table 7 below.

Besides following the established targeted time as mentioned before in section 1, the ED understudy also has their own KPI for the total average patients' waiting time. For total average patients' waiting time, their KPI is to serve patients within 3 hours. Based on the results in Table 6, when the number of resources increased, the total average patients' waiting time has decreased significantly for improvement model, IM1 (53.32 minutes reduction), IM2 (125.13 minutes reduction) and IM3 (154.15 minutes reduction). Even though the improvement model, IM4, IM5 and IM6, are over the targeted time but it is not far enough to be accepted. The utilization rate for doctors, nurses and medical assistant are also reduced and within the acceptable range. Perhaps, it can reduce the dissatisfaction and tiredness among staffs due to long working hours.

Table 6: The Optimal number of resources for each demand

% Increase in number of patients	Number of resources		
	Doctor	Nurse	Medical Assistant
5	7	9	5
12	7	9	5
15	7	11	5
21	8	12	6
23	9	12	6
30	9	14	7

Table 7: The improvement model results compared to GZ simulation model (before)

Model	Total Average patients' waiting time (minutes)		Average utilization rate (%)					
			Doctor		Nurse		Medical Assistant	
	Before	After	Before	After	Before	After	Before	After
IM1	281.78	179.32	75	70	73	69	69	60
IM2	298.37	173.24	80	75	78	71	74	66
IM3	323.35	169.20	85	75	84	76	78	69
IM4	365.74	193.21	88	77	86	79	81	72
IM5	389.44	198.06	91	79	89	79	85	74
IM6	402.15	215.34	93	81	90	81	87	77

CONCLUSIONS AND FUTURE WORKS

This study presents a development of a computer simulation model of GZ in ED. The simulation model is developed using DES approach with the aim to provide the ED management with a better understanding towards their system and to help them in analyzing the performance of the system. This study incorporates the simulation model with optimization approach to determine the optimal number of resources required to meet an increase in demand without increasing the average patients' waiting time and staffs' utilization rate. The results from simulation model show that, when the number of patients increased to a certain percentage, the total average patients' waiting time and utilization rate of staffs will also increase. This may contribute to the overcrowded situation and dissatisfaction among patients and staffs. Therefore, an improvement models are tested to measure the performance of the GZ. These improvement models are constructed based on the optimization process using the OptQuest functionality in Arena software.

The results of the improvement models show that by increasing the number of resources (doctors, nurses and medical assistants), the total average patients' waiting time is reduced significantly and within the targeted KPI of the GZ. In addition, the average utilization rate of staffs is also reduced between the acceptable range of 70% to 80%.

Through this simulation model and optimization process, the ED management able to understand the problems occurred in their current system and they can utilize it to perform "what-if" analysis for any potential improvements. This model perhaps able to assist them in decision making without directly affecting the actual system.

Although the results obtained are acceptable and helpful to the ED management, there are many limitations and constraints needed to be considered for future works. Some of the data also are not included in the simulation model due to lack of information about the data. Therefore, for the future work, these constraints and unavailable data must be studied in thoroughly before it can be included in the model.

ACKNOWLEDGMENTS

The authors wish to thank Universiti Teknologi MARA (UiTM), Universiti Kebangsaan Malaysia (UKM) and Emergency Department understudy for their trust and support towards this research. The authors also wish to thank many individuals for their direct and indirect involvements in this research. The supports given are highly appreciated.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. W. D. S. Arinah, I. Faisal, H. J. Muhamad, I. Ismail, A. S. Mohamed. Factors Associated with Emergency Department Green Zone Utilization in Hospital. *Int. J. of Pub. Health and Clinical Sci.* 2016; 3: 159 – 173.
2. A. K. Erenler, I. Ozel, Y. Ece, M. Karabulut, A. Orucoglu, E. Ciftci. Analysis of triage application in Emergency Department. *Open J. of Emer. Med.* 2015; 3: 13 – 17.
3. M. Gunal, M. Pidd. "Understanding accident and emergency department performance using

- simulation”. Proceedings of the 2006 Winter Simulation Conference, edited by L. F. Perrone et al. Monterey, CA. 2006; pp. 446 – 452.
4. E. M. W. Kolb, T. Lee, J. Peck. “Effect of Coupling between emergency department and inpatient unit on the overcrowding in emergency department”. Proceedings of the 2007 Winter Simulation Conference, edited by E. M. W. Kolb et al. Washington, DC. 2007; pp. 1586-1593.
 5. N. Ahmad, N. A. Ghani, A. K. Anton, R. M. Tahar. Evaluating Emergency Department Resource Capacity Using Simulation. *Modern App. Sci.* 2012; 6: 9 – 19.
 6. M. R. Zulkifli, A. Muthukkaruppan, K. Isahak, R. A. “Estimating the Right Allocation of Doctors in Emergency Department”. Proceedings of 2016 Knowledge Management International Conference (KMICE). Chiangmai, Thailand. 2016; pp. 446 – 452.
 7. I. M. Ibrahim, C. Y. Liong, S. A. Bakar, N. Ahmad, A. F. Najmuddin, “Minimizing Patient Waiting Time in Emergency Department of Public Hospital using Simulation Optimization Approach”. Proceedings of The 4th International Conference on Mathematical Sciences. Bangi, Selangor. 2017; pp. 1 – 8.
 8. L. Garg, S. McClean, M. Barton. “Is management Science doing enough to improve healthcare?”. Proceedings of World Academy of Science, Engineering and Technology. 2008; pp. 76 – 80.
 9. R. Davies, H. Davies, H. Modelling patient flows and resource provision in health systems. *The Int. J. of Mgmt. Sci.* 1994; 22: 123-131.
 10. S. C. Brailsford, P. R. Harpar. An analysis of the academic literature on simulation and modelling in health care. *J. of Simulation.* 2009; 3: 130-140.
 11. W.D. Kelton, R. P. Sadowski, N. B. Zupick. *Simulation with Arena.* McGraw Hill, 2015.
 12. S. Samaha, W. S. Armel, D. W. Starks, “Emergency Department I: The use of simulation to reduce the length of stay in an emergency department”. Proceedings of the 35th Winter Simulation Conference: Driving Innovation. New Orleans, Louisiana. 2003; pp. 1586-1593.
 13. S. Ajami, M. Yarmohammadian, S. Ketabi and H. Bagherian, Waiting Time in Emergency Department by Simulation. *Stud. In Health Tech. & Info.* 2011; 164: 196 – 200.
 14. N. Nunez-Perez, M. Ortis-Barrios, S. McClean, K. Salas-Navarro, G. Jimenez-Delgado, A. Castillo-Zea. “Discrete-Event simulation to Reduce Waiting Time in Accident and Emergency Departments: A Case Study in a District General Clinic”, International Conference on Ubiquitous Computing and Ambient Intelligence. UCAml 2017. Lecture Notes in Computer Science, vol. 10586. Springer, Cham.
 15. W. Abo-Hamad, A. Arisha. Simulation-based framework to improve patient experience in an emergency department. *Eur. J. Oper. Res.* 2013; 224: 154 – 166.
 16. S. Brenner, Z. Zeng, Y. Liu, J. Wang, J. Li and P. K. Howard. Modeling and analysis of the emergency department at University of Kentucky Chandler Hospital using simulations. *J. Emerg. Nurs.* 2010; 36: 303–310.
 17. F. Kadri, S. Chaabane and C. Tahon, A simulation-based decision support system to prevent and predict strain situations in emergency department systems. *Simul. Model. Pract. Theory.* 2014; 42: 32 -52.
 18. W. M. W. M. Aminuddin, W. R. Ismail, and H. Harunarashid, Estimating Emergency Department Maximum Capacity using Simulation and Data Envelopment Analysis. *Ind. J. of Sci. & Tech.* 2016; 9: 1 – 10.
 19. A. Al-Refaie, R. H. Fouad, M. H. Li, M. Shurrab, Applying simulation and DEA to improve performance of emergency department in a Jordanian hospital. *Simul. Model. Pract. Theory.* 2014; 41: 59 – 72.
 20. L. Jeniffer, T. Richard, T. Olsen, Review of Modeling Approaches for Emergency Department Patient Flow and Crowding Research. *J. of Acad. Emerg. Med.* 2011; 11: 1371 – 1379.
 21. R. Ceglowski, L. Churoilov, J. Wasserthiel, Combining Data Mining and Discrete Event Simulation for a value added view of a hospital emergency department. *J. of the Ops. Res. Soc.* 2007; 58: 246 – 254.

22. C. C. Lo, T. Lin. "A Particle Swarm Optimization approach for physician scheduling in a hospital emergency department". *Natural Computation (ICNC). 2011 Seventh International Conference.* Shanghai, China. 2011; pp. 1929 – 1933.
23. F. Fruggiero, A. Lambiase, D. Fallon. *Computer Simulation and Swarm Intelligence Organisation into an Emergency Department: A Balancing Approach across Ant Colony Optimisation.* *Int. J. of Sci. Ops. & Info.* 2008; 3: 142 – 161.
24. S. J. Weng, B. C. Cheng, S. T. Kwong, L. M. Wang, C. Y. Chang. "Simulation Optimization for Emergency Department Resources Allocation". *Proceedings of the 2011 Winter Simulation Conference*, edited by S. Jain et al. Phoenix, AZ. 2011; pp. 1231-1238.
25. K. Ghanes, M. Wargon. O. Jouini, Z. Jemai, A. Diakogiannis, R. Hellmann, V. Thomas, G. Koole. *Simulation-based optimization of staffing levels in an emergency department.* *Simul. Trans. of the Soc. For Model. & Simul. Int.* 2015; 91: 942 – 953.
26. J. S. Carson. "Model verification and validation", *Proceedings of the 2002 Winter Simulation Conference.* edited by E. Yücesan et al. San Diego, CA. 2002; pp. 52-58.

A System Dynamics Model for Predicting Present and Future Demands in Emergency Department's Green Zone

Nazhatul Sahima Mohd Yusoff¹, Choong-Yeun Liong², Abu Yazid Md Noh³, Wan Rosmanira Ismail⁴,
Norazura Ahmad⁵

¹Faculty of Computer Sciences & Mathematics, Universiti Teknologi MARA (UiTM) Cawangan Kelantan, 18500 Machang Kelantan, Malaysia; ^{2,4}School of Mathematical Sciences, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia; ³Jabatan Kecemasan, Hospital Universiti Sains Malaysia (HUSM), Jalan Raja Perempuan Zainab 2, 16150 Kota Bharu Kelantan, Malaysia; ⁵School of Quantitative Sciences, CAS Universiti Utara Malaysia, 06010 Sintok, Kedah Malaysia

ABSTRACT

The increasing number of patients each year visiting to the Green Zone in Emergency Department of Hospital Universiti Sains Malaysia (EDHUSM) requires a reasonable projection and proper planning of resources in order to meet the growing demand of the patients. Proper planning and the repercussions are required to be conducted for the present and the future in order to assist the management to improve the patients flow and services in Green Zone EDHUSM during weekdays, weekends and public holidays. Since the system in the Emergency Department is very complex, a computer simulation model is essential in order to understand the structure and behaviour of the system. Therefore, System Dynamics simulation is used to predict the number of patients that will visit and the resources required to match the demand and supply during weekdays, weekends and public holidays in the Green Zone at the present and for the future for the next five and ten years. The results show at the present, there are resources gaps of three doctors and three nurses on weekdays, while six doctors and six nurses on weekends as well as on public holidays. Therefore, adding new staff are really important in order to improve the patients flow in Green Zone EDHUSM and vital for achievement of the department's KPI. The result garnered from this research will assist the management to make a sound decision within their stipulated budget to improve the quality of services rendered and further enhance the performance of EDHUSM's Green Zone.

Keywords: *System Dynamics, Predicting, Weekdays, Weekends and Public Holidays*

INTRODUCTION

An emergency department (ED) is one of the busiest and vital units in hospitals as it provides immediate treatment to patients who either by walks in or transported in by ambulance without prior appointments in the healthcare systems. EDs are opened and resourced 24 hours every day including working days and holidays. Hence, EDs all over the world are vesting efforts and struggles to maintain high service levels, which are reflected and measured through the patient's waiting time while confronting the increased of patient volume and constrained by limited resources¹. The EDs are often zoned based on level of criticalities and services rendered. The Green Zone located in the ED is designated to attend patients with non-critical conditions and injuries². Although the Green Zone in EDs caters

non-critical cases, many patients still experiences long waiting time before receiving treatment. Due to this downside, a few patients even leave without being treated, particularly during peak hours and overcrowded situations. Consequently the priority of any ED in the world is to provide fast and swift treatment by reducing the patient's waiting time and length of stay³. Moreover, the other trouble that surrounds the ED is the shortage of resource allocations like medical officers and beds⁴.

In light of this, the hospital administrations are seeking and in their quest to find an effective way to achieve the effective balance between the demand and supply in ED⁵. Relatively, it's more than often that the difference in demand and supply contributes largely towards the bottlenecks faced in the ED. Therefore, in an effort to strive the balance between demand and supply,

several methods were explored by previous researchers to solve these problems. In resultant, some of the methods positively contributed towards the solution, sought while some of the methods explored deem to have failed⁶.

As healthcare environment is highly intolerant of failure, the most effective way for decision makers to study, analyze and evaluate processes, whether it is simple or complex processes is through the simulation method as it is proven to be the most powerful tool which garners better result⁷. Researchers have conducted various studies in the ED using simulation that are associated with resource allocation, improvement in patient flow and a reduction in the patient's waiting time^{8,11}. Relatively, there were also several exceptional studies conducted in the ED using System Dynamics (SD), a model developed and applied to predict ED demand¹². Previous scholars^{4,6} have applied SD to simulate the impact of an increase in patient's volume in a government hospital in the Northern region of Peninsular Malaysia. Similarly¹³ developed an SD model in order to project and predict on the future demand of medical specialists at Emilia-Romagna Region.

Although most studies focused on operations in ED which involves improvement in all three zones parallel using SD, but minimal focus were vested in detailing problems faced by each zone. Besides that, there are limited literatures that reports on the use of this approach in order to resolve the problems encountered by the Green Zone in the ED. Therefore, this study will focus on the EDHUSM' Green Zone, which is indeed one of the busiest hospitals located in the capital city of Kelantan, Malaysia. The lengthy patient's waiting time and overcrowded situation, especially after office hours throughout the weekdays, weekends and public holidays gravely contributes to the problem that occurs in Green Zone EDHUSM. These problems also indirectly contribute to the non-achievement of the department's Key Performance Indicator (KPI), especially on weekends and public holidays. In 2009, the Ministry of Health (MOH) introduced and set the maximum key performance indicator (KPI) to be within 90 minutes for patient to receive consultation and treatment at the ED's Green Zone⁵. In our case study, the KPI before receiving consultation and treatment for Green Zone at EDHUSM is at below 120 minutes.

Even though the KPI of EDHUSM is slightly higher compared to the KPI of MOH, the EDHUSM's Green

Zone still faces difficulty in achieving the targeted time. Based on the interviews and surveys conducted, the factors which contribute towards these problems is the insufficient resources whereby there are a low number of medical staffs such doctors and nurses working in the EDHUSM's Green Zone especially during weekends and public holidays. Currently, there are only two doctors and two nurses who serve at the Green Zone for every shift regardless whether it is on weekdays, weekends or public holidays. However, the imbalance occurs as the number of patients visit the EDHUSM's Green Zone on weekends and public holidays are twice more compared to the number of patients' that visits on weekdays. Therefore, the management of EDHUSM is concerned whether the department will be able to handle the increasing patient volume with the current resource capacity available.

System Description: The EDHUSM's green quarter operates 24 hours, every day in a year, which includes weekdays (Sunday to Thursday) and weekends (Friday and Saturday). Certainly to be mentioned that weekdays in Kelantan are from Sunday to Thursday at the same time as weekends are on Friday and Saturday. The green area's operations are divided into three shifts particularly morning, evening and night. The morning shift starts off evolved at 0700 to 1400 (7 hours), 1400 to 2100 for evening shift (7 hours), and 2100 to 0800 on the next day for night shift (10 hours), respectively. The manner flow in Green Zone begins with an affected person's arrival walk in to EDHUSM whereby upon arrival the patients forestall on the registration counter to sign up. After the registration method, sufferers may be triaged by means of a nurse on the triage counter and upon completing the triage, the patients will pass to the waiting place to peer the health practitioner.

In fact that there are five session rooms, handiest two rooms are operated and applied for every shift. Due to the lack of doctors and nurses works in every shift all through the weekdays, weekends and public holidays. Subsequently the doctor will decide if the patient requires similarly assessments, inclusive of medical laboratory tests, x-ray test, counselling session and Plaster of Paris (POP) remedy. Patient should wait as a minimum of half an hour to at least one hour for the end result in which the patient second consultation with the doctor will be accomplished shortly upon receiving the test results. In furtherance, the consequences acquired might be reviewed by doctor and decision can be made on the effects to either discharge the patient or admit them to other zones within ED or hospital wards.

For this case study, data were collected in one month manually for 24 hours in 2016. Interviews with the staffs were also carried out to fully understand Green Zone EDHUSM processes and to identify the critical aspects in the Green Zones EDHUSM that are required to be included in the SD model. Since EDHUSM started operating in new buildings in 2014, therefore data on patient register of 2014 are use as the base case for the SD model which includes a total number of 32000 patients visited EDHUSM on weekdays, while 28000 patients who visited on weekends and public holidays. This initial value is to forecast the number of patients that will visit, and predict the resources required to match the demand and supply during weekdays, weekends and public holidays in the Green Zone at the present and for the future next five and ten years.

Based on the interviews, EDHUSM’s management requires a tool that can assist them to foresee the consequences of their decisions prior to the implementation. The key challenges faced by the management of EDHUSM are in estimating the right number of doctors and nurses to be allocated in the Green Zone especially during weekdays, weekends, and public holidays which in reflect would enable the ED to manage the increase of patients at present as well as in the future. According to¹⁴, with the growth of population, the demand for health services, particularly in the ED has also increased. Henceforth, it is vital for proper allocation of doctors and nurses to be made in order to handle the increase of patients in EDHUSM’s Green Zone as this will improve the service rendered while smoothens the patient’s visitation in flow. Furthermore, this would enable patients to be treated within the allowed waiting time, thus permits the KPI set by EDHUSM to be achieved. Hence, this study will focus on predicting the number of a patient’s visit to EDHUSM’s Green Zone and the resources required during weekdays, weekends and public holidays at present and in future next five years and ten years using the SD method.

METHODOLOGY

As a result of the advancement in computer technology, the attention towards simulation has increased as this method is proven to be a powerful tool in helping decision makers to make a decision. With the aim of improving the decision-making process, SD was developed by Jay Forrester at Massachusetts Institute of Technology in the 1950s and proven to provide accurate insights on how a system behaves in both short and

longer periods¹. In fact, SD is a method used for the representation of complex and dynamic systems with the aid of computer simulation software¹⁵. Moreover, SD offers qualitative and quantitative aspect to further enhance the understanding of system behavior¹.

The SD method has been successfully applied in various fields, including economics, ecology, health science, physics, mathematics and biology. In brief, SD is an appropriate technique and is a suitable approach to study problems of a complex system. In addition to that, the SD method also focuses on the system from a macro level perspective which can be used for strategic level decision making. Furthermore, the holistic view offered by SD able to portray the complexity and the dynamic of an emergency service as well as reflects the impact of the ED towards other units in the hospital if changes were to be made in the ED⁴. Likewise, SD has the ability to predict the future conditions or demands which permits the prediction of patients’ requests at EDHUSM’s Green Zone in the future. For instance, the change in the population in future may consequently have an impact on the demand of patients in the future. Moreover, the SD method has the capacity to take into consideration different quantitative and qualitative factors in order to capture the dynamic interactions between these factors¹⁵.

Model Development: The SD model was developed using Vensim DSS software. Instead of modelling the whole EDHUSM completely, this study focused and began with the modelling of the Green Zone of EDHUSM. Even though the drawback of this principle is time-consuming, but by focusing on each zone, we can identify the factors that contribute to the problems in details and find the solutions for that zone. Causal loop diagrams (CLD), that act as the dynamics hypothesis for SD model construction were developed and converted into a formal computer model. According to^{16,17} CLD is to show the cause and effect relationship in a dynamic system. CLD also explain the behaviour of a system by showing a group of nodes that are interconnected by arrows and feedback loops. The arrows then show how a variable affects another variable. Figure 1 shows the CLD that represent the demand for Green Zone EDHUSM.

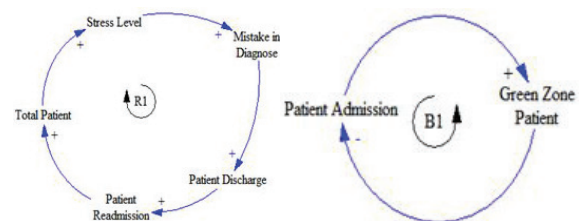


Figure 1: The CLD for Green Zone EDHUSM

As for this SD model, some of the inputs required were obtained based on the recommendation and discussion from the System Head as well as the management of Green Zone EDHUSM. The models adopted the simulation time range from 2014 to 2024 (10 years) since the objective for this study is to predict the demand needed in Green Zone EDHUSM for next five and ten years as it is the department’s strategic planning period. Figure 2 shows the SD model for Green Zone EDHUSM.

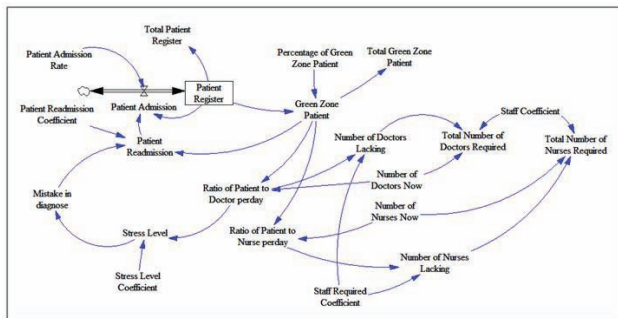


Figure 2: The SD model for Green Zone EDHUSM

According to^{16,19}, mathematically the SD model can be described as a set of integral equations which represent the accumulated stocks or integrated net flows to discrete time (t). A general mathematical representation of stocks and flows at time (T) can be presented in form as in equation (1):

Integral equation:

$$\text{Stock (T)} = (1)$$

The mathematical formulation relating to Patient Register stock as illustrated in Figure 3 is shown in equation (2). Furthermore, the significance variable and equation for the modelling are shown in equation (3), (4) and (5).

$$\text{Patient Register (T)} = (2)$$

$$\text{Total Green Zone Patient} = \text{Green Zone Patient} [\text{weekdays}] + \text{Green Zone Patient} [\text{weekends}] \quad (3)$$

$$\text{Total Number of Doctors Required} = \text{Number of Doctors Now} [\text{workweek}] + (\text{Number of Doctors Lacking} [\text{workweek}] * \text{Staff Coefficient}) \quad (4)$$

$$\text{Total Number of Nurses Required} = \text{Number of Nurses Now} [\text{workweek}] + (\text{Number of Nurses Lacking} [\text{workweek}] * \text{Staff Coefficient}) \quad (5)$$

Model Validation: Once the SD model has been completed, it needs to go through the validation process

before it can be used. According to¹⁷, there are two types of validation techniques which are behavioural validity and structure validity that can be used to build user confidence in using models developed in testing and designing strategies. Hence, in order to implement the behavioural validity test, the Green Zone SD model developed was presented and checked with the Head of EDHUSM to verify that the model represents the correct activities and flows in the department. In addition, the model was run and compared to ensure that the results generated from the model matched the empirical data collected from the Green Zone EDHUSM. Besides that, the Head of EDHUSM were also able to analyze the prediction results generated by the SD model for the number of patients’ visit to the Green Zone and the resources required at present and in the future for the next five years and ten years for weekdays, weekends and public holidays by Green Zone EDHUSM.

In this research we compared between the original data and SD output of total Green Zone patient register from 2014 to 2017 as presented in Table 1 to see the similarity that exists. According to⁷, the difference between the actual data and the SD outputs must be less than 10% using the following formula in equation (6). From the table, we can conclude that the results are valid because the differences are less than 10%.

$$\text{Difference (\%)} = \frac{(\text{Simulation output} - \text{Actual data})}{\text{Actual data}} \times 100\% \quad \dots(6)$$

Table 1: The comparison between the original data and the SD data of total Green Zone patient

Year	Actual data	SD output	Difference (%)
2014	33864	33840	0.1%
2015	35372	35470	0.3%
2016	37106	37286	0.5%
2017	39204	39323	0.3%

While for structural validation, the extreme conditions test was selected in this study. This test is effective in assessing the validity of the structure indirectly and it is one of the strongest tests to find a weakness in the model’s structure. According to^{16,17}, the smallest and greatest value will be used as extreme value to evaluate the validity of the developed model. Therefore, for the validation, the percentage of Green Zone patients for weekdays and weekends will be accumulated to the extreme value of 0 and 0.9 to see the effect on the number of patients’ visit to the Green Zone

in EDHUSM. Therefore, Figures 5 and 6 will show the comparison of both values as compared to the original percentage of Green Zone patients, which is 0.55% for weekdays and 0.58% for weekends. The original percentage of Green Zone patients for weekdays and weekend which been used in the SD model was obtained by discussions with the Head of EDHUSM.

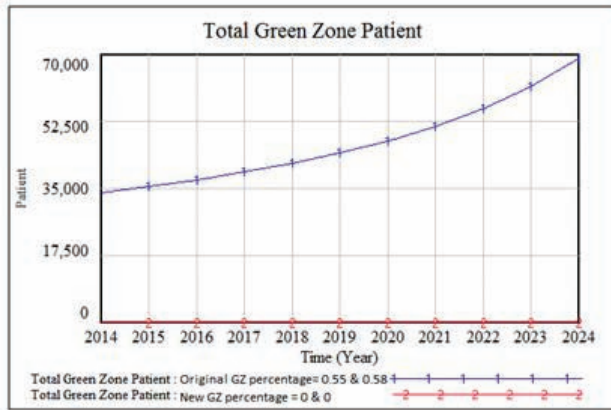


Figure 3: Comparison of extreme value percentage 0 with original percentage

Based on Figure 3, when the percentage of Green Zone patient is accumulated to 0, it indicates that no EDHUSM patients are registered as Green Zone patients. Therefore, the total number of patients in the Green Zone will be 0 when compared to the total number of Green Zone patients based on the original percentage. Whereas when percentage of Green Zone patients are accumulated to 0.9, the total number of Green Zone patients will increase drastically compared to the total number of Green Zone based on original percentage as shown in Figure 4. As a result, after conducting extreme conditions test with extreme percentage value of 0 and 0.9, this Green Zone SD model developed is deemed valid and acceptable.

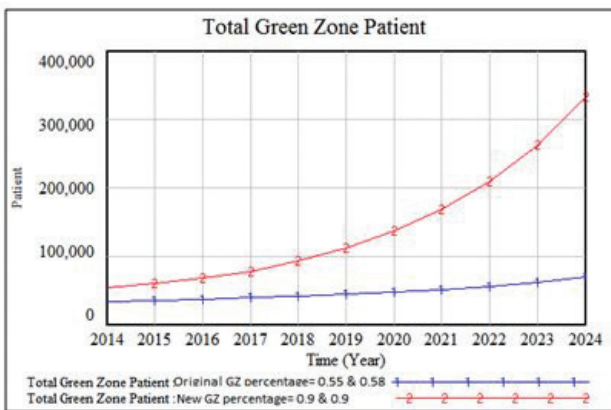


Figure 4: Comparison of extreme value percentage 0.9 with original percentage

RESULTS AND DISCUSSION

Results from the SD model reveal the prediction results of Green Zone EDHUSM at present and for the future on weekdays, weekends and public holidays. Figure 5 shows the results of the predicted number of patients' visit to Green Zone EDHUSM, number of doctors and nurses required at present and in the future for the next five years and ten years on weekdays, weekends and public holidays by Green Zone EDHUSM.

Time (Year)	2014	2015	2016	2017	2018	2019
Selected Variables Run: SDGreenZoneYear						
Green Zone Patient						
[weekdays]	17,600	18,159	18,754	19,389	20,066	20,792
Green Zone Patient[weekends]	16,240	17,311	18,532	19,934	21,560	23,490
Total Number of Doctors Required						
[weekdays]	8.444	8.522	8.605	8.693	8.787	8.888
Total Number of Doctors Required[weekends]		11.15	11.51	11.93	12.42	12.29
Total Number of Nurses Required						
[weekdays]	8.444	8.522	8.605	8.693	8.787	8.888
Total Number of Nurses Required[weekends]		11.15	11.51	11.93	12.42	12.29
Time (Year)	2020	2021	2022	2023	2024	
Selected Variables Run: SDGreenZoneYear						
Green Zone Patient						
[weekdays]	21,571	22,409	23,313	24,291	25,352	
Green Zone Patient[weekends]	25,858	28,820	32,618	37,419	43,658	
Total Number of Doctors Required						
[weekdays]	8.996	9.112	9.238	9.374	9.521	
Total Number of Doctors Required[weekends]		12.75	13.08	13.50	14.02	
Total Number of Nurses Required						
[weekdays]	8.996	9.112	9.238	9.374	9.521	
Total Number of Nurses Required[weekends]		12.75	13.08	13.50	14.02	

Figure 5: Table results on predicting demand for Green Zone EDHUSM from 2014 to 2024

The results show that the demands in Green Zone EDHUSM are extremely increasing every year during weekends and public holidays compared to weekdays. This is due to the fact all outpatient clinics in government hospitals and all government clinics are closed for the duration of weekdays and public holidays. The results given by the SD model are matched with the current scenarios occurring in the Green Zones EDHUSM. In fact, the number of patients predicted by SD who visited Green Zone in 2014 during weekdays, weekends and public holidays are approximately equal with the real number of patients that visited Green Zone EDHUSM on weekdays, weekends and public holidays on 2014. However, the numbers of doctors and nurses who serve in Green Zones EDHUSM are not sufficient according to SD's results based on the current scenarios. Thus, this is the key factors which contributed to the current problems in the Green Zone, which mirrors the non-achievement of KPI by Green Zone EDHUSM.

Currently, there are two doctors and two nurses working for every shift in Green Zone EDHUSM which totals up to six doctors and six nurses working per day at Green Zone EDHUSM. Based on the results produced by the SD model which indicates that the total number

of doctors and nurses who are required to work in the Green Zone EDHUSM is 9 people per day compared to 6 people per day for weekdays while the number of doctors and nurses who are supposed to work on weekends and public holiday should be 12 people per day compared to 6 people per day as the current scenario practiced by the Green Zone EDHUSM. While for the next five years, no additional resources need to be made if the addition of resources has been made at present in Green Zone EDHUSM. However, in order to meet the number of patients' visit to Green Zone for the next 10

years, the addition of a doctor and a nurse on weekdays and two doctors and two nurses on weekends and public holidays are required.

Therefore, adding new staffs are really important in order to improve the patient flow in Green Zone EDHUSM and vital for the department's KPI achievement. Table 2 below, shows the predictions of the number of patients visit, reasonable number of doctors and nurses required for weekdays, weekends and public holidays at present and in the future for the next five and ten years by Green Zone EDHUSM.

Table 2: Comparison between actual data and SD results yearly in predicting demand for the present and in the future for the next five and ten years for Green Zone EDHUSM

Item	AD		Current (SD Results)		5 years (SD Results)		10 years (SD Results)	
	WD	WE/PH	WD	WE/PH	WD	WE/PH	WD	WE/PH
Number of Patients Visit in Green Zone	17600	16264	17600	16240	20792	23490	25352	43658
Number of Doctor	6	6	9	12	9	12	10	14
Number of Nurse	6	6	9	12	9	12	10	14

*Note: WD-Weekdays, WE/PH-Weekends/Public Holidays

CONCLUSIONS

This paper presents the study on developing SD model to predict and forecast the patients' volume in Green Zone EDHUSM at present and in the future for the next five years and ten years on weekdays, weekends and public holidays. Besides that, the results also show that the appropriate number of doctors and nurses, which is required to serve the demand from the patients who visits the Green Zone during weekdays, weekends and public holidays at the present time and in the future. Based on the results, it clearly shows that patient's arrivals at Green Zone EDHUSM are higher and busier on weekends and public holidays compared to weekdays. The need for resources such as the number of doctors and nurses to serve the demand from the patients should be greater compared to weekday demand. Therefore, the management needs to have proper planning and derive with a new working schedule for doctors and nurses for weekdays, weekends and public holidays in order to improvise the services in Green Zone EDHUSM. Furthermore, the SD results obtained from this study, might be an initial benchmark to assist and guide the management of Green Zone EDHUSM to initiate some improvement within

the department's budget allocation to solve the current scenario that occurs at the Green Zone throughout the weekdays, weekends and public holidays. Besides that, the findings are also benefits and provide a preliminary outline for the management to come out with strategic and long term planning for the preparation towards the growing number of the patients' visit as well as to plan the appropriate resources to cater the demand in the next five years and ten years period. Additionally, the results can also be used at the strategic level decision making in improving the quality, performance and services at Green Zone EDHUSM. While the future plans for this research is to come out with hybrid methods of simulation and mathematical programming techniques for a greater improvement in Green Zone EDHUSM.

ACKNOWLEDGMENT

The authors would like to thank the Emergency Department of Hospital Universiti Sains Malaysia (HUSM) for granting permission to conduct this study. This research received no specific grant from any funding agency in the public, commercial, or not-for profit sectors.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. A. Norazura, A.G. Noraida, A.K. Anton, M.T. Razman, Emergency department problems: a call for hybrid simulation. *Proceedings of the World Congress on Engineering*. 2012a;3.
2. A. Komashie, A. Mousavi, Modeling emergency departments using discrete event simulation techniques. *Proceedings of 2005 Winter Simulation Conference*. 2005;2681-2685.
3. C. Eduardo, T. Manel, E. Francisco, L.I. Ma, ABMS optimization for emergency department. *Proceedings of 2012 Winter Simulation Conference*. 2012;1039-1042.
4. A. Norazura, A.G. Noraida, A.K. Anton, M.T. Razman, Managing Resource Capacity Using Hybrid Simulation. *International Conference on Quantitative Sciences and Its Applications*. 2014;504-511.
5. A. Norazura, A.G. Noraida, A.K. Anton, M.T. Razman, Evaluating emergency department resource capacity using simulation. *Modern Applied Science*. 2012b; 6(11): 9-19.
6. A. Norazura, A.G. Noraida, A.K. Anton, M.T. Razman, Simulating the Impact of an Increase in Patient Volume on a Government Emergency Department in Malaysia. *International Proceeding of Economics Development and Research (IPEDR)*. 2013;78-82.
7. W.D. Kelton, R.P. Sadowski, N.B. Zupick. *Simulation with ARENA*, 6th ed, McGraw-Hill Education, Singapore. 2015.
8. E.R. Blasak, W.D. Starks, S.W. Armel, C. Hayduk, The use of simulation to evaluate hospital operations between the emergency department and a medical telemetry unit. *Proceeding of 2003 Winter Simulation Conference*. 2003;1887-1893.
9. K. Chahal, T. Eldabi, Applicability of hybrid simulation to different models of governance in UK healthcare. *Proceeding of 2008 Winter Simulation Conference*. 2008;1469–1477.
10. M.M. Gunal, M. Pidd, Discrete Event Simulation for Performance Modelling in Healthcare: a review of the literature. *Journal of Simulation*. 2010; 4(1):42-51.
11. W.M. Wan Mohd Aminuddin, W.R. Ismail and H. Husyairi, “Estimating emergency department maximum capacity using simulation and data envelopment analysis. 2016; 9(28): 1-10.
12. S.C. Brailsford, S.M. Desai, J. Viana, Towards the holygrail: Combining system dynamics and discrete-event simulation in healthcare. *Proceeding of 2010 Winter Simulation Conference*. 2010; 2293-2303.
13. F. Senese, P. Tubertini, A. Mazzocchetti, A. Lodi, C. Ruozi, R. Grilli, Forecasting Future Needs and Optimal Allocation of Medical Residency Positions: the Emilia-Romagna Region Case Study. *Human Resources for Health*. 2015; 13(7):1-10.
14. N.C. Hong, N.A. Ghani, A Model for Predicting Average Ambulance Service Travel Times in Penang Island. *Proceeding of the 2nd IMT-GT Regional Conference on Mathematics, Statistics and Applications*. University Sains Malaysia. 2006.
15. R. Alasad, I. Motawa, S. Ogunlana, A system dynamic-based method for demand forecasting in infrastructure projects – A case of PPP projects. *Proceeding of 28th Annual ARCOM Conference*. 2012; 327-336.
16. J. Sterman, *Business dynamics: System thinking and modelling for a complex world*. McGraw-Hill, Boston, USA. 2000.
17. S. Hasimah, Z. Jafri, A. Norazura, Z.A. Norhaslinda, N.H. Nurul, *Introduction to System Dynamics Modelling and Vensim Software*. UPM Press, Malaysia. 2017.
18. W. Rashwan, W. Abo-Hamad, A. Arisha, A system dynamics view of acute bed blockage problem in Irish healthcare system, *European Journal of Operational Research*. 2015; 247(1).
19. F.A. Hassan, N. Minota, A system dynamics analysis of Malaysian Healthcare resources, *International Journal of Japan Association for Management Systems*. 2017; 9(1): 61-69.

The Perceptions of Residents toward Safeness of Living Vicinity of Telecommunication Base Station

Norazmawati M. S.¹, Muhammad Arkam C. M.², Kai X T³

^{1,3}*School of Housing, Building & Planning, Universiti Sains Malaysia, Malaysia;* ²*School of Environmental Engineering, Universiti Malaysia Perlis, Malaysia*

ABSTRACT

Studies about the telecommunication base station in both medical and economic contexts have been carried out over the past decades. With advanced technology, the users of cellular phones are increasing. Meanwhile, the public is concerning about the health issues which comes along with the increase usage of cellular phone; particularly regarding the exposure to electromagnetic field (EMFs). However, its impacts toward the residents living in close proximity to the telecommunication base station in Malaysia have yet to be studied in detail. Using the quantitative survey method, this study applied the binomial logit model to investigate the perceptions of residents who are living within close proximity to the telecommunication base station in Malaysia. The degree of awareness regarding the possible health effects of living in close proximity to the telecommunication base station was significantly different in different demographics and type of resident. This comparison would allow the telecommunication industry to understand the perceptions of these residents. Besides that, recommendations were also suggested to ease the health concerns of these residents.

Keywords: *Telecommunication base station, residents' perceptions, binomial logit model, safe to live, health awareness.*

INTRODUCTION

In the era of globalisation, the use of mobile communication technologies for phoning, texting and internet services are vital part of human life. Based on the statistical data from ITU¹⁷, global mobile penetration has increased approximately 126% in 2016 compared to the past 10 years, and mobile phone subscription is expected to increase further in the future. Technology advancement in Malaysia, especially in networking (mobile broadband), devices (smart phone), and mobile applications (Web streaming, video surfing), has led to the high demand of internet services, which has risen from 21.38% in 2000 to 78.79% in 2016 ITU¹⁸.

To fulfil the demand of internet users, infrastructure for the telecommunication network has widely expanded in Malaysia. Telecommunication companies have to build more base stations at strategic locations to ensure the high quality mobile network service for end-users, in addition to stay ahead of their competitors in term of signal coverage. Most of the base stations are located in highly populated residential or business areas, such as on the rooftops of shop lots and apartments, open spaces

at playing fields, or parking lots of shopping complexes Din⁹. The closer the base station to human, the higher risk impacts on human health condition Cousin & Siegrist^{6,7}; Neubauer et al²⁷; Ngui²⁹; Van Kleef, Fischer, Khan, & Frewer⁴⁵; Viel et al⁴⁶ despite the recent and rapid introduction of mobile communication technologies. This study aims to identify factors that are influential in determining the tradeoffs that Bangladeshi citizens make between risks and benefits in terms of mobile phone technology acceptance and health concerns associated with the technology. Bangladesh was selected as representative of many developing countries inasmuch as terrestrial telephone infrastructure is insubstantial, and mobile phone use has expanded rapidly over the last decade, even among the poor. Issues of importance were identified in a small-scale qualitative study among Bangladeshi citizens (n = 13). Malaysia has an estimated a total of 16,000 to 18,000 telecommunication base stations (cellular and broadband) nationwide Ngui²⁹.

The installation of telecommunication base stations in residential areas has resulted in substantial controversies about the potential harmful effects of the radiofrequency electromagnetic fields (EMF) emissions

D'Angelo, Costantini, Kamal, & Reale⁸; Din⁹; Isabona, Srivastava, & Robert¹⁶; Ozovehe, Usman, & Hamdallah³⁰; Siegrist, Earle, Gutscher, & Keller⁴⁰ According to Cousin and Siegrist (2010), and Hallberg and Oberfeld (2006) while experts consider exposure under the current international standards as unproblematic. These conflictive estimations may be attributed to the different mental models of lay people and experts. Less is known about lay people's knowledge in regard to mobile communication and their intuitive understanding of the associated health risks. An adaptation of the 'Mental Models Approach' was used to reveal lay people's beliefs about mobile communication and to learn more about lay people's information requirements, potential knowledge gaps, and misconceptions. Through the means of open interviews with Swiss experts (N = 16, the health effects of EMF are headaches, dizziness, nausea, skin rashes, feeling warm, depression, night sweats, memory loss, disturbances in menstruation, and insomnia. Many prior studies indicated that people living in the vicinity of telecommunication base stations suffer from adverse health conditions e.g. Augner & Hacker²; Isabona et al¹⁶; Roje, Poljak, & Sarolic³³; Shahbazi-Gahrouei, Karbalae, Moradi, & Baradaran-Ghahfarokhi³⁹.

In Malaysia, the health issues resulted from effects of EMF require more attention. Only a handful of studies which investigate the residents' health awareness towards the telecommunication base stations in Malaysia. The only record found was a study conducted in Penang, Malaysia by Suleiman, Gee, and Krishnapillai⁴¹ health related problems and the public concern. Comparison of symptoms frequencies and its significance (Chi-square test). Hence, this study aimed to fill the void and expand the research by including study sites in selected states in West Malaysia. The study identified the residents' perceptions about whether it is safe to live near to telecommunication base stations, the cause variables of types of resident, degree of awareness, and the possible health symptoms of EMF.

Studies on telecommunication base station impacts:

Studies regarding the health effects of EMF have been widely conducted in the last decade (Kundi & Hutter²¹; Santini, Santini, Danze, Le Ruz, & Seigne^{36,37} but the research outcomes are heterogeneous and inconsistent. Klaps et al¹⁹ outlined the problems for studying the impacts of base stations. The first problem is about the proper selection of the independent variable, or a list of measurement indicators to examine the exposure to

base station signals. The second problem is about the discrepancies found between the outcome of assessments conducted in the environmental trials and the laboratory tests Hutter, Moshammer, Wallner, & Kundi¹³; Neubauer et al²⁷ 365 subjects were investigated. Several cognitive tests were performed, and wellbeing and sleep quality were assessed. Field strength of high-frequency electromagnetic fields (HF-EMF. The third problem is concerning the population selection. Even though base stations are ubiquitous, the actual intensity of exposure is relatively low and hardly detectable, making it hard to measure an accurate exposure level. Therefore, random selection of study sites or respondents carries the risk of including only a few persons - or virtually no one has been exposed to EMF, resulting in inaccurate research findings Klaps et al¹⁹. As a result, the residents who are living near to base station within 500m were selected for this study.

Many studies have been conducted to examine the health effects of EMF in real life. In France, Santini et al^{36,37} 260 women studied the correlation of gender and the distance from the base station toward the health symptoms experienced by the residents. The results showed that residents living within the distance of 300 m from base stations experienced tiredness; those within 200m experienced headaches, sleep disturbances, and discomfort; while those within 100m experienced irritation, depression, loss of memory, dizziness, decrease in libido, and other symptoms. More women than men were reported to have suffered from headache, nausea, loss of appetite, sleep disturbance, depression, discomfort and visual disturbances.

Navarro, Segura, Portolés, and Mateo²⁶ conducted a health survey in Murcia, Spain which involved 101 residents living in the immediate vicinity of base stations. The survey examined microwave sickness and RF syndrome. The microwave power density was measured at each respondent's house, while the strength of an electric field in the frequency range 1 MHz to 3 GHz was assessed in bedrooms. This study reported that the respondents suffered from severe health symptoms such as headaches, sleep disturbances, concentration difficulties, and discomfort.

Hutter et al. (2006) A cross-sectional study was conducted by Mohler et al²⁴ which is a common public health concern. We assessed self-reported sleep disturbances and daytime sleepiness in a random

population sample of 1,375 inhabitants from the area of Basel, Switzerland. Exposure to environmental far-field RF EMFs was predicted for each individual using a prediction model that had been developed and validated previously. Self-reported cordless and mobile phone use as well as objective mobile phone operator data for the previous 6 months were also considered in the analyses. In multivariable regression models, adjusted for relevant confounders, no associations between environmental far-field RF EMF exposure and sleep disturbances or excessive daytime sleepiness were observed. The 10% most exposed participants had an estimated risk for sleep disturbances of 1.11 (95% CI: 0.50 to 2.44) to examine the relationship between the exposure of EMF from the base station and health symptoms. This study randomly selected residents in urban and rural areas who have been living near to 10 base stations for more than one year. A total of 36 households at each location were investigated. Several cognitive tests were conducted, and the well-being and sleep quality of respondents were evaluated. The RF-EMF measurement was collected in the bedrooms of 336 households. The findings found that health symptoms were generally more frequent at higher exposure levels, in addition to more prevalent of headache, vegetative symptoms, and difficulty in concentration. Sleep quality was not significantly affected by the EMF emitted from the base stations.

Abdel-Rassoul et al¹⁹ Egypt, 37 are living in a building under the station antenna while 48 opposite the station. A control group (80 identified the possible neuro-behavioural deficits among residents living near a base station in Menoufiya Governorate, Egypt. A total of 85 respondents were involved, comprising 37 residents living underneath base station antennas, and another 48 respondents working in an agricultural directorate building which was located approximately 10m opposite the base station. Headache, memory changes, tremors, dizziness, depression, and sleep disturbances were found to affect the respondents significantly and more frequently than the controls of the study. However, according to Kundi and Hutter's²¹, this study could be criticised for including employees who worked near the base stations because other factors such as stressful working environment, indoor pollutants and other attributes of the workplace might have caused such health symptoms.

In Germany, researchers incorporated personal

dosimetry in studies and managed to reveal different results. For example, Heinrich, Ossig, Schlittmeier, and Hellbrück¹¹ used a double-blind experiment (*i.e.* neither experimenters nor the respondents knew whether the antenna was on or off) to investigate the effects of base station's EMF emission on the well-being of employees working in close proximity. There was no statistical difference between having the antenna on or off toward the health symptoms observed. Kuhnlein, Heumann, Thomas, Heinrich, and Radon²⁰, Thomas et al⁴³, and Thomas, Heinrich, Von Kries, and Radon⁴² also found that the symptoms exhibited by adults, children nor adolescents were not significantly correlated to exposure. However, Heinrich, Thomas, Heumann, von Kries, and Radon¹² study found different results. They found that a few symptoms were significantly associated with exposure. For example, Adolescents were reported to have experienced headache at noon and irritation during bedtime after being exposed in highest quartile of EMF in the morning and afternoon respectively. On the other hand, children were reported to have suffered from concentration problems.

Mohler et al²⁴ and Mohler, Frei, Fröhlich, Braun-Fahrlander, and Röösli²⁵ conducted a series of investigations, combining a cross-sectional study (with 1,375 participants) and longitudinal study (955 respondents) in the area of Basel, Switzerland. The studies revealed homogeneous results and the association between RF-EMF exposure and sleep disturbances or excessive daytime sleepiness was not found. This corresponded with Hutter et al¹³ study. Numerous meta-reviews have been done by researchers to understand the effects of EMF exposure on the well-being of mankind (*e.g.* Klaps et al¹⁹; Kundi & Hutter²¹; Röösli, Frei, Mohler, & Hug³⁴; Röösli & Hug³⁵

In more recent studies, Baliatsas et al³ discovered that non-specific symptoms became prevalent among residents living in the proximity of a base station before and after an increase in number of base station antennas. A total of 1,069 adult participants from different regions in the Netherlands were analysed. The study compared two periods (before and after) and revealed that after increasing the number of base stations, most non-specific symptoms became prevalent. For instance, the participants experienced some health symptoms in ear, muscle and skeleton. Wiedemann, Freudenstein, Böhmert, Wiart, and Croft⁴⁷ *i.e.*, the extrapolability of

risk perceptions expressed in a survey, to risk perceptions in everyday life. To that end, risk perceptions were measured by a multidimensional approach. In addition to the traditional focus on measuring the magnitude of risk perceptions, the thematic relevance (how often people think about a risk issue) conducted an online survey with 2454 respondents in six European countries to identify the potential risks of staying close to base stations and access points such as Wi-Fi routers and cell phones. This study found that respondents believed that even a very low EMF exposure can lead to detrimental effects in health.

On the other hand, Suleiman et al⁴¹ health related problems and the public concern. Comparison of symptoms frequencies and its significance (Chi-square test) conducted a study in Penang, Malaysia. 14 symptoms were used to compare the possible health effects on residents exposed (170 respondents) and not exposed (31 respondents) to EMF from the telecommunication towers. Residents who live within the radius of 0 to 150m from the base station were considered being exposed to EMF, while more than 150m were considered as not exposed. The findings revealed that symptoms like headache, giddiness, insomnia, loss of memory, diarrhoea, mental slowness, slower reaction times and mood swings were observed in both exposed and non-exposed residents, however more severe health effects were reported in the residents exposed to EMF compared to those who were not. Overall, health awareness toward the radiation or EMFs effects requires more attention. This awareness would directly influence the perception of residents towards living near to base station.

Several organisations have been established to handle the health issues brought by the EMF emission from the base station. These bodies provide guidelines and standards aiming to allay public fear on the effects of EMF. Malaysian telecommunication companies use the guidelines provided by the International Commission on Non-Ionising Radiation Protection (ICNIRP)¹⁵, Institute of Electrical and Electronics Engineers (IEEE)¹⁴ and the World Health Organisation (WHO) Din⁹; Tukimin, Mahadi, Ali, & Thari⁴⁴ in their operations. Based on radiation detection tests by the Malaysian Communications and Multimedia Commission (MCMC), the radiation effects of EMF from telecommunication base stations in Malaysia are still at a low level Ngui²⁹, with simulation tests and

empirical tests at base station sites showing radiation levels to be well below 1%. This indicated that the radiation is less than one per cent, compared to the ICNIRP-recommended level of mandatory standards for emission of EMFs from infrastructure. However, there is still lack of research demonstrating the perceptions of residents on safety level of living proximity base station.

METHODOLOGY

Sampling and Data Collection: Quantitative method involving a survey questionnaire was employed. This approach was selected because this research was based on pragmatic grounds; with respect to perceptions on demographic, type of resident, awareness, and health symptoms from living in the vicinity of base station. The data collection started with the development of a survey instrument, aimed to establish the measurement indicators: five demographic items, four types of resident items, seven health awareness items, and seven health symptoms which would affect residents' perception of whether it was safe to live in vicinity of the base stations in West Malaysia. The questionnaire was designed as a self-administered survey. Next, the survey instrument was pilot-tested and then refined. The selection of respondents took place by random sampling in several states of Malaysia (Kelantan, Penang, Kedah, Perlis, Selangor, Negeri Sembilan) between January to July 2017. The questionnaire included a set of questions on certain themes, respondents' demographic, type of resident, health awareness, and health symptoms to gauge residents' perception on safety level towards the impact of base station. The items asked in questionnaire were presented in Table 1.

Table 1: Dependent and independent variables themes

Variable	Characteristics	%
Dependent Variable		
Safe to live	Does this area is safe to live even there is a telecommunication tower?	
	No (Code 0)	31.63
	Yes (Code 1)	68.37
Independent Variables		
Demographic		
Gender	Male (reference alternative)	54.03
	Female	45.97

Conted...

Age	19-24 years old (reference alternative)	24.36
	25-35 years old	26.72
	36-45 years old	22.99
	>46 years old	25.93
Marital status	Single (reference alternative)	36.54
	Married	59.33
	Widow	4.13
Education level	Primary (reference alternative)	9.82
	Secondary	37.52
	Degree	37.13
	Master	3.14
	PhD	1.77
	No formal education	10.61
Occupation	Management (reference alternative)	13.95
	Engineer	5.30
	Doctor	3.73
	Education	9.04
	Other	44.60
	Unemployed at the moment (Housewife/students)	23.38
Type of resident		
House type	Bungalow (reference alternative)	15.91
	Terrace house	54.62
	Semidetached house	14.73
	Office	14.54
Ownership	Rental (reference alternative)	34.58
	Own	44.20
	Heritage house	21.22
Length of stay	Live within 1 year (reference alternative)	12.18
	Live 2-5 years	26.92
	Live 6-10 years	27.11
	Live more than 10 years	33.79
Distance from the base station	Less than 100m (reference alternative)	21.22
	Between 101-200m	22.79
	Between 201-300m	23.18
	More than 300m	32.81

Conted...

Awareness		
Health effect	Did you know that telecommunication tower will gives adverse health effect to human?	
	No (reference alternative)	39.10
	Yes	60.90
Radiation	Did you know that the telecommunication tower will gives radiation effect?	
	No (reference alternative)	44.79
	Yes	55.21
Comfortable	Do you feel comfortable living /working near to this telecommunication tower?	
	No (reference alternative)	27.90
	Yes	72.10
Factor to move out	Do the telecommunications tower be a factor for you to move to another area?	
	No (reference alternative)	80.35
	Yes	19.65
Medical check up	Do you have done your medical check-up since you stay here?	
	No (reference alternative)	48.13
	Yes	51.87
Health problem experience	Did you experienced any serious health problems since moving here?	
	No (reference alternative)	71.12
	Yes	28.88
Caused by base station	Do this health problem caused by the radiation of telecommunications towers in your residential area?	
	No (reference alternative)	77.80
	Yes	22.20
Health symptoms: Have you ever experience the following symptoms since living in this residential area?		
Headache	Yes (reference alternative)	32.22
	No	67.78
Fatigue	Yes (reference alternative)	33.46
	No	66.54
Nausea vomiting	Yes (reference alternative)	4.91
	No	95.09
Sight problem	Yes (reference alternative)	12.97
	No	87.03

Conted...

Skin problem	Yes (reference alternative)	5.89
	No	94.11
Loss of appetite	Yes (reference alternative)	7.27
	No	92.73
Nosebleed	Yes (reference alternative)	2.95
	No	97.05

DATA ANALYSIS

The data were first analysed by using chi-square tests to explore the single-dimensional relationship between the two group of respondents (those who feel safe and those who feel unsafe) with categorized measurement items (demographic, type of resident, awareness, and health symptoms). In the next stage, the binomial logit model was used to examine the difference between these two group of respondents. The model proposed by McFadden^{22,23} was adapted, whereby the choice of yes (coded 1) and no (coded 0) indicated that code 1 was those who felt safe to live near to base station and code 0 was those who were not. McFadden’s model relied on the assumption that the respondents who feel safe to live are a non-random function, V_1 of the travel characteristics plus a random error term:

$$T(\text{safe to live} = 1) = V_1 + e_1$$

On the other hand, the respondents who felt unsafe to live as a random error term:

$$T(\text{unsafe to live} = 0) = V_0 + e_0$$

As a result, the measurement items (demographic, type of resident, awareness, and health symptoms) related more to safe to live rather than the otherwise if, and only if:

$$T(\text{safe to live} = 1) > T(\text{unsafe to live} = 0)$$

Or

$$V_1 - V_0 > e_0 - e_1$$

In the case of the distributions of e_0 and e_1 , the probability that safe to live = 1 was

$$P(\text{safe to live} = 1) = \exp(V_1) / [\exp(V_1) + \exp(V_0)]$$

However, if case 1 was unable to estimate the absolute levels of the parameters of V_1 , it would be able to estimate the measurement variable parameters

of the respondents felt safe to live relative to those who felt unsafe to live. This was known as the logodds_i of occurrence on safe to live over unsafe to live, as expressed by the function:

$$V_1 - V_0 = b_0 + \sum b_j x_j$$

Then,

$$P(\text{safe to live} = 1) = \exp(b_0 + \sum b_j x_j + V_0) / [\exp(b_0 + \sum b_j x_j + V_0) + \exp(V_0)] \text{ ---- with parameters } V_1$$

Or

$$P(\text{safe to live} = 1) = \exp(b_0 + \sum b_j x_j) / [\exp(b_0 + \sum b_j x_j) + 1] \text{ ----- without parameters } V_1$$

Then, dividing the numerator and denominator by $\exp(b_0 + \sum b_j x_j)$ yields the logit model as:

$$P(\text{safe to live} = 1) = 1 / [1 + \exp(-(b_0 + \sum b_j x_j))] \dots (1)$$

Therefore, the logit model in equation (1) showed the probability of the intra-safe/unsafe to live, where the measurement variable x_j included the demographic, type of resident, awareness, and health symptoms. This logit equation was used to run the logistic regression analysis in Stata software 14.2. The Hosmer-Lemeshow test was used for the goodness of fit test. Additionally, the vector of the coefficient b_j was estimated by the maximum likelihood. For measuring the goodness of fit of the equation, McFadden (1974, p. 121) suggested the use of the likelihood ratio index:

$$1 - L_{UR} / L_R$$

Where L_{UR} was the unrestricted vector of the log-likelihood function at the maximum likelihood estimation of the parameters b_j , while L_R was the value of the likelihood function when all the parameters were restricted to zero Reece³².

FINDING

Table 2 presented the chi-square test results of the safety level related to demographic, type of resident, awareness, and health symptoms. The results showed that three variables demographic (age and marital status), type of resident (house type), and awareness (comfortable, factor to move, and health problem experience) were significantly different ($p < 0.50$) in term of whether it was safe to live nearby the base station. However, significant difference was not found in those who felt it was safe live in proximity of the base station and those who were not.

Due to the weakness in the statistical power of the chi-square test as it is a non-parametric test, binomial logistic regression analysis was selected as a more understandable approach for this study (Table 3). The first column of Table 3 showed the coefficient b_j of equation (1), the standard errors associated with the coefficients, the Wald statistic or Wald chi-square value together with the 2-tailed p-value, and the odds ratio or exponential of the coefficients. In assessing the model fit, two statistical tests were applied to assess the significance of the binomial logit model. Hosman-Lemeshow statistic of overall fit indicated that there was no significant difference between the actual and predicted classifications, where the p -value > 0.05 [0.829]. The likelihood ratio index measure of the goodness of fit of the estimated equation was 0.205. These two statistics provided good support for the logit model.

The fourth column showed the p -value for these parameters (Table 3). The age (25-35) in demographic, house type (terrace house and office), ownership (own), and distance from the base station (210-300m) under type of resident, comfortable (yes) and factor to move out (yes), under theme of awareness, and nosebleed (no) for health symptom were found to be significant to the predictive ability of the model. The p -value of 25-35 years old was 0.05. The odds of the residents age between 25 to 35 was 0.485, value less than 1. This expressed that respondents aged 25-35 years old were less likely to feel safe to live in vicinity of base station. Significant results were observed in the respondents living in terrace house, working in office or owning a house with a p -value of 0.05, 0.00, and 0.01 respectively, and the odds ratio obtained for these variable (0.478, 0.192, and 0.502 respectively) was less than 1. This indicated that residents who selected these items were more likely to feel unsafe to live nearby the base station.

Two items under the theme of awareness ‘Comfortable’ and ‘factor to move out’ were found statistically significant with p -value 0.00. The residents who feel comfortable to live near to base station would more likely to agree that it was safe to live there (odd ratio: 2.449, which >1), however, there were also residents who plan to move out from the area because they felt it was harmful to live around there (odd ratio: 0.168, which <1). There was only one item found statistically significant from the health symptoms which was the item ‘nosebleed’ with p -value:0.03 and odd ratio 3.889,

more than 1. This implied that the residents who did not experience nosebleed would be more likely to feel safe to live close to the base station (see also Pallant (2010), p. 175-178, for further explanation on the p -value and odd ratio of the binomial logit model analysis).

Table 2: Chi-square test for safety level with demographic, type of resident, awareness, and health symptoms

Variables	N(df)	Chi-square X^2	p-value
Demographic			
Gender	509(1)	0.5806	0.45
Age	509(3)	8.8139	0.03*
Marital status	509(2)	5.7255	0.05*
Education level	509(5)	7.7776	0.17
Occupation	509(5)	2.7184	0.74
Type of resident			
House type	509(4)	13.5551	0.01**
Ownership	509(2)	3.8717	0.14
Length of stay	509(3)	5.3238	0.15
Distance from the base station	509(3)	0.6983	0.97
Awareness			
Health effect	509(1)	2.4210	0.12
Radiation	509(1)	0.9330	0.33
Comfortable	509(1)	28.4187	0.00**
Factor to move out	509(1)	67.9779	0.00**
Medical check up	509(1)	0.4470	0.50
Health problem experience	509(1)	5.8525	0.02*
Caused by base station	509(1)	0.2680	0.61
Health symptoms			
Headache	509(1)	0.1880	0.67
Fatigue	509(1)	0.1839	0.67
Nausea vomiting	509(1)	0.8516	0.36
Sight problem	509(1)	1.9141	0.17
Skin problem	509(1)	1.0149	0.31
Loss of appetite	509(1)	0.0119	0.91
Nosebleed	509(1)	3.3662	0.07

* $p < 0.05$, ** $p < 0.01$

Table 3: Logistic Regression Test

Items	Coefficient b_j	Standard error	Wald statistic	P-value	Odd ratio
Demographic					
<i>Gender (Male)</i>					
Female	-0.288	0.237	-1.22	0.22	0.749
<i>Age (19-24)</i>					
25-35	-0.724	0.365	-1.98	0.05*	0.485
36-45	-0.168	0.427	-0.39	0.69	0.845
>45	-0.499	0.461	-1.08	0.28	0.607
<i>Marital status(Single)</i>					
Married	0.356	0.320	1.11	0.27	1.427
Widow	-0.384	0.603	-0.60	0.55	0.695
<i>Education level (Primary)</i>					
Secondary	0.302	0.439	0.69	0.49	1.352
Degree	0.234	0.479	0.49	0.63	1.264
Master	1.136	1.111	1.02	0.31	3.116
PhD	-0.450	1.033	-0.44	0.66	0.637
No formal education	0.689	0.538	1.28	0.20	1.991
<i>Occupation (Management)</i>					
Engineer	0.765	0.649	1.18	0.24	2.149
Doctor	0.776	0.788	0.99	0.32	2.174
Education	-0.194	0.492	-0.40	0.69	0.823
Other	-0.470	0.375	-1.25	0.21	0.625
Unemployed	-0.420	0.440	-0.95	0.34	0.657
Type of resident					
<i>House type (Bungalow)</i>					
Teres house	-0.739	0.384	-1.93	0.05*	0.478
Semidetached house	0.007	0.475	0.02	0.98	1.007
Office	-1.651	0.469	-3.52	0.00**	0.192
<i>Ownership (Rental)</i>					
Own	-0.688	0.287	-2.4	0.01**	0.502
Heritage house	-0.235	0.385	-0.61	0.54	0.791
<i>Length of stay (1 year)</i>					
2-5 years	-0.305	0.407	-0.75	0.45	0.737
6-10 years	-0.316	0.425	-0.74	0.46	0.730
>10 years	0.233	0.450	0.52	0.61	1.262
<i>Distance from the base station (>100m)</i>					
101-200m	-0.006	0.359	-0.02	0.99	0.994
201-300m	-0.726	0.365	-1.99	0.06	0.484
>301m	-0.595	0.346	-1.72	0.09	0.552
Awareness					
Health effect (Yes)	-0.258	0.283	-0.91	0.36	0.772
Radiation (Yes)	0.085	0.296	0.29	0.77	1.089

Conted...

Comfortable (Yes)	0.895	0.271	3.30	0.00**	2.449
Factor to move out (Yes)	-1.785	0.294	-6.06	0.00**	0.168
Medical checkup (Yes)	-0.274	0.253	-1.08	0.28	0.760
Health problem experience (Yes)	-0.300	0.257	-1.17	0.24	0.741
Caused by base station (Yes)	-0.012	0.288	-0.04	0.97	0.988
Health symptoms					
Headache (No)	0.090	0.254	0.35	0.72	1.094
Fatigue (No)	0.136	0.246	0.55	0.58	1.145
Nausea vomiting (No)	-0.417	0.546	-0.76	0.45	0.659
Sight problem (No)	-0.436	0.365	-1.20	0.23	0.647
Skin problem (No)	-0.597	0.552	-1.08	0.28	0.551
Loss of appetite (No)	-0.283	0.482	-0.59	0.56	0.754
Nosebleed (No)	1.358	0.633	2.15	0.03*	3.889
Number of Obs	507				
Hosmer & Lemeshow					
Chi-square (df)	4.30(8)				
<i>p</i> -value	0.8288				
L_{UR}	-251.440				
L_R	-316.112				
$I-L_{UR}/L_R$	0.205				

* $p < 0.05$, ** $p < 0.01$

DISCUSSION AND CONCLUSION

The study examined residents' perceptions on whether it was safe to live in the vicinity of telecommunication base stations in Malaysia, through four measurement indicators: demographic, type of resident, and their awareness towards the effects of living near the constructions, as well as the health symptoms. A questionnaire survey was conducted and the data was used to analyse the relationships between the measurement indicators toward the safety conscious of adjacent residents to base stations. Two analyses, namely the Chi-square test and the logistic regression analysis, were used to determine their relationships and they were presented in the early part of this article. The Chi-square results revealed that age and marital status were statistically significant in deciding whether it was safe to live in close proximity to the base station. The study of Shahbazi-Gahrouei et al³⁹ by tremendous use of mobile phone telecommunication, a growing concern about the possible health hazards has increased greatly among public and scientists. The mobile phone exposure has been shown to have many effects upon the immune functions,

stimulating hormones, mammalian brain, sperm motility and morphology, and neurological pathologies syndrome. The aim of this study was to find out the psychological and psychobiological reactions of the people who are living near mobile phone base transceiver stations (BTS and Siegrist et al⁴⁰ base stations, and other sources of electromagnetic fields (EMF also found that different age groups have different sensitivity towards EMFs. Different house type, feeling of comfort, factor to move out, and health problem experience were influencing the perceptive safety level of living near to base station.

For deeper understanding, binomial logistic regression was used and it discovered that people with the age between 25 to 35 years old tended to feel their health was threatened when they were living in proximity to base stations. This might have due to the younger generation was more aware about the hazardous risks of EMFs. People living in terrace houses or working in the offices adjacent to base stations would have higher probability to feel unsafe. It was surprising to disclose that the house owners would feel dangerous to live nearby

the base stations. Perhaps this was because the house owners considered themselves as permanent residents, unlike those who rented premises at the same place. These people considered themselves to be temporal residents. There are many studies revealed that distance away from the base station was a significant variable to determine the exposure level from EMFs e.g. Augner & Hacker²; Baliatsas et al⁴; Bond⁵; Kundi & Hutter²¹; Santini et al³⁶; Schüz & Mann³⁸; Viel et al⁴⁶ some people living close to these masts reported symptoms they attributed to electromagnetic fields (EMF). However, this study revealed that distance was not related to safety concern. There were two items of awareness significantly influence the perception of safety in term of living near to base stations, feeling of comfort and factor to move out. People who felt comfortable living near the telecommunication tower have positive coefficient indicating that they feel safe to live there. On the other hand, those who agreed that the base station could be a factor to move to another area would be more likely to feel unsafe to live around that place.

The study of Abdel-Rassoul et al¹, Mohler et al²⁴, Navarro et al²⁶, Santini et al^{36,37} and Suleiman et al⁴¹ 260 women revealed that fatigue, sight problem, and loss of appetite were the health risks of living in proximity to base stations. However, the present study showed only one item 'nosebleed' was significantly affected the perception of people and causing them to feel unsafe to live near to base station. People might perceive that the illnesses brought by EMF were rather chronic than acute. In addition, the Malaysian Communications and Multimedia Commission (MCMC) has distributed information to Malaysian citizens to raise public awareness regarding the health risks of EMF Din⁹; Ng²⁸; Tukimin et al⁴⁴.

To reduce the intensity of EMFs exposure, telecommunication companies should consider sharing base stations to mount their transceivers rather than increase the number of towers. Local authorities should regulate base station constructions to ensure that the constructions were carried out follow the guidelines provided by the Institute of Electrical and Electronics Engineers (IEEE)¹⁴ and the International Commission on Non-Ionizing Radiation Protection (ICNIRP)¹⁵. The MCMC should conduct random audits to ensure that the wireless communication environment is conformed to the EMF safety level.

Furthermore, the MCMC should openly disclose details on the localities of each telecommunication base station, including the names of the telecommunication companies operating them, on an official website. This will not only encourage transparency in conduct but it can also avoid the operation of illegal base stations. Lastly, public opinion should be heard and considered before any construction of base stations was taken place to avoid controversy.

ACKNOWLEDGMENT

Much appreciation is extended to the Ministry of Higher Education Fundamental Research Grant Scheme (FRGS) with the account number 203/PPBGN/6711518, USM members and those involved in this study.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Abdel-Rassoul G, El-Fateh O. A, Salem M. A, Michael A, Farahat F, El-Batanouny M, Salem E. Neurobehavioral effects among inhabitants around mobile phone base stations. *NeuroToxicology*. 2007; 28(2): 434–440. <https://doi.org/10.1016/j.neuro.2006.07.012>
2. Augner C, Hacker G. Are people living next to mobile phone base stations more strained? Relationship of health concerns, self-estimated distance to base station, and psychological parameters. *Indian Journal of Occupational and Environmental Medicine*. 2009; 13(3): 141. <https://doi.org/10.4103/0019-5278.58918>
3. Baliatsas C, van Kamp I, Bolte J, Kelfkens G, van Dijk C, Spreeuwenberg P, Yzermans J. Clinically defined non-specific symptoms in the vicinity of mobile phone base stations: A retrospective before-after study. *Science of the Total Environment*. 2016; 565: 714–720. <https://doi.org/10.1016/j.scitotenv.2016.05.021>
4. Baliatsas C, Van Kamp I, Kelfkens G, Schipper M, Bolte J, Yzermans J, Lebet E. Non-specific physical symptoms in relation to actual and perceived proximity to mobile phone base stations

- and powerlines. *BMC Public Health*. 2011; 11. <https://doi.org/10.1186/1471-2458-11-421>
5. Bond S. Cell phone tower proximity impacts on house prices: A new zealand case study. *Pacific Rim Property Research Journal*. 2007; 13(1): 63–91. <https://doi.org/10.1080/14445921.2007.11104223>
 6. Cousin M. E, Siegrist M. The public's knowledge of mobile communication and its influence on base station siting preferences. *Health, Risk and Society*. 2010; 12(3): 231–250. <https://doi.org/10.1080/13698571003710332>
 7. Cousin M, Siegrist M. Risk perception of mobile communication: a mental models approach. *Journal of Risk Research*. 2010; 13(5): 599–620. <https://doi.org/10.1080/13669870903236751>
 8. D'Angelo C, Costantini E, Kamal M. A, Reale M. Experimental model for ELF-EMF exposure: Concern for human health. *Saudi Journal of Biological Sciences*. 2015; 22(1): 75–84. <https://doi.org/10.1016/j.sjbs.2014.07.006>
 9. Din N. M. Radio Frequency Radiation Study. 2009; Retrieved March 30, 2018, from rfemf.mcmc.gov.my/skmmgovmy/.../Radio-Frequency-Radiation-Study_Uniten.pdf
 10. Hallberg Ö, Oberfeld G. Letter to the editor: Will we all become electrosensitive? *Electromagnetic Biology and Medicine*. 2006; 25(3): 189–191. <https://doi.org/10.1080/15368370600873377>
 11. Heinrich S, Ossig A, Schlittmeier S, Hellbrück J. Elektromagnetische felder einer UMTS-mobilfunkbasisstation und mögliche auswirkungen auf die befindlichkeit - Eine experimentelle felduntersuchung. *Umweltmedizin in Forschung Und Praxis*. 2007; 12(3): 171–180.
 12. Heinrich S, Thomas S, Heumann C, von Kries R, Radon K. Association between exposure to radiofrequency electromagnetic fields assessed by dosimetry and acute symptoms in children and adolescents: a population based cross-sectional study. *Environmental Health*. 2010; 9(1): 75. <https://doi.org/10.1186/1476-069X-9-75>
 13. Hutter H. P, Moshhammer H, Wallner P, Kundi M. Subjective symptoms, sleeping problems, and cognitive performance in subjects living near mobile phone base stations. *Occupational and Environmental Medicine*. 2006; 63(5): 307–313. <https://doi.org/10.1136/oem.2005.020784>
 14. Institute of Electrical and Electronics Engineers (IEEE). IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, Pub. L. No. IEEE Std C95.1.1999; IEEE.
 15. International Commission on Non-Ionizing Radiation Protection (ICNIRP). *ICNIRP Guidelines for Limiting Exposure To Time - Varying Guidelines for Limiting Exposure To Time-Varying*. *Health Physics*. 1998; 74(4): 494-522; <https://doi.org/10.1097/HP.0b013e3181f06c86>
 16. Isabona J, Srivastava V. M, Robert O. O. Spatial variation of the electromagnetic radiations due to exposure to telecommunication base station transmitters in a pilot region. *International Journal of Applied Engineering Research*. 2016; 11(22): 10994–11001.
 17. ITU. ICT Facts and Figures: Mobile-cellular subscriptions. 2016a; Retrieved March 30, 2018, from <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>
 18. ITU. ICT Facts and Figures: Percentage of Individuals using the Internet. 2016b; Retrieved March 30, 2018, from <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>
 19. Klaps A, Ponocny I, Winker R, Kundi M, Auersperg F, Barth A. Mobile phone base stations and well-being - A meta-analysis. *Science of the Total Environment*. 2016; 544: 24–30. <https://doi.org/10.1016/j.scitotenv.2015.11.009>
 20. Kuhnlein A, Heumann C, Thomas S, Heinrich S, Radon K. Personal exposure to mobile communication networks and well-being in children--a statistical analysis based on a functional approach. *Bioelectromagnetics*. 2009; 30(4): 261–269. <https://doi.org/10.1002/bem.20477>
 21. Kundi M, Hutter H. P. Mobile phone base stations--Effects on wellbeing and health. *Pathophysiology*. 2009; 16(2–3): 123–135. <https://doi.org/10.1016/j.pathophys.2009.01.008>
 22. McFadden D. Condition logit analysis of qualitative choice behavior. In *Frontiers in Econometrics*. 1974a; Vol. 1: pp. 105–143. <https://doi.org/10.1108/eb028592>

23. McFadden D. The measurement of urban travel demand. *Journal of Public Economics*. 1974b; [https://doi.org/10.1016/0047-2727\(74\)90003-6](https://doi.org/10.1016/0047-2727(74)90003-6)
24. Mohler E, Frei P, Braun-Fahrlander C, Fröhlich J, Neubauer G, Rössli M. Effects of everyday radiofrequency electromagnetic-field exposure on sleep quality: a cross-sectional study. *Radiation Research*. 2010; 174(3): 347–356. <https://doi.org/10.1667/RR2153.1>
25. Mohler E, Frei P, Fröhlich J, Braun-Fahrlander C, Rössli M. Exposure to radiofrequency electromagnetic fields and sleep quality: A prospective cohort study. *PLoS ONE*. 2012; 7(5): <https://doi.org/10.1371/journal.pone.0037455>
26. Navarro E. A, Segura J, Portolés M, Mateo C. G. de. The microwave syndrome: A preliminary study in Spain. *Electromagnetic Biology and Medicine*. 2003; 22(2–3): 161–169.
27. Neubauer G, Feychting M, Hamnerius Y, Kheifets L, Kuster N, Ruiz I, Rössli M. Feasibility of future epidemiological studies on possible health effects of mobile phone base stations. *Bioelectromagnetics*. 2007; 28(3): 224–230. <https://doi.org/10.1002/bem.20298>
28. Ng K. H. *Radiation, Mobile Phones, Base Stations and Your Health*. Gains Print Sdn. Bhd. 2003.
29. Ngui A. EMF radiation levels at telecommunication base stations still low: MCMC. *The Sun Daily*. 2016, April 20. Retrieved from <http://www.thesundaily.my/news/1773239>
30. Ozovehe A, Usman A. U, Hamdallah A. Electromagnetic Radiation Exposure From Cellular Base Station: a Concern for Public Health. *Nigerian Journal of Technology*. 2015; 34(2): 355–358. Retrieved from <http://10.0.16.218/njt.v34i2.20%5Cnhttp://bibliotecavirtual.unad.edu.co:2048/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=aci&AN=115962187&lang=es&site=ehost-live>
31. Pallant J. *SPSS Survival Manual: A step by step guide to data analysis using SPSS*. *Journal of Advanced Nursing*. 2010; (Vol. 3rd).
32. Reece W. S. Are Senior Leisure Travelers Different? *Journal of Travel Research*. 2004; 43(1): 11–18. <https://doi.org/10.1177/0047287504265507>
33. Roje V, Poljak D, Sarolic A. Safety aspects of the GSM Base Station Radiation Concerning Human Health. In *IEEE International Symposium on Electromagnetic Compatibility*. 2003; Vol. 2: pp. 720–723. <https://doi.org/10.1109/ICSMC2.2003.1429006>
34. Rössli M, Frei P, Mohler E, Hug K. Systematic review on the health effects of exposure to radiofrequency electromagnetic fields from mobile phone base stations. *Bulletin of the World Health Organization*. 2010; 88(12): 887–896. <https://doi.org/10.2471/BLT.09.071852>
35. Rössli M, Hug K. Wireless communication fields and non-specific symptoms of ill health: A literature review. *Wiener Medizinische Wochenschrift*. 2011; 161(9–10): 240–250. <https://doi.org/10.1007/s10354-011-0883-9>
36. Santini R, Santini P, Danze J. M, Le Ruz P, Seigne M. Enquête sur la santé de riverains de stations relais de téléphonie mobile: I/Incidences de la distance et du sexe. *Pathologie Biologie*. 2002; 50(6): 369–373. [https://doi.org/10.1016/S0369-8114\(02\)00311-5](https://doi.org/10.1016/S0369-8114(02)00311-5)
37. Santini R, Santini P, Danze J. M, Le Ruz P, Seigne M. Enquête sur la santé de riverains de stations relais de téléphonie mobile: II/Incidences de l'âge des sujets, de la durée de leur exposition et de leur position par rapport aux antennes et autres sources électromagnétiques. *Pathologie Biologie*. 2003; 51(7): 412–415. [https://doi.org/10.1016/S0369-8114\(03\)00020-8](https://doi.org/10.1016/S0369-8114(03)00020-8)
38. Schüz J, Mann S. A discussion of potential exposure metrics for use in epidemiological studies on human exposure to radiowaves from mobile phone base stations. *Journal of Exposure Analysis and Environmental Epidemiology*. 1999; 10(6 Pt 1): 600–605. <https://doi.org/10.1038/sj.jea.7500115>
39. Shahbazi-Gahrouei D, Karbalae M, Moradi H. A, Baradaran-Ghahfarokhi M. Health effects of living near mobile phone base transceiver station (BTS) antennae: A report from Isfahan, Iran. *Electromagnetic Biology and Medicine*. 2014; 33(3): 206–210. <https://doi.org/10.3109/15368378.2013.801352>
40. Siegrist M, Earle T. C, Gutscher H, Keller C. Perception of mobile phone and base station risks.

- Risk Analysis. 2005; 25(5): 1253–1264. <https://doi.org/10.1111/j.1539-6924.2005.00672.x>
41. Suleiman A, Gee T. T, Krishnapillai A. D. Electromagnetic Radiation Health Effects in Exposed and Non-Exposed Residents in Penang. 2014; (April), 77–83. <https://doi.org/10.4236/gep.2014.22012>
42. Thomas S, Heinrich S, Von Kries R, Radon K. Exposure to radio-frequency electromagnetic fields and behavioural problems in Bavarian children and adolescents. *European Journal of Epidemiology*. 2010; 25(2): 135–141. <https://doi.org/10.1007/s10654-009-9408-x>
43. Thomas S, Kühnlein A, Heinrich S, Praml G, Nowak D, Von Kries R, Radon K. Personal exposure to mobile phone frequencies and well-being in adults: A cross-sectional study based on dosimetry. *Bioelectromagnetics*. 2008; 29(6): 463–470. <https://doi.org/10.1002/bem.20414>
44. Tukimin R, Mahadi W. N. L. W, Ali M. Y. M, Thari M. N. M. Public Awareness on Electromagnetic Field in Malaysia. In *International Engineering Convention*. 2009; pp. 486–492. Damascus, Syria.
45. Van Kleef E, Fischer A. R. H, Khan M, Frewer L. J. Risk and benefit perceptions of mobile phone and base station technology in Bangladesh. *Risk Analysis*. 2010; 30(6): 1002–1015. <https://doi.org/10.1111/j.1539-6924.2010.01386.x>
46. Viel J. F, Clerc S, Barrera C, Rymzhanova R, Moissonnier M, Hours M, Cardis E. Residential exposure to radiofrequency fields from mobile phone base stations, and broadcast transmitters: A population-based survey with personal meter. *Occupational and Environmental Medicine*. 2009; 66(8): 550–556. <https://doi.org/10.1136/oem.2008.044180>
47. Wiedemann P. M, Freudenstein F, Böhmert C, Wiart J, Croft R. J. RF EMF risk perception revisited: Is the focus on concern sufficient for risk perception studies? *International Journal of Environmental Research and Public Health*. 2017; 14(6): <https://doi.org/10.3390/ijerph14060620>

Bayesian Spatial Survival Models for HIV/AIDS Event Processes in East Java

Nur Mahmudah¹, Nur Iriawan¹, Santi Wulan Purnami¹

¹Department of Statistics, Faculty of Mathematics, Computing, and Data Science, Institut Teknologi Sepuluh Nopember, Kampus ITS Sukolilo–Surabaya, Indonesia

ABSTRACT

Survival analysis can be defined as a statistical analysis of the duration of time of an event happen as a response that can also be influenced by several influencing covariates. This paper would elaborate this analysis to understand the survival rate of HIV/AIDS patients in East Java province, Indonesia. The spread of HIV/AIDS infection which affects the human immune system caused by some factors, i.e. the level of reproductive health education in the area, imported cases, the number of people at risk in the area. An incidence of HIV infection from one area will be suspected to affect the others. Modelling of spatial survival, therefore, will be suitable for this case. A model that includes the spatial random effect of Conditionally Autoregressive (CAR) was used to adjust unexplainable spatial dependent in the model. The weighted matrix Queen's contiguity is employed and the Moran's I statistical test is used to detect the existence of an effect of between-districts/cities toward the incidence rate of HIV/AIDS cases are exist. The preliminary analysis to the data show that there is a significant effect of space (spatial) to the HIV/AIDS incidence in every districts/city in East Java province, and the distribution of the survival time of HIV/AIDS patients is following the 3-parameter Lognormal. The work of the approach demonstrates that the survival function of HIV/AIDS patients reduced as the more extended treatment time while hazard function increased, and additionally all districts/cities had different survival rate.

Keywords: Bayesian, CAR (Conditionally Autoregressive), HIV/AIDS, Moran's I, Queen Contiguity, Survival analysis, Survival spatial.

INTRODUCTION

Survival analysis is a part of the statistical procedure to analyze data over which response variable induced time until the phenomenon happened. The objective of this analytical method is to identify risk factors of incidence and handle a situation when a risk factor is fluctuating toward time. Based on the statement as mentioned above, a researcher has to have an objective to determine the factors affecting a phenomenon to happen. With risk factors of incidence over time, thus the survival model will be reliable to be used¹.

Spatial survival analysis is a Hazard function estimating a possibility of an object that experiences an event in time to t based on location effect. It is called a spatial factor because of an event is frequently correlated with location over which this event is happening and affected by these location factors. In determining spatial dependence to random effect of closely related areas by

distance, a Bayesian method is suitable to be applied². Spatial reliance further is coded by prior conditionally autoregressive (CAR) to raise an autocorrelation that previously should not be present in the random effect of survival model to acceptably exist. These autocorrelation is exhibiting a correlation between geographically close areas coded by a matrix called adjacent (neighboring pattern). Further, hierarchical survival model is implemented using Markov Chain Monte Carlo (MCMC) method with Gibbs sampling^{3,4}.

Darmofal³ implemented spatial survival model in political science of which time has been modelled until parliament member sequence announced by NAFTA (American government). The term "survival" was not referring to death cases but instead referring to the survival time of a unit until a political event happened. Spatial survival model by Aksiomaand Iriawan⁵ on HIV/AIDS incidence in East Java province was conducted to model a time until a patient died or referred out of

anti-retroviral (ART) Program with spatial effect. The use of survival model in health sciences is based on death cases with spatial impact. Hasyim, Iriawan, and Prasetyo⁶ employed the spatial analysis in the survival mixture model on dengue incidence in Pamekasan, where the time is recorded when the patient of dengue hemorrhagic fever come to the hospital until getting well or he back home and identified as the existence of censored data or failure. The utility of survival mixture model in health sciences can also be used to estimate death cases while considering spatial effect. Previous reports regarding spatial survival model which include spatial effect concluded that model would result in proper estimation if the survival data of every location is assumed to be having some equally distributed variables. In reality, not all distribution of survival data in every area could represent as clear distribution. This research on HIV/AIDS data follows the 3-parameter Lognormal distribution.

METHODOLOGY

Data in this research are derived secondarily from Dr. Soetomo hospital of Surabaya – Indonesia that includes house-based treatment (treatment condition of HIV-AIDS patients) involving spatial/lattice factor. The data is found as a medical record obtained from 2012 to 2017. The additional observation to the on-going treatment is followed at the time until referred out from ART or failure event. The spatial factor is stated as adjacent between locations (as an adjacent matrix).

Response variable in this research is treatment time symbolized by *t*, the time at which treatment-derived ART of HIV-AIDS patients is prescribed or on progress until referred out from ART therapy, died or lost-of-follow up from last visit (identifying a censored data or failure). Covariate variables to explain the diversity of the response time are sex (X_1), age (X_2), education (X_3), sort of job (X_4), marital status (X_5), body weight (X_6), absolute level of CD4 (X_7), stadium of the patient (X_8), functional status (X_9), adherence of therapy (X_{10}), opportunistic infection (X_{11}), status of tuberculosis (X_{12}), risk factor of infection (X_{13}), history of ARV (X_{14}), Adherence of ARV (X_{15}), regiment of ARV (X_{16}), and companion of taking medicine (X_{17}). Besides those variables, the spatial variable is also included which stated the lattice data of the district where the patients originated from. The step of the analysis would be as follows:

1. Discussing survival model by considering the existence of location effect with the step of adding the spatial random effect (spatial frailty term) on the proportional hazard model and determining prior distribution, posterior distribution, and determining the algorithm of parameter estimation of spatial survival model by using MCMC couple with the Gibbs sampling.
2. Determining spatial effect by frailty distribution of CAR on HIV-AIDS patients in East Java province based on factors affecting the survival rate of the patients. The sequence of steps are: determining the spatial weight (inputting a map area of East Java into program package of Win BUGS while deciding adjacent matrix), testing for spatial autocorrelation using statistical test of Moran’s I, testing the assumption of the proportional hazard modelling and distribution of survival time data, and finally calculating the survival and hazard function.
3. Determining spatial survival model by estimating its parameters using MCMC couple with the Gibbs sampling.

RESULTS

In this research, distribution of treatment time (survival time) of HIV-AIDS patients was following a 3-parameter Lognormal distribution (β, τ, γ). This distribution has a likelihood concentrated function as follows:

$$f(t; \beta, \tau, \gamma) = \frac{1}{(t - \gamma)\tau\sqrt{2\pi}} \exp\left\{-\frac{[\ln(t - \gamma) - \beta]^2}{2\tau^2}\right\} \dots(10)$$

where $\tau > \gamma \geq 0, -\infty < \beta < \infty, \tau > 0$ and γ is location parameter. If it is a response changing factor which has 3-parameter Lognormal distribution, then $y = \ln(t - \gamma)$ possesses a normal distribution with average and variance τ^2 . When $\gamma = 0$, then the distribution become 2-parameter Lognormal. A lognormal distribution that transformed into normal deviation distribution could be obtained by:

$$f(t) = \frac{P\left(Z = \frac{\ln(t - \gamma) - \beta}{\tau}\right)}{\tau(t - \gamma)} \dots(11)$$

The cumulative distribution function of 3-parameter Lognormal distribution or $F(t)$ has an equation of:

$$F(t) = \int_0^t \frac{1}{(u-\gamma)\tau\sqrt{2\pi}} \exp\left\{-\frac{[\ln(u-\gamma)-\beta]^2}{2\tau^2}\right\} du, \dots(12)$$

and its survival function would be as follows:

$$\begin{aligned} S(t) &= 1 - F(t) \\ &= 1 - \int_0^t \frac{1}{(u-\gamma)\tau\sqrt{2\pi}} \exp\left\{-\frac{[\ln(u-\gamma)-\beta]^2}{2\tau^2}\right\} du \\ &= P(T > t) \\ &= P\left[Z > \frac{\ln(t-\gamma)-\beta}{\tau}\right]. \dots(13) \end{aligned}$$

While its hazard function is given by:

$$\begin{aligned} h(t) &= \frac{f(t)}{S(t)} \\ &= \frac{P\left(Z = \frac{\ln(t-\gamma)-\beta}{\tau}\right)}{\tau(t-\gamma)\left\{P\left[Z > \frac{\ln(t-\gamma)-\beta}{\tau}\right]\right\}}. \dots(14) \end{aligned}$$

The general Cox regression equation on equation (4) for the 3-parameter Lognormal model is

$$\begin{aligned} h(t, X) &= h_0(t) \exp(\beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_p X_p) \\ &= \frac{P\left(Z = \frac{\ln(t-\gamma)-\beta}{\tau}\right)}{\tau(t-\gamma)\left\{P\left[Z > \frac{\ln(t-\gamma)-\beta}{\tau}\right]\right\}} \dots(15) \end{aligned}$$

Further $h_0(t)$ is a function which value is dependent on the value of t , while $\exp(\beta_1 X_1 + \beta_2 X_2 + \dots + \beta_p X_p)$ is free from the value of t , this μ parameter could be stated as follows:

$$\begin{aligned} \mu &= \frac{P\left(Z = \frac{\ln(t-\gamma)-\beta}{\tau}\right)}{\left\{P\left[Z > \frac{\ln(t-\gamma)-\beta}{\tau}\right]\right\}} \\ &= \exp(\beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_p X_p) \dots(16) \end{aligned}$$

and the hazard baseline $h_0(t)$ could be reported as follows:

$$h_0(t) = \frac{1}{\tau(t-\gamma)}. \dots(17)$$

Therefore, the hazard function is considered by:

$$\begin{aligned} h(t, X) &= \frac{P\left(Z = \frac{\ln(t-\gamma)-\beta}{\tau}\right)}{\tau(t-\gamma)\left\{P\left[Z > \frac{\ln(t-\gamma)-\beta}{\tau}\right]\right\}} \\ &= \left\{\frac{1}{\tau(t-\gamma)} \exp(\beta_0)\right\} \\ &\quad \exp(\beta_1 X_1 + \beta_2 X_2 + \dots + \beta_p X_p + W_i) \dots(18) \end{aligned}$$

where W_i is a form of stratum-specific frailty that is formed by stating a difference between strata/group, and W_i is assumed to be identical, independent and

iid $W_i \sim N(0, \sigma^2)$. CAR distribution is used as a prior distribution for ν parameter representing random effect (frailty) over which spatially inter-correlated, and could be stated as⁷:

$$W^* | \lambda \sim \text{CAR}(\lambda)$$

where $\lambda = 1/\nu$. While the general form of prior CAR has joint proportional distribution as:

$$\begin{aligned} &\lambda^{I/2} \exp\left[-\frac{\lambda}{2} \sum_{i \text{ adj } i'} (W_i^* - W_{i'}^*)^2\right] \propto \\ &\lambda^{I/2} \exp\left[-\frac{\lambda}{2} \sum_{i=1}^I m_i W_i^* (W_i^* - \bar{W}_i^*)\right] \dots(19) \end{aligned}$$

where i and i' : neighbouring areas

$\bar{W}_i^* = m_i \sum_{j=1}^I W_j^*$ is an average of W_j^* neighbouring to W_i^* ,

$i \text{ adj } j$ is neighbouring locations, and

m_i : the number of neighbour possessed by i

Estimating the spatial survival model parameters throughout the Gibbs sampling can be explained as in the following steps:

Determining initial value or initial estimation for each parameter.

$(\gamma^{(0)}, \tau^{(0)}, \lambda^{(0)}, \beta_1^{(0)}, \dots, \beta_p^{(0)})$ and set $s = 0$

Afterward, the random sequence can be obtained as below:

Increase s by one, or $s = s + 1$

$\tau^{(s)}$ from $p(\tau | t, \gamma^{(s-1)}, \lambda^{(s-1)}, \beta_1^{(s-1)}, \dots, \beta_p^{(s-1)})$

$\gamma^{(s)}$ from $p(\gamma | t, \tau^{(s)}, \lambda^{(s-1)}, \beta_1^{(s-1)}, \dots, \beta_p^{(s-1)})$

$\lambda^{(s)}$ from $p(\lambda | t, \tau^{(s)}, \gamma^{(s)}, \beta_1^{(s-1)}, \dots, \beta_p^{(s-1)})$

$\beta_1^{(s)}$ from $p(\beta_1 | t, \tau^{(s)}, \gamma^{(s)}, \lambda^{(s-1)}, \beta_2^{(s-1)}, \dots, \beta_p^{(s-1)})$:

$\beta_j^{(s)}$ from $p(\beta_j | t, \tau^{(s)}, \gamma^{(s)}, \lambda^{(s)}, \beta_2^{(s)}, \beta_{j-1}^{(s)}, \dots, \beta_p^{(s-1)})$:

$\beta_p^{(s)}$ from $p(\beta_p | t, \tau^{(s)}, \gamma^{(s)}, \lambda^{(s)}, \beta_2^{(s)}, \beta_{p-1}^{(s)}, \dots, \beta_p^{(s-1)})$

Repeating the second step until convergence condition (sample for model parameter inference) is sufficient^{8,9}.

The Gibbs sampling process above will provide the parameter estimation of the 3-parameter Lognormal survival model and will report predictor variables that affect the time to survive until the patient is referred to ART or dies and loses follow-up by involving location factors. Table 1 shows the estimation result of all the parameter in the spatial survival model 3-parameter Lognormal with frailty CAR.

Table 1: Estimation result of spatial survival model 3-parameter Lognormal with frailty CAR

Variable	Parameter	Mean	2.50%	Median	97.50%
X _{1,1}	b ₁	-11.430	-19.590	-10.760	-6.501
X _{1,2}	b ₂	-11.180	-19.170	-10.500	-6.447
X _{2,0}	b ₃	-4.141	-8.071	-4.515	1.435
X _{2,1}	b ₄	-4.316	-7.588	-4.853	1.302
X _{2,2}	b ₅	-5.535	-9.892	-5.810	0.069
X _{3,0}	b ₆	-0.282	-19.930	-0.073	18.900
X _{3,1}	b ₇	3.985	0.079	3.242	10.220
X _{3,2}	b ₈	2.698	-1.392	1.853	9.174
X _{3,3}	b ₉	3.782	-0.057	2.997	9.940
X _{3,4}	b ₁₀	3.628	-0.135	2.985	9.776
X _{4,0}	b ₁₁	-1.909	-6.851	-2.088	4.420
X _{4,1}	b ₁₂	-2.314	-6.927	-2.513	3.979
X _{5,0}	b ₁₃	-6.763	-10.530	-7.247	-1.409
X _{5,1}	b ₁₄	-6.763	-10.630	-7.179	-1.402

Conted...

X _{6,0}	b ₁₅	-0.702	-3.938	-0.738	2.947
X _{6,1}	b ₁₆	-0.727	-3.917	-0.853	2.758
X _{6,2}	b ₁₇	-0.287	-3.414	-0.339	3.284
X _{7,0}	b ₁₈	4.993	1.294	4.698	9.920
X _{7,1}	b ₁₉	4.618	0.632	4.333	9.652
X _{8,1}	b ₂₀	2.435	-4.713	2.827	7.012
X _{8,2}	b ₂₁	2.067	-4.987	2.643	6.431
X _{8,3}	b ₂₂	2.824	-4.399	3.122	7.317
X _{8,4}	b ₂₃	2.410	-4.453	2.795	7.325
X _{9,1}	b ₂₄	5.657	0.019	5.596	11.080
X _{9,2}	b ₂₅	2.510	-10.460	2.766	15.080
X _{9,3}	b ₂₆	1.093	-9.897	1.433	11.080
X _{10,0}	b ₂₇	6.575	1.000	7.094	11.020
X _{10,1}	b ₂₈	6.594	0.777	7.165	10.830
X _{11,0}	b ₂₉	6.029	2.405	5.760	10.560
X _{11,1}	b ₃₀	6.604	2.823	6.313	11.290
X _{12,1}	b ₃₁	1.135	-1.985	0.756	5.654
X _{12,2}	b ₃₂	0.911	-2.096	0.493	5.623
X _{12,3}	b ₃₃	1.049	-2.745	0.740	5.635
X _{12,4}	b ₃₄	0.733	-2.648	0.391	5.293
X _{13,1}	b ₃₅	-1.079	-9.042	-4.082	9.745
X _{13,2}	b ₃₆	-1.589	-9.907	-4.330	9.469
X _{13,3}	b ₃₇	-0.061	-20.310	-0.051	2.000
X _{13,4}	b ₃₈	-2.163	-10.350	-5.059	9.542
X _{13,5}	b ₃₉	-0.273	-20.420	-0.303	19.280
X _{13,6}	b ₄₀	0.028	-19.520	0.061	19.550
X _{14,0}	b ₄₁	3.244	-3.567	2.916	10.160
X _{14,1}	b ₄₂	2.114	-5.005	1.653	9.444
X _{15,1}	b ₄₃	-3.003	-10.280	-2.380	0.934
X _{15,2}	b ₄₄	-2.143	-9.600	-1.499	1.825
X _{15,3}	b ₄₅	-3.659	-10.930	-3.102	0.589
X _{16,1}	b ₄₆	1.076	-9.549	1.480	10.360
X _{16,2}	b ₄₇	0.082	-19.720	0.033	19.530
X _{16,3}	b ₄₈	-3.094	-10.270	-2.595	1.923
X _{16,4}	b ₄₉	-2.895	-10.130	-2.526	1.983
X _{16,5}	b ₅₀	0.038	-19.800	0.113	20.160
X _{16,6}	b ₅₁	0.835	-14.710	1.382	12.920
X _{17,1}	b ₅₂	-1.051	-8.346	0.228	5.523
X _{17,2}	b ₅₃	-1.180	-8.509	0.006	5.223
X _{17,3}	b ₅₄	-0.746	-8.422	-0.056	6.829
Constant	b ₀	6.303	3.426	5.810	12.850
Spatial	τ	9.773	2.985E-15	0.055	94.160
	λ	1.084E+15	0.1032	4.259	1.886E+7

Table 1 shows factors considered to be significantly affecting the recovery rate of HIV-AIDS patients if the

credible interval between 2.5% to 97.5% does not hold zero. Table 1 exhibits that not all factors are significantly being an effect of recovery rate or survival rate of HIV-AIDS patients. Parameter column is factors suspected being an effect of recovery rate or survival rate of HIV-AIDS patients, while mean column exhibit the value of the model parameter, and the other three columns are the 97.5% credible interval of the estimated parameter. CAR frailty parameter of τ , where $\tau = 1/\sqrt{\lambda}$, significantly affect the survival rate of HIV-AIDS patients from death which means there is an existence of unexplainable spatial dependence in a standard survival model, thus causing the rise of dependency on random effect. This dependence on random impact exists between observation units in a group while the unexpected result of between-group will be reciprocally independent. Based on the estimation of survival model parameter by frailty CAR on Table 1, it can be concluded that female patient factor following ART program affects the survival rate of HIV-AIDS patients from death as much as $\exp(-11.430)$ or 0.00011 times compared to a male patient. Thus, it is indicating that female patient is apparently quickly recovered or statistically 0.000011 times faster than the male HIV-AIDS patient. Therefore, the vast majority of death caused by HIV-AIDS more likely come from male than the female patient. This is because a male patient is more susceptible to HIV-AIDS virus. The contribution of other variables can be read in the same way.

Table 1 gives the following summary of the survival model parameter by frailty CAR. Based on equation(18) and those estimated parameters, the hazard of HIV-AIDS patients in each district/cities East Java province can be modelled as follows:

$$\begin{aligned} h(t, X) &= h_0(t) \exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_p X_p) \\ &= \frac{1}{\tau(t-\gamma)} \exp(6.303 - 11.430X_{1,1} - 11.180X_{1,2} \\ &\quad - 1.141X_{2,0} + \dots - 0.746X_{17,3} + W_i) \end{aligned}$$

Random effect between units in a district/city is reciprocally dependent and stated in a value of i^{th} district, W_p , and these values will be different among districts/cities. Based on the model, the hazard of HIV-AIDS patients can be determined based on time (days) and factors affecting these hazard value, while considering the original area of the patients. For example, the hazard of HIV-AIDS patients based on the element that they

used to have prior ARV treatment by following ART program. This hazard value is obtained by considering that other factors are constant and the hazard of the patients is only affected by a real report of the patients used to get ART prior following program.

The result of Spatial Survival Analysis using lifetime 3 parameters Lognormal distribution with Bayesian method shows that every Regency/City in East Java has each model in determining survival rate or healing of HIV / AIDS patient. This finding differs from the previous studies which is done by Aksioma and Iriawan⁵. They found that using a lifetime distribution of Weibull has only one model representing all districts in East Java in determining the survival rate of HIV/AIDS.

The high level of HIV/AIDS in East Java can be epidemiologically important in relation to health program focused on people at risk in the area with routine surveillance and monitoring system based on survival in the location where the patient lives. In line with this research, some of them have described lifetime distribution. The findings of this study indicate that factors affecting the survival rate of HIV / AIDS are sex (X_1), education (X_3), marital status (X_5), and the absolute level of CD4 (X_7). This also applies to the functional status (X_9), adherence to therapy (X_{10}), and opportunistic infection (X_{11}). This finding also differs from the Aksioma and Iriawan⁵ study in which factors affecting the HIV/AIDS survival rate are patient stages, ARV history, functional status, and absolute CD4 levels.

CONCLUSIONS

Based on the aforementioned analysis, it can be concluded that survival time distribution of 3-parameter Lognormal can implicate on spatial survival model. Whereas adding frailty spatial that result in the random effect of spatial dependence caused of significant correlation between patient's condition and unsuitable environmental factor creates every district/city having a different range of credible interval for the survival rate of HIV-AIDS patients. The spatial survival model 3-parameter Lognormal is easy to be performed by a Bayesian approach using MCMC couple with Gibbs sampling which is implemented in Win BUGS.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Kleinbaum D G, Klein M. Survival Analysis. A Self-Learning Text, New York: Springer. 2005.
2. Cressie N. Statistics for Spatial Data. Revised Edition, John Wiley & Sons, New Jersey. 2015.
3. Darmofal D. Bayesian Spatial Survival Models for Political Event Processes. Department of Political, Science University of South Carolina. 350 Gambrell Hal. Columbia. 2008.
4. Iriawan N, Astutik S, Prastyo D D. Markov Chain Monte Carlo – Based Approaches for Modeling the Spatial Survival with Conditional Autoregressive (CAR) Frailty. International Journal of Computer Science and Network Security. 2010;10(12):1-6.
5. Aksioma D F, Iriawan N. Spatial Autocorrelation of the DHF Outbreaks in the City of Surabaya. Proceeding of The Third International Conference on Mathematics and Natural Sciences (ICMNS). Bandung. 2010;48-56.
6. Hasyim M, Iriawan N, Prasetyo D D. Spatial Mixture Survival Model by Normal Distribution of Frailty for Incidence Rate of Dengue Hemorrhagic Fever (DHF) in Pamekasan. Proceeding of the 2nd International Conference on Basic Sciences. 2012;S5-S9.
7. Banerjee S, Wall M M, Carlin B P. Frailty modeling for spatially correlated survival data, with application to infant mortality in Minnesota. Biostatistics. 2003;123-142.
8. Ntzoufras I. Bayesian Modeling Using WinBUGS. John Wiley & Sons. New Jersey. 2009.
9. Mahmudah N, Pramoedyo H. Pemodelan Spasial Survival Weibull-3 Parameter dengan Frailty Berdistribusi Conditional Auto regressive (CAR). Natural B. 2015;93-102.

Survival Analysis of Chronic Kidney Disease Patients using Stratified Cox Regression in Arifin Achmad Hospital, Pekanbaru, Riau

Muhammad Muhajir¹, Cynthia Hazirah Imanina¹

¹Department of Statistics, Faculty of Mathematics and Science Islamic University of Indonesia, Yogyakarta, Indonesia

ABSTRACT

Chronic Kidney Disease (CKD) is a clinical condition characterized by decreased kidney function requiring renal replacement therapy were fixed, in the form of dialysis. The mortality rate caused by CKD increases significantly each year and needs to be reduced. The purpose of this study to determine the factors that affect patients from CKD in hospitals Arifin Achmad, Pekanbaru, Riau in 2015-2017. The sample of this study amounted to 230 samples. One of the tools to analyze the longer survival of patients with CKD is cox proportional hazards regression. In the long survival data of patients with CKD there is a possibility of ties, so there is one method in determining the partial likelihood estimation parameters, that is exact. Based on the analysis results obtained the factors that most influence with the best parameter estimation is the exact approach are diastolic blood pressure, respiratory rate, urea levels, and action. There is a variable that does not meet the proportional hazard assumption, is the action variable. One way to overcome this by using Cox Stratified Regression Without Interaction and Cox Stratified Regression with Interaction. Based on the results of the analysis that meets the proportional hazard assumption is the method of Cox Stratified Regression Without Interaction and obtained the factors that affect the length of survival of CKD patients are age, diastolic blood pressure, respiratory rate, and urea levels. Interpretation of equation model of Cox Stratified Regression Without Interaction obtained result of increase of age patient have chance to die bigger of 1.0208 times, increase of diastolic blood pressure patient has chance to die smaller equal to 1.0571 times, increase of respiration rate patient have chance to die bigger equal to 1.0677 times, and increase of ureum level patient have chance to die bigger of 1.0073 times.

Keywords: CKD, Cox Proportional Hazard, Stratified Cox

INTRODUCTION

Chronic kidney disease (CKD) is a condition in which the kidneys are damaged or cannot filter blood as well as healthy kidneys¹. CKD is a global public health problem with increased prevalence and incidence of CKD, poor prognosis and high costs. The prevalence of CKD increases with the increasing number of elderly population and the incidence of diabetes mellitus and hypertension. About 1 in 10 global populations experience CKD at a particular stage. The result of systematic review and metaanalysis conducted by Hill et al, 2016, get the global prevalence of CKD of 13.4%. According to the 2010 Global Burden of Disease results, CKD was the 27th leading cause of death in the world in 1990 and increased to 18th in 2010. In Indonesia in 2013, 499.800 Indonesians suffered CKD. While

in Indonesia, the treatment of kidney disease is the second largest funding ranking of BPJS health after heart disease². Based on the Basic Health Research data of 2013, the prevalence of CKD in Riau Province is 0.1% of the population of patients with kidney disease in Indonesia, including patients undergoing treatment, renal replacement therapy, peritoneal dialysis, and hemodialysis by 2013³.

Arifin Achmad Hospital is one of the government-owned hospitals in the city of Pekanbaru, Riau. This hospital is used as a referral hospital from government hospitals and puskesmas in Riau Province. In addition the hospital also has hemodialysis service and installation of CAPD (Continuous Ambulatory Peritoneal Dialysis) for patients with CKD. CKD itself is a disease classified in the list of 10 major outpatient diseases. CKD lies in the

9th sequence after medical observation and evaluation for alleged illness and condition, gastric function disturbance, lower back pain, impact teeth, follow-up examination after fracture treatment, primary essential hypertension, insulin dependent militat militus, and other ear disorders outside.

Departing from the background of the above phenomenon, then selected life test analysis method as a method of analysis to solve the problem. Life test analysis is an analysis of the individuals of one population by focusing on the length of time the individual performs its function well until the individual's healing or death. Live test data usually will follow a certain distribution pattern. Therefore, in this study will be compared some results of life test analysis using Cox regression method.

In addition to looking for factors that influence and the best model of CKD data in RSUD Arifin Achmad Pekanbaru, Riau, there is one assumption that must be met in cox regression method that is proportional hazard assumption. This assumption is useful for examining the independent variables in the model meeting the proportional hazard assumptions or not. If the assumption is fulfilled then the model can be directly interpreted, whereas if the assumption is not met can be done two ways. First issue an independent variable that does not meet the proportional hazard assumption. The two do strata on variables that do not meet the proportional hazard assumption with the Cox Stratified Regression method. Independent variables that previously met proportional hazard assumptions remain included in the model, but not strata in those variables.

METHODOLOGY

The data used in this study is secondary data in the form of medical record data of CKD patients in 2015-2017 at Arifin Achmad Hospital, Pekanbaru, Riau. In this study, the target population was taken namely patients affected by chronic kidney disease from 2015-2017 which amounted to 454 patients. As well as the sample that the authors use in this study as many as 230 patients. The research variables used were survival variable as dependent variable, while the independent variables used were gender variables (X_1), age (X_2), disease history (X_3), systolic blood pressure (X_4), diastolic blood pressure (X_5), respiratory rate (X_6), pain (X_7), pain scale (X_8), diabetes mellitus (X_9), urea (X_{10}), *creatine* (X_{11}),

action (X_{12}), dan therapy (X_{13}). The research method used as follows:

- a. Cox Proportional Hazard Regression with Paramal Likelihood Parameter Estimation Approach
Cox regression is generally more commonly used in the health field, but the growing time of Cox regression can be applied to other fields. In general, the Cox Proportional Hazard equation can be written as follows⁵:

$$h(t, X) = h_0(t) \exp(\beta_1 X_1 + \beta_2 X_2 + \dots + \beta_p X_p) \\ = h_0(t) \exp\left(\sum_i^p \beta_i X_i\right)$$

The method with partial likelihood exact approach is an alternative method of case incident. However, this method has a very intensive computational level but is capable of generating estimated parameters that have a bias close to 0 even if the data of joint events or ties are of a very large size. In general, the partial likelihood exact approach has the following form of equation⁶:

$$L(\beta_{\text{Exact}}) = \prod_{i \in D} \frac{\exp(\sum_k S_k)}{\sum_{i \in R_{t_i}, d_k} \exp(\sum_k X_i)}$$

- b. **Testing Parameters:** In regression cox proportional hazard required testing the significance of parameters in order to know whether the independent variable significantly affect the cox equation formed. Testing of significance is done by simultaneous test (overall), partial test, and proportional hazard assumption test⁵.

1. Overall Test

Hypothesis : $H_0 : \beta_i = 0$

$H_1 : \text{At least there is one } \beta_i \neq 0 \text{ where } i = 1, 2, \dots, p$

Level of Significance: $\alpha = 5\% = 0.05$

Statistic Test: $G = -2[\ln L_R - \ln L_j] \dots(3)$

Area of Critism: H_0 is rejected if $p\text{-value} \leq \alpha$ or $G \geq \chi^2_{\alpha; ab=p}$

2. Partial Test

Hypothesis: $H_0 : \beta_i = 0$

$H_1 : \beta_i \neq 0 \text{ where } i = 1, 2, \dots, p$

Level of Significance: $\alpha = 5\% = 0.05$

Statistic Test: $Z = \frac{\beta_i}{SE(\beta_i)} \dots(4)$

Area of Critism: H_0 is rejected $p\text{-value} \leq \alpha$ or $|Z| \geq Z_{0.05/2}$

3. Proportional Hazard Assumptions Test

Hypothesis: $H_0 : \rho = 0$ (Proportional hazard assumptions are met)

$H_1 : \rho \neq 0$ (Proportional hazard assumptions are not met)

Level of Significance: $\alpha = 50\% = 0.05$

Statistic Test: *p-value* ... (5)

Area of Critism: H_0 is rejected $p\text{-value} \leq \alpha$

c. Selection of the Best Model: AIC method is a method that can be used to select the best regression model invented by Akaike and Schwarz⁷. How to select several models to choose the best model is based on AIC with the following formula+:

$$AIC = 2\ln \hat{L} + 2k$$

d. Cox Stratified Regression: Cox Stratified Regression is one of the methods used to overcome independent variables that have non proportional hazard assumptions. Cox Stratified model is a modification of the Cox Proportional Hazard model in which the Cox Stratified model divides the hazard function into the strata or stages of the covariate. The covariates divided into these strata are covariates that do not meet the proportional hazard assumptions⁵.

Cox Stratified model without interaction is as follows:

$$h_g(t, X) = h_{0g}(t)\exp(\beta_1 X_1 + \beta_2 X_2 + \dots + \beta_p X_p) \dots (7)$$

The Stratified Cox model with interaction is as follows:

$$h_g(t, X) = h_{0g}(t)\exp(\beta_1 X_1 + \beta_2 X_2 + \dots + \beta_{pg} X_p) \dots (8)$$

RESULTS

There are three forms of probability distribution of survival, namely parametric survival function, non-parametric survival function, and semi-parametric survival function. In this parametric survival function there are three methods, namely Regression with Exponential Distribution, Weibull, and Log-Logistics. While in this semi-parametric survival function there is one method, namely Cox Regression. In this study, the data obtained will be comparative analysis using

regression method with parametric and semi parametric survival function. Based on calculations using software R, then obtained comparison of analysis using regression method of survival function with the best parameter estimation as follows:

Table 1: Selection of the Best Survival Function Model with AIC Value Comparison

Regression Models	AIC Values
Ekspponential Distribution	583.5625
Weibull Distribution	543.1974
Log-Logistic Distribution	537.3215
Cox with Breslow Partial Likelihood Approach Method	392.1115
Cox with Efron Partial Likelihood Approach Method	384.7155
Cox with Exact Partial Likelihood Approach Method	321.0316

Based on Table 1, it's to obtain the best model by looking at the smallest AIC value as a relative measure of the fit goodness of the statistical model. The smallest AIC value is in Cox Regression model with Exact Parameter Estimation. Furthermore, because the value of AIC for regression analysis with parametric survival function and cox regression with Breslow and Efron Partial Likelihood parameter estimation still big enough, then the next step the authors do regression analysis using cox regression method with estimated parameters of Exact Partial Likelihood.

Cox Regression with Exact Partial Likelihood Approach Method: The parameter estimation using the exact partial likelihood approach method is the same parameter estimation method as the approach of the efron parameter used to overcome the common occurrence in small and large size. However, the approach method of the exact parameter is capable of producing better estimation value. It's caused by the resulting error is close to zero compared to other parameter estimation approach methods. The calculation result of cox regression parameter with approach of partial likelihood approach is obtained by the model determined by using backward elimination method. Backward elimination method is a way to get the best model by issuing one by one the largest p-value first. Based on calculations using software R, then obtained the best parameter estimation as follows:

Table 2: Best Parameter Estimation Results Using Cox Regression with Exact Partial Likelihood Approach

Variables	Coefficients	p-value			Decisions
X_2	0.0245	0.0290	<	0.05	Reject H_0
X_5	- 0.0592	3.01×10^{-8}	<		Reject H_0
X_6	0.0679	4.91×10^{-5}	<		Reject H_0
X_{10}	0.0081	7.26×10^{-7}	<		Reject H_0
X_{12} (Drug Administration and Blood Transfusion)	- 1.6761	5.42×10^{-6}	<		Reject H_0
X_{12} (Drug Administration, Blood Transfusion and Surgery)	- 1.9646	0.0002	<		Reject H_0

Based on Table 2 it can be seen that the p-value of all variables is less than 0.05, so H_0 rejected. This is because the p-value < level significance. It can be concluded that the cox regression model with parameter estimation using the exact partial likelihood approach is feasible to use. The model formed is as follows:

$$h(t, X) = h_0(t)\exp(0.0245X_2 - 0.0592X_5 + 0.067X_6 + 0.0081X_{10} - 1.6761X_{12} \text{ (Drug administration and blood transfusion)} - 1.9646X_{12} \text{ (Drug administration, Blood transfusion and Surgery)})$$

The next step to find out whether a best equation using cox regression method with exact partial likelihood approach has independent variable which influence significantly to dependent variable, hence need to do testing which include test of overalls, partial test, and proportional hazard assumption test. Based on the results of the analysis of the overall test on the cox regression

with exact partial likelihood approach can be concluded with the significance level of 0.05 H_0 rejected, because the p-value < significance level, ie $0 < 0.05$, causing one of the parameters contained in regression β_i has a value not equal to 0. Therefore it is necessary to do a partial test to examine one by one regression coefficient β_i .

Based on the partial test results obtained results that the six variables in Table 1 are analyzed significantly to the model. This is because the p-value < level of significance, thus causing the six variables affect the long survival of CKD patients. Further testing of proportional hazard assumptions by using the Schoenfeld Residual correlation value. Schoenfeld’s residual value is one of the statistical tests used in this method. Based on calculations using software R, then Schoenfeld residual value obtained as follows:

Table 3: Schoenfeld Residual Correlation Value

Variables	Correlation	p-value			Decisions
X_2	0.0420	0.7087	>	0.05	Failed to Reject H_0
X_5	-0.1086	0.4362	>		Failed to Reject H_0
X_6	0.0043	0.9797	>		Failed to Reject H_0
X_{10}	-0.0274	0.8292	>		Failed to Reject H_0
X_{12} (Drug Administration and Blood Transfusion)	0.3253	0.0401	<		Reject H_0
X_{12} (Drug Administration, Blood Transfusion and Surgery)	0.3699	0.0252	<		Reject H_0

It can be seen in Table 3 that not all variables have p-value more than 0.05. Based on the result of assumption test proportional hazard can be concluded with significance level 0.05 H_0 failed to be rejected for variable X_2 , X_5 , X_6 , dan X_{10} , because the p-value > level of significance. Then it can be concluded that there is data that supports the value of H_0 , so that the four independent variables meet the proportional hazard assumption. While the significance level of 0.05 H_0 is rejected for X_{12} variables with the category of Drug Administration

and Blood Transfusion and Drug Administration, Blood Transfusion and Surgery category, because the p-value < level of significance. Then it can be concluded that there is data that supports the value of H_1 , thus causing the two independent variables do not meet the proportional hazard assumption. The next step to overcome these problems, the authors tries to issue a variable that does not meet the proportional hazard assumptions and use Cox Stratified Regression.

Cox Regression with Exact Partial Likelihood Estimation Approach Without Action Variable in Overcoming Non Proportional Hazard Assumptions:

One of the easiest ways to overcome the non proportional hazard assumption is by removing the independent variable from within the model. In this research, the

authors use exact partial likelihood parameter approach. The calculation result of cox regression parameter with exact partial likelihood approach without action variable in overcoming non proportional hazard assumption using software R as below:

Table 4: Best Parameter Estimation Results Using Cox Regression with Exact Partial Likelihood Approach Without Action Variable in Overcoming Non Proportional Assumptions Hazard

Variables	Coefficients	p-value			Decisions
X_2	0.0316	0.0027	<	0.05	Reject H_0
X_5	-0.0532	1.36×10^{-7}	<		Reject H_0
X_6	0.0612	0.0001	<		Reject H_0
X_{10}	0.0076	1.02×10^{-6}	<		Reject H_0

Based on Table 4 it can be seen that the p-value of all variables is less than 0.05, so H_0 is rejected. It because the p-value < level of significance. It can be concluded that the cox regression model with parameter estimation using the exact partial likelihood approach without the action variable is feasible to use. The model formed is as follows:

$$h(t, X) = h_0(t) \exp(0.0316 X_2 - 0.0532 X_5 + 0.0612 X_6 + 0.0076 X_{10})$$

The next step is to find out whether a best equation using cox regression method with exact partial likelihood approach without action variable has independent variable which have significant effect to dependent variable, it is necessary to test which include test of overalls, partial test, and proportional hazard assumption test. Based on the result of the analysis of the overall

test on the cox regression with exact partial likelihood approach without the action variable can be concluded with the significance level of 0.05, H_0 rejected, because the p-value < significance level, ie $4.846 \times 10^{-13} < 0.05$, which causes one of the parameters contained in the regression β_i has a value not equal to 0. Therefore it is necessary to do a partial test to examine one by one regression coefficient β_i .

Based on the partial test results obtained the result that the four variables in Table 4 were analyzed significantly to the model. This is because the value of p-value < level of significance, thus causing the four variables affect the long survival of CKD patients. Further testing of proportional hazard assumptions by using the Schoenfeld Residual correlation value. Based on calculations using software R, then Schoenfeld residual value obtained as follows:

Table 5: Schoenfeld Residual Correlation Value

Variables	Correlation	p-value			Decisions
X_2	-0.0809	0.477	>	0.05	Failed to Reject H_0
X_5	-0.1189	0.391	>		Failed to Reject H_0
X_6	0.0011	0.995	>		Failed to Reject H_0
X_{10}	-0.0618	0.605	>		Failed to Reject H_0

It can be seen in Table 5 that all variables have p-value values greater than 0.05. Based on the result of testing proportional hazard assumption can be concluded with significance level 0.05 H_0 failed to be rejected for all variable, because the p-value > level of significance. So it can be concluded that there is data that supports the value of H_0 , so that the four independent variables meet the proportional hazard assumption. The next step

The authors tries to overcome in another way against the variable that does not meet the proportional hazard assumption, namely using Cox Stratified Regression.

Cox Stratified Regression in Overcoming Non-Proportional Hazard Assumptions: Cox stratified regression is one way to overcome independent variables that do not meet proportional hazard assumptions. Cox Stratified Regression is a modification of the Cox

Regression model by strata on independent variables that do not meet the proportional hazard assumptions. Independent variables that previously met proportional hazard assumptions remain included in the model, but not strata in those variables⁴.

Cox Stratified Regression without Interaction: Regression method cox stratified without interaction is a method to overcome the assumption of non proportional hazard that produces the model with the same parameters assumption. Based on calculations using software R, then obtained parameter estimation as follows:

Table 6: Parameter Estimation Results Using Cox Stratified Regression Without Interaction

Variables	Coefficients	p-value			Decisions
X ₂	0.0206	0.059	>	0.05	Failed to Reject H ₀
X ₅	-0.0555	8.43 × 10 ⁻⁸	<		Reject H ₀
X ₆	0.0655	5.84 × 10 ⁻⁵	<		Reject H ₀
X ₁₀	0.0073	2.90 × 10 ⁻⁶	<		Reject H ₀

Based on Table 6 it can be seen that not all variables have p-value less than 0.05. However, this does not have a significant effect due to stratified cox regression without this interaction only to overcome the problem of unfulfilled proportional hazard assumptions. Then the parameter estimation in Table 6 obtained the model formed is as follows:

$$h_g(t, X) = h_{og}(t) \exp(0.0206 X_2 - 0.0555 X_5 + 0.0655 X_6 + 0.0073 X_{10})$$

The next step to find out whether a best equation using stratified cox regression method without interaction has independent variables that significantly affect the dependent variable, it is necessary to test that includes the test of overalls, partial test, and proportional hazard assumptions test. Based on the results of the overall test analysis on stratified cox regression without interaction can be concluded with the significance level of 0.05 H₀ rejected, because the p-value < significance level, ie 2.867 × 10⁻¹² < 0.05, causing one of the parameters

contained in the regression β_i has a value not equal to 0. Therefore it is necessary to do a partial test to examine one by one regression coefficient β_i.

Based on the result of partial test, it is found that not all variables in Table 6 are analyzed significantly to the model. This is because there are only three variables, namely X₅, X₆, and X₁₀ which have the p-value < level of significance, thus causing the three variables to affect the long life of CKD patients. While one of variable, that is X₂ has the p-value > level of significance, so cause variable X₂ does not have an effect on long life of CKD patient. However, the variable X₂ remains incorporated into the model, due to stratified cox regression without this interaction only to overcome the problem of unfulfilled proportional hazard assumptions. Further testing of proportional hazard assumptions by using the Schoenfeld Residual correlation value. Based on calculations using software R, then Schoenfeld residual value obtained as follows:

Table 7: Schoenfeld Residual Correlation Value

Variables	Correlation	p-value			Decisions
X ₂	0.0076	0.948	>	0.05	Failed to Reject H ₀
X ₅	-0.1187	0.405	>		Failed to Reject H ₀
X ₆	0.0425	0.808	>		Failed to Reject H ₀
X ₁₀	-0.0480	0.731	>		Failed to Reject H ₀

It can be seen in Table 7 that all variables have p-value values greater than . Based on the result of testing proportional hazard assumption can be concluded with significance level failed to be rejected for all variable, because the p-value > level of significance. So it can be concluded that there is data that supports the value of , so that the four independent variables meet the proportional hazard assumption.

Cox Stratified Regression with Interaction: Cox stratified regression method with interaction is a method to overcome non proportional hazard assumption which produce model with different parameter assumption for each strata. Based on calculations using software R, then obtained parameter estimation as below:

Table 8: Parameter Estimation Results Using Cox Stratified Regression with Interaction

Variables	Coefficient	p-value			Decisions
X_2	0.0239	0.0890	>	0.05	Failed to Reject H_0
X_5	-0.0570	0.0003	<		Reject H_0
X_6	0.0914	0.0055	<		Reject H_0
X_{10}	0.0089	0.0001	<		Reject H_0
$X_2 \times X_{12}$ (Drug Administration and Blood Transfusion)	-0.0193	0.4278	>		Failed to Reject H_0
$X_2 \times X_{12}$ (Drug Administration, Blood Transfusion and Surgery)	0.2028	0.1016	>		Failed to Reject H_0
$X_5 \times X_{12}$ (Drug Administration and Blood Transfusion)	0.0058	0.8011	>		Failed to Reject H_0
$X_5 \times X_{12}$ (Drug Administration, Blood Transfusion and Surgery)	-0.0548	0.2145	>		Failed to Reject H_0
$X_6 \times X_{12}$ (Drug Administration and Blood Transfusion)	-0.0641	0.1926	>		Failed to Reject H_0
$X_6 \times X_{12}$ (Drug Administration, Blood Transfusion and Surgery)	0.4112	0.0721	>		Failed to Reject H_0
$X_{10} \times X_{12}$ (Drug Administration and Blood Transfusion)	-0.0036	0.3060	>	Failed to Reject H_0	
$X_{10} \times X_{12}$ (Drug Administration, Blood Transfusion and Surgery)	0.0170	0.2212	>	Failed to Reject H_0	

Based on Table 8 it can be seen that not all variables have the p-value less than 0.05. This does not, however, have a significant effect due to stratified cox regression with this interaction only to overcome the problem of unfulfilled proportional hazard assumptions. Then the parameter estimation in Table 8 obtained model which formed is as follows:

$$\begin{aligned}
 h_g(t, X) = & h_{og}(t) \exp[0.0239 X_2 - 0.0570 X_5 \\
 & + 0.0914 X_6 + 0.0089 X_{10} \\
 & - 0.0193 (X_2 \times X_{12} \text{ (Drug Administration and Blood Transfusion)}) \\
 & + 0.2028 (X_2 \times X_{12} \text{ (Drug Administration, Blood Transfusion and Surgery)}) \\
 & + 0.0058 (X_5 \times X_{12} \text{ (Drug Administration and Blood Transfusion)}) \\
 & - 0.0548 (X_5 \times X_{12} \text{ (Drug Administration, Blood Transfusion and Surgery)}) \\
 & - 0.0641 (X_6 \times X_{12} \text{ (Drug Administration and Blood Transfusion)}) \\
 & + 0.4112 (X_6 \times X_{12} \text{ (Drug Administration, Blood Transfusion and Surgery)}) \\
 & - 0.0036 (X_{10} \times X_{12} \text{ (Drug Administration and Blood Transfusion)}) \\
 & + 0.0170 (X_{10} \times X_{12} \text{ (Drug Administration, Blood Transfusion and Surgery)})]
 \end{aligned}$$

The next step is to find out whether a best equation using cox stratified regression method with interaction has independent variable that significantly influence dependent variable, it is necessary to do testing which include test of overalls, partial test, and proportional

hazard assumption test. Based on the results of the overall test analysis on stratified cox regression with interaction can be concluded with a significance level of 0.05 H_0 rejected, because the p-value < significance level, ie $1.225 \times 10^{-10} < 0.05$, which causes one of the parameters contained in the regression β_i has a value not equal to 0. Therefore it is necessary to do a partial test to examine one by one regression coefficient β_i .

Based on the partial test results obtained the results that not all variables in Table 8 analyzed significant to the model. This is because there are only three variables, namely X_5 , X_6 , and X_{10} which have the p-value < level of significance, thus causing the three variables to affect the long life of CKD patients. While the rest have the p-value > level of significance, thus causing these variables do not affect the long survival of CKD patients. However, the non-influencing variables are still incorporated into the model, due to stratified cox regression with this interaction only to overcome the problem of non-fulfillment of proportional hazard assumptions. Further testing of proportional hazard assumptions by using the Schoenfeld Residual correlation value. Based on calculations using software R, then Schoenfeld residual value obtained as follows:

Table 9: Schoenfeld Residual Correlation Value

Variables	Correlation	p-value			Decisions
X_2	0.0192	0.874	>	0.05	Failed to Reject H_0
X_5	-0.0341	0.800	>		Failed to Reject H_0
X_6	-0.5090	0.719	>		Failed to Reject H_0
X_{10}	0.0605	0.677	>		Failed to Reject H_0
$X_2 \times X_{12}$ (Drug Administration and Blood Transfusion)	-0.0700	0.536	>		Failed to Reject H_0
$X_2 \times X_{12}$ (Drug Administration, Blood Transfusion and Surgery)	0.1138	0.490	>		Failed to Reject H_0
$X_5 \times X_{12}$ (Drug Administration and Blood Transfusion)	0.0107	0.943	>		Failed to Reject H_0
$X_5 \times X_{12}$ (Drug Administration, Blood Transfusion and Surgery)	-0.1593	0.408	>		Failed to Reject H_0
$X_6 \times X_{12}$ (Drug Administration and Blood Transfusion)	0.1944	0.249	>		Failed to Reject H_0
$X_6 \times X_{12}$ (Drug Administration, Blood Transfusion and Surgery)	0.1392	0.530	>		Failed to Reject H_0
$X_{10} \times X_{12}$ (Drug Administration and Blood Transfusion)	-0.0799	0.575	>		Failed to Reject H_0
$X_{10} \times X_{12}$ (Drug Administration, Blood Transfusion and Surgery)	0.1103	0.607	>		Failed to Reject H_0

It can be seen in Table 9 that all variables have p-value values greater than 0.05. Based on the result of testing proportional hazard assumption can be concluded with significance level 0.05 H_0 failed to be rejected for all variable, because the *p-value* > level of significance. So it can be concluded that there is data that supports the value of H_0 , so that the four independent variables meet the proportional hazard assumption.

Selection and Interpretation of the Best Cox Regression Model: To get the best model can be done comparison of AIC value of each regression model that formed. The AIC value is a relative measure of the fit goodness of the statistical model. Based on calculations using software R, then obtained comparison of analysis using cox regression method as follows:

Table 10: Selection of the Best Model of Cox Regression with AIC Value Comparison

Cox Regression Models	AIC Value
Exact Partial Likelihood Approach Method $h(t, X) = h_0(t) \exp(0.0245 X_2 - 0.0592 X_5 + 0.0679 X_6 + 0.0081 X_{10} - 1.6761 X_{12} \text{ (Drug Administration and Blood Transfusion)} - 1.9646 X_{12} \text{ (Drug Administration, Blood Transfusion and Surgery)})$	321.0316
Exact Partial Likelihood Approach Method (without variable Action) $h(t, X) = h_0(t) \exp(0.0316 X_2 - 0.0532 X_5 + 0.0612 X_6 + 0.0076 X_{10})$	342.4729
Stratified Without Interaction $h_g(t, X) = h_{0g}(t) \exp(0.0206 X_2 - 0.0555 X_5 + 0.0655 X_6 + 0.0073 X_{10})$	262.8794
Stratified With Interaction $h_g(t, X) = h_{0g}(t) \exp[0.0239 X_2 - 0.0570 X_5 + 0.0914 X_6 + 0.0089 X_{10} - 0.0193 (X_2 \times X_{12} \text{ (Drug Administration and Blood Transfusion)}) + 0.2028 (X_2 \times X_{12} \text{ (Drug Administration, Blood Transfusion and Surgery)}) + 0.0058 (X_5 \times X_{12} \text{ (Drug Administration and Blood Transfusion)}) - 0.0548 (X_5 \times X_{12} \text{ (Drug Administration, Blood Transfusion and Surgery)}) - 0.0641 (X_6 \times X_{12} \text{ (Drug Administration and Blood Transfusion)}) + 0.4112 (X_6 \times X_{12} \text{ (Drug Administration, Blood Transfusion and Surgery)}) - 0.0036 (X_{10} \times X_{12} \text{ (Drug Administration and Blood Transfusion)}) + 0.0170 (X_{10} \times X_{12} \text{ (Drug Administration, Blood Transfusion and Surgery)})]$	266.6776

Based on Table 10 to get the best model by looking at the smallest AIC value, that is equal to on Cox Stratified Without Interaction Regression model. The best model that is formed is as follows:

Table 11: Estimated Cox Stratified Regression Parameters without Interaction

Variables	Coefficients	Exp (Coefficients)
X_2	0.0206	1.0208
X_5	-0.0555	0.9460
X_6	0.0655	1.0677
X_{10}	0.0073	1.0073

$$h_g(t, X) = h_{0g}(t) \exp(0.0206 X_2 - 0.0555 X_5 + 0.0655 X_6 + 0.0073 X_{10})$$

The above model can be interpreted as follows:

1. At Variable Age has a positive influence. The value of this variable hazard ratio states that with every age, the patient has a greater chance of dying by times.
2. In Diastolic Blood Pressure Variables have a negative effect. The hazard ratio value of this variable states that every increase in diastolic blood pressure, then the patient has a smaller chance of dying by $\frac{1}{0.9460} = 1.0571$ times.
3. In the respiratory rate variable has a positive effect. The value of this variable hazard ratio states that each increase in the respiratory rate, then the patient has a greater chance of dying by 1.0677 times.
4. In the Ureum Content Variables have a positive effect. The value of the hazard ratio of this variable states that every increase in urea level, then the patient has a greater chance of dying by 1.0073 times.

CONCLUSIONS

The best regression model equation is Cox Stratified Regression without Interaction formed is as follows:

$$h_g(t, X) = h_{0g}(t) \exp(0.0206 X_2 - 0.0555 X_5 + 0.0655 X_6 + 0.0073 X_{10})$$

Based on the above equation, the factors that influence the duration of survival of patients with chronic kidney disease are age, diastolic blood pressure, respiratory rate, and urea level. Interpretation of the above model equation is obtained as the result of increasing the age of the patient has a chance to die larger by times, the increase in diastolic blood pressure of the patient has a chance to die smaller by times, increased respiration rate of patients have a greater chance to die by times, and increased urea levels of patients have a greater chance of dying by times.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Center for Disease Control and Prevention. National Chronic Kidney Disease Fact Sheet. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention. 2017.
2. Kementerian Kesehatan Republik Indonesia. Info Pusat Data dan Informasi Kementerian Kesehatan RI, Situasi Penyakit Ginjal Kronis. Jakarta: Kementerian Kesehatan Republik Indonesia. 2017.
3. Kementerian Kesehatan Republik Indonesia. Riset Kesehatan Dasar. Jakarta: Kementerian Kesehatan Republik Indonesia. 2013.
4. Ata N, Sozer M T. Cox Regression Models with Non Proportional Hazards Applied to Lung Cancer Survival Data. Hacettepe Journal of Mathematics and Statistics. 2007;36(2).
5. Kleinbaum D G, dan M. Klein. Survival Analysis: A Self-Learning Text Second Edition. New York: Springer. 2005.
6. Collet D. Text in Statistical Science: Modelling Survival Data in Medical Research Second Edition. USA: Chapman & Hall. 2003.
7. Grasa A A. Econometric Model Selection: A New Approach. USA: Springer. 1989

Principles of Skin Cancer Detection in Image Processing: Challenges and Techniques

A. Omar Adil Dheyab¹, B Rahmatullah¹, C. M. Hashim¹

¹Universiti Pendidikan Sultan Idris, Malaysia

ABSTRACT

Skin cancer is most common and widespread type of cancer. Fortunately, its early diagnosis assists to prevent and cure several cases and increase the possibilities of reducing its dangerous effect. However, proper detection of skin cancer especially malignant melanoma in its early stages is still challenging. Image processing is a good choice for skin cancer early detection. Image processing techniques for skin cancer detection commonly include several stages such as pre-processing to enhance images, segment the interest regions to extract significant features, and finally perform classification process. This paper introduces the principles of skin cancer detection in image processing and addresses the challenges of each stage and the common techniques used in analysis.

Keywords: Skin cancer; segmentation; classification, feature extraction

INTRODUCTION

Skin cancer is the most popular type of cancer that prevailed in many areas of the world such as the United States, Australia, and Europe over the last decades (Zeljko et al.⁴⁹). According to World Health Organization, around 2-3 million cases of non-melanoma and 132000 cases of melanoma occur every year universally (Bhowmik, et al.⁶). However, its early diagnosis assists to prevent malignant melanoma and cure many cases (Elgamal¹¹; Wen et al.⁴⁵). Most automated systems for skin cancer early detection and diagnosis systems use an imaging instrument, such as dermoscopy, or employ mathematical models, and utilize computational algorithms to evaluate the skin lesion. Natural computing plays a key role in providing flexible solutions to analysis problems of medical image. It includes fuzzy sets, neural networks, genetic algorithms, rough sets, swarm intelligence, and other techniques that mimic biological and physical nature processes (Mitra and Shankar³²). Image processing is a good choice for skin cancer early detection, since it is not an expensive technique, powerful due to advance computer systems and applications. Image processing techniques for skin cancer detection commonly require pre-processing procedures to enhance images, segment the interest regions to extract significant features, and finally perform classification process (Alfed and

Khelifi⁴). All these stages have their own challenges that affect the outcome of each stage and the final results. However, current researches for skin cancer detection from medical images that use supervised techniques such as fuzzy systems, support vector machines, and artificial neural networks coupled with techniques of feature extraction have achieved optimal results (Salah et al.³⁷; Jain and Jain¹²; Mhaske and Phalke³¹; Elgamal¹¹; Kaur et al.²¹; Dalila et al.⁸).

PREPROCESSING

The aim of the preprocessing is to enhance the image quality and remove the background noise and the artefacts in order to determine the important areas in the image by utilizing image segmentation to properly identify the skin cancer (Demir and Yener⁹).

Image Quality: There are many skin cancer types, each type has a various color, size and features. Many skin features may have effect on digital images like hair and color, in addition to other impacts of lightness, noise due scanner or digital camera type and sensitivity (Elgamal¹¹). Several imaging techniques are used in diagnosing skin lesions. Clinical images (Macroscopic images) are normally used in skin lesions analysis. These images may be taken by using normal digital video or image cameras. However, in most cases the imaging

conditions are inconsistent. For instance, images are taken under various illumination conditions and from variable distances as well as the images may have low resolution. Moreover, the images may contain artefacts, such as hair, shadows and reflection. All these issues impeded the proper analysis of the skin lesions (Oliveira et al.³⁴). Therefore, in the preprocessing step, it is necessary to perform, Noise reduction, color space transformation, contrast enhancement, and artifact removal such as black frames, ink markings, rulers, air bubbles (Elgamal¹¹). Many techniques are used for enhancing image quality such as histogram equalization, low-pass, high-pass, and homomorphic filters. To remove the noise, wavelet thresholding, Gaussian smoothing, total variation and anisotropic filtering are used, and for deblurring, many techniques are available such as inverse filter, regularized filter, Wiener filter (Al-Ameen and Sulong, 2016). To smooth images of skin lesions as well as to remove artefacts A median filter is applied (Oliveira et al.³⁴).

Segmentation: Image segmentation is one of the major image processing steps. It is the process of separating an image into regions that include groups of identical linked pixels. The regions include region of interest (ROI) and non-region of interest (NROI). Image segmentation is utilized for locating objects and borders (edges, lines, corners, curves, etc.) in images. In particular, image segmentation process assigns a label to every image pixel, where pixels with same label have certain visual characteristics. The image segmentation result is a segments set that jointly cover the whole image, or a contours set extracted from an image. Each pixel in a region is similar with some property, such as color, texture, or intensity. The adjacent regions are mainly diverse with respect to the same properties (Mandal and Baruah²⁹). Several image segmentation techniques have been reported for medical images such as color k-means, fuzzy c-means, total variation fuzzy c-means, and texture based segmentation, but most of the techniques have limitations in terms of segmentation accuracy and computational cost (Kumar et al.²⁵). There is no optimal technique for image segmentation, because each image has its own diverse type, moreover, it is hard task to find a segmentation method for a certain image type (Khan²²). Several factors influence Image segmentation such as images homogeneity, image continuity spatial characteristics; image and texture content (Kannan et al.¹⁸). Moreover, many artifacts during image processing such as noise artifact, non-sharp edges, motion and,

intensity inhomogeneity affect the segmentation techniques outcome (Sharma and Aggarwal³⁸). Image segmentation methods into homogeneous regions with respect to a selected feature such as luminance, color, texture, etc can be classified into many categories such as clustering, edge-based, histogram region-based, thresholding, morphological, active contours, model-based, and soft computing (Elgamal¹¹). Each method has its own advantages and disadvantages in terms of performance, applicability, computational cost, and suitability. However, none of the mentioned methods can meet all requirements of a given research problem (Mitra and Shankar³²). Some of the common image segmentation methods include region based, clustering based, threshold based and soft computing based.

Region Growing: Region based segmentation is simple compared with other methods and also noise resilient and it includes three categories; region growing, region splitting, and region merging (Khan²²). Region growing is a segmentation approach to group pixels into larger regions based on their similarity based on predefined similarity criteria relating to their intensity, color or object. Similarity criteria alone are not an effective basis for segmentation and it is necessary to consider the adjacency spatial relationships between pixels. Therefore, the grouping should consider the similarity and the statistical properties of their own neighborhoods (Solomon and Breckon⁴⁰). Region growing technique doesn't considered robust (Thirumaran and Shylaja⁴²), because its performance depends on regions selection and whether these regions are clearly and accurately defined. Moreover, there is a possibility of image over or under-segmentation (Wanjari et al.⁴⁴). K-means, Fuzzy C-Means, and Markov Random Fields are some examples of region growing techniques.

Clustering Methods: Clustering is an unsupervised data analysis which is used to partition a set of records or objects into clusters or classes with similar characteristics (Simhachalam and Ganesan³⁹). In these methods, the image is segmented into clusters of pixels with similar characteristics using unsupervised clustering algorithms. These methods include two types namely hard clustering, and soft clustering. In hard clustering, the image is divided into clusters, where each pixel belongs to only one cluster using a membership function of 1 (pixel belong) or 0 (pixel not belong). K-means image clustering method is a favorite example of hard clustering methods (Hadi et al.¹²). In soft clustering, one pixel can belong

to more than one cluster, where the belonging degree is described by membership values. Soft clustering is most useful and flexible than hard clustering. Fuzzy c-means clustering is an example of soft clustering. Fuzzy uses partial membership therefore; it is more useful for real problems (Kaur and Kaur²⁰). Clustering techniques are characterized by computational cost due to use distance calculation metrics such as Euclidean and Mahalanobis distances (Deserno, 2011). Moreover, these techniques may not provide optimal results; generally, there is no perfect clustering algorithm for a specific application (Sharma and Aggarwal³⁸).

Thresholding: Thresholding is one of the easiest and most commonly used techniques for image segmentation. It is useful to discriminate background from the foreground (Mandal and Baruah²⁹). The pixels of image are divided with respect to their intensity level (Kaur and Kaur²⁰). An optimal gray-level threshold value for separating objects of interest in an image is selected from the background based on their gray-level distribution (Patil and Shaikh³⁵). These techniques are categorized into global thresholding and local (adaptive) thresholding. In the global thresholding, a single threshold value is assigned to the entire image. In the local thresholding, a threshold value is used to each pixel to calculate if it belongs to the foreground or the background pixels using local information around each pixel. Global thresholding is a common technique

because it is easy and simple to implement (Mandal and Baruah²⁹). Selecting a threshold is difficult (Sharma and Aggarwal³⁸), and improper threshold leads to destroy the object contour (Affi et al.²). On other hand, this technique is sensitive to unintended and uncontrolled illumination differences; and affected by noise. Furthermore, in this technique, the spatial relationships among pixels are not considered (Läthén²⁶; Solomon and Breckon⁴⁰). OTSU, type-2 fuzzy logic, and Renyi entropy method are among the thresholding techniques (Oliveira et al.³⁴). OTSU method is one of the wide use global thresholding methods, due to its simplicity and effectiveness (Patil and Shaikh³⁵). The Otsu method requires computing a gray level histogram before running. Thresholding is less computations compared with other techniques (Yogamangalam and Karthikeyan⁴⁷).

Soft Computing: These methods involve the classification of pixels using soft-computing techniques including neural networks, fuzzy logic, and evolutionary algorithms (Elgamal¹¹). However, most techniques need inclusive supervision and training (Sharma and Aggarwal³⁸). Neural network is commonly used for medical images segmentation to separate the target image from background (Kaur and Kaur²⁰). Hopfield, multi-layer perception MLP, and self-organization map SOM are some of the common neural networks for image segmentation (Khan²²). Table 1 shows a comparison between various segmentation techniques.

Table 1: Comparison of Different Segmentation Techniques (Udomhunsakul and Wongsita⁴³; Sharma and Aggarwal³⁸; Solomon and Breckon⁴⁰; Kaur and Kaur²⁰; Wanjari et al.⁴⁴)

Segmentation Techniques	Description	Advantages	Disadvantages
Region Growing	Based on partitioning image into homogenous regions	-More immune to noise. -Useful when it easy to define similarity criteria.	-Possibility of image over or under-segmentation. -Consume time and memory. -Its performance depends on clear and accurate definition of regions
Clustering Method	Based on division into homogeneous clusters	-Easy to define real problem and understandable	-Determining membership function is not easy. -Characterized by computational cost. -Sensitive to noise
Thresholding	Based on the histogram peats of the image to find particular values	-No need of previous information. -Simplest method. Reduce the noise	-Highly dependent on peaks. -Selecting a threshold is difficult. -Spatial relationships among pixels are not considered.
Soft Computing Method	Based on simulation of learning process for decision making	-No need to write complex programs -Model complex system	-Long training time -Provide optimal solutions

FEATURE EXTRACTION AND SELECTION

Feature extraction transforms the total dataset features into new reduced features set by merging features instead of deleting them. The new features set can attain better performance in extracting relevant information from the input dataset (Krizek²³; Kantardzic¹⁹). Image transformation into a set of features that define it is a crucial stage to analyze and explore the image in proper way for the consequent classification process (Arias et al., 2017). Feature extraction is very important. After enhancing the image quality, it is necessary to identify the region of interest (ROI). The ROI may be characterized by various parameters such as size, color, texture and shape. These parameters are described by a feature vector (figure 1), which contains information that assist to classify skin lesions.

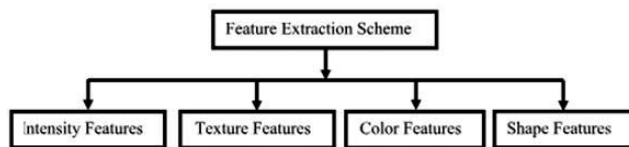


Figure 1: Features Vector

Each component of the vector has its own distinctive features. The features for each vector component and their properties are introduced in table 2.

Table 2: Image features and their properties (Manojbhai and Rajamenakshi³⁰)

Image Feature	Properties
Shape Based Features	Area, Circularity, Irregularity, Perimeter, Roundness
Intensity Features	Mean, Median, Intensity, Standard, Variance, Kurtosis, Skewness
Texture Features	Contract, Correlation, Entropy, Homogeneity, Sum of Square Variance, Spectral And Special
Color Based Features	Impression , Expression And Construction RGB, LUV, HSV and HMMD

Extraction or selection of features, in combination with classification techniques is subsequently applied for malignancy diagnosis. Changes in skin color are the key features in skin cancer detection. However, the skin dermatography quality is mainly affected by the environment, such as lighting and instrument. Lightings may cause shadows and illumination on the skin, which may cause segmentation errors. Moreover,

segmentation based on color features only may not be efficient to address the nature skin colors variations. Clinical diagnosis also uses other features such as asymmetry, border irregularity, and area. Researches combine these clinical features to detect skin cancer automatically (Lee and Chen²⁷). In automatic analysis of images, the feature extraction is very crucial step in skin cancer screening system. ABCD, Menzies method, CASH (color, architecture, symmetry, and homogeneity) algorithm, etc. are used by experts to evaluate visual features in dermoscopy images for detecting melanoma lesions (Chakravorty et al.⁷). The ABCD includes primary clinical criteria or diagnosing suspected lesions. The ABCD guidelines include four visual features: It can be based on the ABCD-rule of dermoscopy. The ABCD stands for Asymmetry, Border, Color Variation and Diameter of Lesion (Murumkar and Gumaste³³). Principal component analysis (PCA) is an example of the common used algorithms for feature extraction (Xie et al.⁴⁶). While it is probable to extract many features, small subset of them can be used in the classification due to dimensionality curse. Data dimensionality is a significant problem in machine learning that affect the reliable analysis of any dataset and increases the computational cost. Feature selection is a substantial technique for dimensionality reduction and data preprocessing (Jebur et al.¹⁶). Therefore, it is necessary to select a small number of features that can maintain the information as much as possible as in the whole dataset (Hira and Gillies¹³). Analyzing the data with small features is simple, consuming less computation time and computer resources (Jebur et al.¹⁷). Several challenges are identified for feature extraction such as how to select best features for class discrimination, which features should be extracted, and what is the best technique for feature extraction.

CLASSIFICATION

The image classification objective is the automatic categorization of all image pixels into classes (Thakur and Maheshwari⁴¹) to distinguish the cancer structures into benign, or healthy. High classification rate can be achieved by extracting the significant object features (Jebur et al.¹⁷). The classification methods mainly utilize unsupervised and supervised approaches. The unsupervised approach is commonly known as clustering and produces statistics for spectral and statistical clusters. K-means clustering is an example

of unsupervised approaches (Ma and Tavares²⁸). In the supervised approach such ANN (Abdulkaki¹), support vector machine SVM (Ahmed and Chaya³), and ensemble learning, the image pixel categorization process is supervised by defining numerical descriptors of the various classes to the computer algorithm (Kumar²⁴). The classification rate depends on the extracted features, dataset, and the efficiency of the classification techniques. For the dataset, several challenges raise such data dimensionality, suitable dataset training samples, and data imbalance problem. However, categorizing objects is a difficult task and need more researches (Zahradnikova et al.⁴⁸). Moreover, classification techniques or methods have pros and cons and they vary in their performance. Current classification trend of medical image data is the intelligent hybrid techniques such as artificial neural network, fuzzy logic and genetic algorithm (Hota et al.¹⁴) or k Nearest Neighbor (kNN) and a Neural Network (NN) (Elgamal¹¹; Dalila et al.⁸), ornaïve Bayes and fuzzy systems (Pota et al.³⁶).

CONCLUSION

The medical image processing field and the applications in computer assisted diagnoses have great importance in modern medicine. The basic motive of medical image processing is to extract clinical knowledge or information from medical images. The medical image processing encompasses several and various stages, and the key of them are segmentation of image, extraction of feature, and classification. This helps to early diagnosis of skin cancer to decrease its danger and effects. Most stages have challenges; however, artificial intelligence, soft computing and machine learning can tackle the challenges or at least mitigate them.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Abdulkaki A. S. Skin cancer image segmentation & detection by using unsupervised neural networks (UNN). In 13th International Arab Conference on Information Technology. 2012.
2. Afifi A, Ghoniemy S, Zanaty E. A, El-Zoghdy S. F. New region growing based on thresholding

- technique applied to MRI data. International Journal of Computer Network and Information Security. 2015;7(7):61.
3. Ahmed I. N, Chaya P. Segmentation and Classification of Skin Cancer Images. International Journal. 2014;4(5).
4. Alfed N, Khelifi F. Bagged textural and color features for melanoma skin cancer detection in dermoscopic and standard images. Expert Systems with Applications. 2017;90:101-110.
5. Arias J, Martinez-Gomez J, Gamez J. A, de Herrera A. G. S, Müller H. Medical image modality classification using discrete Bayesian networks. Computer Vision and Image Understanding. 2016;151:61-71.
6. Bhowmik A, Repaka R, Mulaveesala R, Mishra S. C. Suitability of frequency modulated thermal wave imaging for skin cancer detection—A theoretical prediction. Journal of thermal biology. 2015;51:65-82.
7. Chakravorty R, Liang S, Abedini M, Garnavi R. Dermatologist-like feature extraction from skin lesion for improved asymmetry classification in PH 2 database. In Engineering in Medicine and Biology Society (EMBC), 2016 IEEE 38th Annual International Conference of the. IEEE. 2016 August;3855-3858.
8. Dalila F, Zohra A, Reda K, Hocine C. Segmentation and Classification of Melanoma and Benign Skin Lesions. Optik-International Journal for Light and Electron Optics. 2017.
9. Demir C, Yener B. Automated cancer diagnosis based on histopathological images: a systematic survey. Rensselaer Polytechnic Institute, Tech. Rep. 2005.
10. Deserno T. M. Fundamentals of biomedical image processing. In Biomedical Image Processing. Springer Berlin Heidelberg. 2010;1-51.
11. Elgamal M. Automatic skin cancer images classification. IJACSA) International Journal of Advanced Computer Science and Applications. 2013;4(3):287-294.
12. Hadi S, Tumbelaka B. Y, Irawan B, Rosadi, R. Implementing DEWA framework for early

- diagnosis of melanoma. *Procedia Computer Science*. 2015;59:410-418.
13. Hira Z. M, Gillies D. F. A review of feature selection and feature extraction methods applied on microarray data. *Advances in bioinformatics*. 2015.
 14. Hota H. S, Shukla S. P, Gulhare K. Review of intelligent techniques applied for classification and preprocessing of medical image data. *International Journal of Computer Science Issues*. 2013; 10(1/3):267-272.
 15. Jain Y. K, Jain M. Skin cancer detection and classification using Wavelet Transform and Probabilistic Neural Network. *Communication and Computing (ARTCom2012)*, Fourth International Conference on Advances Recent Technologies in, Bangalore, India. 2012;250-252.
 16. Jebur H. H, Maarof M. A, Zainal A. Enhancing Rough Set Theory Attributes Selection of KDD Cup 1999. *Journal of Theoretical & Applied Information Technology*. 2015a;76(3).
 17. Jebur H. H, Maarof M. A, Zainal A. Identifying Generic Features of KDD Cup 1999 for Intrusion Detection. *Jurnal Teknologi*. 2015b;74(1).
 18. Kannan S, Gurusamy V, Nalini G. Review On Image Segmentation Techniques. *ResearchGate*. 2014.
 19. Kantardzic M. *Data mining: concepts, models, methods, and algorithms*. 2nd ed .John Wiley & Sons. 2011.
 20. Kaur D, Kaur Y. Various Image Segmentation Techniques: A Review. *International Journal of Computer Science and Mobile Computing*. 2014;3(5):809-814.
 21. Kaur G, Singla S, Kaur, A. Skin cancer detection using skin images with image processing and back propagation (ANN) for classification. *I J C T A*. 9(40):463-470
 22. Khan W. Image segmentation techniques: A survey. *Journal of Image and Graphics*. 2013;1(4):166-170.
 23. Krizek P. Feature selection: stability, algorithms, and evaluation. Doctoral dissertation. Department of Cybernetics, Faculty of Electrical Engineering, Czech Technical University. 2008.
 24. Kumar M. *Digital Image Processing. Satellite Remote Sensing and GIS Applications in Agricultural Meteorology*. India. 2003.
 25. Kumar R, Srivastava S. Srivastava R. A fourth order PDE based fuzzy c-means approach for segmentation of microscopic biopsy images in presence of Poisson noise for cancer detection. *Computer methods and programs in biomedicine*. 2017;146:59-68.
 26. L  th  n G. Segmentation methods for medical image analysis. *Link  ping studies in science and technology Thesis*. 2010;2(2):1403-1408.
 27. Lee H, Chen Y P P. Image based computer aided diagnosis system for cancer detection. *Expert Systems with Applications*. 2015;42(12):5356-5365.
 28. Ma Z, Tavares J M R. A review of the quantification and classification of pigmented skin lesions: From dedicated to hand-held devices. *Journal of medical systems*. 2015;39(11):177.
 29. Mandal A K, Baruah D. K. Image Segmentation Using Local Thresholding And Ycber Color Space. *Journal of Engineering Research and Applications*. 2013;3(6):511-514.
 30. Manojbhai D. D, Rajamenakshi R. Large Scale Image feature extraction from medical image analysis. *International journal of advanced engineering and research*. 2016.
 31. Mhaske H. R, Phalke D. A. Melanoma skin cancer detection and classification based on supervised and unsupervised learning. In *Circuits, Controls and Communications (CCUBE)*, 2013 International conference on IEEE. 2013 December;1-5.
 32. Mitra S, Shankar B U. Medical image analysis for cancer management in natural computing framework. *Information Sciences*. 2015;306,111-131.
 33. Murumkar O S, Gumaste P. P. Feature Extraction for Skin Cancer Lesion Detection. *International Journal of Science. Engineering and Technology Research (IJSETR)*. 2015;4(5).
 34. Oliveira R B, Marranghello N, Pereira A S, Tavares J M R A computational approach for detecting pigmented skin lesions in macroscopic images. *Expert Systems with Applications*. 2016;61:53-63.

35. Patil A B, Shaikh J. A. Segmentation and Feature Extraction of Flowers Intended for Image Retrieval: A survey .IJARECE. 2016;5(1).
36. Pota M, Esposito M, De Pietro G. Designing rule-based fuzzy systems for classification in medicine. Knowledge-Based Systems. 2017;124:105-132.
37. Salah B, Alshraideh M, Beidas R, Hayajneh F. Skin cancer recognition by using a neuro-fuzzy system. Cancer informatics. 2011;10(1).
38. Sharma N, Aggarwal L. M. Automated medical image segmentation techniques. Journal of medical physics/Association of Medical Physicists of India. 2010;35(1):3.
39. Simhachalam B, Ganesan G. Performance comparison of fuzzy and non-fuzzy classification methods. Egyptian informatics journal. 2016;17(2):183-188.
40. Solomon C, Breckon T. Fundamentals of Digital Image Processing: A practical approach with examples in Matlab. John Wiley & Sons. 2011.
41. Thakur N, Maheshwari D. Review of Image Classification Techniques. International Research Journal of Engineering and Technology. 2017;4(11)
42. Thirumaran J, Shylaja S. Medical Image Processing – An Introduction. International Journal of Science and Research. 2015;4(11).
43. Udomhunsakul S, Wongsita P. Feature extraction in medical MRI images. In Cybernetics and Intelligent Systems, 2004 IEEE Conference on IEEE. 2004 December;1:340-344.
44. Wanjari M T, Kalaskar K D, Dhore M P. Document Image Segmentation using Region Based Methods. International Journal of Computing Science and Information Technology. 2015;3(3).
45. Wen Q, Ming D, Chen J, Liu W. A superpixel based post-processing approach for segmenting dermoscopy images. In Advanced Computational Intelligence (ICACI), 2013 Sixth International Conference on IEEE. 2013 October;155-158.
46. Xie S, Lawnizak A T, Lio P, Krishnan S. Feature extraction by multi-scale principal component analysis and classification in spectral domain. Engineering. 2013;5(10):268.
47. Yogamangalam R, Karthikeyan B. Segmentation techniques comparison in image processing. International Journal of Engineering and Technology (IJET). 2013;5(1):307-313.
48. Zahradnikova B, Duchovicova S, Schreiber P. Image mining: Review and new challenges. IJASA) International Journal of Advanced Computer Science and Applications. 2015;6(7): 242-246p.
49. Zeljkovic V, Druzgalski C, Bojic-Minic S, Tameze C, Mayorga P. Supplemental melanoma diagnosis for darker skin complexion gradients. In Health Care Exchanges (PAHCE), 2015 Pan American IEEE. 2015 March;1-8.

Workplace Stress Experienced by Contractor in Malaysian Construction Industry

Roshartini Omar¹, Aina Mardia Sallehudin¹

¹*Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia (UTHM), Malaysia*

ABSTRACT

Work pressure can be experienced by any of the parties and organizations within various sectors. The work pressure issue also can be found in the construction industry, as the orientation and the nature of the job lead toward work pressure, such as organization factors, work demand factors, job roles and challenging work environment. Besides, previous studies have proven that uncontrollable of work pressure also led positively towards accident on a construction site. However, this issue had a lack of support and consensus among the parties itself. Therefore, this study is being carried out to explore the issue work stress in the Malaysian construction industry. The aim of this study is to identify the major contributor and measure work stress level in the Malaysian construction industry. The study was conducted within 78 individuals that involved from G7 class of contractors in Malacca with 74% rate of respond. This research is statistically descriptive orientation and questionnaire is being used as a research instrument. Data were analyzed by using the Statistical Package for the Social Sciences 20.0 software. Based on the results, it showed that work demand is the main factors contributing to the high-pressure jobs. Level of work stress experienced by the respondents is high, but they still have a good job in terms of achievements and satisfaction. Therefore, based on the results, all parties; DOSH, CIDB, contractors and others should take this issue seriously. The parties also need to put effort to handle the issue as its consider as an alternative to reduce the number of accidents in construction sites as well as improving performance of the industry.

Keywords: *Contractors, Construction Industry, Malaysia, SPSS, Work pressure*

Jel Classification: L14, L74

INTRODUCTION

The rapid growth of development and globalization today make each of organization in various sectors become alert and well ready to face the challenges from multiple dimensions to maintain its competitive advantages. Several of innovations, unique and complex ideas are being introduced to maintain productivity and sustainability and improve organization's performance in the wide world market. However, within the midst and bustle to meet all the demands from client and tasks that are parallel towards the mission and vision of the organization, there are times where the organization tends to be insensitive towards organization's precious assets of itself which in human resources. This negligence may induce huge problems to the organization, such as stress at work. Prolonged of uncontrolled of this issue may affect various parties, including colleagues and organization's performances (Yip, 2009).

According Asquin et al.⁴, the work stress can be experienced by any parties and organizations in various sectors of industries. Therefore, work stress also exists in the construction industry. According to Ibem et al.¹⁹, construction industry is being described as an industry that exposed towards stressful working environment. The construction industry has also been labelled as industry with nature of 3D working environment; Dangerous, Dirty and Difficulty. According to Poon et al.³⁰, individual that associates within this industry need to work in extremely dangerous and uncomfortable working conditions such as exposed towards direct heat, inefficient ventilation system, dusty environment and high noise levels. While Lingard et al.²⁴ also stated that, the construction industry is usually associated with financial problems, an insistence upon timelines completion of the project, long working hours, unreasonable demand from clients and massive communication problems thru various parties.

Therefore, to investigate this issue a study will be conducted to assess the current level of work stress on individuals who worked in the construction industry which is professional contractors. Besides this study also will discuss on the main factors that contribute to work stress problems among contractors and work stress level within the construction industry.

PROBLEM STATEMENT

Based on 2016 statistic of Department Occupational Safety and Health first three sectors that contribute to the highest number of accidents at the workplace are; manufactured, forestry and construction. According to the statistic 2016, the construction sector is the third sector that contributes to high number in the workplace, however construction sector is the highest number that contribute to death in workplace compare to others. Table 1 shows the accident at workplace statistic that's been reported by DOSH¹⁴.

Table 1: Number of Accident in Malaysia Sectors (DOSH¹⁴)

Sector	Death (%)	Permanent Disability (%)	Temporary Disability (%)
Manufacture	17	57	50
Mining and Quarrying	0	1	0
Construction	40	5	13
Agriculture, Forestry and Fisheries	19	20	1
Facilities	0	3	10
Transport, Storage and Communication	5	5	7
Wholesale and Retail Trade	0	5	10
Hotel and Restaurant	7	4	4
Finance, Insurance, Real Estate and Business Services	7	3	3
Public Services and Statutory Authorities	5	2	3
Total	100	100	100

According to Enshassi et al.¹⁷, extension of uncontrollable of work-stress in construction industry leads to an increment of number accident in site positively.

In fact, work-stress issue also been declared connected towards accidents issue in sight. This issue may be proven as many previous studies discussed on towards the topic. According to Nahrgang et al.²⁷, high level of uncontrolled work-stress, enhance towards increment of accident in the Palestine construction industry.

According to Bowen et al.⁹, job role may induce to work-stress. Individual with different tasks and responsible, experienced different levels of work-stress (Arzmi³). Bowen el al.⁹ stated that, individuals with greater task and responsibility suffered a high degree of work stress in the construction industry. This statement also agreed by Lingard et al.²⁴ by stating that professionals usually experienced high level work stress compared to non-professionals. While Nordin²⁹ state that, professional that working in contractor firm experience high level of stress compare to professional in consultant firm. This issue also had been detailed by Wahab³² by stating that, work-stress experienced by professional not only will affect individual but it also may affect other people and surroundings.

According to Nordin²⁹, professionals that experience uncontrollable work stress issue tends to be incompetent while working. They tend to be negligence and careless which may induce to mislead direction or unprofessional decision-making. In some of the circumstances they to tend ignore safety requirement while make decision and disregard ethic of safety while enter to construction site (Nordin²⁹). Lack of disciplinary among professional such as do not wear properly safety attire and failed to follow the site regulation become one of factors accidents in construction site (Love et al., 2010). The issue become more serious when it also may involve other people as professional is considered as important person while decision making. Therefore, uncontrollable work-stress may among professional may lead to bad decisions that may bring lots of negative impacts (Love et al.²⁶).

Despite of accidents, decontrol work stress also may result to chronic health problem based on the level of stress, such as heart attack, high blood pressure and more (Nahrgang et al.²⁷). According to Brickford¹¹, each level of stress brings different of health problem based on individual health status. Therefore, this study is conducted to investigate work stress issue among contractors in Malaysia construction industry. This study also may consider as a vital study as it is considered as one of alternative to reduce number

accident in Malaysia construction industry as well as to improving its performance to world quality of standard. However, according to Lingard et al.²³, the work stress issue received a lack of attention towards many parties. Asquin et al.⁴ also agreed by stating that work stress issue with construction industry get lack of attention compared to public facilities sectors; lectures, nurses, doctor, policemen and more.

In fact, Chartered Industrial of Building (CIOB¹³) also figured that 82% of construction industry players had a lack of level resistance towards work-stress issue. They also have a lack of knowledge on the issue and known how technique to control work-stress in place. While Arzmi³ also claimed that, most of participant had zero tolerance on the issue and implement multiple mitigation method inefficiently. Furthermore, according to Dr Rajinderit Singh Hulton; Vice President of Health Department, for the time being there is no formal documentation or report on this issue at the Department of Occupational Safety and Health (DOSH). Therefore, this study will be conducted to explore current work-stress in Malaysia construction industry.

LITERATURE REVIEW

Work Stress in Construction Industry: According Lingard et al.²³, work-stress issue in the construction industry can be resulted due to the nature of high tense working environment within the sector. According to Asquin et al.⁴, work-stress is a component of human response that is not specify towards any part of the body while received any form of insistence of responsibility. While Arzmi³ characterizes work-stress as a psychological syndrome and negative emotional response to someone due to a stressful work environment. Enshassi et al.¹⁷ also supports the statement by emphasizing that high job demands that exceed the ability of an individual ability may lead to workplace stress problems.

Work-stress issue also exists in the construction industry as the industry is known as a high demand industry. According to Bowen et al. (2013), construction industry is basically known of nature high work demand as it consists of complex problems and complicated task that requires usage of both mentally and physically. In addition, uncomfortable working environment and exposure towards a high degree of dangerous become one of challenges in the industry (Bowen et al.¹⁴). The nature of working environment become tense when Leung et al.²¹ defines that issues such incompetent

management, financial issue, insist upon timelines completion of project, unrealistic demands of clients and communication issue usually happens while working. Prolonged associating with these issues may induce to work-stress.

According to Poon et al.³⁰, professionals that experience uncontrollable work stress issue tends to be incompetent while working. They tend to be negligent and careless which may induce to mislead direction or unprofessional decision-making. In some of the circumstances they tend to ignore safety requirement while make a decision and disregard ethic of safety while enter to the construction site (Nordin²⁹). Lack of disciplinary among professional such as do not wear properly safety attire and failed to follow the site regulation become one of accidents factors in construction site (Poon et al.³⁰). The issue becomes more serious when it also may involve other people as professional is considered as an important person while decision-making. Therefore, uncontrollable work-stress may among professional may lead to bad decisions that may bring lots of negative impact (Love et al., 2010).

Besides, uncontrollable of work-stress issue may induce many negative outcomes such as; burnout, health problems, accident at workplace and productivity deterioration (Yip, 2009). According to Enshassi et al.¹⁷, prolonged of work-stress issue may induce to accident in construction site positively. Wahab³² also agreed by stating that prolonged of work-stress issue that especially experienced by professionals leads to negligence while work and exposed many parties towards accident in a construction site. According to Arzmi³, work-stress issue experienced by professionals, not only will expose themselves towards dangerous working environment, they also tend to expose other individual as they are the main person that give order to others. Furthermore, extension of work-stress issue also may bring a negative reputation and performance towards firm (Wahab³²).

Work Stress in Malaysian Construction Industry: Work stress issue is not a new phenomenon in the work field. Work stress issue had been experienced by most of the communities either public or private sector. Recently many articles discussing on health problems often associated with higher treatment costs. Nahrgang et al.²⁷ agreed the statement of the problem of protracted pressure may cause the employer to bear high medical costs. Asquin et al.⁴ also concurred by explaining that the problem of work pressure leads to high medical costs

as it includes two different medical costs; accidents and health. In addition, Dopkeen & DuBois¹⁵ stated that the total liability cost of employers due to uncontrolled work stress is high, especially for developing countries and the world. The total average liability cost for health problems in the United States each year is estimated at 310 billion dollars (Dopkeen & DuBois¹⁵). These costs include the overall costs of medical costs, accidents, losses, costs and the cost of employee turnover (Dopkeen & DuBois¹⁵). While, the cost of liability for a developing country like Malaysia is RM 2,488.02 million (SOCISO³¹). Thus, the work stress is noteworthy because this issue is potentially harmful to national economy and image (Arzmi³).

Issue of protracted work stress may also lead to physical health problems and mental (Wahab³²).

Recently Malaysia has been rocked by a number of incidents of mental problems as a result of protracted work stress. According to local newspapers; Borneo Post¹⁰, there was an incident resulting in death, where construction workers were attacked by colleagues. According to Local Chief Police Officer, a 50-year-old victim was found dead at the scene with multiple stab wounds in the body. Based on the police report, the motive of murder is vague and still under investigation. But the offender was suspected of having a mental illness problem (Borneo Post¹⁰). In another incident that occurred in Johor Bahru, Johor. One contractor believed to have killed his family members. The contractor is accused of killing his wife and children their residency (Archive¹). According to the newspaper report every incident shows that they can be said to have symptoms of serious mental health problems arising in the workplace, the home and the feeling of pressure or stress.

Besides of mental and physical health issues, work stress issue also related to an increment number of accident issue (Leung et al.²²). Based on 2016 statistic of Department Occupational Safety and Health first three sectors that contribute to the highest number of accidents at workplace in Malaysia are; manufacture, forestry and construction. According to the statistic (2016) construction sector is the third sector that contributes to high number in the workplace, however construction sector is the highest number that contribute to death in workplace compare to others. Enshassi et al.¹⁷ claimed that factors of accidents on construction sites happened due several factors such as; contractor's negligence, fails to comply with safety guidelines and work in a dangerous condition is the result of work pressure checked. Nordin²⁹

also stated that the negligence of the contractor is a key factor to accidents in the construction industry is which is due to prolonged of work stress issue.

Besides, Malaysia construction industry also facing accident problem such as the Second Penang Bridge collapse in June 2013 (Bernama⁵) and the collapse of the Mass Rapid Transit (Bernama⁶). According to the press reports, both incidents occurred due to the negligence of the contractor and failure to comply with the safety aspect in which the issue of the Second Penang Bridge collapse in June 2013 is a work failure and failure in safety (Bernama⁵). While the incidence of collapse of Mass Rapid Transits, Mass Rapid Transit Corp Sdn Bhd (MRT Corp) said no adequate oversight of the factors that led to the collapse of the foundation blocks of the project (Bernama⁶). MRT Corp Chief Executive Officer Datuk Azhar Abdul Hamid also said the investigation found deficiencies have caused runway shims have limited stability and therefore when the parapet is mounted on one side of the bridge, it resulted in the foundation of the bridge collapse. Based on two of these incidents, it is clear negligence of the contractor contributed to the accident at the construction site.

Based on the paragraph before, the needs of study in this research are high. This research will be conducted to explore regarding on the issue. This research also can be as a reference for future purpose. This research also may help many parties; DOSH, CIDB and contractors. Therefore, research will be conducted to explore the current situation regarding the issue. This research also will be conducted to give formal information and create awareness regarding this issue as it considers of one of the best alternative to reduce the number of accidents in construction industry as well as improve the industry performance.

METHODOLOGY

This research is descriptive and using questionnaires as a research instrument. The questionnaire was developed based on a literature review and established sets of questionnaires were used in the previous study. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 20.0. The target population involved in the survey is individual professionals in the construction industry in the state of Malacca. Individual professionals such as architects, engineers, project managers, health and safety officers and others were chosen as samples because they are

more vulnerable to the dangers of the work environment and stress (Bowen et al.⁹). Stressful and dangerous working environment not only expose them to accidents, but other people are also involved (Enshassi et al.¹⁷).

The scope of research is professional individuals who are employed by the contractors for the mega project. According to the CIOB¹³, mega-sized projects, known as mega projects, infrastructure projects that involve an investment of more than 1, 000,000 USD. Projects selected for mega-sized projects are more exposed to a high work conflict that led to the issue of work stress and accidents (Yip, 2009). Furthermore, the scope of research narrowed by focusing on the construction industry within Malacca as it consists of numerous conflicts and challenging work because of the issue of the growing population and limited land availability. Therefore, to fulfill all demands for development of the construction industry within the stated, land reclamation projects should be carried out. According to EPU¹⁶, land reclamation projects had been carried since 1970 due to limited land issue in Malacca.

Based on the scenario, researcher has determined the population that involved in this study is professional individuals who serve first class contractor’s organization in the state of Malacca. The researcher also determined the sample of contractor organizations dealing with mega-projects due to high exposure of dangerous working environment and advance machinery. Therefore, its shows the unit of analysis for this study based organization. Researchers also figure out the number of samples involved in this study based on the reference in Krejcie & Morgan²⁰ sample study table in accordance with the number of classes G7 contractors in the state of Malacca. According to the official website CIDB¹², the number of registered contractors G7 class in Melaka is the latest of 144 organizations. Thus, the numbers of samples involved in this study were 105 individuals.

DATA ANALYSIS AND DISCUSSION

Major Contributor of Work Stress towards Contractor in Malaysian Construction Industry:

Based on the findings, researcher found that all these factors; working environment, workload, work conflict and organization contributed greatly to job stress positively in Malaysia construction industry. In fact, all these factors lead to high impact pressures of work at the construction site. All factors contributor to work stress level in higher degree. This shows

the entire factor influenced towards work stress in Malaysia construction industry positively. However, based on the total average of score min as shown above, work demand contributed the highest degree towards work stress in the industry with value of 4.11.

Table 2: Overall Min Scores of Work Stress Contributor in the Construction Industry

Factors	Total Average of Min	Level
Organisation	3.95	High
Work Demand	4.11	High
Work Conflict	3.75	High
Work Enviroment	3.95	High

Highly work demand aspect in construction field faced by professionals such as; long working hour, inconsistent working hour, complicated work conflict and problems, wide exposure to communication issue due to many parties involved within a task led to work stress in construction industry. Hence, based on the illustrated table above, research may consider the first objective of the research has been achieved clearly as shown in table 2.

Work Stress Level Experience by Contractor in Malaysia Construction Industry:

The second aim of this research is to measure the work stress level experienced by contractor in Malaysia construction industry. Based on gathered research data, researcher found that level of work stress experience by contractors in Malaysia construction industry is relatively high. This statement is proven with high value to the total average score min of 4.86 as shown in Table 3. This value shows that, work stress in Malaysia construction industry in exist. This research also shows that, work stress issue in the construction industry need to be highlighted as well as other sectors such public sectors.

Table 3: Overall Min Scores of Work Stress Level in the Construction Industry

Stress Stage	Total Min Average	Level
Emotional Exhaustion	5.59	High
Depersonalisation	4.52	Medium
Achievement	4.48	Medium
Total	4.86	High

Based on the table 3, it proves that professional that associated with contractor organization experience high level of work stress. This study also shows that contractor faced emotional exhaustion stage frequently where they tend to feel tense and angry at the end of the day. However, researcher found that the contractors has medium level for both depersonalization and achievement stage with a value of 4.52 and 4.48. This value shows that, contractors still have good achievement and the ability to communicate well with colleagues and others. Hence, the researcher concludes that, the level of stress experienced by contractors in Malaysia construction industry is relatively high, but the contractors still able to communicate and perform better in their task. Besides researcher also may conclude that the second aim of the study is achieved by succeeding to measure the work stress level.

CONCLUSION

Research based on descriptive analysis orientation and using questionnaires as an instrument for collection data purposed. This research has considered received a good feedback from many individual as the response rate for the research is respectively high with 74% and involvement from 78 individuals from contractors in Malacca. Research used latest software of the Statistical Program for Social Science version 20.0 for data evaluation.

Based on a survey study conducted by CIOB¹³, there were four main factors that led to work stress in the construction industry which were environmental, organization, work demand and work conflict. Therefore, based on the study and literature review, 24 questions were constructed to identify the major contributor to work stress in construction field. Each of the questions is also being constructed by using the Michigan Organizational Assessment Package which had been widely used in the working environment study area. Based on research data, all those factors influence towards work stress in the Malaysian construction industry are positive. In fact, result showed all those factors bring great impact in work stress within the industry. However, work demand is considered as the major contributor towards work stress experience by a contractor with highest value total min of 4.11.

Besides, this research data also had been supported by previous studied conducted by Lingard et al.²⁴ regarding work stress in a construction site. According to Lingard

et al.²³ work demand factors such as long working hour and unstable working hour leads positively toward work stress. Lingard et al.²³ also found that professional within the construction industry usually spend more than 60 hours per week to fulfill organization tasks. According to Brickford¹¹ having prolonged working hour will lead low satisfaction level, reduces performance and degraded individual achievement. Beside other high work demand issue comes from clients such as expecting high quality project in the short term and limited budget also made the working in construction huge challenges and led to work stress. In addition, work demand issue such as deliver construction in short time - period and unstable work hours may bring work pressure experienced by the contractor at the construction site (Ng et al.²⁸).

According to Ng et al.²⁸, one of the demands of working in the construction industry, which can tend towards the working pressure is the scope of work that involves too many individuals from various parties, including clients and consultants. In addition, Nordin²⁹ also believes that the involvement of too many individual professionals, especially in construction activities such as project managers, engineers, architects and others brought pressure upon each of them has a different view of work and opinion may lead discussion activities more stressful and intense. Involvement of too many individuals also may lead too communication issue and decision making period prolonged. This issue can be proven when work demand problem such as many involvements in construction field aspect brings the highest mean value of 4:35. It shows many professionals within the contractor firm agreed that involvement from too many parties may lead towards work stress.

According to Bowen et al. (2013) stress the workplace consists of three stages; emotional exhaustion, depersonalization and destructive performance. Individuals who suffer from workplace stress will have symptoms that vary with the level of stress experienced (Love et al., 2010). In order to fulfill the second aim of the study, researchers prepare the questions of 22 questions based on concepts Likert scale of seven to represent each level as discussed in the literature. The question is constructed to assess the level of work stress experienced by the individual.

Based on the assessment that has been carried out, the researchers found that the level of work stress experienced by the contractor in the construction industry

is said to be at a high level with an average value of 4.86. These findings are also supported by the results of previous studies that have been carried out by Wahab³² on the pressure of work in the construction industry in Nigeria. Based on the findings of the study, as many as 86.70% of individual professionals in the construction industry in Nigeria were reported having problems with working pressure. Work stress levels experienced by individual professionals in Nigeria are also said to be high level (Wahab³²). However, these findings contradict the findings of a study conducted by Yip (2009) in Hong Kong. According to Yip (2009), the level of work stress experienced by the contractor is a moderate level. This is because the cultural lives of the people of Hong Kong attach great importance to the family of the job. Yip (2009) also argues that family oriented culture may help to reduce work pressures in the construction industry.

Based on this conclusion, the level of work stress in the construction industry is not a new phenomenon in the construction industry. The issue of work stress in the construction industry need to be considered as an extension of this issue leads to job performance weakens and thus the destruction of his career. Based on the findings, family factors also affect the level of pressure of work on construction sites as evidenced in the study (Yip, 2009). However, this study is descriptive and is free from any form of family factor contact. In addition, the findings also prove that even individual contractors are experiencing high levels of work stress, but they still have a level of performance and job satisfaction that simple. This can be seen in the respect that people are still enthusiastic in their work and they can control their emotions when working with a higher mean number of 4.79. This proves that although the level of work stress experienced by the contractors at construction sites is high, but they still have a good level of job satisfaction and work performance is good.

Therefore, employers should be alert and always strive to ensure job satisfaction can be improved for outstanding work performance. Based on these findings, it is evident that the problem of work pressure in the building construction industry does exist. This study clearly shows that workplace stress is an important issue because the situation and the work environment in the construction industry led to job stress experienced by the contractor in the construction industry.

ACKNOWLEDGMENT

The authors would like to thank the Geran Penyelidikan Kontrak Khas 2015 (U432), Office for Research Innovation, Commercialization and Consultancy Management (ORICC) and Centre for Graduate Studies (CGS) of Universiti Tun Hussein Onn Malaysia (UTHM) who was supported the research paper.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Archive. Contractor Murdered His Wife and Kids Sentence to Death. 2010; Retrieved from (10th December 2015). <http://ww1.utusan.com.my/>
2. Archive. Failure of Contractor Suicidal. 2010; Retrieved from (10th December 2015). <http://ww1.utusan.com.my/>
3. Arzmi A. Cara pengurus projek pembinaan menangani stres di tempat kerja (Doctoral dissertation, Universiti Teknologi Malaysia). 2009.
4. Asquin A, Garel G, Picq T. When project-based management causes distress at work. *International Journal of Project Management*. 2010; Volume 28, issues 2: pp. 166-172.
5. Bernama. Four people died in Second Penang Bridge Collision. 2013; Retrieved from (10th September 2015). <http://www.themalaysianinsider>
6. Bernama. 300 tons' concrete fell, three individuals trapped. 2014; Retrieved from (10th September 2015). <http://www.astroawani.com>
7. Bernama. MRT Collapse. MRT Corps Reveals Investigation Report. 2014; Retrieved from (14th October 2015). <http://www.dosh.gov.my/>
8. Bowen P, Edwards P, Lingard H. Workplace stress experienced by construction professionals in South Africa. *Journal of Construction Engineering and Management*. 2012; Volume 139, Issues 4: pp. 393-403.
9. Bowen P, Edwards P, Lingard H, Cattell K. Predictive modelling of workplace stress among construction professionals. *Journal of*

- Construction Engineering and Management. 2014; Volume 140, Issues 3: pp. 1-10.
10. Borneo Post. Two Construction Worker Stabbed Death. 2014; Retrieved from (10th November 2015). <http://www.utusanborneo.com.my/>
 11. Bickford M. Stress in the Workplace: A General Overview of the Causes, the Effects, and the Solutions. Canadian Mental Health Association Newfoundland and Labrador Division. 2005; pp. 1-3.
 12. Construction Industry Development Board (CIDB). Malaysian Contractor Lists. 2016; Retrieved from (27th September 2016). <http://www.cidb.gov.my>
 13. The Chartered Institute of Building (CIOB). Occupational Stress in the Construction Industry, CIOB, Ascot, U.K. 2006.
 14. Department of Safety and Health (DOSH). Number of Accident within Sectors. 2016; Retrieved from (10th Mac 2016). <http://www.dosh.gov.my>
 15. Dopkeen J. C, DuBois R. Stress in the Workplace: A Policy Synthesis on Its Dimensions and Prevalence. 2014.
 16. Economic Planning Unit (EPU). Gross Domestic Product Construction Industry in Malacca. 2016. Retrieved from (10th Mac 2016) www.melaka.gov.my/
 17. Enshassi A, El-Rayyes Y, Alkilani S. Job stress, job burnout and safety performance in the Palestinian construction industry. *Journal of Financial Management of Property and Construction*. 2015; Volume 20, Issues 2: pp. 170-187.
 18. Enshassi A, Choudhry R, Abualqumboz, M. Quality and safety in the palestinian construction industry. *Revista Ingeniería de Construcción (Journal of Construction Engineering)*. 2009; Volume 24, Issues 1: pp. 49-78.
 19. Ibem E. O, Anosike M. N, Azuh D. E, Mosaku T. O. Work Stress among Professionals in Building Construction Industry in Nigeria. *Construction Economics and Building*. 2011; Volume 11, Issues 3: pp. 45-57.
 20. Krejcie R. V, Morgan D. W. Determining sample size for research activities. *Educational and psychological measurement*. 1970; Volume 30, Issues 3: pp. 607-610.
 21. Leung, M. Y, Chan Y. S, Olomolaiye P. Impact of stress on the performance of construction project managers. *Journal of Construction Engineering and Management*. 2008; Volume 134, Issues 8: pp. 644-652.
 22. Leung M. Y, Chan Y. S, Yu J. Integrated model for the stressors and stresses of construction project managers in Hong Kong. *Journal of Construction Engineering and Management*. 2009; Volume 135, Issues 2: pp. 126-134.
 23. Lingard H, Francis V, Turner M. Work time demands, work time control and supervisor support in the Australian construction industry: An analysis of work-family interaction. *Engineering, construction and architectural management*. 2012; Volume 19, Issues 6: pp. 647-665.
 24. Lingard H. C, Francis V, Turner M. The rhythms of project life: a longitudinal analysis of work hours and work-life experiences in construction. *Construction Management and Economics*, 2010; Volume 28, Issues 10: pp. 1085-1098.
 25. Love P. E, Edwards D. J, Irani Z. Work stress, support, and mental health in construction. *Journal of Construction Engineering and Management*. 2009. Volume 136, Issues 6: pp. 650-658.
 26. Love P. E, Edwards D. J. Taking the pulse of UK construction project managers' health: Influence of job demands, job control and social support on psychological wellbeing. *Engineering, Construction and Architectural Management*. 2005; Volume 12, Issues 1: pp. 88-101.
 27. Nahrgang J. D, Morgeson F. P, Hofmann D. A. Safety at work: a meta-analytic investigation of the link between job demands, job resources, burnout, engagement, and safety outcomes. 2011.
 28. Ng S. T, Skitmore R. M, Leung T. K. Manageability of stress among construction project participants. *Engineering, Construction and Architectural Management*. 2005; Volume 12, Issues 3: pp. 264-282.
 29. Nordin. Z. *Kajian Mengenai Punca Kemalangan di tapak bina di Zon Utara Semenanjung Malaysia*. Politeknik Sultan Abdul Halim Mua'dzam Shah: Unpublished Bachelor Degree Thesis. 2014.

30. Poon S. W, Rowlinson S. M, Koh T, Deng Y. Job burnout and safety performance in the Hong Kong construction industry. *International Journal of Construction Management*. 2013; Volume 13, Issues 1: pp. 69-78.
31. Social Security Organization (SOCSO). SOCSO Annual Report 2014. 2014.
32. Wahab, A. B. Stress management among artisans in construction industry in Nigeria. *Global Journal of Researches in Engineering*. 2010; 10(1), 93-103.
33. Yip, L. P., & Ye Liping. Job burnout among construction professionals in Hong Kong: A moderator model with coping strategies. *HKU Theses Online (HKUTO)*. 2007.

The Effect of Living nearby Telecommunication Base Station: From the Residents' Feeling

Norazmawati M. S.¹, Muhammad Arkam C. M.², Kai X. T.³

^{1,3}*School of Housing, Building & Planning, Universiti Sains Malaysia, Malaysia;*

²*School of Environmental Engineering, Universiti Malaysia Perlis, Malaysia*

ABSTRACT

With advanced technology, the users of cellular phones are increasing, yet the public concern on health issues, particularly to the impacts of exposure to electromagnetic field (EMFs). However, it is unknown that the impacts of EMFs perceived by the adjacent residents. This paper presents the results of a case study to determine residents' perceptions towards living proximity of telecommunication base station in Malaysia and how they evaluate the impact of these constructions. Using the quantitative survey method, this paper applied the chi-square test and binomial logit model to investigate the perceptions of residents who are living within close proximity to the telecommunication base station in Malaysia. The result shows that demographic (age), types of residence (length of stay and distance), and health symptoms (nausea vomiting and sight problem) were statistically significant to determine whether the residents felt comfortable to live nearby telecommunication base station. The result of logistic regression exhibits that residents who live more than 100 m away from the base station would more likely to feel comfortable, and the longer they live, more likely to choose comfortable compared to those who live there less than 5 years. The implications were also presented.

Keywords: *telecommunication base station, binomial logit model, feeling of comfort, health symptoms, types of residency.*

INTRODUCTION

In recent years, the use of mobile communication technologies for phoning, texting and internet services are becoming main part of human life. Based on the statistical data from ITU¹⁵, global mobile penetration has increased approximately 126% in 2016 compared to the past 10 years, and mobile phone subscription is expected to increase further in the future. Technology advancement in Malaysia, especially in networking (mobile broadband), devices (smart phone), and mobile applications (Web streaming, video surfing), has led to the high demand of internet services, which has risen from 21.38% in 2000 to 78.79% in 2016 (ITU¹⁶).

To satisfy the demand of internet users, infrastructure for the telecommunication network has widely expanded in Malaysia. Telecommunication companies have to build more base stations at strategic locations to ensure the high-quality mobile network service for end-users, in addition to stay ahead of their competitors in term of signal coverage. Most of the base stations are located in highly populated

residential or business areas, such as on the rooftops of shop lots and apartments, open spaces at playing fields, or parking lots of shopping complexes (Din⁹). The closer the base station to human, the higher risk impacts on human health condition (Cousin & Siegrist^{6, 7}; Neubauer et al.²³; Ngui²⁴; Van Kleef, Fischer, Khan, & Frewer³⁶; Viel et al.³⁷). Malaysia has an estimated a total of 16,000 to 18,000 telecommunication base stations (cellular and broadband) nationwide (Ngui²⁴).

The installation of telecommunication base stations in residential areas has resulted in substantial controversies about the potential harmful effects of the radiofrequency electromagnetic fields (EMF) emissions (D'Angelo, Costantini, Kamal, & Reale⁸; Din⁹; Isabona, Srivastava, & Robert¹⁴; Ozovehe, Usman, & Hamdallah²⁵; Siegrist, Earle, Gutscher, & Keller³⁵). According to Cousin and Siegrist (^{6, 7}), and Hallberg and Oberfeld¹⁰, the health effects of EMF are headaches, dizziness, nausea, skin rashes, feeling warm, depression, night sweats, memory loss, disturbances in menstruation, and insomnia. Many prior studies indicated that people living in the vicinity

of telecommunication base stations suffer from adverse health conditions (e.g. Augner & Hacker²; Isabona et al.¹⁴; Roje, Poljak, & Sarolic²⁸; Shahbazi-Gahrouei, Karbalaee, Moradi, & Baradaran-Ghahfarokhi³²).

In Malaysia, the health issues resulted from effects of EMF require more attention. Only a handful of studies which investigate the residents' health awareness towards the telecommunication base stations in Malaysia. The only record found was a study conducted in Penang, Malaysia by Suleiman, Gee, and Krishnapillai³⁴. Hence, this study aimed to fill the void and expand the research by including study sites in selected states in West Malaysia. The study identified the residents' perceptions about whether it is comfortable to live near to telecommunication base stations, the cause variables of demographic, types of residency, and the possible health symptoms of EMF.

STUDIES ON TELECOMMUNICATION BASE STATION IMPACTS

The researches regarding the health effects of EMF have been widely conducted in the last decade (Kundi & Hutter¹⁸; Santini, Santini, Danze, Le Ruz, & Seigne^{29, 30}, but their research outcomes are heterogeneous and inconsistent. Klaps et al.¹⁷ outlined the problems for studying the impacts of base stations. The first problem is the proper selection of the independent variable, or a list of measurement indicators to examine exposure to base station signals. The second problem is to study the outcome assessment due to people suffering from idiopathic environmental intolerance attributed to EMF in experimental trails, while lab experiments may cause inaccurate results in studying the subjective well-being and physiological indicators of the subjects (Hutter, Moshammer, Wallner, & Kundi¹¹; Neubauer et al.²³). The third problem concerns population selection. Even though base stations are ubiquitous, the actual exposure intensity is very low and hardly detectable, making it hard to measure an accurate human exposure level. Therefore, a random selection of study sites or respondents carries the risk of imprecise findings that may include only a few persons - or virtually no one - who have been exposed to EMF (Klaps et al.¹⁷). As a result, the residents who living near to base station within 500m are selected for this study.

In more recent studies, Baliatsas et al.³ explored a possible change in the prevalence of non-specific

symptoms, registered by general practitioners, among residents living in the proximity of a base station before and after an increase in installed base station antennas. A total of 1,069 adult participants from different regions in the Netherlands were analysed. The study compared two time periods (before and after) and revealed that after increasing the total number of base stations, a higher prevalence of most non-specific symptoms was observed. Also, a statistically significant prevalence of ear symptoms and musculoskeletal symptoms was found for the two different periods. Wiedemann, Freudenstein, Böhmert, Wiart, and Croft³⁸ conducted an online survey with 2454 respondents in six European countries to identify the potential risks from base stations and access points comprising Wi-Fi routers and cell phones. This study found that respondents were convinced that even a very low EMF exposure can have chronic negative health effects. They regarded EMF exposure as a moral issue, which elicits antagonistic feelings.

On the other hand, in the case of Penang, Malaysia, Suleiman et al.³⁴ used 14 symptoms to compare the possible health effects on residents exposed (170 respondents) and not exposed (31 respondents) to EMF from telecommunication towers. Residents who live within the radius of 0 to 150m from the base station were considered as EMF exposed, while more than 150m were considered as not exposed. The findings revealed that symptoms like headache, giddiness, insomnia, loss of memory, diarrhoea, mental slowness, reduced reaction times and mood swings were observed to significantly affect both exposed and non-exposed residents, but that the existing base station caused more adverse health effects in exposed residents compared to those who were not exposed.

To deal with the public fear, several bodies have been established internationally to minimise these health symptoms. These bodies provide guidelines and standards aiming to allay public fear on the effects of EMF. Malaysian telecommunication companies use the guidelines provided by the International Commission on Non-Ionising Radiation Protection (ICNIRP)¹³, Institute of Electrical and Electronics Engineers (IEEE)¹², and the World Health Organisation (WHO) (Din⁹; Tukimin, Mahadi, Ali, & Thari³⁵). Based on radiation detection tests by the Malaysian Communications and Multimedia Commission (MCMC), the radiation effects of EMF from telecommunication base stations in Malaysia are still at a low level (Ngui²⁴), with simulation tests and empirical

tests at base station sites showing radiation levels to be well below 1%. This indicates that radiation is less than one per cent, compared to the ICNIRP-recommended level for mandatory standards for emission of EMFs from infrastructure. However, there is not found research shows the perceptions of adjacent residents on comfortable of living proximity base station.

METHODOLOGY

Quantitative method involving a survey questionnaire was employed. This approach was selected because this research was based on pragmatic grounds; with respect to perceptions on demographic, types of residency, and health symptoms from living in the vicinity of base station. The data collection started with the development of a survey instrument, aimed to establish the measurement indicators: five demographic items, four types of residency items, and six health symptoms which would affect residents’ perception of whether residents felt comfortable to live in vicinity of the base stations in West Malaysia. The questionnaire was designed as a self-administered survey. Next, the survey instrument was pilot-tested and then refined. The selection of respondents took place by random sampling in several states of Malaysia (Kelantan, Penang, Kedah, Perlis, Selangor, Negeri Sembilan) between January to July 2017. The questionnaire included a set of questions on certain themes, respondents’ demographic, types of residency, health awareness, and health symptoms to gauge residents’ perception on whether comfortable to live nearby the base station. The items asked in questionnaire were presented in Table 1.

Table 1: Dependent and independent variables themes

Variable	Characteristics	%
Dependent Variable		
Comfortable	Do you feel comfortable living/working near to this telecommunication tower?	
	No (Code 0)	27.90
	Yes (Code 1)	72.10
Independent Variables		
Demographic		
Gender	Male (reference alternative)	54.03
	Female	45.97

Conted...

Age	19-24 years old (reference alternative)	24.36
	25-35 years old	26.72
	36-45 years old	22.99
	>46 years old	25.93
Marital status	Single (reference alternative)	36.54
	Married	59.33
	Widow	4.13
Education level	Primary (reference alternative)	9.82
	Secondary	37.52
	Degree	37.13
	Master	3.14
	PhD	1.77
	No formal education	10.61
Occupation	Management (reference alternative)	13.95
	Engineer	5.30
	Doctor	3.73
	Education	9.04
	Other	44.60
	Unemployed at the moment (Housewife/students)	23.38
Types of residency		
House type	Bungalow (reference alternative)	15.91
	Terrace house	54.62
	Semidetached house	14.73
	Office	14.54
Ownership	Rental (reference alternative)	34.58
	Own	44.20
	Heritage house	21.22
Length of stay	Live within 1 year (reference alternative)	12.18
	Live 2-5 years	26.92
	Live 6-10 years	27.11
	Live more than 10 years	33.79
Distance from the base station	Less than 100m (reference alternative)	21.22
	Between 101-200m	22.79
	Between 201-300m	23.18
	More than 300m	32.81
Health symptoms: Have you ever experience the following symptoms since living in this residential area?		

Conted...

Headache	No (reference alternative)	32.22
	Yes	67.78
Fatigue	No (reference alternative)	33.46
	Yes	66.54
Nausea vomiting	No (reference alternative)	4.91
	Yes	95.09
Skin problem	No (reference alternative)	5.89
	Yes	4.11
Loss of appetite	No (reference alternative)	7.27
	Yes	92.73
Nosebleed	No (reference alternative)	2.95
	Yes	97.05

DATA ANALYSIS

The data were first analysed by using chi-square tests to explore the single-dimensional relationship between the two group of respondents (those who feel comfortable and those who feel uncomfortable to live nearby telecommunication towers) with categorized measurement items (demographic, types of residency, and health symptoms). In the next stage, the binomial logit model was applied to examine the difference between these two group of respondents. The model proposed by McFadden^{19,20} was adapted, whereby the choice of yes (coded 1) and no (coded 0) indicated that code 1 was those who felt comfortable to live near to base station and code 0 was those who were not. McFadden’s model relied on the assumption that the respondents who felt comfortable to live are a non-random function, V1 of the travel characteristics plus a random error term:

$$T(\text{comfortable to live} = 1) = V1 + e1$$

On the other hand, the respondents who felt uncomfortable to live as a random error term:

$$T(\text{uncomfortable to live} = 0) = V0 + e0$$

As a result, the measurement items (demographic, types of residency, and health symptoms) related more to comfortable to live rather than the otherwise if, and only if:

$$T(\text{comfortable to live} = 1) > T(\text{uncomfortable to live} = 0)$$

Or

$$V1 - V0 > e0 - e1$$

In the case of the distributions of e0 and e, the probability that comfortable to live = 1 was

$$P(\text{comfortable to live} = 1) = \exp(V1) / [\exp(V1) + \exp(V0)].$$

However, if case 1 was unable to estimate the absolute levels of the parameters of V1, it would be able to estimate the measurement variable parameters of the respondents felt comfortable to live relative to those who felt uncomfortable to live. This was known as the log odds of occurrence on comfortable to live over uncomfortable to live, as expressed by the function:

$$V1 - V0 = b0 + \sum bjxj.$$

Then,

$$P(\text{comfortable to live} = 1) = \exp(b0 + \sum bjxj + V0) / [\exp(b0 + \sum bjxj + V0) + \exp(V0)] \text{ ---- with parameters } V1$$

Or

$$P(\text{comfortable to live} = 1) = \exp(b0 + \sum bjxj) / [\exp(b0 + \sum bjxj) + 1] \text{ --- without parameters } V1$$

Then, dividing the numerator and denominator by exp(b0 + sum bjxj) yields the logit model as:

$$P(\text{comfortable to live} = 1) = 1 / [1 + \exp(-(b0 + \sum bjxj))] \dots(1)$$

Therefore, the logit model in equation (1) showed the probability of the intra- comfortable/uncomfortable to live, where the measurement variable xj included the demographic, types of residency, awareness, and health symptoms. This logit equation was used to run the logistic regression analysis in Stata software 14.2. The Hosmer-Lemeshow test was used for the goodness of fit test. Additionally, the vector of the coefficient bj was estimated by the maximum likelihood. For measuring the goodness of fit of the equation, McFadden (1974, p. 121) suggested the use of the likelihood ratio index:

$$1 - LUR/LR,$$

where LUR was the unrestricted vector of the log-likelihood function at the maximum likelihood estimation of the parameters bj, while LR was the value of the likelihood function when all the parameters were restricted to zero (Reece²⁷).

FINDING

Table 2 presented the chi-square test results of residents' feeling of comfort related to demographic, types of residency, and health symptoms. The results showed that three variables: demographic (age), type of residency (length of stay and distance from base station), and health symptom (nausea vomiting) were significantly different ($p < 0.50$) in term of whether it was comfortable to live nearby the base station. Due to the weakness in the statistical power of the chi-square test as it is a non-parametric test, binomial logistic regression analysis was selected as a more understandable approach for this study (Table 3). The first column of Table 3 showed the coefficient b_j of equation (1), the standard errors associated with the coefficients, the Wald statistic or Wald chi-square value together with the 2-tailed p-value, and the odds ratio or exponential of the coefficients. In assessing the model fit, two statistical tests were applied to assess the significance of the binomial logit model. Hosman-Lemeshow statistic of overall fit indicated that there was no significant difference between the actual and predicted classifications, where the p-value > 0.05 [0.580]. The likelihood ratio index measure of the goodness of fit of the estimated equation was 0.125. These two statistics provided good support for the logit model.

The fourth column showed the p-value for these parameters (Table 3). The demographic: education level (degree), types of residency: house type (semidetached house), length of stay (live more than 6 years), and distance from the base station ($> 100m$), and nausea vomiting (yes) for health symptom were found to be significant to the predictive ability of the model. The p-value of education level (degree) was 0.03 and the odd ratio was 2.663, value more than 1. This expressed that respondents with undergraduate degree were more likely to feel comfortable to live in vicinity of base station. Significant results were observed in the respondents living in semidetached house with a p-value of 0.04, and the odds ratio obtained for this variable was 0.434, which was less than 1. This indicated that residents who have undergraduate degree were less likely to feel comfortable to live nearby the base station.

Furthermore, as p-value of length of stay - 6-10 years and more than 10 years were .00 and .01 respectively, with odd ratio was 3.219 and 2.939 respectively. Both results show odd ratios were more than 1 and therefore

the respondents who live more than 6 years in proximity of base station would more likely to feel comfortable than those who have live less the 6 years. The house distance from the base station also found statistically significant (p-value of 101-200m, 201-300m, and more than 301m were .05, .00, and .01 respectively), their odd ratio was 1.1910, 3.135, and 2.251 respectively. The results show these odd ratios were more than 1, indicating that the respondents who live more than 100 meters from the base station would more likely to feel comfortable to live compared to those who live less than 100m. There was only one item found statistically significant from the health symptoms which was the item 'nausea vomiting' with p-value:0.00 and odd ratio .201, less than 1. This implied that the residents who experience nausea vomiting would be more likely to feel comfortable to live close to the base station (see also Pallant²⁶, p. 175-178, for further explanation on the p-value and odd ratio of the binomial logit model analysis).

Table 2: Chi-square test for comfortable with demographic, type of residency, and health symptoms

Variables	N(df)	Chi-square X^2	p-value
Demographic			
Gender	509(1)	0.116	0.733
Age	509(3)	12.019	0.007**
Marital status	509(2)	6.8981	0.032
Education level	509(5)	1.832	0.812
Occupation	509(5)	4.847	0.435
Type of residency			
House type	509(4)	7.898	0.095
Ownership	509(2)	0.068	0.966
Length of stay	509(3)	9.043	0.029*
Distance from the base station	509(3)	8.483	0.037*
Health symptoms			
Headache	509(1)	1.746	0.186
Fatigue	509(1)	0.291	0.600
Nausea vomiting	509(1)	10.322	0.001**
Skin problem	509(1)	0.330	0.566
Loss of appetite	509(1)	0.408	0.523
Nosebleed	509(1)	0.012	0.914

$t^*p < 0.05$, $**p < 0.01$

Table 3: Logistic Regression Test

Items	Coefficient b _j	Standard error	Wald statistic	P-value	Odd ratio
Demographic					
Gender (Male)					
Female	.061	.231	.26	.80	1.063
Age (19-24)					
25-35	-.548	.347	-1.57	.12	.578
36-45	.435	.421	1.03	.30	1.545
>45	.736	.451	1.63	.10	2.088
Marital status (Single)					
Married	-.581	.304	-1.91	.06	.559
Widow	-1.492	.577	-2.59	.01	.225
Education level (Primary)					
Secondary	.540	.417	1.30	.20	1.716
Degree	.980	.460	2.13	.03*	2.663
Master	.990	.861	1.15	.25	2.691
PhD	.412	.892	.46	.64	1.510
No formal education	.206	.485	.43	.67	1.229
Occupation (Management)					
Engineer	-.536	.540	-.99	.32	.585
Doctor	-.065	.676	-.10	.92	.937
Education	.108	.493	.22	.83	1.114
Other	.394	.361	1.09	.28	1.483
Unemployed	-.506	.419	-1.21	.23	.603
Type of residency					
House type (Bungalow)					
Teres house	-.664	.361	-1.84	.07	.515
Semidetached house	-.834	.413	-2.02	.04*	.434
Office	.173	.474	.36	.72	1.189
Ownership (Rental)					
Own	-.392	.279	-1.41	.16	.676
Heritage house	-.234	.355	-.66	.51	.792
Length of stay (1 year)					
2-5 years	.420	.371	1.13	.26	1.521
6-10 years	1.169	.399	2.93	.00**	3.219
>10 years	1.078	.408	2.64	.01**	2.939
Distance from base station (>100m)					
101-200m	.647	.322	2.01	.05*	1.910
201-300m	1.142	.347	3.29	.00**	3.135
>301m	.811	.306	2.65	.01*	2.251
Health symptoms					
Headache (Yes)	-.211	.237	-.89	.37	.810
Fatigue (Yes)	-.091	.237	-.38	.70	.913
Nausea vomiting (Yes)	-1.604	.481	-3.33	.00**	.201

Conted...

Skin problem (Yes)	.539	.511	1.05	.30	1.713
Loss of appetite (Yes)	.005	.424	.01	.99	1.005
Nosebleed (Yes)	-.005	.665	-.01	.99	.995
Number of Obs	508				
Hosmer & Lemeshow Chi-square (df)	6.6(8)				
p-value	0.5801				
L_{UR}	-263.289				
L_R	-300.993				
$1 - L_{UR}/L_R$	0.125				

* $p < 0.05$, ** $p < 0.01$

DISCUSSION AND CONCLUSION

The study examined residents' perceptions on whether it was comfortable to live in the vicinity of telecommunication base stations in Malaysia, through three measurement indicators: demographic, types of residency, and health symptom towards the effects of living near the constructions. A questionnaire survey was conducted and the data was used to analyse the relationships between the measurement indicators toward the adjacent residents' feeling of comfort to base stations. Two analyses, namely the Chi-square test and the logistic regression analysis, were used to determine their relationships and they were presented in the early part of this article. The Chi-square results revealed that age was found statistically significant in deciding whether it was comfortable to live in close proximity to the base station. The study of Shahbazi-Gahrouei et al.³² and Siegrist et al.³⁵ also found that different age groups have different sensitivity towards EMFs. This might have due to the younger generation was more aware about the hazardous risks of EMFs. Length of stay, distance from base station and nausea vomiting of health symptom were influencing the perceptive on living comfort near to base station.

For deeper understanding, binomial logistic regression was used and it discovered that people with undergraduate degree tended to feel comfortable living in proximity to base stations compared to those who with only primary education level. The residents who live more than 6 years would more likely to feel comfortable to live nearby base station. There are many studies revealed that distance away from the base station was a significant variable to determine the exposure level from EMFs (e.g. Augner & Hacker²; Baliatsas et al.⁴; Bond²³;

Kundi & Hutter¹⁸; Santini et al.²⁹; Schüz & Mann³¹; Viel et al.³⁷). Similarly, this study revealed that distance was found related to feeling of comfort, the farer they stay, more comfort they felt.

The study of Abdel-Rassoul et al.¹, Mohler et al.²¹, Navarro et al.²², Santini et al. (29, 30), and Suleiman et al.³⁴ revealed that fatigue, sight problem, and loss of appetite were the health risks of living in proximity to base stations. However, the present study showed only one item 'nausea vomiting' was significantly affected the perception of people and causing them to feel uncomfortable to live near to base station. People might perceive that the illnesses brought by EMF were rather chronic than acute. Therefore, the health organisation was suggested to raise public awareness regarding the health risks of EMF and encourages residents to keep track of their yearly medical check-up record.

In the other hand, to reduce the intensity of EMFs exposure, telecommunication companies should consider sharing base stations to mount their transceivers rather than increase the number of towers. Local authorities should regulate base station constructions to ensure that the constructions were carried out follow the guidelines provided by the Institute of Electrical and Electronics Engineers (IEEE)¹² and the International Commission on Non-Ionizing Radiation Protection (ICNIRP)¹³. The Malaysian Communications and Multimedia Commission (MCMC) should conduct random audits to ensure that the wireless communication environment is conformed to the EMF safety level.

Furthermore, the MCMC should openly disclose details on the localities of each telecommunication base station, including the names of the telecommunication

companies operating them, on an official website. This will not only encourage transparency in conduct but it can also avoid the operation of illegal base stations. Lastly, public opinion should be heard and considered before any construction of base stations was taken place to avoid controversy.

ACKNOWLEDGMENT

Much appreciation is extended to the Ministry of Higher Education Fundamental Research Grant Scheme (FRGS) with the account number 203/PPBGN/6711518, USM members and those involved in this study.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Abdel-Rassoul G, El-Fateh O.A, Salem M.A, Michael A, Farahat F, El-Batanouny M., Salem E. Neurobehavioral effects among inhabitants around mobile phone base stations. *NeuroToxicology*. 2007; 28(2); 434–440. <https://doi.org/10.1016/j.neuro.2006.07.012>
2. Augner C, Hacker G. Are people living next to mobile phone base stations more strained? Relationship of health concerns, self-estimated distance to base station, and psychological parameters. *Indian Journal of Occupational and Environmental Medicine*. 2009; 13(3); 141. <https://doi.org/10.4103/0019-5278.58918>
3. Baliatsas C, van Kamp I, Bolte J, Kelfkens G, van Dijk C, Spreeuwenberg P, Yzermans J. Clinically defined non-specific symptoms in the vicinity of mobile phone base stations: A retrospective before-after study. *Science of the Total Environment*. 2016; 565; 714–720. <https://doi.org/10.1016/j.scitotenv.2016.05.021>
4. Baliatsas C, Van Kamp I, Kelfkens G, Schipper M, Bolte J, Yzermans J, Lebret E. Non-specific physical symptoms in relation to actual and perceived proximity to mobile phone base stations and powerlines. *BMC Public Health*, 11. 2011. <https://doi.org/10.1186/1471-2458-11-421>
5. Bond S. Cell phone tower proximity impacts on house prices: A new zealand case study. *Pacific Rim Property Research Journal*. 2007; 13(1); 63–91. <https://doi.org/10.1080/14445921.2007.11104223>
6. Cousin M. E, Siegrist M. The public's knowledge of mobile communication and its influence on base station siting preferences. *Health, Risk and Society*. 2010; 12(3); 231–250. <https://doi.org/10.1080/13698571003710332>
7. Cousin M, Siegrist M. Risk perception of mobile communication: a mental models approach. *Journal of Risk Research*. 2010; 13(5); 599–620. <https://doi.org/10.1080/13669870903236751>
8. D'Angelo C, Costantini E, Kamal M. A, Reale M. Experimental model for ELF-EMF exposure: Concern for human health. *Saudi Journal of Biological Sciences*. 2015; 22(1); 75–84. <https://doi.org/10.1016/j.sjbs.2014.07.006>
9. Din N. M. Radio Frequency Radiation Study. Retrieved March 30, 2018, from 2009. rfemf.mcmc.gov.my/skmmgovmy/.../Radio-Frequency-Radiation-Study_Uniten.pdf
10. Hallberg Ö, Oberfeld G. Letter to the editor: Will we all become electrosensitive? *Electromagnetic Biology and Medicine*. 2006; 25(3); 189–191. <https://doi.org/10.1080/15368370600873377>
11. Hutter H. P, Moshammer H, Wallner P, Kundi M. Subjective symptoms, sleeping problems, and cognitive performance in subjects living near mobile phone base stations. *Occupational and Environmental Medicine*. 2006; 63(5); 307–313. <https://doi.org/10.1136/oem.2005.020784>
12. Institute of Electrical and Electronics Engineers (IEEE). IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, Pub. L. No. IEEE Std C95.1.1999; IEEE.
13. International Commission on Non-Ionizing Radiation Protection (ICNIRP). *ICNIRP Guidelines for Limiting Exposure To Time Varying Guidelines for Limiting Exposure To Time-Varying*. Health Physics. 1998; 74(4); 494-522; <https://doi.org/10.1097/HP.0b013e3181f06c86>
14. Isabona J, Srivastava V. M, Robert O. O. Spatial variation of the electromagnetic radiations due

- to exposure to telecommunication base station transmitters in a pilot region. *International Journal of Applied Engineering Research*. 2016; 11(22); 10994–11001.
15. ITU. ICT Facts and Figures: Mobile-cellular subscriptions. Retrieved March 30, 2018, from 2016a. <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>
 16. ITU. ICT Facts and Figures: Percentage of Individuals using the Internet. Retrieved March 30, 2018, from 2016b. <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>
 17. Klaps A, Ponocny I, Winker R, Kundi M, Auersperg F, Barth A. Mobile phone base stations and well-being - A meta-analysis. *Science of the Total Environment*. 2016; 544; 24–30. <https://doi.org/10.1016/j.scitotenv.2015.11.009>
 18. Kundi M, Hutter H. P. Mobile phone base stations- Effects on wellbeing and health. *Pathophysiology*. 2009; 16(2–3); 123–135. <https://doi.org/10.1016/j.pathophys.2009.01.008>
 19. McFadden, D. Condition logit analysis of qualitative choice behavior. In *Frontiers in Econometrics* 1974a; Vol. 1; pp. 105–143. <https://doi.org/10.1108/eb028592>
 20. McFadden D. The measurement of urban travel demand. *Journal of Public Economics*. 1974b. [https://doi.org/10.1016/0047-2727\(74\)90003-6](https://doi.org/10.1016/0047-2727(74)90003-6)
 21. Mohler E, Frei P, Braun-Fahrlander C, Fröhlich J, Neubauer G, Röösli M. Effects of everyday radiofrequency electromagnetic-field exposure on sleep quality: a cross-sectional study. *Radiation Research*. 2010; 174(3); 347–356. <https://doi.org/10.1667/RR2153.1>
 22. Navarro E. A, Segura J, Portolés M, Mateo C. G. de. The microwave syndrome: A preliminary study in Spain. *Electromagnetic Biology and Medicine*. 2003; 22(2–3); 161–169.
 23. Neubauer G, Feychting M, Hamnerius Y, Kheifets L, Kuster N, Ruiz I, Röösli M. Feasibility of future epidemiological studies on possible health effects of mobile phone base stations. *Bioelectromagnetics*. 2007; 28(3); 224–230. <https://doi.org/10.1002/bem.20298>
 24. Ngui, A. EMF radiation levels at telecommunication base stations still low: MCMC. *The Sun Daily*. Retrieved from 2016; April 20. <http://www.thesundaily.my/news/1773239>
 25. Ozovehe A, Usman A. U, Hamdallah A. Electromagnetic Radiation Exposure From Cellular Base Station: a Concern for Public Health. *Nigerian Journal of Technology*. 2015; 34(2); 355–358. Retrieved from <http://10.0.16.218/njt.v34i2.20%5Cnhttp://bibliotecavirtual.unad.edu.co:2048/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=aci&AN=115962187&lang=es&site=ehost-live>
 26. Pallant J. *SPSS Survival Manual: A step by step guide to data analysis using SPSS*. Journal of Advanced Nursing. 2010; (Vol. 3rd).
 27. Reece W. S. Are Senior Leisure Travelers Different? *Journal of Travel Research*. 2004; 43(1); 11–18. <https://doi.org/10.1177/0047287504265507>
 28. Roje V, Poljak D, Sarolic A. Safety aspects of the GSM Base Station Radiation Concerning Human Health. In *IEEE International Symposium on Electromagnetic Compatibility*. 2003; Vol. 2; pp. 720–723. <https://doi.org/10.1109/ICSMC2.2003.1429006>
 29. Santini R, Santini P, Danze J. M, Le Ruz P, Seigne M. Enquête sur la santé de riverains de stations relais de téléphonie mobile: I/Incidences de la distance et du sexe. *Pathologie Biologie*. 2002; 50(6); 369–373. [https://doi.org/10.1016/S0369-8114\(02\)00311-5](https://doi.org/10.1016/S0369-8114(02)00311-5)
 30. Santini R, Santini P, Danze J. M, Le Ruz P, Seigne M. Enquête sur la santé de riverains de stations relais de téléphonie mobile: II/Incidences de l'âge des sujets, de la durée de leur exposition et de leur position par rapport aux antennes et autres sources électromagnétiques. *Pathologie Biologie*. 2003; 51(7); 412–415. [https://doi.org/10.1016/S0369-8114\(03\)00020-8](https://doi.org/10.1016/S0369-8114(03)00020-8)
 31. Schüz J, Mann S. A discussion of potential exposure metrics for use in epidemiological studies on human exposure to radiowaves from mobile phone base stations. *Journal of Exposure Analysis and Environmental Epidemiology*. 1999; 10(6 Pt 1); 600–605. <https://doi.org/10.1038/sj.jea.7500115>

32. Shahbazi-Gahrouei, D., Karbalae, M., Moradi, H. A., & Baradaran-Ghahfarokhi, M. (2014). Health effects of living near mobile phone base transceiver station (BTS) antennae: A report from Isfahan, Iran. *Electromagnetic Biology and Medicine*, 33(3), 206–210. <https://doi.org/10.3109/15368378.2013.801352>
33. Siegrist, M., Earle, T. C., Gutscher, H., & Keller, C. (2005). Perception of mobile phone and base station risks. *Risk Analysis*, 25(5), 1253–1264. <https://doi.org/10.1111/j.1539-6924.2005.00672.x>
34. Suleiman A, Gee T. T, Krishnapillai A. D. Electromagnetic Radiation Health Effects in Exposed and Non-Exposed Residents in Penang, (April). 2014; 77–83. <https://doi.org/10.4236/gep.2014.22012>
35. Tukimin R, Mahadi W. N. L. W, Ali M. Y. M, Thari M. N. M. Public Awareness on Electromagnetic Field in Malaysia. In *International Engineering Convention*. 2009; pp. 486–492. Damascus, Syria.
36. Van Kleef E, Fischer A. R. H, Khan M, Frewer L. J. Risk and benefit perceptions of mobile phone and base station technology in Bangladesh. *Risk Analysis*. 2010; 30(6); 1002–1015. <https://doi.org/10.1111/j.1539-6924.2010.01386.x>
37. Viel J. F, Clerc S, Barrera C, Rymzhanova R, Moissonnier M, Hours M, Cardis E. Residential exposure to radiofrequency fields from mobile phone base stations, and broadcast transmitters: A population-based survey with personal meter. *Occupational and Environmental Medicine*. 2009; 66(8); 550–556. <https://doi.org/10.1136/oem.2008.044180>
38. Wiedemann P. M, Freudenstein F, Böhmert C, Wiart J, Croft R. J. RF EMF risk perception revisited: Is the focus on concern sufficient for risk perception studies? *International Journal of Environmental Research and Public Health*. 2017; 14(6). <https://doi.org/10.3390/ijerph14060620>

What Do Undergraduates Think About Green Investment? Empirical Evidence From A Developing Nation

Kar Hoong Chan¹, Tuan Hock Ng¹, Almowallad Fadi¹

¹Faculty of Business, Multimedia University, Jalan Ayer Keroh Lama, 75450 Bukit Beruang, Melaka

ABSTRACT

Climate change and its disastrous effects have called for more concentrated efforts of all parties to accelerate the transition to a low-carbon economy. Green investment seems a solution to tackle environmental degradation issues but existing study in this area remains scanty. This study adopted Theory of Planned Behaviour (TPB) to examine the relationships between personal attitude, subjective norms and perceived behavioural control (PBC), and the intentions of making green investment among university students in Malaysia. 260 university students were surveyed (Kuala Lumpur and Melaka) with a response rate of 77%. The results of multiple linear regression analysis show that these factors (personal attitude, subjective norms and PBC) are significant predictors. Various measures and policy recommendations are provided in this study to promote green investment.

Keywords: *Green Investment Intentions, Theory of Planned Behaviour, Personal Attitude, Subjective Norms, Perceived Behavioural Control*

INTRODUCTION

The intensifying effects of global climate change such as drought and wildfires, due mainly to increase in annual emissions of Greenhouse gases (GHG), have necessitated speed in mitigation efforts. As a developing nation in Asia, Malaysia is no exception with deteriorating carbon dioxide (CO₂) emissions per capita, rose from 4.76 metric tons in 1999 to 8.03 metric tonnes in 2014 (The World Bank²²). Taking into account this worrying and rising trend, Malaysia's government has pledged to reduce carbon emissions by 40% in 2020 with various measures and policies well underway under Malaysia Plans 2006-2020 (Lokman¹⁵).

Over the recent decades, green investment which by definition refers to "approaches that seek to invest capital in 'green' assets" (Cambridge Institute for Sustainability Leadership⁵) has turned out to be progressively popular. This financing alternative is believed to be the spearhead of a greener economy as larger flows of funds committed to low-carbon infrastructure developments, including smart grid and energy efficiency projects play a vital role in creating a low-carbon environment (The Organization for Economic Co-operation and Development [OECD]²¹). It is a source of capital that essentially meets not only the objective of economic growth but also sustainability, according to a report

by World Economic Forum²⁷. Braunstein⁴ highlighted that, with higher awareness of and stronger interest in the importance of environmental protection, investors and financial institutions begin to put priority to green financing tools for investments.

While it is clear that green investment is the catalyst promoting cleaner environments, as far as we are concerned, there is no existing empirical evidence in the area that analyses what factors influence the intentions to make green investment from the perspective of individuals. This is the research gap that we aim to bridge. Understanding motivational factors affecting intentions of individuals to invest in companies delivering on environmental performance is important to ensure abundant financial capital is mobilised to support the financing of climate action which in turn help meet the objective of lower greenhouse gas emissions.

The rest of the paper is organized as follows. We discuss the literature review in the next section, followed by the research methodology and analysis results. This paper ends with the conclusion and implications of study.

LITERATURE REVIEW

The interplay among financial development, economic growth and environmental degradation have

formed an important question among policymakers and environmentalists. Hence, this section provides a review of studies concerning green investment intentions, particularly the motivational factors affecting that intentions.

Green investment is a broad financial term that covers socially responsible investing (SRI), environmental, social and governance investing (ESG), sustainable, long term investing and other similar thoughts (Inderst, Kaminker, Stewart¹⁴).

Aside from that, practices of companies which involve sustainable energy, energy efficiency, waste management, or water management are also categorised as green investment (Inderst, et al.¹⁴). Green investment is also clearly demonstrated by the efforts of reducing greenhouse gas and air pollutant emissions (Eyraud & Clements⁹).

Green investment is a process of making investment decisions which are expected to produce a positive impact on the environment and generate certain amounts of financial return on the capital invested. It is a tool to mitigate the rising issues of pollutions and global warming. In other words, the main objective of green investment is to be actively involved in the improvement of environmental health and to compensate investors with the financial return from the capital invested.

According to Theory of Planned Behavior (TPB), people's attitude, subjective norms and perceived behavioral control (PBC) are the major factors directly influence the intention to perform a certain behavior (Ajzen⁵)1985, 1987. As alluded by TPB, behavioural intention is the immediate antecedent to behaviour. Ajzen² stated that individuals intend to perform the behaviour when they evaluate it positively, when they experienced a positive feedback from the society and when they believe it is worth and have opportunities to perform the said behaviour. Thus, intention of the behavioural actions is being viewed as the internalized summary of pros and cons from the expected actual behaviour taken place. Behavioural intention is being viewed as the motivator of performance of the said behaviour (Ajzen⁵)1985, 1987.

Attitude is an expression either thinking or feeling about someone or something which it is reflected in a person's behaviour. Attitude emerges from a person's

beliefs about the outcomes of his execution of behaviour and reaction towards the result of his behaviour (Cordano & Frieze⁶). Therefore, attitudes towards a behaviour are the actions link to the behaviour in believing of a certain outcome from the action performed (Ajzen⁵)1985, 1987. In the case of pro-environmental behaviour, attitude towards the behaviour is being justified as the feelings or thinking regarding practices in environmental friendly activities (Wang, Zhang, Yin, & Zhang²⁵). In short, if the person has a favorable attitude towards environment concerns, he or she has higher possibility to commit in environmental protection actions. Studies conducted by Wang, Zhao, Yin, and Zhang²⁶China's environmental pollution and energy security issues have become increasingly more prominent. As a result, new energy vehicles (NEVs and Goh, Ritchie, and Wang¹¹ for instance demonstrated that attitude has a positive impact on the behavioural intention.

Social norms are another factor that links to an individual's intention and behaviour. In order to perform a certain form of behaviour, the perception of stress given by his or her social circle has a major influence (Ajzen⁵)1985, 1987. In other words, it is the decision made by a person to perform a particular behavior given the social pressure. Subjective norms in this context mean the various external forces which can influence the individual's intention to invest or not in companies with green initiatives. For instance, a person who are subject to social pressure is more likely to be positive in terms of food consumption, choice of accommodation, green products purchase or recycling intention (Scalco, Noventa, Sartori, & Ceschi¹⁸the purchase of organic food within a sustainable consumption context has gained momentum. Consequently, the amount of research in the field has increased, leading in some cases to discrepancies regarding both methods and results. The present review examines those works that applied the theory of planned behavior (TPB; Ajzen, 1991; Tan, Ooi, & Goh²⁰the current investment trend is showing signs of power supply inadequacy. Hence, many countries have embraced energy efficiency as a partial solution to looming energy problems. In reality, many people are not replacing their household appliances with energy-efficient ones. The use of energy efficient products in Malaysia is still at unsatisfactory level. Hence, this study aims at closing the gap by applying the moral extension of the theory of planned behavior (TPB; Wan, Shen, & Choi²³; Han, Hsu, & Sheu¹²).

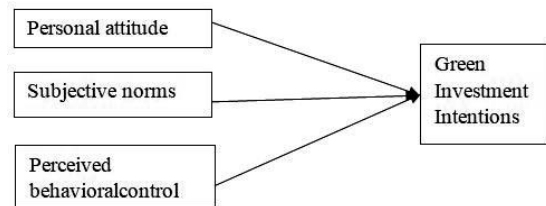
PBC is defined as the self-perception on the level of difficulty towards performance of certain behaviour. It is connected with self-belief in which the belief of a person regarding the factors that exist in order to facilitate the performance of the behaviour. In other words, it means the degree of difficulty perceived by a person to execute the said behavior (Ajzen⁵)1985, 1987. PBC on green investment intentions means the perception of an individual about the degree of difficulty in their investment choices. Studies conducted by Freire¹⁰; Wu, Li, and Sung²⁸; Zhang, Wang, and Zhou²⁹; Wang, Fan, Zhao, Yang, and Fu²⁴ and Long, Chen, Du, Oh and Han¹⁶ show that PBC and the intentions to perform green practices behavior are positively related.

On the other hand, there is a growing awareness of the importance of sustainable environment and its practices among Malaysians, specifically youth (Osman, Isa, Othman, & Jaganathan¹⁷). The authors reported that attitude is positively related to recycling behavioural intentions. Another study on green consumption was also carried out in Malaysia, Azizan and Suki³ found that attitude is the most important factor for the green consumption intentions. Despite these overwhelming studies, research in relation to green investment seems neglected. Therefore, this study aims to close the research gap in the area of green investment in Malaysia.

Recently, the number of countries with focus on green investment has increased drastically due mainly to its potential environmental benefits (Higgins, Hajkowicz & Bui¹³) to maximise multiple environmental benefits. The problem was formulated as a multi-objective integer programming model, with objective functions representing biodiversity, water run-off and carbon sequestration. We applied a multi-objective Greedy Randomised Adaptive Search Procedure (GRASP). Nevertheless, in the case of Malaysia, the participation of private investors in green investments is relatively low compared to other nations. For example, the first issuance of Socially Responsible Investment (SRI) sukuk or green sukuk by Malaysia was small, at RM 100 million. The size of issuance is considerably insignificant compared to the total issuance of the global market which was USD 40 billion (Malaysia International Islamic Financial Centre [MIFC], 2016). Hence, this study, is keen to examine the motivational factors that contribute to the intentions of making green investment among undergraduate students.

RESEARCH METHODOLOGY

Research Framework: Below is the research framework constructed from the above literature review:



This study adopts TPB, in which personal attitude, subjective norms and PBC are the independent variables. Based on the literature, the hypotheses formed are as follows:

Hypothesis 1 (H₁): There is a positive relationship between personal attitude and undergraduates' intentions towards making green investment in Malaysia.

Hypothesis 2 (H₂): There is a positive relationship between subjective norms and undergraduates' intentions towards making green investment in Malaysia.

Hypothesis 3 (H₃): There is a positive relationship between perceived behavioural control and undergraduates' intentions towards making green investment in Malaysia.

DATA COLLECTION

A total of 260 questionnaires were distributed to the universities students across Melaka and Kuala Lumpur from different institutions. 215 questionnaires were returned, where out of 215 questionnaires, 15 questionnaires were found inappropriate and were discarded. Consequently, 200 questionnaires were found usable for the final analysis. This concluded with the response rate 76.92%.

Pilot Study: The pilot study for this study has been conducted over a period of one week and a total of 30 questionnaires were collected. The collected data was analysed statistically using Statistical Package for the Social Sciences (SPSS) version 23 to determine the reliability of the scales in the questionnaire. Table 1.0 shows the results of reliability test with Cronbach's Alpha above 0.70, indicating high internal consistency. Therefore, the questionnaires are valid and readily distributed.

Table 1.0: Reliability Test for Pilot Study

Variables	No. of Items	Cronbach's Alpha
Personal attitude	3	0.950
Subjective norms	4	0.821
Perceived behavioural control	4	0.965
Intentions	4	0.771

Descriptive Analysis: The majority of the participants for this study are female (62%) while there are 41% of male participation in this survey. The distribution of sample by age group is: below 18 (2.5%), 18-20 years (22.5%), 21-23 (41%), 24-26 years (25.5%), and above 27 (8.5%). In this study, 41% respondents are Chinese, followed by other races (25%), Malay (20%) and Indian (14%).

Most of the respondents are in their third year of their study. 22.5% of the respondents are in their second year of study, followed by 4% of them who are in their fourth year of study. The participation of the first year students in this study is low at 2.5%.

Reliability Test: Table 2.0 illustrates the result for reliability test. The value of Cronbach's Alpha for the 200 participants for each of the variables used in this study are above 0.7. Hence, there are high internal consistency.

Table 2.0: Reliability Test

Variables	No. of Items	Cronbach's Alpha
Personal attitude	3	0.932
Subjective norms	4	0.702
Perceived behavioural control	4	0.908
Intentions	4	0.721

Multiple Linear Regression: This section presents the results of the regression analysis pertaining the test of relationship between independent and dependent variables of the study. This study applied the statistical test through using SPSS v 23 for the confirmation of relationship between the independent and dependent variables. Table 3.0 shows the results for multiple linear regression.

This study reports a positive relationship between personal attitude and intentions of making green investment among university students ($\beta = 0.162$), at the 0.05 significance level. This means that a person with a positive attitude towards environment is more likely to invest in green projects.

Likewise, there is a positive relationship between subjective norms and intentions of making green investment ($\beta = 0.255$), significant at the 0.01 level. Not only that, PBC is positively related to intentions ($\beta = 0.149$), at the 0.05 significance level. Based on these results, it is believed that social norms and PBC play a role in encouraging students to participate more actively in green projects financing.

Table 3.0: Multiple Linear Regression

		Beta Coefficients	Sig.
H1	PA -> I	.162	.017**
H2	SN -> I	.255	.000***
H3	PBC -> I	.149	.028**

Notes: PA = Personal attitude, SN = Subjective norms, PBC = Perceived behavioural control,

I = Green investment intentions

*P-value < 0.10

** P-value < 0.05

*** P-value < 0.01

CONCLUSION AND IMPLICATION OF STUDY

In accordance with the Eleventh Malaysia Plan (2016-2020), Malaysia has set a goal to become an advanced economy by 2020. This can be accomplished in a resilient, low-carbon, resource-efficient, and socially-inclusive manner. The goal is to move from the conventional model to a greener model in term of cost efficiency and environmental friendly approaches. Financial and technology advancement are the fundamental in raising the quality of lives of Malaysians, however in the event that limited natural assets are not utilized effectively, it will bring about irreversible harm and put Malaysia's development in danger. Thus, green growth is the key to change the vital situation. It considers all three pillars of sustainable development which are economic, social, and environment, and better prepares the nation for future challenges. On the off chance that it is successfully carried out, it will benefit the economic, change of mentality and behaviour at all levels of the society, as well as influence policy decisions in government, production decisions in industries, and consumption decisions by individuals. In addition, it will influence the policy decisions in government, production

decisions in industries, and consumption decisions by individuals(Economic Planning Unit⁸).

Premised on TPB, this research aims to investigate the relationship between personal attitude, subjective norms and PBC and intentions of making green investments among undergraduate students in Malaysia. The multiple linear regression results show that all the identified variables have a positive relationship with intentions of making green investments. In which, the findings shown in this study appeared to be consistent with the findings shown in both Spence, Stancu, Elliott and Dean¹⁹ and Cronan, Mullins and Douglas⁷.

Through the last decade, the trend of green investment has been increasing around the world. As more people understand the critical situation of the global climate change, there will be more chance that more people will be willing to invest in green companies. This study contributes to increasing the awareness level on the global warming and climate change issues and their impact on our lives. It is importance to understand the trend of investment among undergraduates as they are the future investors in the country.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Ajzen I. The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*. 1991; Vol. 50(2): pp. 179–211. [http://doi.org/10.1016/0749-5978\(91\)90020-T](http://doi.org/10.1016/0749-5978(91)90020-T)
2. Ajzen I. *Attitudes, Personality and Behavior*. Mapping Social Psychology. Open University Press (McGraw-Hill). 2005; <http://doi.org/10.1037/e418632008-001>
3. Azizan S. A. M, Suki N. M. The Potential for Greener Consumption: Some Insights from Malaysia. *Mediterranean Journal of Social Sciences*. 2014; Vol. 5(16), pp. 11–17. <http://doi.org/10.5901/mjss.2014.v5n16p11>
4. Braunstein J. Green finance. [World Bank Blog]. 2017; May 16. Retrieved from <https://blogs.worldbank.org/taxonomy/term/14597>
5. Cambridge Institute for Sustainability Leadership. Green Investment. 2018; June 20. Retrieved from <https://www.cisl.cam.ac.uk/business-action/sustainable-finance/investment-leaders-group/what-is-responsible-investment/forms-of-responsible-investment/green-investment>
6. Cordano M., Frieze I. H. Pollution Reduction Preferences of U.S. Environmental Managers: Applying Ajzen’s Theory of Planned Behavior. *Academy of Management Journal*. 2000; Vol. 43(4), pp. 627–641. <http://doi.org/10.2307/1556358>
7. Cronan T. P, Mullins J. K, Douglas D. E. Further Understanding Factors that Explain Freshman Business Students’ Academic Integrity Intention and Behavior: Plagiarism and Sharing Homework. *Journal of Business Ethics*. 2018; Vol. 181(147): pp.197–220.
8. Economic Planning Unit. Chapter 6: Pursuing Green Growth for Sustainability and Resilience (Eleventh Malaysia Plan). *Rancangan Malaysia Kesebelas (Eleventh Malaysia Plan)*. 2015; 2016–2020, pp. 1–30.
9. Eyraud L, Clements B. Going Green. *Finance & Development*. 2012; June: pp. 34–37.
10. Freire P. A. Enhancing Innovation through Behavioral Stimulation: The Use of Behavioral Determinants of Innovation in the Implementation of Eco-Innovation Processes in Industrial Sectors and Companies. *Journal of Cleaner Production*. 2018; Vol. 170 (2018), pp. 1677–1687. <http://doi.org/10.1016/j.jclepro.2016.09.027>
11. Goh E, Ritchie B, Wang J. Non-Compliance in National Parks: An Extension of the Theory of Planned Behaviour Model with Pro-Environmental Values. *Tourism Management*. 2017; Vol. 59(2017), pp. 123–127. <http://doi.org/10.1016/j.tourman.2016.07.004>
12. Han H, Hsu L. T. (Jane), Sheu C. Application of the Theory of Planned Behavior to Green Hotel Choice: Testing the Effect of Environmental Friendly Activities. *Tourism Management*, 2010; Vol. 31(3): pp. 325–334. <http://doi.org/10.1016/j.tourman.2009.03.013>
13. Higgins A. J, Hajkovicz S, Bui E. A Multi-Objective Model for Environmental Investment

- Decision Making. *Computers and Operations Research*. 2008; Vol. 35(1): pp. 253–266. <http://doi.org/10.1016/j.cor.2006.02.027>
14. Inderst G, Kaminker Ch, Stewart F. “Defining and Measuring Green Investments: Implications for Institutional Investors” *Asset Allocations*, OECD Working Papers on Finance, Insurance and Private Pensions, No.24, OECD Publishing. 2012.
 15. Lokman T. PM: Malaysia on Course to Reduce Carbon Emissions by 40pct by 2020. *New Straits Time*. 2017; December 3: Retrieved from <https://www.nst.com.my/news/nation/2017/12/310231/pm-malaysia-course-reduce-carbon-emissions-40-pct-2020>
 16. Long X, Chen Y, Du J, Oh K, Han I. Environmental Innovation and Its Impact on Economic and Environmental Performance: Evidence from Korean-Owned Firms in China. *Energy Policy*. 2017; Vol. 107(2017): pp. 131–137. <http://doi.org/10.1016/j.enpol.2017.04.044>
 17. Osman A, Isa F. M, Othman S. N, Jaganathan M. Attitude towards Recycling Among Business Undergraduate Students in Malaysia. *American-Eurasian Journal of Sustainable Agriculture*. 2014; Vol. 8(13): pp. 6–12.
 18. Scalco A, Noventa S., Sartori R, Ceschi A. Predicting Organic Food Consumption: A Meta-Analytic Structural Equation Model Based on the Theory of Planned Behavior. *Appetite*, 2017; Vol. 112(2017): pp. 235–248. <http://doi.org/10.1016/j.appet.2017.02.007>
 19. Spence M, Stancu V, Elliott C. T. Dean M. Exploring Consumer Purchase Intentions towards Traceable Minced Beef and Beef Steak Using The Theory of Planned Behavior. *Food Control*. 2018; Vol. 91(2018): pp. 138–147.
 20. Tan C. S, Ooi H. Y, Goh Y. N. A Moral Extension of the Theory of Planned Behavior to Predict Consumers’ Purchase Intention for Energy-Efficient Household Appliances in Malaysia. *Energy Policy*. 2017; Vol. 107(2017): pp. 459–471. <http://doi.org/10.1016/j.enpol.2017.05.027>
 21. The Organization for Economic Co-operation and Development [OECD]. *Green Investment Banks*. 2015; Retrieved from <https://www.oecd.org/environment/cc/Green-InvestmentBanks-POLICY-PERSPECTIVES-web.pdf>
 22. The World Bank. CO2 Emissions (Metric Tons per Capita). 2018; January 25: Retrieved from <https://data.worldbank.org/indicator/EN.ATM.CO2E.PC?locations=MY>
 23. Wan C, Shen G. Q, Choi S. Experiential and Instrumental Attitudes: Interaction Effect of Attitude and Subjective Norm on Recycling Intention. *Journal of Environmental Psychology*, 2017; Vol. 50, pp. 69–79. <http://doi.org/10.1016/j.jenvp.2017.02.006>
 24. Wang S, Fan J, Zhao D, Yang S, Fu Y. Predicting Consumers’ Intention to Adopt Hybrid Electric Vehicles: Using an Extended Version of the Theory of Planned Behavior Model. *Transportation*. 2016; Vol. 43(1): pp. 123–143. <http://doi.org/10.1007/s11116-014-9567-9>
 25. Wang Z, Zhang B, Yin J, Zhang, Y. Determinants and Policy Implications for Household Electricity-Saving Behaviour: Evidence from Beijing, China. *Energy Policy*. 2011; Vol. 39(6): pp. 3550–3557. <http://doi.org/10.1016/j.enpol.2011.03.055>
 26. Wang Z, Zhao C, Yin J, Zhang B. Purchasing Intentions of Chinese Citizens on New Energy Vehicles: How Should One Respond to Current Preferential Policy? *Journal of Cleaner Production*. 2017; Vol. 161(2017), pp. 1000–1010. <http://doi.org/10.1016/j.jclepro.2017.05.154>
 27. World Economic Forum. *The Green Investment Report The Ways and Means to Unlock Private Finance for Green Growth*. 2013; Retrieved from http://www3.weforum.org/docs/WEF_GreenInvestment_Report_2013.pdf.
 28. Wu J. hwa, Li S. H, Sung W. Y. The Study of Perceived Environment and Its Relation to Senior Citizen’s Physical Activity Behavior Intention. *Journal of Business Research*. 2016; Vol. 69(6): pp. 2259–2264. <http://doi.org/10.1016/j.jbusres.2015.12.039>
 29. Zhang Y, Wang Z, Zhou G. Determinants of Employee Electricity Saving: The Role of Social Benefits, Personal benefits and organizational electricity saving climate. *Journal of Cleaner Production*. 2014; Vol. 66: pp. 280–287. <http://doi.org/10.1016/j.jclepro.2013.10.021>

Commitment on Corporate Social Responsibility by the Government Link Companies in Malaysia

Rozita Arshad¹, Zalinah Ahmad¹, Kalthum Hassan¹

¹School of Government, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia

ABSTRACT

Corporate social responsibility (CSR) is a concept whereby organizations consider the interests of the society by taking responsibility for the impact of their activities on customers, suppliers, employees, shareholders, communities and other relevant stakeholders. CSR portrays the collaboration and integration between public and private sectors towards ensuring the healthier and better quality of life of society. The concept of CSR is based on the mutual dependence between a corporate and society as well as the indicators that affect these relationships. Society at large is looking at private sectors for answers regarding problems such as health crises, and environmental issues that related to their daily lives. Therefore, this study will explore the types of social responsibility programs provided by public companies in Malaysia. In other words, the paper tries to look at the Government-Linked Companies roles in anchoring Malaysia Government socioeconomic structure by identifying their initiative to provide CSR programmes or activities to the community.

Keywords: *Corporate Social Responsibility; Government Link Companies; CSR Programmes; society;*

INTRODUCTION

In the current situation of economic globalisation, corporate social responsibility (CSR) is becoming a major topic of concern that been seen to offer innovative solution through the collaboration of private and public sector to encounter some basic socio-economics and politics challenges. According to Béthoux, Didry, and Mias⁷, CSR through the roles of corporate entity is a new mode of governance that can be voluntary or spontaneous actions of solution for some social issues in developing countries. Today's corporate social responsibility (CSR) has become a new tool for organizations and their managers in the modern commercial era. The concept of CSR is based on the mutual dependence between a corporate and society as well as the indicators that affect this relationship. There are some interactions plays in this relationship: corporate and stakeholders, corporate and governments, corporate and environment, corporate and ethical, and corporate and sustainable competitive advantage.

CSR can be conceptualized as "the social responsibility of business encompasses the economic, legal, ethical, and discretionary expectations that society has of organizations at a given point of time" (Mallin³⁰). According to Carroll¹¹, there is the existence of relationship between business (companies) to the

public (stakeholders) whether indirect or direct relation between both parties. Publics always look for answers from the companies regarding some basic daily activities such as environmental issues, social problems, poverty, disaster and others on how the companies can help them to resolve the problem (Gyves, and O'Higgins²⁴). Companies, society, government and stakeholder have to collaborate together in finding ways of solution to ensure that each of them will gain mutual benefit. Nowadays, from the perspective of business, CSR can be used as one of the element to attract investors or to gain consumer trusts. It can bring prosperity and benefits to the company, such as a distinct position in the marketplace, protecting the company's brand as well as can be portrayed as part of nurturing ethical corporate image in the company (Abdul Rahman & Omar¹). Due to this reason, corporations that implement CRS are belief can better able to establish a positive image to their stakeholders or public (Chiu&Hsu¹⁵).

CORPORATE SOCIAL RESPONSIBILITY IN MALAYSIA

There are many programmes initiated by government in order to promote CSR agenda. The Malaysian government has introduced various

initiatives in promoting the CSR agenda and this can be observed through the incorporation of CSR practices and reporting in years 1990's and after including the government-linked companies (GLCs) Transformation Plan (the Silver Book), the New Economic Model (NEM), the Government Transformation Programmes (GTP) and introduced the National Integrity Plan (NIP). Government also endorsed other initiatives in order to enhance more in participations in CSR including PM CSR Award, Companies Commission of Malaysia Corporate Responsibility (CR) Agenda, and UN Global Compact (Allen³).

In upholding the principle of accountability and sharing amities, The Prime Minister's CSR Awards was launched in 2007, as Malaysia highest recognition of corporations in CSR through the Ministry of Women, Family and Community Development. This is perhaps to instill recognition to the companies that having work much and made a difference to the communities in which they are active and participate in their CSR programmes. Therefore, this CSR award and all CSR initiatives are important to be comprehended as an agenda and tool to achieve mutual understanding between companies and society. Besides, according to Allen³, the Malaysian Government had required all PLCs to disclose their CSR activities in their annual report effective from year 2007. This requirement affects all the Public Listed Companies in Malaysia and without exception to the Public Listed GLCs, which is being monitored and controlled under the Bursa Malaysia regulations.

GOVERNMENT LINK CORPORATIONS (GLCS)

GLCs can be defined as companies that have primary commercial objective and in which there is ownership and direct controlling state by the Malaysian government. Companies have controlling stake in it for instance subsidiaries or affiliates. The government does have abilities (not just percentage ownership) to appoint Board members, senior management, and/or make major decisions (e.g. contract awards, strategy, restructuring and financing, acquisitions and divestments etc.) for GLCs, either directly or through GLICs (www.pcg.gov.my). The GLCs in Malaysia has evolved and become important national institution recognised for their achievement locally and regionally. GLCs constitute crucial part of Malaysian economy and make up of nearly 49 percent of

the market capitalisation of Bursa Malaysia (Esa¹⁸). The government has emphasised the importance of GLCs to promote the well-being of society through corporate social responsibility (CSR) activities. In doing so the government has firstly introduced GLC Transformation Programme in May 2004. The programme is a part of ongoing effort initiated by Malaysian government to gear the economic development of the country. There are three key principles under the programme which are: 1) programme is part of the larger national development strategies; 2) programme is focused on enhancing performance at the GLC's; and 3) programme takes full cognisance of matters relating to governance, shareholder value and stakeholder management.

The aim of the programme in general is to improve the performance of GLCs to have positive effect on the corporate world and also towards achieving the Vision 2020. By doing so, the government has set up the Putrajaya Committee on GLC High Performance (PCG) in 2005 to follow and catalyse the programme. The PCG is chaired by 2nd Finance Minister and consists of heads of GLICs, namely Khazanah Nasional Berhad, Permodalan Nasional Berhad, Employees Provident Fund, Lembaga Tabung Amanah Tentera and Lembaga Urusan Tabung Haji. Representatives from the Ministry of Finance and Prime Minister Department also included in the Committee to monitor the developments and recommend measures of improvement for GLCs.

Abdul Razak, Ahmad and Joher² mention that majority of the studies have shown negative result when looking at the government ownership and performance or firm valuation. Reasons explaining the poor financial performance are first, the government is guided by the social altruism which may not in line with the profit oriented. Second, the government played the role as an agent of the citizens who are the real owner of the companies; however, the bureaucrats, who do not have personal interest in ensuring that an organisation is run efficiently or governed well since they may not have gained any benefits of good governance. A government corporation or government owned corporation is a legal entity created by a government to exercise some of the powers of the government in which it may appear to be not-for-profit corporations (Mishra, & Suar³¹).

In case of Malaysia, despite the negative public perception of GLCs, study done by Lau and Tong²⁶ shows in favour of government intervention. The higher degree

of government ownership ensures that they are being better governed and finally to value creation. In addition, their study suggests that although GLCs' attention is divided between several goals, the goals are attained without damaging the goal of wealth maximization.

LITERATURE REVIEW

Corporate social responsibility (CSR) refers to the ethical conduct of a corporation, which is responsible for the general stakeholders, and not just its stockholders (Chiu & Hsu¹⁵). The concept of CSR is based on the mutual dependence between a corporate and society as well as the indicators that affect this relationship. There are some interactions between corporate and stakeholders or governments or environment or ethical or sustainable competitive advantage (Gholami²³). Surely, when talking about corporate social responsibility we should know its vastness; a topic that includes a variety of ideas and concepts incorporated in the same number of definitions, each definition has its unique characteristics and every definition is relying on the origin country, organization or the author.

According to Roy, (2010) the origin of Corporate Social Responsibility (CSR) is traced around 1950s, a period that the advocate of the concept and activist of the time express the need and call for the business owners and corporations to show more empathy, sympathy and understanding of the vulnerable situation of the society in general. The prelude or the origination of corporate social responsibility dates back to early 1930s, when it drew the attention of scholars and practitioners in the sphere of business ethics and management (Fairbrass & Zueva-Owens²⁰). Corporate social responsibility (CSR) connotes corporate responsibility, corporate conscience or corporate citizenship embedded into a business model which is self-regulating. There exists no clear universal definition of CSR, but widely cited includes Archie Carroll's (1991), pyramid of corporate social responsibility, encompassing legal, economic, ethical and discretionary expectation of the society on organizations. Robins³⁵ posited that CSR is a voluntary action by the company that impacts on social stakeholders. Carroll¹² (pg. 2) in his revisit on his Carroll's CSR pyramid posited that "CSR as policies and practices that business people employ to be sure that society, or stakeholders, other than business owners, are considered and protected in their strategies and operations". Carroll¹² also added

that many arguments exist related to CSR definition, which claims other elements should be included such as voluntary, legal compliance, element of ethics and corporate philanthropic.

World Business Council for sustainable Development has defined CSR as the continuing commitment of business to behave ethically and contribute to economic development while improving the quality of life of the work force and their families as well as the local community and society at large (Barret⁵). Social responsibilities of the companies can be seen through their policy and practice, which voluntarily incorporates social and environmental issues, follows the principles of respect for all stakeholder groups, society and environment (Dahlsrud¹⁶, Žėkienė & Ruževičius⁴⁴). In addition, the Australia Standards Association (2003) in developing a standard for corporate social responsibility defines CSR as a voluntary mechanism that integrates societal, environmental issues into the core activities of the company and it should be beyond the legal responsibilities of the company. CSR is defined as open and transparent business practices that are based on ethical values and respect for the community, employees, the environment, shareholders and other stakeholders (Bursa Malaysia¹⁰).

Notably, governments give more attention to CSR as a tool to encourage businesses in raising social and environmental standards. However, most businesses are still convinced that CSR must be a voluntary initiative led by businesses (Freeman & Hasnaoui²¹). They argue that government role should only be limited to soft policy measure, such as information provision and the spread of best practice (Georgeta²²). The obligation of being social responsible that made by a firm must be a voluntary act or optional action and not mandatory. Besides, the obligation is something broader, meaning that it extends beyond the traditional duty to the shareholders, to other groups in society such as consumers, employees, suppliers and neighboring communities.

Following the 1997 Asian financial crisis, the Malaysian government has established the Malaysian Institute of Corporate Governance in 1998 and subsequently the Malaysia Code on Corporate Governance that has been released in year 2000. The Bursa Malaysia has introduced a CSR Framework and Guideline in 2006 as a part of its efforts to promote CSR. The CSR framework is essentially a set of guidelines for

Malaysian public listed companies to assist them in CSR practice. The framework emphasize on four main areas, namely the environment, the workplace, the community and the marketplace.

PURPOSE OF THE STUDY

The study focuses on the disclosures of CSR programmes in the annual report and online basis of the GLCs to identify their commitment in providing CSR programmes. This paper seeks to contribute to the literature by reviewing and documenting CSR programmes disclose by GLCs as part of identifying their commitment in providing CSR to society. Basically, this study tends to provide a preliminary understanding on the commitment shows by the GLCs in supporting government policy as they are the main actors to lead the corporate companies as stated in the Silver Book guideline that they should contribute to the society. More specifically, the objectives of the paper is to identify the types and themes (i.e., environment, community, marketplace and workplace) of CSR programmes been disclose in their annual report and online web page of the GLCs, and also to identify the division of GLCs sectors that intends and commits to disclose their CSR programmes

RESEARCH METHODOLOGY

This paper is a preliminary study which intends to explore the commitment of GLCs in providing CSR programmes in Malaysia from 106 GLCs. This paper tends to explore a descriptive explanation on the commitment of the GLCs in disclosing their CSR programmes in their online webpage and annual report. The CSR programmes cover six areas: environment, community, education, health care, workplace and marketplace.

This study is limited to the analysis of the annual reports as being used frequently in CSR disclosure studies and content analysis (Shirley et al⁴¹, Che Hassan, Yusoff and Yatim¹⁴, Pozniak, Ferauge, Arnone, and Geerts, 2011, Zakaria and Dewa⁴³). The measurement instruments in this study were adapted and modified based from Shirley et al⁴¹ and Bursa Malaysia framework that covers six types of CSR programmes as summarised below:

1. Environment: climate change, energy (renewable energy, energy efficiency, biofuel), waste management, biodiversity, and endangered wildlife;

2. Community: Employee volunteerism, community development, philanthropic (giving money to specific charities, which may be linked to their line of business) or charity, and sponsoring sporting or recreational projects;

3. Education (Schools Adoption Scheme), youth development, underprivileged, graduate employment and children;

4. Health: paying attention to health of general public living in surrounding areas of the project (provide fund to the Health Department, physical examination programme,

5. Marketplace: green products, stakeholder engagement, ethical procurement, supplier management, vendor development, social branding and corporate governance; and

6. Workplace: employee involvement, workplace diversity, gender issues, human capital development, quality of life, labour rights, human rights and health & safety.

For the purpose of this study, education and health have been separately measured for CSR programmes. Community programmes will focus on charity/philanthropic and employee volunteerism and community development activities only.

FINDING AND DISCUSSIONS

Table 1 provide descriptive background on the number of GLCs and types of CSR programmes. Majority of the GLCs (37 or 35%) of the GLCs disclosed that they have provided CSR environment and community programmes, respectively. This is followed by 32 GLCs or 30% disclosed on their education programmes, and 30 GLCs or 28% marketplace programmes. Only 22 GLCs or 21% disclosed that they have workplace programmes. The least number of GLCs disclosures was related to healthcare programmes, which is only 19 GLCs or 18% to be disclosed by GLCs.

From the result, it shows that the environment, community, education and marketplace are among the highest scores of CSR programmes disclosed by the GLCs. This result is consistent with Che Hassan, Yusoff, and Yatim¹⁴ and Branco and Rodrigues⁸ who found that environment and community are among the highest scores committed by the organization in indicating CSR

programmes. According to Silly (2015), community programmes is called as philanthropic, and most of the programmes are related to the intention to provide money or in kind or call charities to the society. The charities are used to support the society and should be linked with the business of the organizations. Such a result implied that the disclosure for environmental and community programmes are among the common to be reported (Thomson and Zakaria⁴²). Besides, this finding in line with Shauki⁴⁰ that found CSR content and CSR format that reflect the CSR performance of the company are important in influencing investment decision by the shareholder. Thus, to have better commitment in providing CSR programmes to the society is very important for the GLCs.

Table 1: Number of GLCs and types of CSR by programmes.

No.	CSR Programmes	No. of GLCs	Percentage %
1.	Environment	37	35
2.	Community	37	35
3.	Education	32	30
4.	Health Care	19	18
5.	Workplace	22	21
6.	Marketplace	30	28
	Total	177	

Table 2 show the types of CSR programmes and GLCs by sector. GLCs of Malaysia in the sectors of economic, land transport and infrastructure companies are the largest to disclose their CSR programmes (79 programmes), followed by GLCs of Malaysia social sector companies (54 programmes), 35 programmes under GLCs of Malaysia infrastructure sector companies (air & sea) and only 9 CSR programmes disclosed under GLCs of Malaysia technology & infrastructure companies (land transport) sector.

Education programmes (17 programmes) have been identified to have the highest number of CSR programmes for GLCs of Malaysia economic, land transport & infrastructure companies, Followed with 16 environment programmes and 13 healthcare programmes. For the GLCs of Malaysia social sector companies, the highest number of CSR programmes belongs to environment programmes (12 programmes) and followed with community programmes (11 programmes). For the GLCs of Malaysia infrastructure sector companies (air & sea), the community and workplace programmes with 8 programmes respectively have been identified to have highest number of CSR programmes. Community programmes (3 programmes) are also the highest score under GLCs of Malaysia technology & infrastructure companies (land transport) sector. Due to these finding, the different types of CSR programmes have been identified to fulfill the priority of the GLCs by sectors in providing CSR programmes to the society.

Table 2: Types of CSR programmes and GLCs by sector

GLCS by sector / CSR	Environ-ment	Com-munity	Edu-cation	Health Care	Work-place	Market-place	Total
Malaysia economic, land, transport & infrastructure companies	16	15	17	13	6	12	79
Malaysia infrastructure sector companies (air & sea)	7	8	4	1	8	7	35
Malaysia technology & infrastructure companies (land transport)	2	3	2	0	1	1	9
Malaysia social sector companies	12	11	9	5	7	10	54
Total	37	37	32	19	22	30	177

CONCLUSION

This paper has explored the fact of CSR programmes provided by the GLCs in Malaysia to the society. Basically, people are very sensitive and difficult to accept unethical business practices or organisation who acts

irresponsibly. The CSR programmes in the corporate company mainly bring good image on their initiative to contribute towards better well-being of the society. The society at large gains benefits of the programmes, specifically CSR programmes provided by the GLCs because they also known as agent of development for

the government. In conclusion, the CSR programmes contribute towards the well-being of the society. The paper has highlighted the types of CSR programmes and sectors of GLCs in Malaysia. Majority of the GLCs have disclosed that they have provided CSR environment and community programmes as well as education and marketplace programmes. This study also found that GLCs in the sectors of land, transportation and infrastructure are among the highest GLCs to provide CSR programmes to the society. However, this study is limited to focus on those GLCs which had disclosed their CSR programmes in the website or online information of the company only. Overall, based on the findings and CSR programmes disclosed by GLCs in Malaysia have shown their commitment towards contributing benefit and prosperity for the society. Government can utilize this effort and commitment by providing more encouragement and assistance to those GLCs that have very high commitment in providing CSR programmes. This is in line with the government agenda as stated in the GLC Transformation Programme in May 2004, which to gear up the economic development of the country.

ACKNOWLEDGMENT

The authors would like to thank the Ministry of Education Malaysia and Universiti Utara Malaysia for providing financial support to this study through its Fundamental Research Grant Scheme (FRGS). Special thanks also dedicated to all parties who indirectly involved in completing this research.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Abdul Rahman R, Omar N. CSR-Based corporate governance, Shah Alam: University Publication Centre(UPENA). 2009.
2. Abdul Razak N. H, Ahmad R, Joher H. A. Does government linked companies (GLCs) perform better than non-GLCs? Evidence from Malaysian listed companies. *Journal of Applied Finance & Banking*. 2011;1(1):213-240.
3. Allen A. Corporate social responsibility policies in Malaysia enhancing the child focus, United Nations Children's Fund (UNICEF) Malaysia. 2009.
4. Banerjee S. B. Corporate social responsibility: The good, the bad and the ugly. *Critical Sociology*. 2008;34(1):51-79.
5. Barrett J. D. Corporate social responsibility and quality management revisited: Acting responsibly with a focus on the future. *Journal for Quality and Participation*. 2009;31(4).
6. Barrett J. D. Corporate Social Responsibility and Quality Management Revisited-Acting responsibly with a focus on the future. *Journal for Quality and Participation*. 2009;31(4).
7. Béthoux É, Didry C, Mias A. What Codes of Conduct Tell Us: corporate social responsibility and the nature of the multinational corporation, *Corporate Governance*. 2007;15(1):77-90
8. Branco M C, Rodrigues L.L. Factors influencing social responsibility disclosure by Portuguese companies. *Journal of Business Ethics*. 2008;83:685-701.
9. Brilius P. Dynamic model of dependancies between economic crisis and corporate social responsibility contribution to sustainable development. *Ekonomika ir Vadyba (Economics and Management)*. 2010;(15):422-429.
10. Bursa Malaysia. Corporate social responsibility (CSR) framework for Malaysian Public Listed Companies. accessed on 2015 April 13. www.csr-weltweit.de/uploads/tx_jpdownloads/Bursa_Malaysia_01.pdf
11. Carroll A. B. Corporate social responsibility evolution of a definitional construct. *Business & society*. 1999;38(3):268-295.
12. Carroll A. B. Carroll's pyramid of CSR: taking another look, *International Journal of Corporate Social Responsibility*. 2016;1-8. DOI: 10.1186/s40991-016-0004-6.
13. Carroll A. B, Shabana K. M. The business case for corporate social responsibility: a review of concepts, research and practice. *International Journal of Management Reviews*. 2010;12(1):85-105.

14. Che Hassan N, Yusoff H, Yatim N. Disclosing social responsibility information via the internet: a study on companies in Malaysia, *International Journal of Arts and Commerce*. 2012;1(5):83-96
15. Chiu K, Hsu C. Research on the connections between corporate social responsibility and corporation image in the risk society: take the mobile telecommunication industry as an example, *International Journal of Electronic Business Management*. 2010;8(3):183-194.
16. Dahlsrud A. How corporate social responsibility is defined: an analysis of 37 definitions. *Corporate social responsibility and environmental management*. 2008;15(1):1-13.
17. Dumitru M. I, Ionel V. C, Ileana-Sorina B. SA 8000-Accounting for corporate social responsibility. *Annals of the University of Oradea, Economic Science Series*. 2010;19(2):892-898.
18. Esa E, Mohd Ghazali N. A. Corporate social responsibility and corporate governance in Malaysia government-linked companies. *Corporate Governance: The International Journal of Business in Society*. 2012;12(3):292-305.
19. Ewing M. T, Windisch L. E. Contemporary corporate social responsibility in China: an extension of Confucian philosophy? Monash University. 2007. accessed online 2015 March 30, <http://www.buseco.monash.edu.au/units/dru/papers/working-papers-07/p4407contemporaryewingwindisch.pdf>
20. Fairbrass J. and Zueva-Owens A. Conceptualising Corporate Social Responsibility: 'Relational Governance' Assessed, Augmented, and Adapted, *Journal of Business Ethics*. 2012;105 (3):321-335
21. Freeman I, Hasnaoui A. The meaning of corporate social responsibility: The vision of four nations. *Journal of Business Ethics*. 2011;100(3):419-443.
22. Georgeta G. Corporate social responsibility: Strategies in European style. *Annals of the University of Oradea, Economic Science Series*. 2008;17(2):662-665.
23. Gholami S. Value Creation Model through Corporate Social Responsibility (CSR), *International Journal of Business and Management*. 2011;6(9):148-154.
24. Gyves S, O'Higgins, E. Corporate social responsibility: an avenue for sustainable benefit for society and the firm? *Society and Business Review*. 2008;3(3):207-223.
25. Kumar P. Corporate Social Responsibility in India. *Asian Journal of Multidisciplinary Studies*. 2014;2(8):223-229
26. Lau Y.W, Tong C.Q. Are Malaysian Government-Linked Companies (GLCs) creating value? *International Applied Economics and Management Letters*. 2008;1(1):9-12.
27. Leonard D, McAdam R. Corporate social responsibility. *Quality Progress*. 2003;36(10):27-33.
28. Lin L.-W. Corporate social responsibility in China: Window dressing or structural change. *Berkeley Journal of International Law*. 2010;28:1-37. <http://scholarship.law.berkeley.edu/cgi/viewcontent.cgi?article=1377&context=bjil>
29. Luke T. W. Corporate social responsibility: an uneasy merger of sustainability and development. *Sustainable Development*. 2013;21(2):83-91.
30. Mallin C. *Corporate governance*, 3rd edition, Oxford: Oxford University Press. 2010.
31. Mishra S, Suar D. Does corporate social responsibility influence firm performance of Indian companies? *Journal of Business Ethics*. 2010;95(4):571-601.
32. Moir L. What do we mean by corporate social responsibility? *Corporate governance*. 2001;1(2):16-22.
33. Newton P. *Guide To Corporate Social Responsibility Part 3: Types of CSR*, IntellegentHQ. 2014. accessed online on 2015 March 30. <http://www.intelligenthq.com/latest-news/part-3-types-corporate-social-responsibility/>
34. Parra C. M. (2008). *Quality of Life Markets: Capabilities and Corporate Social Responsibility 1*. *Journal of Human Development*. 2008;9(2):207-227.
35. Robins F. The future of corporate social responsibility. *Asian Business & Management*. 2005;4(2):95-115.
36. Saraf V, Singhai S, Payasi S. *Corporate Social Responsibility: Building Brand and Linking*

- Corporate Strategy with Philanthropy. *BVIMR Management Edge*. 2012;5(2).
37. Schwartz M. S, Carroll A. B. Corporate social responsibility: a three-domain approach. *Business Ethics Quarterly*. 2003;503-530.
38. Scilly M. Four Types of Corporate Social Responsibility. Accessed online on 2015 February 20, <http://smallbusiness.chron.com/four-types-corporate-social-responsibility-54662.html>
39. Sharma S. K, Mehta S. Where Do We Go From Here? Viewing Corporate Social Responsibility through a Sustainability Lens. *Journal of Contemporary Management Research*. 2012;6(2):69-76.
40. Shauki E. Perceptions on corporate social responsibility: A study in capturing public confidence, *Corporate Social Responsibility and Environmental Management*. 2011;18:200-208.
41. Shirley C, Suan A. G, Leng C.P, Okoth M.O.A, Fei N. B. Corporate social responsibility reporting in Malaysia: an analysis of website reporting of Second Board companies listed in Bursa Malaysia. 2009. www.segi.edu.my/onlinereview/chapters/vol2_chap8.pdf
42. Thompson P, Zakaria Z. Corporate social responsibility reporting in Malaysia progress and prospects. *Journal of Corporate Citizenship*. 2004;13(Spring):125-136.
43. Zakaria S, Dewa N. Corporate social responsibility (CSR) reporting in six Malaysian financial institutions. St. Hugh's College, Oxford University, Oxford Business & Economics Conference Program. 2010;1-27. ISBN: 978-0-9742114-1-9.
44. Žėkienė A, Ružėvičius J. Socially responsible investment as a part of corporate social responsibility. *Economics and Management*. 2011;16:628-636.

GSM and GPS Based Solid Waste Management for Smart Cities

A. Chaitanya krishna¹, K. Subramanyam Chary¹, K. Anil Kumar¹

¹Assistant Professor, Department of Electronics and Communication Engineering,
CMR Engineering College, Hyderabad

ABSTRACT

Smart city has various annotations such as intelligent city, clean city, digital city, green city and many more. This conceptual project aims at developing a device & portal for solid waste processing unit which needs the classified information regarding solid waste and the portal also enables the waste processing unit to collaborate with other satellite units and waste collectors for efficient and faster actions. Today, waste management from its inception to its disposal is one of the important challenges for the municipal corporations in all over the world. Dust bins placed across cities set at open places are flooding because of increment in the waste each day and making unhygienic condition for the citizens, to maintain a strategic distance from such a circumstance we have proposed wireless solid waste management system for smart cities which allows municipal corporations to monitor status of dustbins remotely over web server and keep cities clean very efficiently by optimizing cost and time required for it [4]. As soon as dustbin has reached its maximum level, waste management department gets alert via SMS along with location via GSM & GPS module placed at dustbin so department can send waste collector vehicle to respective location to collect garbage. The objective of the project is to enhance practicality of IoT based solid waste collection and management system for smart city.

Keywords: Solid waste, GSM, GPS

INTRODUCTION

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. In other words, IoT is short for Internet of Things. The Internet of Things refers to the ever-growing network of physical objects that feature an IP address for internet connectivity, and the communication that occurs between these objects and other Internet-enabled devices and systems [8].

A thing, in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network. IoT has evolved from the convergence of wireless technologies, micro-electromechanical systems (MEMS), micro services and the internet. The convergence has helped tear down the silo walls between operational technology (OT) and information technology

(IT), allowing unstructured machine-generated data to be analyzed for insights that will drive improvements.

Kevin Ashton, cofounder and executive director of the Auto-ID Center at MIT, first mentioned the Internet of Things in a presentation he made to Procter & Gamble in 1999. Here's how Ashton explains the potential of the Internet of Things:

“Today computers -- and, therefore, the internet -- are almost wholly dependent on human beings for information. Nearly all of the roughly 50 petabytes (a petabyte is 1,024 terabytes) of data available on the internet were first captured and created by human beings by typing, pressing a record button, taking a digital picture or scanning a bar code.

IPv6's huge increase in address space is an important factor in the development of the Internet of Things. According to Steve Leibson, who identifies himself as “occasional docent at the Computer History Museum,” the address space expansion means that we could “assign an IPV6 address to every atom on the surface of the earth, and still have enough addresses left to do another 100+ earths.” In other words, humans could easily assign an IP address to every “thing” on the planet. An increase in the

number of smart nodes, as well as the amount of upstream data the nodes generate, is expected to raise new concerns about data privacy, data sovereignty and security.

Practical applications of IoT technology can be found in many industries today, including precision agriculture, building management, healthcare, energy and transportation. Connectivity options for electronics engineers and application developers working on products and systems for the Internet of Things [1].

Broadband Internet is become more widely available, the cost of connecting is decreasing, more devices are being created with Wi-Fi capabilities and sensors built into them, technology costs are going down, and smart phone penetration is sky-rocketing [2]. All of these things are creating a “perfect storm” for the IoT

An Embedded system is a computer system designed for specific control functions within a larger system and often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts [3]. By contrast, a general-purpose computer, such as a personal computer (PC), is designed to be flexible and to meet a wide range of end-user needs. Embedded systems control many devices in common use today.

Embedded systems contain processing cores that are typically either microcontrollers or digital signal processors (DSP) [5]. The key characteristic, however, is being dedicated to handle a particular task. They may require very powerful processors and extensive communication, for example air traffic control systems may usefully be viewed as embedded, even though they involve mainframe computers and dedicated regional and national networks between airports and radar sites (each radar probably includes one or more embedded systems of its own) [6].

EXISTING AND PROPOSED

The first step is to clearly define the attributes of the trash, make it uniquely identifiable and then classify it in to three different buckets such as dry, wet and hazardous. The unique identifier could be barcode placed directly on the trash item bag containing a group of similar waste items like a bag of waste tissue papers identified by the digitally coded label that serves as a unique identifier.

The Proposed System shown in Figure 1, we make use of this device to construct an automatic solid waste management system. The decisions of sending a notification are taken by an onboard Arduino to which the ultrasonic sensor is interfaced. The display and GSM & GPS modules module and are interfaced to the same onboard Arduino [7].

This onboard Arduino consists of number of input and output ports. The onboard Arduino is commonly termed as micro controller. The input and output port of the micro controller are interfaced with different input and output modules depending on the requirements. In other words, micro controller acts as a communication medium for all the modules involved in the project. The device also consists of LCD which displays the information about the filling of Bin.

The Solid waste management system runs using the raspberry pi board. The data is collected from the sub-station and send to the hub where the raspberry pi is installed. The raspberry pi collects the information from the sub-station and analyses the data along with the satellite data and sends the vehicle to collect the trash. A SMS is sent using a GSM & GPS Module to the team about the waste management. The block diagram of the proposed work is shown in the Figure 1.

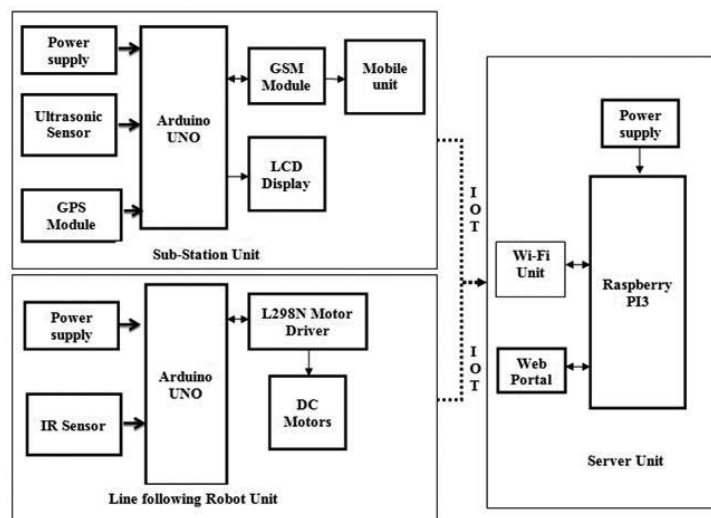


Figure 1: Block Diagram of the Proposed System

Ultrasonic sensor ^[5] is used to check the level status of dust bin so to determine if it is full or empty. Algorithm has developed which checks filled level continuously and if dustbin is filled to its maximum limit then there is indication on LCD display. Monitoring the webpage will help the garbage collection department to track for the exact location and amount of the garbage. The garbage vehicles can then unload the garbage from a particular location. The function of GSM module is to send a message to the garbage collection department. The allure of the Raspberry Pi comes from a combination of the computer's small size and affordable price. Enthusiasts envision using the small form-factor PC as a cheap home theater PC (HTPC), or secondary low-power desktop. Institutions, like schools and businesses, could benefit from deploying a fleet of computers for a fraction of the cost of traditional desktop towers. The small size makes for an easy-to-hide computer that sips power and can be mounted behind the display with an appropriate case. It could also be used in niche applications, like digital signage. While it will not blow away any recent hardware in performance, it does make for a cheap secondary computer which could be useful for troubleshooting and researching solutions if your man rig fails to boot as well.

ALGORITHM

Raspberry Pi board uses Linux-Kernel operating systems supporting programming languages like C, Python etc., Python language is used in ARS system makes easy to communicate with a serial port, GSM modules. GSM module responds to AT commands through serial communication. AT means attention. Set of AT commands perform different functions.

By following below steps the system is implemented:

1. Import all the required modules for serial communication
2. Initialize serial port for communicating with GSM module.
3. Communicate with GPS module to read the location.
4. When Ultrasonic sensor detects the distance of the object the notification is displayed in the LCD screen and notification is sent to the user.
5. If motion is detected, then message is sent is sent.
6. If a motion detection fails, then surveillance continues.
7. Message is sent by GSM module which sends the notification to the user.

FLOW CHART

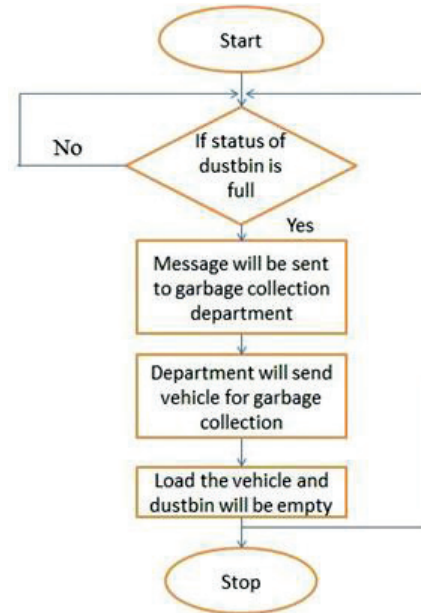


Figure 2: Proposed System Flow Chart

Ultrasonic sensor is used to check the level status of dust bin so to determine if it is full or empty, while Load cell senses the weight of the garbage present in the dustbin and to determine if the threshold limit is reached or not. Algorithm has developed which checks filled level continuously and flow chart in given in Figure 2, if dustbin is filled to its maximum limit then there is indication on LCD display. Active status of dustbin is shown on web page using connections through Ethernet shield. Simplified flowchart of proposed system is shown in figure. Monitoring the webpage will help the garbage collection department to track for the exact location and amount of the garbage. The garbage vehicles can then unload the garbage from a particular location. The function of GSM & GPS module is to send a message to the garbage collection department.

RESULTS AND DISCUSSION

This system is practically tested and the results are obtained successfully as shown in Figure 3. We have performed 5 test runs which completed 2 full cycles of loading and unloading of garbage. The empirical outcomes shown in Table 1 and Figure 3 represent the bin filling level values for both ultrasonic sensors placed at top of the bin, weight of waste inside the bin and respective status shown in Figure 4.

Various possible combinations have been tested to assess performance of proposed prototype under different conditions. As shown in Table, if the bin is

almost empty level shown by both ultrasonic sensors is less than 5 cm for filling level. Gradually, we loaded bin with garbage and recorded readings for the same. At certain point when bin was fully filled no values were displayed by ultrasonic sensor this is nothing but overload condition. Again, we unloaded the garbage from bin because garbage was mainly unloaded from right side of bin and which resulted in unbalanced level of garbage in bin. The result of this system is follows:

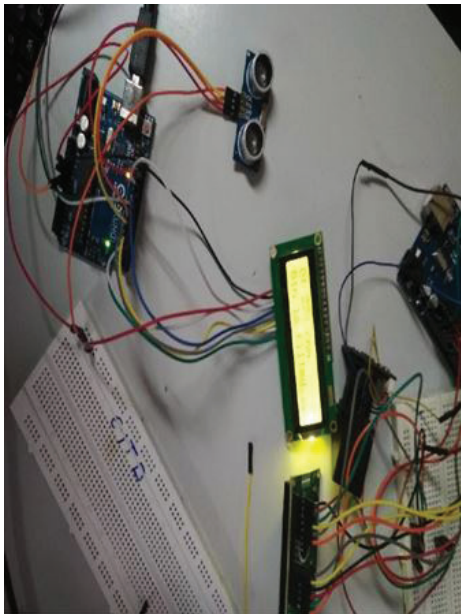


Figure 3: Bin filling level values in LCD

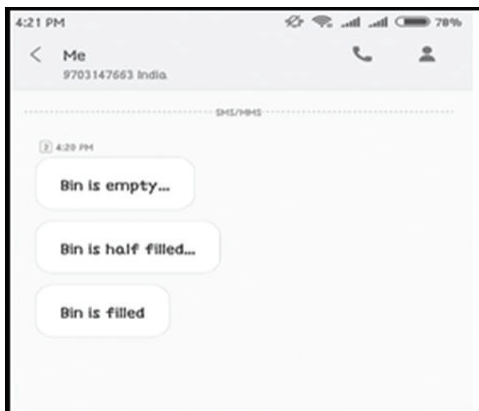


Figure 4: Bin filling level status

Table 1: Outcomes

Test No.	Level Sensor (cm)	Status
1.	25 cm	Bin is Empty...
2.	20 cm	Bin is Empty...
3.	10 cm	Bin is Half Filled...
4.	8 cm	Bin is Half Filled...
5.	7 cm	Bin is Filled...

CONCLUSION AND FUTURE SCOPE

We have recommended making use of popular data science and analytics classification algorithm to make sense of data and convert into actionable insights. The processed information is also ready to be consumed by stakeholders in waste management by making use of proposed collaboration portal WPU-CP. In future, we can include few vital and measurable parameters that have potential to become part of e governance are like the following:

1. Quantity of wastes processed and disposed safely
2. Quantity of wastes recycled and reused
3. Number of trash service requests placed
4. Number of trash service requests fulfilled
5. Percentage increase in income from manufacturing of recycled and reused trash

Ethical Clearance: Taken from CMR Engineering College, Hyderabad.

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. H. Gharavi and R. Ghafurian, “Smart grid: The electric energy system of the future”, Proceedings of the IEEE, 2011, 99(6): 917 – 921
2. Madakam S, Ramaswamy R. The state of art: Smart cities in India: A literature review report. International Journal of Innovative Research and Development. 2013 Dec 13;2(12).
3. Hannan MA, Arebey M, Begum RA, Basri H. Radio Frequency Identification (RFID) and communication technologies for solid waste bin and truck monitoring system. Waste Management. 2011 Dec 1;31(12):2406-13.
4. Solid Waste Management Rules Revised After 16 Years; Rules Now Extend to Urban and Industrial Areas retrieved from website <http://pib.nic.in/newsite/PrintRelease.aspx?relid=138591>, updated on 05-April-2016 17:05 IST
5. Saravana Kannan G, Sasi Kumar S, Ragavan R, Balakrishnan M. Automatic Garbage Separation

- Robot Using Image Processing Technique. International Journal of Scientific and Research Publications. 2016 Apr;6(4):326-8.
6. Surie D, Laguionie O, Pederson T. Wireless sensor networking of everyday objects in a smart home environment. In Intelligent Sensors, Sensor Networks and Information Processing, 2008. ISSNIP 2008. International Conference on 2008 Dec 15 (pp. 189-194). IEEE.
 7. Bui N, Castellani AP, Casari P, Zorzi M. The internet of energy: a web-enabled smart grid system. IEEE Network. 2012 Jul;26(4).
 8. Iera A, Floerkemeier C, Mitsugi J, Morabito G. The internet of things. IEEE Wireless Communications. 2010 Dec 1;17(6):8-9.

Inter Region Minutiae Transitive Measure Based Finger Print Analysis for Forgery Detection in Health Care Systems

Vinoth A¹, S. Saravana Kumar²

¹Research Scholar, Department of Computer Science, Bharathiar University, Coimbatore, Tamilnadu;

²Associate Professor, Shanmuganathan Engineering College, Tamilanadu, India

ABSTRACT

The problem of forgery detection has been well studied and the forged finger prints produces highly impacting results in the biometric based security systems. There are number of approaches available for the detection of forged finger prints. However, they suffer to achieve higher performance in terms of security. To improve the security performance, an inter region minutiae transitive measure (IRMT) based approach. The method reads the input finger print image and preprocesses the image to remove the noisy points by applying the multi-level Gabor filters. The enhanced image has been split into number of sectional images to produce regional image. From the regional image, the method extracts various features of finger print like island, dot, enclosure, bifurcation and edges. Extracted features have been converted into a feature vector which has been used to estimate the IRMT measure. Based on the IRMT measure, the presence of forged finger print has been identified and the same has been used to identify the region which has been modified. The proposed algorithm improves the performance of finger print analysis and reduces the false classification ratio.

Keywords: *Finger Print, Forgery Detection, Finger Print Analysis, Regional Based Image, IRMT.*

INTRODUCTION

The growing development of information technology supports not just the growth of organizations and the same has been utilized towards the demolishing of the same organizations. As the most organizations maintains their data belongs to their business, customer in their own database server in a centralized or decentralized manner. Whatever the case, the data present in the database server has to be restricted from illegal access. In most cases, all the data present in the database server cannot be allowed to be accessed by different malicious users who has no access rights. Also, it is a responsibility of the organization to maintain the integrity of the data.

There are number of authentication approaches available which uses different features. However, the application of biometrics is highly influenced in the authentication schemes. The face recognition algorithms have been used in many situations to restrict the malformed access of any person. Eventhough there are many issues identified in the restriction of illegal users. The finger print based authentication algorithms are more efficient in restricting the illegal access. The finger print is a biometric which does not change due to age or

any factor. The other features of biometric are subject to change due to the age factor and due to other reasons. So by using finger print the authentication can be performed in most efficient manner.

Still at the finger print based applications, there are a malicious user who modifies or alter the finger prints to produce a fake one to intrude into the system. Forgery detection is the process of detecting forged or altered finger print using some metrics. To identify the altered finger prints, the finger print analysis can be performed. The finger print has number of components and falls into one against four categories. It has minutiae edges, islands, enclosures, and bifurcation. By identifying the parts of finger print, the finger print analysis can be performed in an efficient way to authenticate a person.

The health care organization is highly depending on more efficient authentication systems because of they maintain various information about different patients which must be safeguard. The details would cover many personal information which cannot be exposed to others in any kind. So access restriction in the health care units should be enforced in a rigid way to ensure the information security.

There are number of approaches available to work over the forged detection of finger prints. Each uses various features of the finger print and uses different measures. However the methods suffer to achieve higher performance on the restriction process. To improve the performance of finger analysis, an efficient inter region minutiae transitive measure has been presented in this paper. To perform this task, a region based approach is incorporated which split the image into number of sections. From the sections, the features are extracted and estimates the transitive measures. Based on the measures estimated, the method identifies the forged or altered print. The detailed approach is discussed in the next section.

MATERIALS AND METHOD

There are number of approaches discussed towards the detection of altered finger print and this section discusses some of the methods.

A support vector machine with kernel has been used for the classification of finger prints in ^[1]. The method uses finger print data set and has been presented towards the usage in access restriction, user verification in ATM and criminal identification process. The method has produced efficient results in altered finger print identification.

In ^[2], the author performs an analysis on fake finger prints and concludes that the image quality software is not suitable in detecting the altered prints in efficient manner. It has been identified that the image quality does not change because of alteration in the finger prints. Toward the detection of altered finger print an efficient approach is presented. The method uses the distribution of minutiae and detects the finger prints based on the orientation fields of the image. Based on the distribution value the fake prints are identified.

A novel approach to fingerprint identification using method of sectorization ^[3], introduce a complete (fully-implemented) algorithm for fingerprint recognition. The work describes image preprocessing based on our previous works and feature vector creation that bases on sectoralization. The image preprocessing includes filtering, skeletonisation, minutiae extraction by CN (Crossing Number) algorithm and spurious minutiae removal. The feature vector creation is based on dividing the fingerprint into sectors. The division is done on the basis of image height.

Altered fingerprint detection—algorithm performance evaluation ^[4], present a comparative study on the performance of altered fingerprint detection algorithms. Different algorithms from different institutions have been evaluated on two different datasets. Both datasets feature real alterations on fingers and the ground truth regarding the alteration is known a priori, as, in some cases, corresponding pre-altered fingerprints were also available.

In ^[5], a synthetic alteration on the finger prints has been generated artificially and the generated finger prints are used to evaluate the performance of various finger print analysis approaches. This supports the research of finger print alteration detection by providing dataset to the researchers. Similarly in ^[6], an efficient approach has been proposed and has been validated with the dataset generated. In ^[7], an orientation based altered finger print identification and detection has been presented.

In ^[8], the author performs a survey on attack detection methods which detects altered finger prints. As the biometrics are mostly used in overall systems for the restriction and authentication of different users, the malicious users try to access the system by generating fake finger prints. There are number of approaches available to perform altered finger print detection and the author performs a detailed survey on the methods.

In Critical Analysis and Detection of Altered Fingerprints ^[9], the author performs optimization of image quality based algorithm in altered finger print. The method uses neuro fuzzy in the detection of altered finger print and the fuzzy rule has been generated using image database.

An investigation of fake fingerprint detection approaches ^[10], the author performs a detailed review on various methods of fake finger print detection. Number of research articles has been considered and based on that various taxonomy of fake prints has been generated. In ^[11], a gradient texture based altered finger print detection algorithm is presented. The method extracts the co-occurrence matrix and gradient features from the image. Based on the features extracted, the multi order gradient features are generated to identify the altered finger print detection.

Towards the detection of spoofing attack by altered finger print, an efficient approach is presented based on counter measures in ^[12]. In ^[13], CNN feature based

finger print liveliness detection is presented. The method initially segments the input image and using the segmented image, the distribution of various features has been identified. The distribution measures have been used to perform altered finger print detection. In [14], the quality features have been used to perform spoofed or altered finger print detection. The method considered the Gabor feature, frequency of ridges, direction map and frequency filed. Based on the above mentioned features, the method performs altered finger print detection. Similarly, in [15], the same set of features has been considered and evaluated using large data set.

In [16], a minutiae match algorithm using divide and conquer approach is presented to identify the altered finger print. The method divides the image into different sections and for each section the method matches the minutiae with the template available. Based on that the altered finger print has been detected and produces efficient results. In [17] a security protocol for the securing of health care record using biometric is presented. The method considers the advantages, disadvantages, and ethical consequences of utilizing biometric technology to secure the electronic health record in regards to cost, usability, accessibility, and accuracy. In addition to evaluating the primary application, the essay acknowledges the potential use of biometric technology to identify patients by vasculature scanning in the future.

Biometric Fingerprint System to Enable Rapid and Accurate Identification of Beneficiaries [18], founded SimPrints, a nonprofit health technology organization centered on development of a pocket-sized fingerprint scanner that wirelessly syncs with a health worker’s smartphone to link individuals’ fingerprints to their health records.

Fingerprint and Iris Template Protection for Health Information System Access and Security [19], focus on template database attacks which includes attacks on the integrity of biometric templates by presenting a new approach using both chaos and Hadamard matrices. Although a considerable amount of work was conducted on protecting biometric templates, the proposed approaches in the literature do not satisfy the main requirements of security, performance, diversity and revocability. However, our approach contributes better results in case of recognition rate i.e., 100 percent, zero percent false rejection rate and false acceptance rate and satisfies the requirements of revocability, diversity and privacy.

In [20], combination of biometrics and other personal identification techniques were used to identify individual’s resident within a surveillance population seeking care in two district hospitals. Visits from resident individuals were successfully recorded and categorized by the success of the techniques applied during identification. The successes of visits that involved identification by fingerprint were further examined by age.

All the above discussed methods suffer to achieve higher performance in forgery detection and requires some strategically approach.

The proposed inter region minutiae transitive measure based forgery detection algorithm performs preprocessing of the input finger print image to remove the noisy particles from the image. From the enhanced image, the regional images are split. From each regional image, the method extracts various features and estimates the transitive measure to identify the forged one. The detailed approach is discussed in this section.

The preprocessing is the process of preparing the input finger print image for the forgery detection. To perform this, the input image has been read and applied with the median filter. The median filter has been initialized with number of levels and at each level, the method applies the median filter. Then the noise removed image has been applied with histogram equalization. The histogram equalization helps to retain the edges of the finger print which support higher accuracy.

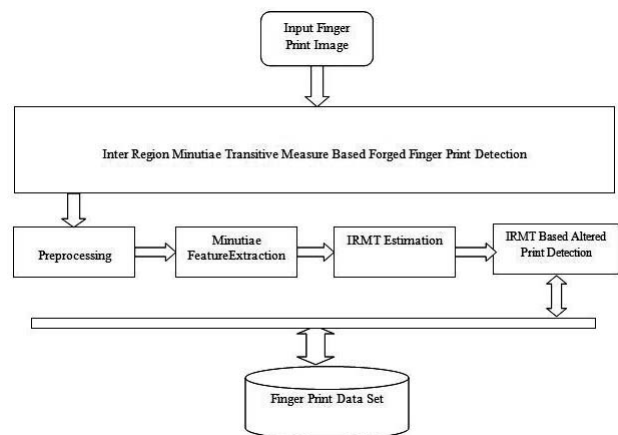


Figure 1: Architecture of proposed IRTM based Forged Finger Print Detection system

The Figure 1, shows the architecture of proposed region based forged finger print detection algorithm which uses IRTM measure.

Preprocessing Algorithm:

Input: Finger Image Fimage
 Output: Preprocessed Image Pre-img
 Start
 Read input finger print image Fimage
 Initialize number of levels $Nl=y$
 Initialize coordinates of filter $x=\{1\dots y\}$
 Initialize Median Filter $MF(Nl,x)$
 For each level l of MF
 Pre-img = Apply $MF(l, Fimage,x(l))$
 End
 Pre-Img = Histogram Equalization(Pre-img)
 Stop

The above discussed algorithm removes the noise from the image by applying median filter in number of levels by varying the window size. The noise removed image has been applied with the histogram equalization technique. The enhanced image has been used to extract the features of finger print.

The preprocessed image has been taken for feature extraction. First, the image has been split into number of sectional image based on the window size. From each regional image, the method extracts the number of dots, edges, enclosure, island and bifurcation present in the regional image. Extracted features are converted into feature vector which will be used to estimate the IRTM measure in the next stage.

Algorithm:

Input: Preprocessed Image Pre-Img
 Output: Feature Vector Fv.
 Start
 Read preprocessed image Pre-Img.
 Split image into sectional image.
 $Si = \int_{i=1}^{Nos} \text{split}(\text{PreImg} < \text{Scoord}, \text{Ecoord}>)$
 Nos – no of sections or regions
 Scoord – Starting coordinate
 Ecoord- Ending coordinate
 For each sectional image Si
 Extract Minutiae island $Mi = \sum \text{Islands} \in Si$
 Extract Minutiae dots $Md = \sum \text{Dots} \in Si$
 Extract Minutiae End $Me = \sum \text{End} \in Si$

Extract Minutiae enclosures $Men = \sum \text{Enclosures} \in Si$
 Extract Minutiae Bifurcation $Mb = \sum \text{Bifurcation} \in Si$
 Construct feature vector $Fvi = \{Mi, Md, Me, Men, Mb\}$
 Add to feature vector $Fv = \sum (Fvk \in Fv) \cup Fvi$
 End
 Stop

The feature extraction algorithm extracts various features from each sectional image and adds to the feature vector. Generated feature vector has been used to estimate IRTM measure in the next stage.

The IRTM measure represents the transition of the minutiae feature towards different regions. The minutiae feature may start from any region and move towards other region. So the transition measure has been measured for all the directions like clock wise, anti clock wise, up and down. To estimate the IRTM value, the number of dots, edge, bifurcation, end and enclosures are computed. Then the number of edges, enclosures, bifurcation and edges carried on the next region has been computed. Based on the count of each, the IRTM measure has been estimated. The estimated IRTM value has been used to classify the input finger print image.

Algorithm:

Input: Feature Vector Fv
 Output: IRTM Set IRTMS
 Start
 Read Feature vector Fv.
 Compute Number of dots present $Nod = \int_{i=1}^{\text{size}(Fv)} \sum Fv. \text{Minutiae} == \text{dot} \ \& \ \& \ Fv. \text{dot} \gg Fv. \text{Region}(\text{coordinate})$
 Compute No of Edge $NoE = \int_{i=1}^{\text{size}(Fv)} \sum Fv. \text{Minutiae} == \text{Minutiae. edge}$
 Compute no of ends $Noed = \int_{i=1}^{\text{size}(Fv)} \sum Fv. \text{Minutiae} == \text{Minutiae.end}$
 Compute no of enclosures $Noen = \int_{i=1}^{\text{size}(Fv)} \sum Fv. \text{Minutiae} == \text{Minutiae. enclosure}$
 Compute No of bifurcation $Nob = \int_{i=1}^{\text{size}(Fv)} \sum Fv. \text{Minutiae} == \text{Minutiae. Bifurcation}$

Compute no of dots falls to clock region Nodcr

$$= \int_{i=1}^{\text{size}(Fv)} \Sigma Fv. \text{Minutiae} == \text{dot} \ \&\& \ Fv. \text{dot} \ \gg \ Fv.$$
 Region (clock region)

Compute no of dots falls to anti clock region

$$\text{Nodacr} = \int_{i=1}^{\text{size}(Fv)} \Sigma Fv. \text{Minutiae} == \text{dot} \ \&\& \ Fv. \text{dot} \ \gg \ Fv.$$
 Region (anti clock region)

Compute no of edges falls to clock region

$$\text{Noecr} = \int_{i=1}^{\text{size}(Fv)} \Sigma Fv. \text{Minutiae} == \text{edge} \ \&\& \ Fv. \text{edge} \ \gg \ Fv.$$
 Region (clock region)

Compute no of edge falls to anti clock region

$$\text{Noeacr} = \int_{i=1}^{\text{size}(Fv)} \Sigma Fv. \text{Minutiae} == \text{edge} \ \&\& \ Fv. \text{edge} \ \gg \ Fv.$$
 Region (anti clock region)

Compute no of ends falls to clock region

$$\text{Noedcr} = \int_{i=1}^{\text{size}(Fv)} \Sigma Fv. \text{Minutiae} == \text{end} \ \&\& \ Fv. \text{end} \ \gg \ Fv.$$
 Region (clock region)

Compute no of ends falls to anti clock region

$$\text{Noedacr} = \int_{i=1}^{\text{size}(Fv)} \Sigma Fv. \text{Minutiae} == \text{end} \ \&\& \ Fv. \text{end} \ \gg \ Fv.$$
 Region (anti clock region)

Compute no of enclosure falls to clock region

$$\text{Noencr} = \int_{i=1}^{\text{size}(Fv)} \Sigma Fv. \text{Minutiae} == \text{enclosure} \ \&\& \ Fv. \text{enclosure} \ \gg \ Fv.$$
 Region (clock region)

Compute no of enclosure falls to anti clock region

$$\text{Noenacr} = \int_{i=1}^{\text{size}(Fv)} \Sigma Fv. \text{Minutiae} == \text{enclosure} \ \&\& \ Fv. \text{enclosure} \ \gg \ Fv.$$
 Region (anti clock wise)

Compute no of bifurcation falls to clock region

$$\text{Nobcr} = \int_{i=1}^{\text{size}(Fv)} \Sigma Fv. \text{Minutiae} == \text{bifurcation} \ \&\& \ \text{bifurcation} \ \gg \ Fv.$$
 Region (clock wise)

Compute no of bifurcation falls to anti clock region

$$\text{Nobacr} = \int_{i=1}^{\text{size}(Fv)} \Sigma Fv. \text{Minutiae} == \text{bifurcation} \ \&\& \ \text{bifurcation} \ \gg \ Fv.$$
 Region (anti clock wise)

IRTM set IRTMS = {Nodcr, Nodacr, Noecr, Noeacr, Noedcr, Noedacr, Noencr, Noenacr, Nobcr, Nobacr}

Stop

The above discussed algorithm computes the minutiae transitive measure and add to the inter region transitive set and returns that. The generated transitive set has been used to perform classification.

The forged finger print or articulated finger print has been classified based on the inter region transitive measures of various minutiae features and their measures

on a given image The input image has been read and preprocessed to remove the noise and enhance the image. The enhanced image has been split into number of regional image and for each regional image various minutiae features have been extracted. From the extracted features various minutiae transitive measures are estimated. Using all these minutiae measures estimated, the method estimates the IRTM measure for the input image. Based on estimated IRTM measures, the method computes the similarity with the various feature set available. Based on the similarity threshold, the method classifies the finger print as natural or articulated.

Algorithm:

Input: Finger print image Fpi, Data set Ds.

Output: Boolean

Start

Read Input image Fpi

Read data set Ds.

PI = Proprocessing (Fpi)

Fv = Minutiae feature extraction (PI)

For each feature Fvi

IRTMsetIRTMS_{Fvi} = Estimate IRTMS (Fvi)

End

Compute IRTM =

$$\int_{i=1}^4 \frac{\text{Dist}(Fv(i)\text{Nodcr}, Fv(i+1).\text{Nodacr})}{\text{NoE}} \times \frac{\text{Dist}(Fv(i)\text{Nodcr}, Fv(i+1).\text{Noeacr})}{\text{Noed}} \times \frac{\text{Dist}(Fv(i)\text{Nodcr}, Fv(i+1).\text{Noedacr})}{\text{Noend}} \times \frac{\text{Dist}(Fv(i)\text{Noencr}, Fv(i+1).\text{Noenacr})}{\text{NoEn}} \times \frac{\text{Dist}(Fv(i)\text{Nobcr}, Fv(i+1).\text{Nobacr})}{\text{Nob}}$$

For each feature Fvd from data set

Compute IRTM similarity IRTMsim

$$= \sum_{i=1}^{\text{Size}(ds)} \frac{\text{Dist}(Ds(i).\text{IRTMS}, \text{IRTMS})}{\text{size}(Ds)}$$

End

If IRTMSim > IRTMTh then

Forged and return false

End

End

Stop

The above discussed algorithm computes the inter region transitive minutiae measure with all the feature set available in the data set. Based on the similarity measure and the threshold value, the classification is performed.

FINDINGS

The proposed algorithm has been implemented using Matlab and has been evaluated for its efficiency in the classification. The proposed algorithm has produced efficient results on the forged finger print detection and improves the performance of classification. The efficiency of the method has been evaluated and compared with other methods. The proposed method has produced the following results.

Table 1: Details of evaluation

Parameter	Value
Tool Used	Matlab
No of classes	1000
No of fake prints	90

The Table 1, shows the details of evaluation being used to measure the performance of the proposed algorithm. The method has been evaluated with the finger prints of thousand different peoples. For the classification, there are 90 fake finger prints has been considered. The proposed method has produced the following results.

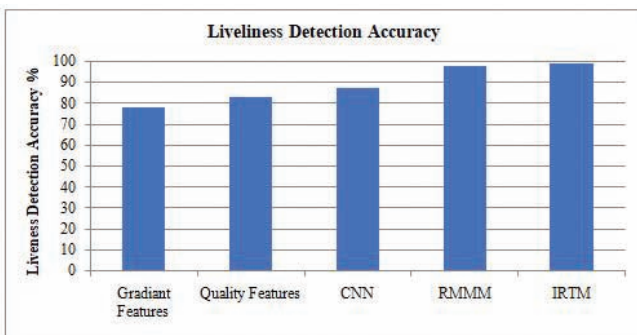


Figure 2: Comparison on liveness detection accuracy

The Figure 2, shows the comparative result on liveness detection accuracy produced by various approaches. The proposed algorithm has improved the performance of liveness detection accuracy than other methods.

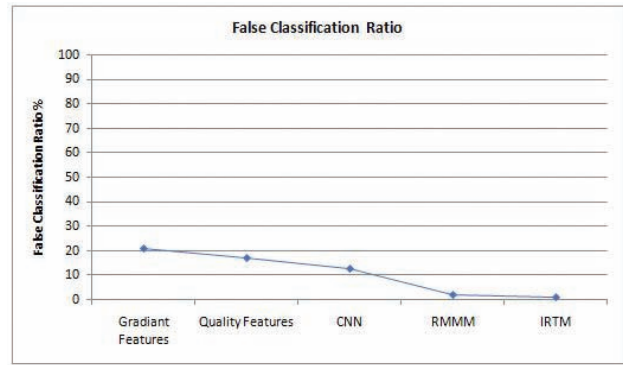


Figure 3: Comparison on false classification ratio

The Figure 3, shows the comparison result on false classification ratio produced by various methods and the proposed algorithm has produced less false ratio compare to other methods.

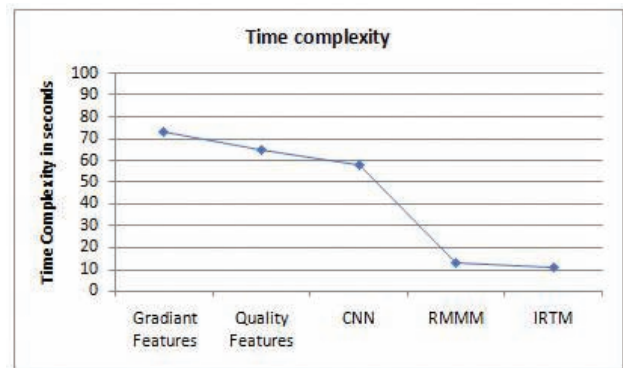


Figure 4: Comparison on time complexity

The Figure 4, shows the comparative result on time complexity produced by different methods and the result shows that the proposed method has produced less time complexity than other methods.

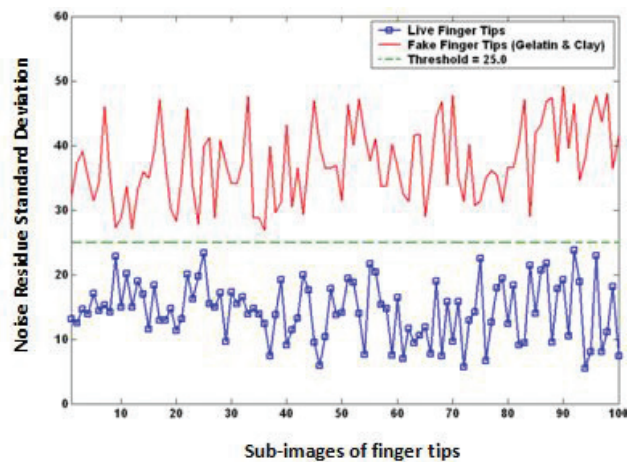


Figure 5: Experimental results of the proposed method

The algorithm proposed in this paper is applied to all the sub-images to get the standard deviations of their noise residues. Matching results shown in Figure. 5 shows that our system is capable to successfully distinguish all the real finger tips from the fake ones.

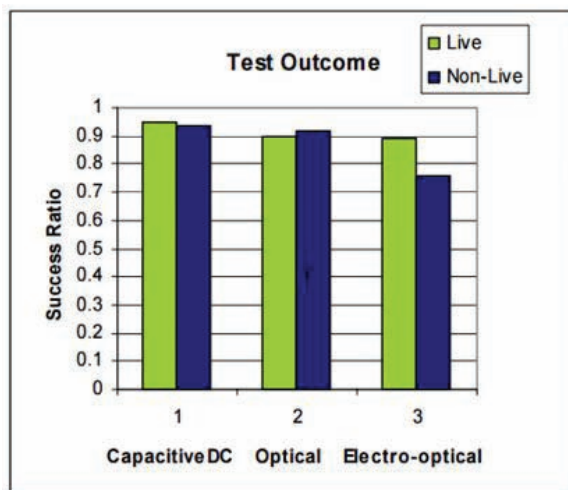
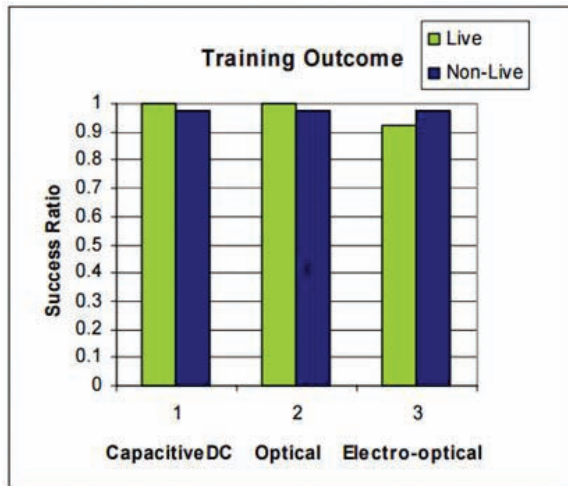


Figure 6: Classification outcome of intensity based approach

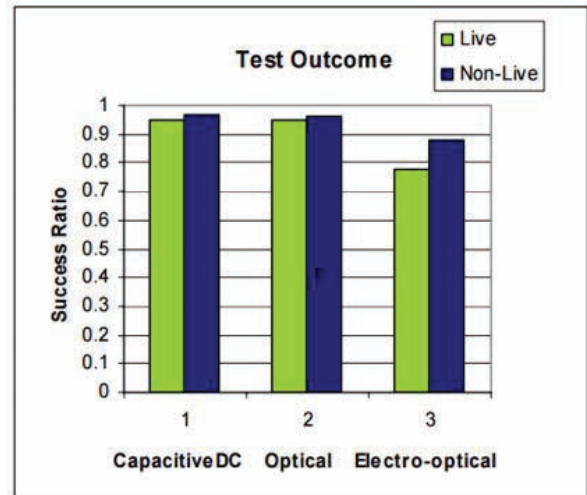
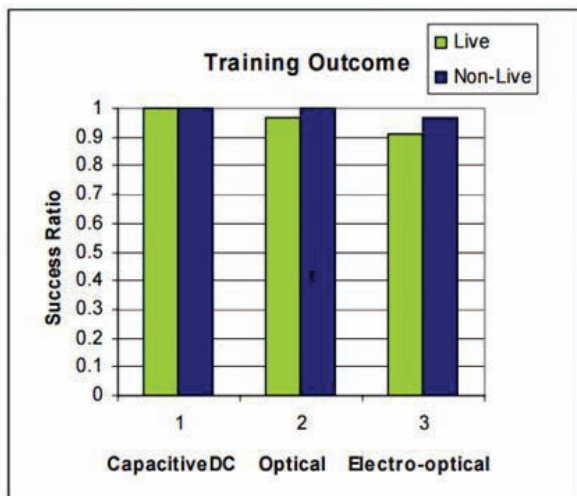


Figure 7: Classification outcome of ridge based approach

Figure 6 and 7 illustrates the training and test classification rates for live and non-live fingerprints for different device using the intensity and ridge based methods. The capacitive DC scanner demonstrates between 93.8-95% both for live and non-live respectively, correct classification rate using the intensity method and 95-96.9% for the ridge technique. The optical scanner proves between 90-92% correct classification rate using the intensity technique and 95-96% using the ridge technique. Finally, the electro-optical scanner has a minor classification rate which establishes between 76-88.9% correct classification rate using the intensity technique and 77.8-88% using the ridge technique, compared to the former two technologies.

CONCLUSION

An efficient inter region minute transitive measure based forgery detection algorithm is presented. The method reads the input image and removes the noise from the image. Then the method improves the image quality by applying histogram equalization technique. The enhanced image has been cropped into number of regional image according to the window size considered. From each cropped image, the method extracts various minutiae features. Using the features extracted the method estimates the IRTM value with corresponding features of neighbor regions. Finally, the similarity with the feature set has been measured and based on the threshold the classification is performed to identify the forged finger print. The proposed algorithm has improved the performance of forgery detection and reduces the false ratio and time complexity as well.

Ethical Clearance: Taken from Bharathiar University and Science and Shanmuganathan Engineering College.

Source of Funding: Self

Conflict of Interest: Authors have no conflict of interest to declare regarding the publication of this paper.

REFERENCES

- Josphineleela R, Ramakrishnan M. A new approach of altered fingerprints detection on the altered and normal fingerprint database. *Indian Journal of Computer Science and Engineering*. 2012 Dec;3(6):818-21.
- Yoon S, Feng J, Jain AK. Altered fingerprints: Analysis and detection. *IEEE transactions on pattern analysis and machine intelligence*. 2012 Mar;34(3):451-64.
- Szymkowski M, Saeed K. A novel approach to fingerprint identification using method of sectorization. In *Biometrics and Kansei Engineering (ICBAKE), 2017 International Conference on* 2017 Sep 15 (pp. 55-59). IEEE.
- Haraksim R, Anthonioz A, Champod C, Olsen M, Ellingsgaard J, Christophe B. Altered fingerprint detection—algorithm performance evaluation. In *Biometrics and Forensics (IWBF), 2016 4th International Workshop on* 2016 Mar 3 (pp. 1-6). IEEE.
- Papi S, Ferrara M, Maltoni D, Anthonioz A. On the Generation of Synthetic Fingerprint Alterations. In *Biometrics Special Interest Group (BIOSIG), 2016 International Conference of the* 2016 Sep 21 (pp. 1-6). IEEE.
- Vinoth MA, Saravanakumar S. An Analysis of Altered Fingerprint Detection, Recognition and Verification.
- Selvarani SM, Jebapriya S, Mary RS. Automatic identification and detection of altered fingerprints. In *2014 International Conference on Intelligent Computing Applications* 2014 Mar 6 (pp. 239-243). IEEE.
- Sousedik C, Busch C. Presentation attack detection methods for fingerprint recognition systems: a survey. *Iet Biometrics*. 2014 Jan 30;3(4):219-33.
- Latha K, Manikandan C. Critical Analysis And Detection Of Altered Fingerprints Using Evolutionary Computation Algorithm. *Applied Mechanics & Materials*. 2014 Jul 22(573).
- Ahmad AS, Hassan R, Othman RM. An investigation of fake fingerprint detection approaches. In *AIP Conference Proceedings* 2017 Oct 3 1891(1), p. 020020. AIP Publishing.
- Xia Z, Lv R, Zhu Y, Ji P, Sun H, Shi YQ. Fingerprint liveness detection using gradient-based texture features. *Signal, Image and Video Processing*. 2017 Feb 1;11(2):381-8.
- Hadid A, Evans N, Marcel S, Fierrez J. Biometrics systems under spoofing attack: an evaluation methodology and lessons learned. *IEEE Signal Processing Magazine*. 2015 Sep;32(5):20-30.
- Park E, Kim W, Li Q, Kim J, Kim H. Fingerprint liveness detection using CNN features of random sample patches. *Biosig* 2016. 2016.
- G. Arunalatha and M. Ezhilarasan, "Fingerprint Spoof Detection Using Quality Features," *Int. J. Secur. Its Appl.*, vol. 9, no. 10, pp. 83–94, 2015.
- Galbally J, Alonso-Fernandez F, Fierrez J, Ortega-Garcia J. A high performance fingerprint liveness detection method based on quality related features. *Future Generation Computer Systems*. 2012 Jan 1;28(1):311-21.
- Vinoth A, Saravanakumar S. ACCURACY FINGERPRINT MATCHING FOR ALTERED FINGERPRINT USING DIVIDE AND CONQUER AND MINUTIAE MATCHING MECHANISM.
- Iacona A. Health Care Information Technology: Securing the Electronic Health Record with Biometric Technology. *The Review: A Journal of Undergraduate Student Research*. 2014;15(1):4-8.
- Storisteanu DM, Norman TL, Grigore A, Norman TL. Biometric fingerprint system to enable rapid and accurate identification of beneficiaries. *Global Health: Science and Practice*. 2015 Mar 1;3(1):135-7.
- Abdul W, Alzamil A, Masri H, Ghouzali S, Hussain M, AlZuair M. Fingerprint and Iris Template Protection for Health Information System Access and Security. *Journal of Medical Imaging and Health Informatics*. 2017 Oct 1;7(6):1302-8.
- Odei-Lartey EO, Boateng D, Danso S, Kwarteng A, Abokyi L, Amenga-Etego S, Gyaase S, Asante KP, Owusu-Agyei S. The application of a biometric identification technique for linking community and hospital data in rural Ghana. *Global health action*. 2016 Dec 1;9(1):29854.

Lempel-Ziv-Oberhumer Coding (LZOD) for Reducing Congestion in MANET

N. Nisha Rosebel¹, E. Logashanmugam²

¹Research Scholar, Department of Computer Science and Engineering, St. Peter's Institute of Higher Education and Research, Avadi, Chennai; ²Professor and Head, Sathyabama Institute of Science and Technology, Chennai

ABSTRACT

Mobile Ad Hoc Networks (MANETs) demonstrates a fundamental job for impermanent and brisk correspondence. The two directing conventions, for example, tree-based and work based convention gives the assurance and effective conveyance. As a result of the presence of just a single connection between two hubs Tree-based gives low data transfer capacity utilization, high sending proficiency. A tree-based multicast steering convention is best reasonable for lightweight specially appointed systems. Lempel-Ziv-Oberhumer (LZO) coding technique is proposed in this paper to reduce the congestion. The QoS (Quality of Service) and execution is corrupted when the heap of system increments. By combining the advantages of the tree structure and work structure the impact of system load can be made strides. This outcome in improved execution in the system even in thick limit specially appointed systems.

Keywords: Mobile Ad Hoc Networks, congestion, Quality of Service, LZO coding technique.

INTRODUCTION

A MANET is a kind of specially appointed system that can change areas and arrange itself on the fly. Since MANETS are versatile, they utilize remote associations with interface with different networks. This can be a standard Wi-Fi association, or another medium, for example, a cell or satellite transmission. Ad hoc arrange plan objective is to give web get to whenever described by absence of framework and nonappearance of base station, versatility and heterogeneity which require a dynamic proficient routing convention. MANET is a system of portable nodes which is framework less, self-designing and is picking up prominence lately because of the simplicity of organization. Applications, for example, sound/video conferencing require exceptionally stringent and unyielding QoS in information conveyance. To give QoS in Routing in MANET is a testing issue due to the dynamic idea of nodes and restricted node vitality.

MANET is an unconstrained, self configurable system comprising with different portable nodes. Every one of the nodes that are conveying in organize acts like switch and take after an irregular, regularly changing topology for sharing information on any versatile situation. Because of this consistently changing system

topology, one of the testing undertakings in interactive media specially appointed system is to give QoS amid spilling transmission. QoS alludes as some application situated parameters that give a type of certification to any expansive and versatile network. Change of QoS in interactive media spilling is exceptionally basic for smooth and powerful transmission.

A few MANETs are confined to neighborhood remote devices; others might be associated with the Internet. For instance, A Vehicular Ad Hoc Network (VANET) is a sort of MANET that enables vehicles to speak with roadside hardware. While the vehicles might not have an immediate Internet association, the remote roadside device might be associated with the Internet, enabling information from the vehicles to be sent over the Internet. The vehicle information might be utilized to traffic movement conditions or monitor trucking fleets. Due to the dynamic idea of MANETs, they are ordinarily not extremely safe, so it is vital to be careful what information is sent over a MANET.

MANET is a gathering of remote nodes that can progressively frame a network to trade data without utilizing any prior settled network foundation. The exceptional highlights of MANET bring this innovation

extraordinary open door together with serious difficulties. The military strategic and other security-touchy tasks are as yet the principle utilizations of ad hoc networks, despite the fact that there is a pattern to receive ad hoc networks for business utilizes because of their one of a kind properties. In any case, they confront various issues. A portion of the specialized difficulties MANET presents are likewise introduced in view of which the paper calls attention to the related piece boundary.

A portion of the key research issues for ad hoc networking administration innovation are talked about in detail that are required to advance the improvement and quicken the business utilizations of the MANET innovation. Amid the most recent decade, propels in both equipment and programming methods have brought about versatile hosts and remote networking administration normal and different.

RELATED WORK

MANETS are a gathering of remote versatile nodes with no prefixed foundation that can move anyplace breaking and framing the connections with the gadgets. Every node is in charge of directing the packets. Subsequently, every node goes about as a router. MANETs are exceptionally reconfigurable systems of versatile nodes which convey by remote connections. The primary issues in MANETs incorporate the portability of the network nodes, vitality constraints and data transfer capacity. A multi rate organizes permits a higher transmission limit with wide range and furthermore the signs can be transmitted with various bit rates. Along these lines there are numerous imperatives worried with the multi rate arrange like the information activity combination, Quality of administration and course foundation and so on. In MANET, QoS convention incorporates the intermediate nodes which have adequate assets along the route. Nodes may turn non helpful when they are running with lack of assets, which debilitates the adequacy of the convention.

The Uncertain Rule-based Fuzzy Logic QoS Trust Model (FQTM) chooses the nodes which are competent and helpful. Node ability is assessed through the QoS parameters and helpfulness is estimated regarding dependability [1]. Fluffy logic is connected to figure the node trust an incentive by thinking about its quality and dependability measurements. FQTM chooses the nodes with higher trust esteems to build route from source

to destination. The execution of proposed strategy is displayed hypothetically and experimentally.

MANETS are haphazardly circulated self configurable systems utilized in an ad-hoc form. Because of its expanding network information, load balancing turns into an unmanageable perspective in these systems. An Enhanced Co-Operative Game Theory (ECGT) based arbitrary stage based calculation for load balancing to spare the node from contortion at a prior stage and can ready to decrease the network delay [2]. This co-operative irregular versatile GT limits the loss factor. Moreover, a circulated Nash balance approach, can decide the measure of load the network can deal with before it really achieves the most minimal level.

A multicast routing protocol that develops numerous multicast trees and utilizes network coding is introduced for lossy MANETs, where every multicast tree can fulfill a predefined level of the data bandwidth requirement. The proposed convention can decrease the aggregate data bandwidth consumption utilization while giving bandwidth consumption certifications to an asked for stream and continuous streams. As an outcome of utilizing network coding, no excess packet is created, and no booking calculation for appropriating packets among the multicast trees is required [3].

Outline of a profoundly productive and steady convention at IP benefit layer alongside overseeing heterogeneous sub systems having numerous innovations is a testing undertaking. Solid system layer convention with improved postponement and power for MANET in light of the Concept of AODV is present in this paper [4]. The proposed convention enhances throughput in information transmission with ensured parcel conveyance and least data transfer capacity.

System coding is a promising innovation demonstrated to enhance the execution of remote systems. Too effectively plan a QoS - fulfilled directing convention with organize coding, the transfer speed utilization of a coding host ought to be resolved. Characterize the coding conditions to distinguish a coding host is present in this paper. The data transmission utilization of a coding host is then assessed under the dispute based remote systems with an irregular access method. Bandwidth-Satisfied and Coding-Aware Multicast Protocol introduced a transfer speed fulfilled and coding-mindful multicast directing convention. By considering the leftover transfer speed

of the transporter sense neighbors of the forwarders, the proposed convention can fulfill the transmission capacity necessities of the asked for stream and other progressing flows. As an outcome of considering coding openings in multicast tree development, the multicast convention can diminish the aggregate transmission capacity utilization ^[5].

Least Delay Path Estimation (LDPE) Routing Protocol ^[6] explained diverse defers that is included amid packet transmission thinking about various courses, bounces and distinctive rates with essential numerical plans and conditions which turns out to be sufficient for fulfilling requests of QoS like finding a way with insignificant time delay. In the meantime alternate ways should be used to maintain a strategic distance from the information rates to get debased. For this reason, Packetizing is utilized which can expand the effectiveness and utility of a system. However, this scheme cannot control the congestion.

Q-Learning based Adaptive Routing model (QLAR), created by means of Reinforcement Learning strategies, which can recognize the level of portability at various purposes of time with the goal that every individual node can refresh routing metric in like manner. The proposed convention presents: 1. new model, created through QLAR strategy, to identify the level of portability at every node in the system; 2. another metric, called Qmetric, which represent the static and dynamic routing measurements, and which are joined and refreshed to the changing system topologies. Broad reproductions approve the viability of the proposed show, through correlations with the standard Optimized Link State Routing conventions ^[7].

Automatic Neuro-Fuzzy Inference System (ANFIS) and Kalman Filter are utilized to enhance the learning and disclosure of consistently changing parametric qualities shrewdly and naturally ^[8]. Various parameters are really in charge of the working of any MANET, these parameters should be sifted and advanced to discover through more enhanced network. This ANFIS framework gives the speed and insight to MANETS, ideal optimality is being given by the multi-heuristic and stochastic methodology of Kalman filtration. The parameter esteems are checked and examined on informational index of reproductions conveyed before refreshing improvements are found.

The QoS imperatives of the system that incorporates least delay, most extreme data transfer capacity and

successful throughput for ongoing interactive media gushing should be upgraded. Specially appointed on Ad-hoc on-demand Distance Vector Multipath routing (AOMDV) convention is utilized on Mac layer or in arrange layer for continuous and consistent gushing of sound, video and content kind of information. This work explains methodology of information pressure with AOMDV to improve the QoS of the system ^[9]. QoS mindful weight in light of demand Multipath Routing convention (QMR) to improve QoS. QMR depends on cross-layer plan, which participates in sharing system status data inside various layers of convention while keeping up the layers' partition to enhance in general system execution. In QMR, the heaviness of the connection is chosen by various QoS factors like flag quality, and remaining vitality. The greatest accumulated weight chosen by these components picks the most ideal course which is steady and vitality effective among source and destination ^[10]. This paper made a variation and QoS safe adaptable system utilizing lossless pressure method over multipath AODV component. The principle part of this paper is to upgrade the gushing rate by change of QoS parameters by apply Mpeg4 pressure ^[11].

In ^[12] explained a distributive and methodical calculation to address the flooding component in routing. To lessen the control overhead of RREQ packets likelihood system is utilized. After that found courses are examined for the accessibility of QoS bolster as far as Bandwidth and delay. Whenever required most extreme transfer speed and least postponement are accessible over a route, at that point the way is chosen for information transmission for an application. This calculation is in truth a stage to soak up QoS support to AODV convention as decreased control overhead. QoS mindful steering is expected to give ideal courses as an element of parameters like data transmission, delay, packet loss and so forth. This methodology is centered around QoS empowered course disclosure technique which includes estimation of node data transfer capacity and delay at each node. The directing necessities of hard continuous applications with stringent limitations of data transfer capacity and postpone breaking point can be satisfied utilizing this methodology. Existing connection recuperation procedure includes visit course revelations which cause high routing overhead and expanded end-to-end delay. The greater part of the directing conventions in this classification utilize single route and don't use different interchange ways. In this scheme, effective connection disappointment technique

is additionally fused by evaluating join lapse metric with the assistance of flag force level to give forecast before course separate [13].

The two directing conventions, for example, tree-based and work based convention gives the assurance and effective conveyance. In light of the presence of just a single connection between two nodes, Tree-based gives low data transfer capacity utilization, high sending productivity. A tree-based multicast routing convention is best reasonable for lightweight specially appointed systems. The QoS and execution is corrupted when the heap of system increments. By mixing the advantages of the tree structure and work structure the impact of network load can be made strides. To enhance the effectiveness and packet conveyance proportion clog control instrument is presented by transmitting the compacted information parcel [14].

A defer vitality mindful directing convention called as receptive blockage mindful multipath steering convention RCRP mean to choose the route in view of vitality decrease rate and packet conveyance time it address two imperative attributes of MANETs: enhancing life time of systems and dodging clog. It consider the packet delivery time and node energy reduction rate to process the delay energy drain rate hopefully regarding current vitality and movement condition [15].

PROPOSED SYSTEM

This algorithm improves information transmission by taking into account congestion control. Congestion happens when the load of the network is more than its ability in a network. That implies the quantity of information packets transmit to the network is bigger than the quantity of packets. Congestion control method is presented which will enhance the packet delivery ratio.

Step 1: Characterize add up to numeral of nodes. The node is introduced as Source Node (SN). Presently SN makes a course by communicating hi text to all its Neighbor Nodes (NN). It likewise gets answer for hello message sent from NN.

Step 2: It rehashes the procedure and registers every single conceivable route from a sender to a target node. It additionally computes the expense of each route.

Step 3: Compression decreases correspondence cost and calculation cost. Lempel-Ziv-Oberhumer (LZO)

Coding Technique is appropriate for without loss of information compression. Therefore utilizing this strategy the information is compressed. The measure of the information packet is decreased. This Compression procedure diminishes the collision which results in complex PDR. The network layer utilizes the component of queue. In the queue, if there are a few packets which as of now exist, at that point the packets holding up time increments as the past packets in the queue ought to be served first. In the event that the congestion happens in the queue, at that point the packet will hold up until the point when the congestion is lessened. This expands the deferral in steering. Some of the time the packets may likewise lost amid congestion. Along these lines, the controlled of congestion leads to decreases the movement as well as expands the execution. Compression proportion is characterized as:

$$C = CDS / UCDS \quad \dots(1)$$

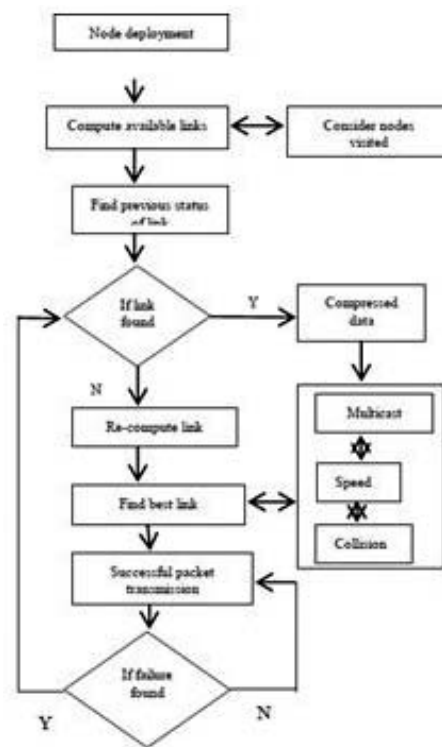


Fig. 1: Proposed System

Fig. 1 explains the flowchart of proposed system. Where CDS is compacted information size and UCDS is uncompressed information estimate. Holding up occasion of the packet which located in queue is ascertained by the transitional node. This may go about as the packet compression criteria. On the off chance that the holding up time is more noteworthy than the ascertained limit, at that point the node will pack the packet as delineated.

$$W > T - (1 - CR) * PS / B \quad \dots(2)$$

Step 4: A link state protocol (OSPF) is utilized to make a database of connections. Every router holds the connection subtle elements in the connection state database. Utilizing this we can check and locate the past status of connection. On the off chance that the past connection exists in the database at that point utilizing that connection the compressed packet is routed.

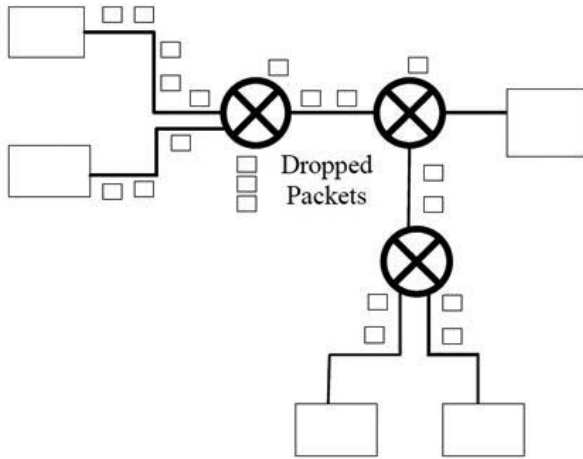


Fig. 2: Network suffering from Collision

Fig 2 explaining the packet dropped and collision effects that caused in the network.

Step 5: Utilizing phase 2, think about every one of the expenses of registered connections. Think about least hops and most limited way to routing. At long last a route with least expense is chosen which a best way is. For the best way determination Dijkstra’s calculation is utilized.

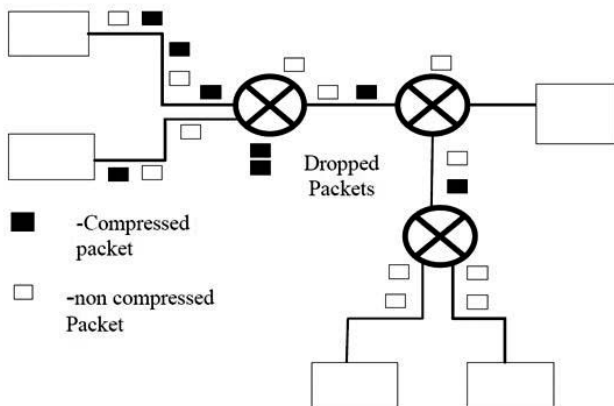


Fig. 3: Network with compressed and non-compressed data flow

Fig 3 explains the data flow of compressed and non-compressed packets. The Non-compressed packet suffers collision and packets are dropped.

Step 6: The host can pick to take part in the multicast gathering. Where W is the holding up packet time, T is the packet compression process time, CR is the compression proportion, PS is packet size and B is the bandwidth.

Step 7: The router in this system sends a multicast packet or, in other words prepared by individuals from the multicast gathering.

Performance Evaluation: The performance of the projected method is examined by the Network simulator. The simulation of the projected method has 50 nodes disposal in the simulation region 600×600. The nodes are communicated with others by the help of communication protocol User Datagram Protocol.

Average Delay: The difference of time among the current packets received and the previous packet received is called Average Delay. It is calculated by the equation 3.

$$\text{Average Delay} = \frac{\sum_0^n \text{Pack Recvd Time} - \text{Pack Sent Time}}{n} \quad \dots(3)$$

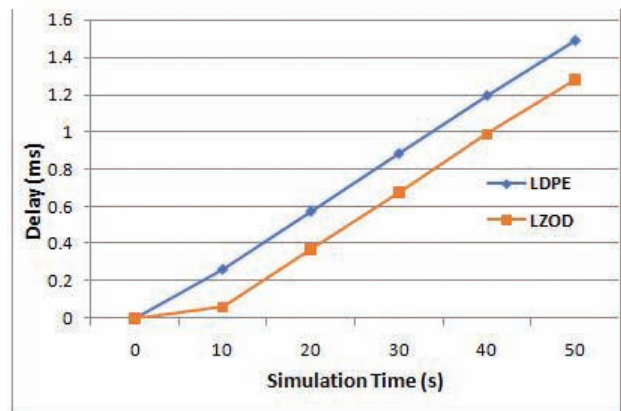


Fig. 4: Average delay of MCD and TMCD

Fig 4 indicates that the range of delay is small for the projected method TMCD than the presented method MCD. The throughput value is larger means that of delay value is smaller in the network. The delay in the network may lead to lose the information. The information must not get lost because of the delay factor, therefore proper sharing is required in this phenomenon during data transmission.

Throughput: The average of victorious messages sends to the base station. The throughput is calculated using equation 4.

$$\text{Throughput} = \frac{\sum_0^n \text{Pkts Received } (n) * \text{Pkt Size}}{1000} \dots(4)$$

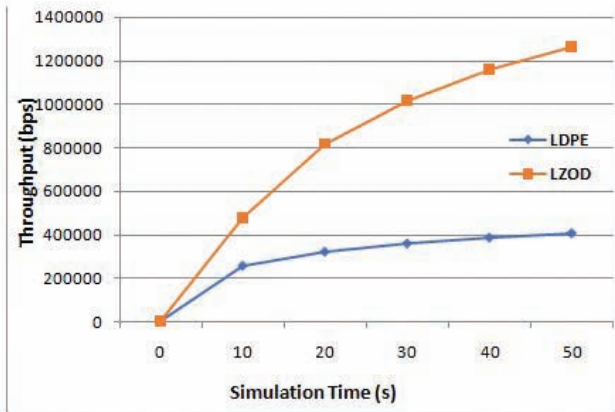


Fig. 5: Throughput of MCD and TMCD

Fig 5 indicates that the projected method TMCD has better throughput when compared to the presented method MCD. Throughput is the important parameter in determining the presentation of the network. If there is improved throughput, system can perform in an efficient manner. The efficiency thus plays a significant part in the communication networks.

Residual Energy: The quantity of remaining energy in a node at the present case of time is called as residual energy. In the network operations the rate of consumed energy is calculated by the residual energy.

Fig 6 indicates that in the network the residual energy is enhanced for the projected method TMCD when compared with the presented method MCD. In TMCD, reduce the node will be dead also As long as there is residual energy, the network would have an enhanced network lifetime in the network.

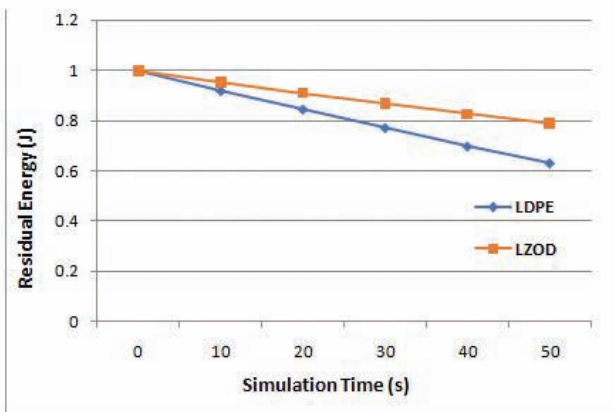


Fig. 6: Residual Energy of MCD and TMCD

CONCLUSION

In MANET, congestion is the main factor that collapses the forwarding packets. The congestion may occur by forwarding excess number of data packets or overflow of packets which has been sent otherwise the delay may be leads to congestion. To overcome this problem, the proposed method takes place at seven stages. By using the Lempel-Ziv-Oberhumer Coding (LZOD) the congestion could be controlled. The simulation result shows that the proposed method performance is 30% higher than the existing method.

Ethical Clearance: St Peter’s Institute of Higher Education and Research

Source of Funding: Self

Conflict of Interest: NA

REFERENCE

1. Sirisala N, Bindu CS. Uncertain rule based fuzzy logic QoS trust model in manets. InAdvanced Computing and Communications (ADCOM), 2015 International Conference on 2015 Sep 18 (pp. 55-60). IEEE.
2. Loganathan J. Enhanced load balancing scheme in MANET by using Co-Operative Game Theory approach. InInnovations in Information, Embedded and Communication Systems (ICIIECS), 2015 International Conference on 2015 Mar 19 (pp. 1-5). IEEE.
3. Chen YH, Wu EH, Chen GH. Bandwidth-satisfied multicast by multiple trees and network coding in lossy manets. IEEE Systems Journal. 2017 Jun;11(2):1116-27.
4. Rath M. Optimized network layer protocol with cross layer handshaking mechanism in MANET. InIntelligent Systems and Control (ISCO), 2016 10th International Conference on 2016 Jan 7 (pp. 1-10). IEEE.
5. Chen YH, Wu EH, Lin CH, Chen GH. Bandwidth-satisfied and coding-aware multicast protocol in MANETs. IEEE Transactions on Mobile Computing. 2018 Aug 1;17(8):1778-90.
6. Hussain SM, Nizamuddin SA, Asuncion R, Ramaiah C, Rehman SU. Least delay path

- estimation routing protocol (LDPERP) with enhanced multimedia transmission through parallel links over heterogeneous MANETS. In *Research and Development (SCOReD)*, 2016 IEEE Student Conference on 2016 Dec 13 (pp. 1-5). IEEE.
7. Serhani A, Naja N, Jamali A. QLAR: A Q-learning based adaptive routing for MANETS. In *Computer Systems and Applications (AICCSA)*, 2016 IEEE/ACS 13th International Conference of 2016 Nov 29 (pp. 1-7). IEEE.
 8. Sharma S, Agarwal R. Optimizing QoS parameters using computational intelligence in MANETS. In *Computing, Communication and Automation (ICCCA)*, 2017 International Conference on 2017 May 5 (pp. 708-715). IEEE.
 9. Sinha SR, Khatri P, Gupta S. QoS on multimedia streaming using compression in MANET. In *Communication Networks (ICCN)*, 2015 International Conference on 2015 Nov 19 (pp. 252-257). IEEE.
 10. Gawas MA, Modi K, Hurkat P, Gudino LJ. QoS based multipath routing in MANET: A cross layer approach. In *Communication and Signal Processing (ICCSP)*, 2017 International Conference on 2017 Apr 6 (pp. 1806-1812). IEEE.
 11. Sinha SR, Khatri P, Gupta S. Improvisation of qos using compression on scalable multimedia manet. In *Computing, Communication and Automation (ICCCA)*, 2016 International Conference on 2016 Apr 29 (pp. 645-650). IEEE.
 12. Tyagi S, Singh AV, Rana QP. A QoS aware variant of AODV with probabilistic broadcast of control packets in MANETS. In *Reliability, Infocom Technologies and Optimization (ICRITO)(Trends and Future Directions)*, 2015 4th International Conference on 2015 Sep 2 (pp. 1-6). IEEE.
 13. Srivastava P, Kumar R. A novel multi metric QoS routing protocol for MANET. In *Advances in Computing, Communications and Informatics (ICACCI)*, 2015 International Conference on 2015 Aug 10 (pp. 1746-1752). IEEE.
 14. Akshay S, Apoorva P. Bandwidth optimized multicast routing algorithm based on hybrid mesh and tree structure with collision control in MANET using lempel-ziv-oberhumer method. In *Communication and Signal Processing (ICCSP)*, 2017 International Conference on 2017 Apr 6 (pp. 0495-0500). IEEE.
 15. Sana AB, Iqbal F, Mohammad AA. Quality of service routing for multipath manets. In *Signal Processing And Communication Engineering Systems (SPACES)*, 2015 International Conference on 2015 Jan 2 (pp. 426-431). IEEE.

The Development of Mypobes-PAF: A Health Education Program with Child-Friendly Approach to Prevent Obesity among Children

A. M., Maziah¹, R., Saemah²

¹Department of Nursing, Faculty of Medicine, Universiti Kebangsaan Malaysia Kuala Lumpur Campus, 56000 Cheras, Malaysia; ²Faculty of Education, Universiti Kebangsaan Malaysia, 43000 Bangi, Malaysia

ABSTRACT

Unhealthy lifestyle, lack of awareness on health behaviors, and lack of documentation on health aspect in the education of 3-6 year-old children are some of the concerning issues that contributed to the increase of childhood obesity cases. Hence a study with developmental research design was conducted to develop a health education program for 3-6 year-old children in preventing childhood obesity. MyPObes-PaF was developed based on the data obtained from i)focus group discussion conducted with 38 children between 4-6 year-old, ii)interview sessions with four experts in physical activities, dieticians, and experts in educational psychology, iii)interview sessions with eight school teachers, and iv)document analyses. The findings of the study indicated that the MyPObes-PaF program with the application of child-friendly approach is a health education program with high content validity, with S-CVI for physical activity module =0.89, S-CVI for diet module =0.90, and I-CVI for the application of child-friendly concept =0.88; ACP=90%. In conclusion, MyPObes-PaF is a health education program that can be implemented to children of 3-6 year-old. This study suggested that kindergartens and pre-school in Malaysia to establish health education programs with the implementation of child-friendly approach as an effort to prevent childhood obesity.

Keywords: Health Education Program, Childhood Obesity, Physical Activity, Diet, Prevent Childhood Obesity.

INTRODUCTION

Cute and cuddly children are liked by many. However, when the children have obese, it becomes a problem that has to be taken seriously^{1,2}. A number of opinions indicated that there is no problem to have chubby and obese child as they might lose their weight while growing up^{2,3}. Such opinion contradicts with studies which showed the pattern of obese children to grow up as obese adults. A study conducted by Junior et al.⁴ discovered that obese children at the age of 1-5 years-old are significantly at high risk to grow up as obese adults. They are also at risk to remain inactive and unwell⁵, as well at the risk of chronic ailments such as psychosocial problems, high blood pressure, and coronary heart disease in their teenage or adult years^{4,6}. Furthermore, when these children start socializing with their peers, they might be teased and ridiculed verbally due to their physical condition. Eventually these children might be impacted psychologically and might be a reason

for them to feel alienated⁷. Such situation illustrates that childhood obesity is an important issue that need to be addressed immediately. This is consistent with the statistics started at the end of 2009 in Malaysia which indicate that obesity is not an exclusive issue to adults only. In fact, 6.6% of children at the age of seven years-old were found obese and the case increased to 13.8% for 10 year-old children⁸. Recent statistics reported that childhood obesity continues to increase at the average of 1% of reported case to hospital every year⁹. Therefore, it is necessary to take a moment to think the reason behind childhood obesity.

The results of literature study indicated that they are various factors contributing to the increase of childhood obesity. One of the factors include unhealthy and imbalanced eating habit such as excessive intake of sweet food and soft drink, low levels of water intake, fruit and vegetable, and constantly skipping breakfast. Such eating habits are found to have positive

relationship with the increase of adiposity tissue in the body which leads toward childhood obesity^{10,11}. Another contributing factor to childhood obesity is the lack of physical activities such as exercise, doing house chores, and playing sports. Studies have shown that 76% of children between 3-6 years-old with obesity problem were having lack of physical activities^{12,13}. Therefore, the children need to be exposed and educated about being healthy and prevent obesity in order for them to grow as healthy adults in the future.

Children with obesity issue will be likely to gain the benefit of joining awareness-raising intervention program and will be more willing to practice active and healthy lifestyle, and to practice balanced and healthy diet in their daily routine. Forming regular health practices in children should be considered as important. This is supported by previous studies which indicated that routine practices of the children will become a habit while they are growing up¹³. WHO² agreed that early education on healthy diet and physical activities is the best step in overcoming childhood obesity. The process of educating the children can be done at home or at school with the collaboration from parents, society, and related authorities to raise awareness about health. Recommendations on education-based awareness program that emphasizes on healthy diet and physical activities are important. However, so far there is no structured health program or module implemented as recommended by WHO². Research conducted on the curriculum for early childhood education in Malaysia discovered that there is a lack of documented information emphasizing on healthy diet and physical activities. Most of the planned programs conducted on the children were focusing on preparing them for their schooling years¹⁴. The most exposure given if any was focused on general health such as dental care, hand washing, and daily diet¹⁵, but there was no specific module or program on health and prevention of obesity.

In that regard, it is deemed necessary to develop a structured health program for 3-6 year-old children and should be focusing on general health with more emphasis on healthy physical activities and diet to prevent obesity. The only question is what type of learning program or module that can impart knowledge and practical skills of health and obesity prevention to the children? A number of previous studies conducted in Hatyai, New York, Chicago, Massachusetts, and California have developed and implemented a number of health programs which

included equal emphasis on diet and physical activity components as well as on general health. Those programs were developed to prevent obesity among children at the age of 1-10 years-old. Findings from studies conducted by Mo-suwan et al¹⁶, Harvey-Berino & Rourke¹⁷, Dennison et al¹⁸, Fitzgibbon et al¹⁹, Gortmaker et al²⁰, and Weiss et al²¹ indicated that education-based health programs have given positive impacts to the children in losing weight and in curbing the increase of their BMI. Those studies discovered that there were significant differences in their health behaviors after participating in the health education programs prepared for them. The researchers were also able to notice and record the increase on health knowledge among the children as they were able to give health related ideas and suggestions to their parents in providing them with healthy diet and encouraging them to be more active physically as compared to their habits and lifestyle before getting involve with the intervention program. Hence, those researchers suggested for the development of health promotion to be imparted to the children as early as 3-6 years-old as one of the efforts to prevent childhood obesity.

Additionally, the process of educating children about health and obesity is a challenge due to the nature of children who love playing and the complexity of imparting awareness on health in their learning process. In fact, children spend their every second awake with playing²². Thus this shows that the children need a fun and exciting learning process so that it will become a meaningful process to master the mind, attract, and motivate the children to practice what they have learned in their daily lives as acquired health behaviors. Omrod²³ agreed by stating that the implementation of psychological approach in children education is one of the approaches towards fun and effective learning process for them to develop the desired behaviors. Studies conducted by Broberg, Kytaa, and Fagerholm²⁴ on the application of psychology and the implementation of child-friendly approach in childhood education discovered that majority of the children (80%) were able to be in control to what they were learning and to master the content without being forced and showed enthusiast to share the knowledge with others such as telling their parents on the lesson that they had in the classroom or to scold their siblings for littering.

Referring to related issues and literary research on past studies have sparked an idea to the current researchers to develop a health education program

for children at the age of 3-6 years-old with fun and interesting teaching and learning approach that can attract them to learn and to prevent obesity. Therefore this paper is going to discuss further on the development of the health education program which consisted of modules for physical activity and diet. In this study, the researchers intended to develop a child-friendly health education program that is interesting and meaningful for the children and in the same time effective to impart knowledge and practical skills on the prevention of obesity through health behavior practices.

METHODOLOGY

This study was conducted by using developmental research design²⁵ with the purpose to develop a health education program for 3-6 year-old children in preventing obesity. This study adopted concurrent triangulation method²⁶ where the researchers used qualitative and quantitative approaches simultaneously to ensure the content validity of the developed program. The dependent variable for this study was the childhood obesity prevention among 3-6 year-old children, and the independent variables were dietary module, physical activity module, and child-friendly approach which were measurable through interview analysis conducted with 4-6 year-old children, dieticians, experts on physical activity and educational psychology, and teachers as well as document analysis.

Sample: The samples for this study were consisted of 4-6 year-old children, dieticians, experts on physical activity, experts on educational psychology, and kindergarten teachers. A total of 38 children with parental consent, 4 dieticians, 4 physical activity experts, 4 educational psychology experts, and 8 kindergarten teachers were involved in this study. They were chosen through purposive sampling and were interviewed according to the interview protocol in order to collect data for this study.

Data Collection: Data collection methods used in this study consisted of i) focus group discussion with the 4-6 year-old children, ii) interviews with the experts, iii) interviews with kindergarten teachers, and iv) document analysis. Interview protocol was developed and implemented in order to obtain the needed information²⁷ and it started with introduction and followed by transition questions, key questions, and closing/reflection^{28,29}. Data were collected by note taking and video recording. The data collection sessions were done until each protocol question reached saturation level²⁹.

Instrument: The instrument used in this study was interview protocol. The protocol was based on the findings of document analysis. Five protocols were prepared to cater each group of sample which included i) focus group discussion with 4-6 year old children, ii) interview sessions with experts in physical activities, iii) interview sessions with dieticians, iv) interview sessions with experts in educational psychology, and v) interview sessions with kindergarten teachers. This instrument was used to develop content validity for the dietary and physical activity modules for the obesity prevention program for children at the age between 3 to 6 years old. The interview sessions were conducted according to the protocol developed which consisted of 10 questions: 3 introductory questions, 1 transition question, 3 key questions, 2 reflection questions, and 1 closing question. Internal validity and reliability of the instrument were statistically proven to be satisfactory based on the high value of Cronbach's alpha between 0.83 and 0.89. Collected data were used to develop the content for dietary and physical activity modules of the health educational program with the inclusion of child-friendly approach and were analyzed to determine the strength of the program.

RESULTS

This study was conducted with the objective to develop a program to prevent childhood obesity for children between the ages of 3-6 years-old. The program was developed based on the information gathered through interview sessions conducted on the experts, teachers and children within the targeted age range in order to ensure the efficacy of the program in imparting the knowledge and practical skills on health through the modules.

Program Module Development: The study was initiated with data collection process in order to develop the modules for childhood obesity prevention program. Collected data were analyzed inductively and were coded descriptively by using ATLAS.ti version 7 in order to process the needed information to develop the content for the program. The contents were then framed and arranged thematically and discussed based on the objective of the childhood obesity prevention program. Data collected through interview sessions conducted on dietary experts, physical activity experts, and educational psychology experts provided the needed information to develop modules related to physical activity and diet with

the inclusion of child-friendly approach. Hence a program known as MyPObes-PaF was developed. The content planning of each module is as described as below.

(1) Content on physical activity module in childhood prevention program for children between 3 to 6 years old

Physical activity module content

1. Objective: By the end of physical activity module implementation, the children should be able to:

- do physical activity as thought as daily their daily routine
- remain BMI at the 85th percentile with low body fat level
- accept and respond in the physical activity module developed

2. Focus of the module: It consisted of the following aspects:

- Knowledge
- Activities

3. Features of knowledge aspect: Health knowledge on physical activity is to be delivered to the children through indoor and outdoor classroom activities aided with notes included with child-friendly approach such as:

- the use of language suitable for the children
- the use of cartoon illustration
- the use of animation
- colorful and cheerful notes
- the insertion of music or nursery rhymes

4. Features of activity aspect: The activities prepared and conducted with child-friendly approach with the following features:

- Casual and playful activities
- Able to assist in child growth and development
- Cater for physical and emotional health of the children
- Enable the children to be choose the activity to be conducted in order to fulfill their emotional, needs and nature

5. Teaching and learning notes: Inclusion of child-friendly approach in the preparation of notes with the following topics:

- Physical activity
- Types of physical activity
- Physical activity pyramid
- Ways to exercise
- Exercise recommendation (Part 1)
- Exercise recommendation (Part 2)
- Exercise recommendation (Part 3)
- Exercise recommendation (Part 4)

** parents' involvement required in childhood obesity program

** parents to receive same notes as used in school for the program

6. Activity planning: Activities to be planned in physical activity module with the inclusion of child-friendly approach:

a. Stretching exercise

- Light exercise for warming up
- Duration: 5-10 minutes

b. Aerobic (alternate with games)

- Aerobic with animated video
- Aerobic by using 'SenamSeni Malaysia' video
- Aerobic by using '1 Murid 1 Sukan' video
- Duration: 30-40 minutes

c. Games (alternate with aerobic)

- Group games
- Example: ball game, hurdled race, jump rope, exploration/treasure hunt, poison ball, musical chair, inventive games, arranging straws, poison box, Lego or bowling
- Traditional games: chicken and fox, cat and mice, *enjit-enjitsemut*, *pukulberapa Datuk Harimau*
- Duration: 30-40 minutes

d. Total duration needed: 1 hour per day or session

e. Frequency

- 3 days a week
- Every Tuesday, Wednesday and Thursday

7. Schedule: The program to be conducted as follows:

- a. Stretching – warming up (2 minutes)
- b. Aerobic/games (30-40 minutes)
- c. Stretching – warming down (2 minutes)
- d. Short break and water drinking (5 minutes)
- e. Teaching session related to module and quiz (5-10 minutes)
- f. Homework (weekend)

8. Affirmation method: Affirmation methods need to be applied throughout the session which include:

- praising and giving reward/award
- performance of the students to be recorded in their star chart
- smile and cheer from the instructors

9. Parental involvement: Purpose of parental involvement in the program:

- to report physical activity conducted by the children at home
- to help in maintaining positive changes of the children to continuously be motivated to practice the lesson that they have learned at home
- to assist in the daily learning and practice of the children as they are still young to make decision and fully depending on the activities of the parents at home
- to practice the same affirmative technique used such as praising and giving reward/award or the use of star chart to ensure that they will be continuously motivated even at home

(2) Content on dietary module in childhood prevention program for children between 3 to 6 year-old

Content on dietary module

1. Objectives: By the end of the implementation of dietary module, the children should be able to:

- consume healthy and balanced diet in their daily meal
- maintain BMI at 85th percentile with low body fat level

- accept and respond in the dietary module
- follow healthy and balanced eating habit

2. Focus of the module: Dietary module consisted of the following aspects:

- Knowledge
- Activities

3. Features for knowledge: Health knowledge on physical activity is to be delivered to the children through indoor and outdoor classroom activities aided with notes included with child-friendly approach such as:

- the use of language suitable for the children
- the use of cartoon illustration
- the use of animation
- colorful and cheerful notes
- the insertion of music or nursery rhymes
- the use of appropriate videos
- narrative learning sessions

4. Features for activities: The activities prepared and conducted with child-friendly approach with the following features::

- Casual and playful activities
- Able to assist in child growth and development
- Cater for physical and emotional health of the children
- Enable the children to be choose the activity to be conducted in order to fulfill their emotional, needs and nature
- Healthy and balanced food preparation activity for the children (kindergarten menu)
- Food preparing by using healthy food and methods (as taught by teachers and cooks)

5. Teaching and learning notes: Inclusion of child-friendly approach in the preparation of notes with the following topics:

- Healthy
- Food pyramid
- Animation video related to healthy and balanced diet

- Healthy and balanced diet for children
- Your plate
- Rice and cereal
- Fruits and vegetables
- Cartoon video on healthy and balanced diet
- Oil and fat
- Snack
- Spinach and broccoli
- Eating healthily

** parents' involvement required in childhood obesity program

** parents to receive same notes as used in school for the program

6. Activity planning: Activities to be planned in physical activity module with the inclusion of child-friendly approach:

a. Stretching exercise

- Light exercise for warming up
- Duration: 5-10 minutes

b. Aerobic (alternate with games)

- Aerobic with animated video
- Aerobic by using 'SenamSeni Malaysia' video
- Aerobic by using '1 Murid 1 Sukan' video
- Duration: 30-40 minutes

c. Games (alternate with aerobic)

- Group games

Example: matching game (food and pyramid level), rearranging food in the pyramid, matching food to its category, food related games, treasure hunt/exploration on diet, poison food, musical chair, poison box or food related puzzle

- Duration: 30-40 minutes

d. Total duration needed: 1 hour per day or session

e. Frequency

- 3 days a week
- Every Tuesday, Wednesday and Thursday

7. Schedule: The program to be conducted as follows:

- a. Stretching – warming up (2 minutes)
- b. Aerobic/games (30-40 minutes)
- c. Stretching – warming down (2 minutes)
- d. Short break and water drinking (5 minutes)
- e. Teaching session related to module and quiz (5-10 minutes)
- f. Homework (weekend)

8. Affirmation method: Affirmation methods need to be applied throughout the session which include:

- praising and giving reward/award
- performance of the students to be recorded in their star chart
- smile and cheer from the instructors

9. Parental involvement: Purpose of parental involvement in the program:

- to report eating habit of the children at home
- to help in maintaining positive changes of the children to continuously be motivated to practice eating healthily at home
- to assist in the daily learning and practice of the children as they are still young to make decision and fully depending on the diet routine prepared by parents

Validity of the modules developed: Content validity analysis was conducted in order to ensure that the content of dietary and physical activity modules developed in this study is adequate for all measurable variables. Table 1 presents the computation on the content validity index for the scale of 9 main items in physical activity module. Referring to Table 1, the result for inter-rater test analysis indicated high content validity for physical activity module in MyPObes-PaF program with S-CVI = 0.89. This value indicated that the content reliability of the program was high thus indicating that the module can be accepted for implementation. The result of this analysis supported the researchers' hypothesis that health education program for children should emphasize on healthy and active physical activities in order to provide optimum impact on preventing childhood obesity.

Table 1: Computation of content validity index for the scale of 9 main items in physical activity module

Second expert rater	First expert rater		Total
	'Item' Scale 1 & 2	'Item' Scale 3 & 4	
'Item' scale 1 & 2	1	0	1
'Item' scale 3 & 4	0	8	8
Total	1	8	9
S-CVI = 8/9 = 0.89			

Table 2 presents the computation of content validity index for the scale of 10 main items in dietary module. Referring to Table 2, the result of inter-rater test analysis indicated high content validity for dietary module in MyPObes-PaF program with S-CVI = 0.90 thus indicating that the module can be accepted for the implementation in the program. The result of this analysis supported the hypothesis that health program for children should emphasize on healthy and balanced diet in order to provide optimum impact in preventing childhood obesity.

Table 2: Computation of content validity index for the scale of 10 main items in dietary module

Second expert rater	First expert rater		Total
	'Item' Scale 1 & 2	'Item' Scale 3 & 4	
'Item' scale 1 & 2	1	0	1
'Item' scale 3 & 4	0	9	9
Total	1	9	10
S-CVI = 9/10 = 0.90			

Table 3 presents the expert rate on 4-scale items: item at scale 3 or 4 at 4 relevance score scale. Referring to Table 3, the result of inter-rater test analysis indicated high validity for the features of child-friendly approach application in MyPObes-PaF with I-CVI = 0.88; ACP = 90% thus indicating high reliability of the program. This signified that the child-friendly features were acceptable to be implemented in the program. The result of this analysis supported the hypothesis which stated that health program for children should emphasize on child-friendly teaching and learning approach in order to provide optimum meaningful learning experience in promoting health and preventing childhood obesity.

Table 3: Expert rate on 4-scale items: item on scale 3 or 4 in 4 relevance score scale

Item	Expert 1	Expert 2	No. of agreement	CVI
1	X	-	1	0.5
2	X	X	2	1.0
3	X	X	2	1.0
4	X	X	2	1.0
Mean expert proportion	1.0	0.8	**Mean I-CVI = Relevant proportion **ACP =	0.875 0.875 90%

** I-CVI = item-level content validity index

** ACP = average congruency percentage

The researchers also conducted internal consistency test for the content of MyPObes-PaF program. Table 4 presents the statistical explanation on the internal consistency of the program. The result for the test indicated that the Cronbach's Alpha value for the internal consistency of the program at 0.87. Thus it indicated that the content of MyPObes-PaF program has high internal consistency and reliability and the content were fit to be implemented in childhood obesity prevention program for children 3-6 years old.

Table 4: Internal consistency statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.865	.900	102

The results of inter-rater test and internal consistency of the modules indicated that the development of health education program in preventing childhood obesity developed through this study was a good model for such program with acceptable quality, strength and content adequacy to be implemented to 3-6 year old children. Therefore MyPObes-PaF program fits to be a model to prevent childhood obesity. Generally, the inter-rater and reliability analyses conducted have statistically proven that the views provided by the experts in physical activity, diet, and educational psychology were valid to be developed as physical activity and dietary modules to be implemented with child-friendly approach for the program.

DISCUSSION

This study indicated that MyPObes-PaF program is a program with quality, strength, and content adequacy to be accepted and implemented to 3-6 year-old children. The development of MyPObes-PaF program contributed to the development of two main modules which were physical activity and dietary module through child-friendly delivery. MyPObes-PaF was the main focus of this study even though there were other health programs for children developed in previous studies. The findings of this study indicated that child-friendly childhood obesity prevention program is highly needed as an effort to prevent childhood obesity. These findings were supported by WHO² which stated that early education on diet and physical activity is a good step in preventing childhood obesity. Such health program may assist in producing active, healthy, smart and disease-free children for the future. Additionally, early exposure on health may provide the children with knowledge and practical skills in practicing healthy behaviors such as exercising, eating healthily or to be actively involved in physical activity as part as their daily routine. Studies have shown that routine practice of children's behaviors will become habits when they have grown up¹³. Therefore, early exposure on health and obesity should start in childhood education.

The current researchers discovered that dietary and physical activity modules were the main modules to be included in childhood obesity prevention program.

This is because the main cause of childhood obesity is due to the eating habits and physical activity of the children. Diet and physical activities are some of the needs of the children that need to be fulfilled. Obesity prevention program should be exposed to the children as early as possible in order to reduce the ever increasing statistics of obesity. Therefore, the best way to deal with such issue is to consider the factors contributing towards obesity and to develop a module on dealing with them to prevent obesity. This is essential since the fact stated that children with obesity issue will remain obese when they grow up^{13,30}. In addition, these children are also exposed and have higher risk for chronic illnesses e.g psychosocial problems, high blood pressure, and coronary heart diseases during adolescence and adult years^{6,13}. Based on such phenomena, MyPObes-PaF program which consisted of modules for physical activity and dietary was developed as an effort to prevent childhood obesity as well as to produce healthy and fit generation for the future.

The findings of the study also indicated that child-friendly approach was the best approach that could be implemented in delivering the content of the program. This was agreed by six content experts of MyPObes-PaF. In reality, the nature of children and childhood need to be understood as children live in their own living environment which is easily influenced and reacted to their wants and desires³¹. Therefore, the effort to control the mind of the children through child-friendly approach is seemed as desirable with the purpose for the children to develop and practice health behaviors as expected without being forced by anyone, to be happy with healthy living environment, and to be more motivated to practice health. Educational psychology theory was applied in the development of the program by including educating psychological approaches in the teaching-learning process of the childhood obesity prevention program. The implementation of child-friendly approach was viewed as necessary because it emphasized on cognitive and behavioral approaches psychologically to create meaningful learning experience for the children³². The findings of this study were in line with the study conducted by Broberg, Kytaa, and Fagerholm²⁴ which indicated that the implementation of child-friendly approach enabled majority (80%) of the respondents to learn and acquire the knowledge taught without being forced.

Furthermore, this study discovered that MyPObes-PaF program was a quality program with high content

validity: S-CVI for physical activity component = 0.89, S-CVI for dietary component = 0.90, I-CVI for child-friendly concept = 0.99, ACP = 90% and Cronbach's Alpha for content = 0.87. The results from the analyses conducted concluded that MyPObes-PaF program had high content validity and reliability thus statistically proven that it could be used in order to provide the desired implication to the health level of the children. This finding signified that the development of MyPObes-PaF program was consistent with other health programs which were implemented in Hatyai, New York, Chicago, Massachusetts, and California. Health programs as proposed in the past researchers have proven that they were able to contribute towards the prevention of childhood obesity for children between 1-10 years-old. Thus, the development of MyPObes-PaF with its own strength was hoped to help producing healthy and obese-free children. Additionally, MyPObes-PaF program was similar to the health program developed by past researchers^{18,21}.

All health programs from the past studies contained dietary and physical activity modules as the main modules of the program. Although MyPObes-PaF program had several similarities in the content of the program as other health programs, yet it has its own strength. The content of MyPObes-PaF program and the teaching-learning approach were designed to be child-friendly. This program focuses more on the living environment of the children in order to encourage health behaviors and healthy lifestyle to them without feeling forced to do so. The features of this approach were expected to assist the learning process of the children in mastering the knowledge and practical skills on health and obesity which were stated as challenging due to their nature in preferring to play rather than to sit and listen to such complex topics. Therefore, the implementation of child-friendly approach would assist in mastering the mind, attracting the interest, and motivate the children to learn and practice health²³ in their daily lives after the completion of MyPObes-PaF program.

CONCLUSION

The findings of this study clearly indicated that the development of MyPObes-PaF possessed its own quality and strength that could possibly contribute towards the acquisition of knowledge and practical skills of health behaviors among children and to lead them to be healthy and obese-free. The strength of MyPObes-PaF program

includes the combination of physical activity and dietary modules with child-friendly approach in mastering the mind, motivating, and instilling awareness and meaningful learning experience to the children. Health education program with child-friendly approach such as MyPObes-PaF is a very important program that needs to be emphasized besides the emphasis of other academic learning and to be exposed to children as an effort to prevent childhood obesity. Thus this study proposed for such program to be implemented specifically in kindergarten to enable the children at the age of 1-10 years-old to experience meaningful learning as well as to increase their knowledge on health and healthy behaviors in preventing childhood obesity.

ACKNOWLEDGEMENT

The writers acknowledge the ethical committee of UKM Medical Center and Geran Galakan Penyelidik Muda with approval code GGPM-2016-083.

Ethical Clearance: Taken from the committee

Source of Funding: NIL

Conflict of Interest: NIL

REFERENCES

1. Health Bulletin. Dinner culture is cause of obesity [Online]. 2012; March 5. Available: <http://jknpenang.moh.gov.my/modules/news/article.php?storyid=85>.
2. WHO. Global strategy on diet, physical activity and health: Why does childhood overweight and obesity matter? [Online]. 2013; November 10. Available: http://www.who.int/dietphysicalactivity/childhood_consequences/en/.
3. M. Lian. Obesity problems [Online]. 2010; May 18. Available: <http://dwnmasyarakat.mok.my/?p=635>.
4. N.N. Junior, J.A.A. Bianchini, D.F.D. Silva, Z.M. Ferraro, C.A. Lopera, & V.D.S. Antonini, "Building a response criterion for pediatric multidisciplinary obesity intervention success based on combined benefits", *European Journal of Pediatrik*, Doi: 10.1007/s00431-018-3115-0. 2018.
5. M. Ismail Noor, *Obesity in Malaysia*. Kuala Lumpur: Malaysian Obesity Study Association. 2010.

6. I. Zulkifli, Concerns about preschool children who are obesity. Kuala Lumpur: Malaysian Pediatric Association. 2011.
7. J.B. Schwimmer, T.M. Burwinkle, & J.W. Varni, "Health-related quality of life of severely obese children and adolescents", *JAMA*. 2003; 289: 13–19.
8. Malaysian Health Promotion Board. Obesity statistics in Malaysia [Utusan Malaysia Online]. 2011; June 16.
9. C.L. Fazurawati. Obesity problems in Malaysia [Harian Metro Online]. 2012; June.
10. American Dietetic Association. Childhood overweight evidence analysis project [Online]. 2006; August 15. Available: www.adaevidencelibrary.com/topic.cfm?cat_1046.
11. E.A. Lilo, M. Munoz, & T.H. Cruz. Perceptions of healthy eating among Hispanic parent-child dyads. *Health Promotion Practice*. Doi: 10.1177/1524839918761866. 2018.
12. E. M. Taveras, T. J. Sandora, M-C.S. Shih, D. Ross-Degnan, D. A. Goldmann, M. W. Gillman. The association of television and video viewing with fast food intake by preschool-age children. *Obesity*. 2006; 14(11): 2034 – 2041.
13. J. Kao, G. Woodward-Lopez, E. S. Kuo, P. James, C.M. Becker, K. Lenhart, K. Boyle, D. Williamson, & S. Rauzon. Improvements in physical activity opportunities: results from a community-based family child care intervention. *American Journal of Preventive Medicine*. 2018; 54(5S2): S178 – S185.
14. S. Zaidon, A literature review survey of the use of preschool children's portfolio. Kuala Lumpur: Department of Language, College of Islamic Education. 2004.
15. Malaysian Kindergarten Association Preschool Curriculum Standard Documents [Online]. 2011; July 28. Available: http://www.ptm.org.my/about_preschool.html.
16. L. Mo-suwan, S. Pongprapai, C. Junjana, & A. Puetpaiboon. Effects of a controlled trial of a school-based exercise program on the obesity indexes of preschool children. *Am. J. Clin. Nutr.* 1998; 68: 1006 – 1011.
17. J. Harvey-Berino, & J. Rourke. Obesity prevention in preschool Native-American children: a pilot study using home visiting. *Obesity Research*. 2003; 11: 606 – 611.
18. B. A. Dennison, T.J. Russo, P. A. Burdick, & P. L. Jenkins. An intervention to reduce television viewing by preschool children. *Arch. Pediatr. Adolesc. Med.* 2004; 158: 170 – 176.
19. M. L. Fitzgibbon, M. R. Stolley, L. Schiffer, L.V. Horn, K. KauferChristoffel. Two year follow-up results for Hip-Hop to Health Jr.: a randomized controlled trial for overweight prevention in preschool minority children. *The Journal of Pediatrics*. 2005; 146: 618 – 625.
20. S. L. Gortmaker, K. Peterson, J. Wiecha, A. M. Sobol, S. Dixit, M. K. Fox, N. Laird. Reducing obesity via a school-based interdisciplinary intervention among youth. *Arch Pediatr. Adolesc. Med.* 2009; 153: 409 – 418.
21. J. Weiss, M. Mouttapa, L. Nacpil, D. Rubin, A. Gedissman. Addressing obesity among Latino youth in a pediatrician's office: preliminary findings of an obesity prevention program. *Journal of Behavioral Health*. 2012; 1: 86 – 92.
22. S. N. Puteh, & A. Ali. Teachers' perceptions of the use of play-based curricula for aspects of language development & literacy of preschoolers. *Jurnal Pendidikan Bahasa Melayu*. 2012; Vol. 2, No. 1: 141 – 159.
23. J. E. Ormrod, *Educational Psychology: Developing Learners*. (8th ed.). Pennsylvania: Pearson Education. 2014.
24. A. Broberg, M. Kyttä, & N. Fagerholm. Child-friendly urban structures: buller by revisited. *Journal of Environmental Psychology*. 2013; 35(2013): 110 – 120.
25. K. Nisa. Instructional design based on ADDIE model: Research analysis in Emporia State University Korea Selatan & Universiti Teknologi Malaysia [Online]. 2011; June 6. Available: http://geoandyou.com/kajian_model_addie.pdf.
26. J. Creswell, *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. (4th ed.). Upper Saddle River, NJ: Pearson Education. 2012.

27. M. Wiersma. Making conscious choices in doing research on workplace spirituality utilizing the holistic development model to articulate values, assumptions and dogmas of the knower. *Journal of Organizational Change Management*. 2012;16: 406 – 425.
28. R.K. Yin, *Case study research: Design and methods* (3rd ed.). California: Sage Publications, Inc. 2002.
29. A.S. Fischler, *Mixed methods*. Southeastern University: NOVA. 2013.
30. S.S. Chee, M.N. Ismail, K.K. Ng. Food intake assessment of adults in rural and urban areas from four selected regions in Malaysia. *Mal. J. Nutr.* 2008; 3: 91 – 102.
31. U. Bronfenbrenner. Ecological models of human development. *International Encyclopedia of Education*. 1994; 3: 1643 – 1647.
32. J.W. Santrock, *Educational psychology* (5thed.). University of Texas, New York: McGraw-Hill International Edition. 2011.

The Use of Plants in Traditional Medicine among the Siamese Community in Kedah

Salmah Omar¹, Rafidah Mohamad Cusairi¹

¹*School of Language, Civilisation and Philosophy, Universiti Utara Malaysia, Sintok, Kedah, Malaysia*

ABSTRACT

Both traditional and modern medicine share the same objective, which is to cure diseases and illnesses through its own way and concept. Similar to other traditional societies, the Siamese community also depends on traditional medicine to overcome health-related problems. The penetration of the modern medicinal elements into the Siamese community, however, does not diminish their knowledge and belief of the traditional medicine system completely. This is partly because traditional medicinal practices are still in much demand and the Siamese people believe that such practices are able to cure and treat diseases that could not be treated through modern medicine and treatment. This article seeks to provide insights into the use of plants in traditional medicine among the Siamese community in the state of Kedah. Discussion will focus on the types of plants used, the treatment methods employed, and the types of diseases treated through the use of traditional medicine by the studied community. Information for this research was obtained through field work, chiefly in the forms of interviews and participant observation, and archive research. In most cases, the plant-based medicine used by the Siamese community has two main functions. Firstly, to cure diseases and secondly, to defend self from being infected/affected by diseases. The research shows that the beliefs, customs, values, knowledge, experiences, and skills inherited from their ancestors have led the Siamese community to the practices of using plants in their traditional medicine until today. The Siamese community's values, beliefs and heritage, where traditional medicine is concerned, are viewed as relevant and enduring irrespective of today's modern lifestyle. The Siamese community medicinal practice is a national cultural heritage that continues to be of great value to the Siamese community.

Keywords: *Culture, traditional medicine, plants, Siamese community*

INTRODUCTION

Traditional medicine is defined as practices, approaches, knowledge and beliefs about health that involves the use of plants, animals, and medicines that are based on minerals, spiritual therapy, manual techniques, as well as exercise that are either specifically applied or combined to treat, diagnose or prevent diseases and maintain any individual's health (Norhalim⁸).

The Siamese community's traditional medicine practice is divided into two types, which are the use of plants such as plant roots and leaves as well as remedies that involve spells and black magic. The plants are commonly used to cure physical diseases such as fever and others. Spells and black magic are used to cure *santau* (Malay supernatural act of curse and poisoning), Malay voodoo and epilepsy. However, the use of spells and black magic depends on the intention of the person

who utilises them. If the intention is good, the outcome would be good, and vice versa (Salmah¹²).

In general, the traditional medicine practiced by the medicine man (bomoh) could be categorised into three basic elements, namely, the material used, what is being done, and what is uttered. The first element refers to the use of plants or tool; the second refers to the rites, and the third element is spells or incantations (Rosnah¹¹).

LITERATURE REVIEW

The arrival and influx of the Siamese people to the Malay Peninsula in the 19th century is not a recent event as the Siamese have begun to reside in Kedah earlier on. It is not known exactly when the Siamese first came to this country. An oral history source confirms that the migration of the Siamese begun as early as 1456. At that time, Kedah served as one of the sub-headquarters, for at

least 15 years long, that collected and distributed food for the Siamese armed force in the Malay Peninsula. Some of the army members remained in Kedah even after the war has ended to work as farmers. It is possible that some of them might have left their descendants through their marriage with local women, which led to the formation of the Siamese minority until present day (Ee Lin⁴).

One of the prominent traits of the Siamese community settlements in Kedah, specifically, and in the Malay Peninsula, generally, is that this community's settlement usually centres at one specific area and region (localised). Almost 95% of them reside at four northern states of Malaysia (Kedah, Perlis, Kelantan, dan Terengganu). A small number of the settlements could be found in Perak and Selangor. What is more unique is that in these four known states, the community is commonly found in areas that are close to the borders or on the Thai borders itself (Asiah Othman³).

Most of the Siamese village settlements in Kedah are in the inland areas, such as Changlun (Kubang Pasu district), Pokok Sena (Padang Terap district), Padang Pusing (Kota Star district), district of Baling and Sik (Abu Hassan, 1976).

The Siamese settlement in Kedah is identifiable through the presence of their Buddhist temples, known as *wat* in Thai language, in their villages. There are some 49 *wat* in Kedah. The *wat* functions as a centre for the Siamese community to conduct social activities, including religious and cultural activities (Meri, 2015).

Politically, the Siamese community is viewed as holding the Bumiputra status. The Bumiputra includes the Malays, the natives of Sabah and Sarawak, the Portuguese community in Malacca and the indigenous people of the Malay Peninsula. The Siamese community has been acknowledged by the Malaysian leaders as the citizens of this country and the Siamese community has been awarded Malaysian citizenship. The Siamese community in Kedah covers some 23, 274 people from the total population of the Siamese community in Malaysia (Laporan Tahunan Jabatan Perangkaan⁶).

The rights and interests of the Siamese people are inserted and documented in the constitutions of Kedah, Perlis, Kelantan, Perak and Terengganu. All these laws employ the term '*Siam*' in documenting the rights and privileges of the Siamese in the state constitutions. *Undang-Undang Tubuh Negeri Perak* also uses the word '*Siam*' where the code provides that the state has

to appoint a chief of a village from amongst the local Siamese community to represent the Siamese community in the area of Pengkalan Hulu (who in turn, represents the Perak Siamese community). In fact, in Kedah and Perlis, there is a document known as *Sijil Pertanian Siam* (Siamese Agricultural Certificate) that is issued out by the state government as a condition to allow the Siamese community in both states to put in application for lands that are gazetted as *Malay Reserved Lands*.

There are two groups of Thai-speaking communities in Kedah. The first is known as the Sam Sam community, while the second is the Buddhist Siamese society (Keiko Kuroda⁵). The Sam Sams were purposely brought into Kedah during the war (Archaimbault²). The Sam Sams are believed to be descendants of the Malay captives who were taken to Thailand during the wars between Kedah and Thailand in the 14th century. The descendants of these Malay captives were taken back to Kedah in the 19th century during the war between Kedah and Thailand in the 19th century. The Sam Sams are mainly Muslim Siamese Malays and regarded as one of the sub-Malay ethnic groups in the 1911 statistics. The Siamese Malay populations only made up of 5 per cent of the entire population at that time. They were called the Sam Sams as they are believed to be of a mixed race of Malay or Chinese blood and Thai. Currently, the Sam Sam community could be found in the areas of Kubang Pasu, Padang Terap, Baling and Kroh (Asiah Othman³).

The Siamese community members still hold strongly to the animistic beliefs, specifically beliefs in the supernatural world and of ghosts that intervene their daily lives. Hence, the medicine man plays central roles in their lives. Animism and Buddhism are blended and practiced together by this community. They believe in the supernatural, demons, ghosts, spirits, ghouls, and hobgoblin. Apart from this, they also observe the etiquette (dos and don'ts) that they inherited from their forefathers. The do's and don'ts were established to teach the community members to practice good values in their lives. They believe that good values are reflected through their actions, specifically by restraining self from doing things that could harm or affect other people's peaceful life. These established ways that are observed by the Siamese community are also one of the means to disperse advice and teachings indirectly so as to avoid offending others. Nevertheless, most of the established ways are perceived traditional inherited beliefs that are irrelevant and illogical these days.

METHOD

The data for this study were obtained through field work conducted in Kedah, mainly via interviews and participant observation (Adlina¹). Interviews were carried out, mostly in the forms of in-depth interviews and focus group interviews (Normadiah⁹). These types of interviews involve many informants to ensure that a phenomenon studied becomes more representative or represents specific society. The interviews were open and unstructured. Several medicine men and midwives (*bidan kampung*) were interviewed to obtain information pertaining to the use of plants in traditional medicine. The information acquired includes how they sought knowledge about the use of the plants, types of plants used, how and when the plants are used, the uses of the plants as well as the effects of the plants to the informants. Participant observation was employed when the researchers went along with the informants to collect plants and observed how the plants were used.

The data obtained were then analysed using the emic and etic perspectives. Emic and etic perspectives refer to the analysis of the agent’s/actor’s perceptions and behaviour in a cultural phenomenon (Harris, 1984). Emic perspective, on one hand, allows observations of an event to be analysed from the studied community’s perspective. Etic perspective, on the other hand, refers to the researcher’s ability to identify the forms, relationship and meaning of an event based on the researcher’s perspective (Nanda & Warms⁷).

Plants and its Uses in Siamese Traditional Medicine: The Siamese community has used various types of plants, since time immemorial, to cure all kinds of diseases, such as hypertension, diabetes, eye problems, black magic,

accidental wounds, fever and stomach ache. Usually, plant-based medicinal knowledge is a public knowledge that is disseminated to all society members. Each household, normally, has a family member, who is in the know of the use and properties of the plants as medicine.

There is a rational behind every single use of plants in medicine. The plants are bitter taste, hot (producing a burning sensation to the tongue), and have the cold and warm elements. Plants that are hot are used to remove fat, while bitter taste plants are usually used to cure wounds. The function of warm plants is usually to increase the heat of diseases considered cold, while cold plants are expected to bring down the temperature of warm diseases. Crab claw herb (*daun ketumpangan air*), for instance is crushed and apply on the forehead of individuals suffering from headaches. This herb is considered cold and cold plants could bring down high temperature.

The parts of the plants commonly used for various remedies are the leaves, stems/stalks, shoots, roots, twigs, fruits, flowers, tree barks and latex. The use of these parts of the plants depends on the types of diseases and types of plants. There are many ways on how the Siamese community uses these plants. The remedies could either be applied, smeared, used as drops, compressed, spit on, or massaged on the affected areas. They are also used in bath and made into amulets or demonifuge. The remedies are applied, rubbed on, smeared, or compressed for external use to dry and reduce the wounds, kill the germs and get rid of gas that might have blocked muscles or veins.

Broadly, the use of medicinal plants among the Siamese community serves two purposes, which are to cure diseases and defend self from being infected/affected by diseases.

Table 1: Various plants and their health benefits

Name of plants/herbs	Part(s) of plants used (twigs, leaves, roots, and others)	How remedies are prepared and used	Purpose	Effects/abstinence ritual
Batawali (Batang Wali/Akar Seruntun) (Siamese language: Khetmun; Thai language: Boraphet) Scientific name: <i>Tinospora tuberculata</i>	Stems	Thinly slice the stem of batawali. Leave it to dry. Boil 2-3 slices of dried batawali in water. Strain the liquid and drink. Thinly slice the stem of batawali, blend and squeeze the liquid. Drink.	Good for health, is used to treat diabetes and hypertension, to treat scalp (dry and dandruff), helps with dehydration, to cool the body and good for fever. To treat wounds	-
		Use the latex from the batawali stem. Rub on wounds.		

Conted...

Betel leaves (Sirih) (Siamese language: Bai phu) Scientific name: Piper betel	Leaves/shoots	The healers usually chew the leaves and spit on the area that is covered with shingles	To treat shingles	The wounds will dry in two or three days. Modern people do not believe in this method as shingles need to be treated in a clean manner
	Leaves	Slice the leaves and mix with cold water. Place the remedy on the patient's head and wipe his/her face	To treat bleeding from the nose (epistaxis)	-
	Leaves		Used in spells/incantations or any purpose in traditional medicine	-
Shoots of Common guava (Pucuk Jambu Batu) (Siamese language: Yort phor/bai falang) Scientific name: Psidium guajava	Shoots/leaves	Crush the shoots with some turmeric and bedak sejuk (traditional powder made from fermented rice). Apply to body and face.	To treat spots caused by measles	-
Cat's whiskers (Misai Kucing) (Siamese language: Thon nuat meaw) Scientific name: Orthosiphon stamineus	Whole plant	Boil the plant in water and drink its liquid.	To treat urinary bladder and kidney problems, to lower high blood pressure, to treat diabetes and sinusitis and prevent gastric.	-
Chamber bitter/ Gripeweed/ (Dukung Anak) (Siamese language: Luk tai bai) Scientific name: Phyllanthus urinaria	Whole plant	Boil the plant in water and drink its liquid.	Good for health, is used to increase appetite, to treat gastric, to lower high blood pressure, to treat malaria, to reduce coughing, to relieve stomach pains.	-
Siamese weed/ (Rumpai Siam/ Rumpai Kapal Terbang) (Siamese language: Bai khi kai) (Thai language: Sap seah) Scientific name: Chromolaena odorata	Leaves	Crush the leaves and mix with water/spit and rub it on wounds/stomach	To treat wounds and relieve bloating	-
		Boil the leaves of Siamese weed in water. Use the water for bathing	To treat bruises	

Conted...

Crab claw herb/ Pepper elder/ (Ketumpangan Air/ Sireh tanah) (Siamese language: Phru dhin) Scientific name: Peperomia pellucia	Leaves and stems	Eat as herbs or could be prepared and consumed as kerabu (Malay salad)	Good for health, to treat glaucoma, headaches, to relieve sore throat and fever, to reduce pimples	-
		Crush and apply on head to reduce fever and headache		
	Roots and stems	Boil the roots and stem in water with some salt	Used to treat short-sightedness (myopia) or long-sightedness (hyperopia)	-
		Boil the roots and stem in water ad mixed with palm sugar	Used to treat haemorrhoid	-
		Ground/crush the roots and stem and apply at the affected rectal area	Used to treat discomfort at rectal area/lumps outside the anal	-
	Place the roots and stems on the pot cover until they become withered and watery. Place some drops of the liquid into the ear that is in pain/infected.	Used to treat infected ear/ earache.	-	
Shameplant (Semalu) (Siamese language: Ragap/Tonmai pak krakshed) Scientific name: Mimosa pudica	Entire plant	Dry the plant, boil in some water, and drink the extract.	Good for health, is used to treat exhaustion, headaches, and diabetes.	-
Tamarind (Asam Jawa) (Siamese language: Som karm) Scientific name: Tamarindus indica	Fruits	Eat together with salt or make some juice according to taste to soothe a sore throat and get rid of phlegm.	Soothes a sore throat and gets rid of phlegm.	-
Lime (Limau) (Siamese language: Look nhau) Scientific name: Citrus aurantiifolia	Fruits	Squeeze some lime and drink its juice	Good for the eyes, skin, and pimples. Helps to reduce headache and nausea. It also helps lower high blood pressure and raise low blood pressure.	-
		Get rid of a cough and phlegm	Squeeze some lime juice and mix with 1 spoon of honey. Drink the concoction.	

Conted...

<p>Ginger (Halia) (Siamese language: Khing) Scientific name: Zingiber officinale</p>	Rhizome	Grind (not too finely, grind to get the fragrant and taste). Boil the ginger in water and drink its juice	Helps to relieve headaches or nausea. It is suitable for patients undergoing chemotherapy treatment.	-
	Rhizome		Helps to get rid of gas in the body, and bloating	-
<p>Aloe vera (Lidah Buaya) (Siamese language: Lin khea/Wan hang chorakin) Scientific name: Aloe vera</p>	Leaves	Apply the gel to wounds	To treat hypothermia, small or minor burns	-
		Cut to extract gel from aloe vera stems	Apply the gel to shingles area	
<p>Asiatic Pennywort/ Gotu kola (Pegaga) (Siamese language: Bai bua bok) Scientific name: Centella asiatica</p>	Leaves	Drink as juice or eat as herbs	Aids in reducing swelling, brings down fever, relieves fever and treats dehydration	-
	Leaves	Mix with some honey or fruits to prepare as juice	To prevent hypertension	-
	All parts	Could be boiled to extract liquid	Cools the body and refreshes the body, internally	-
<p>Roselle (Siamese language: Kachiap) Scientific name: Hibiscus sabdariffa</p>	Leaves and flowers	Could be used in curry or prepare as roselle juice	Leaves could be used to cure trichinosis, cough and removes phlegm. Flowers could be used to prevent gallstone, reduce cholesterol, lose some weight, lower blood pressure, reduces blood viscosity, reduce risk of prostate cancer for men	-
<p>Turmeric (Kunyit) (Siamese language: Kakmin) Scientific name: Curcuma longa</p>	Rhizome		Used to neutralize venom from king cobra	-

Conted...

Devil's backbone (Pokok Lipan) (Siamese language:) Scientific name: Pedilanthus tithymaloides	Entire plant	Crush leaves and apply to areas affected by centipedes bites	-	-
Kratom (Ketum) (Siamese language: Bai Thom) Scientific name: Mitragyna speciosa korth	Leaves	Boil the leaves in water and drink the decoction	Used to treat high blood pressure	-
Lansium (Langsat) (Siamese name: Bai Langsat) Scientific name: Lansium domesticum Jack	Leaves	Finely ground the leaves to extract juice and mix with rough salt	Used to treat fever	-
Papaya (Betik) (Siamese language: Malakor) Scientific name: Carica papaya	Fruits	Drink Chinese tea that is steeped in papaya fruit	Used to treat gout	-
	Papaya seeds	Boil the seeds in water, strain and drink the extract	Used to treat gout	-
Green chiretta (Hempedu bumi) (Siamese language: Fathalai churn) Scientific name: Andrographis paniculata	All parts including the roots	Boil in water, strain and drink the extract	Used to treat high blood pressure	-
Tacca cristata (Belimbing Tanah) (Siamese language: Khuang dhin) Scientific name: Tacca Cristata	Roots	Boil in water	Used to treat high blood pressure	-
Angel's trumpets (Terung pungar) (Siamese language: Ton Lamphong) Scientific name: Brugmansia	Leaves	The leaves are rubbed and applied with slaked lime	Used to treat shingles and to relieve mumps	-

Conted...

Banana (Pisang) (Siamese language: Kluai) Scientific name: Musa	Fruits	To be eaten	To dislodge fish bone stuck in throat	-
Mexican marigold (Pokok Tahi ayam) (Siamese language: Dok Dao Reang) Scientific name: Tagetes erecta L.	Flowers	Boil flowers in water with some salt. Take the decoction and gargle (place in mouth, gargle and spit out)	Used to relieve tooth ache	-
Lemon grass (Serai) (Siamese language: Ton Tak Khrai) Scientific name (botany): Cymbopogon citratus	Stalks and roots	Boil roots and stalks in water. Drink the decoction.	Used to relieve menstrual pain	-
	Stalks	Finely grind the stems of lemon grass. Place the mixture in a piece of cloth and press gently on the swollen area -Boil lemongrass stalks and drink its extract	Aids in getting rid of sweat stains, reduces swelling Aids in reducing body heat due to fever and removes poison in body	
Barringtonia (Pokok Putat) (Siamese language: Yort chik) Scientific name: Barringtonia	Tree barks	Grind the tree barks and mix with clay soil	To treat itchy skin	-
Longevity spinach (Pokok Sambung nyawa) (Siamese language: Hua ra pha) Scientific name: Gynura procumbens	Leaves	Eat one to three leaves as herbs. Boil the leaves in water and drink the decoction three times a day to treat diseases	To treat rheumatoid, viral infection, inflammation, fever, enteric infection, heart/ kidney problem, constipation, and toothache.	
Snake grass (Belalai gajah) (Siamese language: Nguang chang/ phaya yor) Scientific name: Clinacanthus nutans	Leaves	Finely grind the leaves and apply on areas that are affected with shingle or insect bites. Blend three handfuls of snake grass leaves until you get half a litre of juice. Drink the juice.	To treat shingles, skin ulcer, insect bites, swelling, fever and enteric infection. Could be used to cure non-chronic cancer	

Conted...

Piper betel (Kaduk) (Siamese language: Yot cha phru) Scientific name: Piper sarmentosum Roxb	Roots and leaves	Boil the roots with seven leaves and roots of mangosteen until bubbles break continuously on the surface. Drink the decoction.	To treat asthma, diabetes, flatulence, muscle pains, and lower blood pressure	
Spurges (Susu Nabi) (Siamese language: Nam Num Phra In) Scientific name: Euphorbiaceae	Entire plant	Uproot the plant together with its roots and clean it. Place it in drinking water and drink the decoction on daily basis.	To treat gout	
Bitter melon plant (Peria katak) (Siamese language: Phak hai khang khok) Scientific name: Momordica charantia	Leaves and fruits	Boil in water and eat as herbs	To lower blood pressure	

Source: Field work

CONCLUSION

The above discussion has shown that the Siamese community depends heavily on the plants in their traditional medicine practices. They believe that every plant has its own uses that benefit their health in general. The plants are not only utilised to treat and cure diseases, they are also used to prevent diseases. Apart from that, the plants are also good and safe to be used as they are free from chemical products and poisons. The rise of modern medicine cost in current market, has inevitably brought the Siamese community closer to the traditional medicine.

ACKNOWLEDGEMENT

This paper is part of a research project on “The use of plants in traditional medicine and health care of the Siamese community in Kedah” under the Research Acculturation Grant Scheme (RAGS), 1s Phase/2015.

Ethical Clearance: Taken from the committee

Source of Funding: This research is funded by the Malaysia Ministry of Higher Education.

Conflict of Interest: NIL

REFERENCES

1. Adlina Ab Halim et al. Traditional knowledge of Kadazandusun ethnic in agriculture and medicine in Ranau. Sabah. JSASS. 2015; Vol 2: Bil 2.
2. Archaimbault C. A Preliminary Investigation of the Sam Sam at Kedah and Perlis. JMBRAS. 1957; VOL XXX: Pt.1.
3. Asiah Othman. Masyarakat Thai di Kedah. 1900-1960an: A general overview of social. economic and uniting activities. Scientific Training, Bangi: UKM. 1978.
4. Ee Lin A/P Endin Jott. Awareness and political activity among the Siamese people in Kampung Sg Baru, Jitra Kedah. Scientific Training. Bangi: UKM. 1999.
5. Keiko Kuroda. The Siamese in Kedah under nation-state making. The First Inter-Dialog Conference on Southern Thailand Conference Paper 60. 2002; 15.
6. Department of Statistics Annual Report. 2010.
7. Nanda S, Warms R. L. Cultural anthropology. (9th ed.). USA: Thomson Wadsworth Group. 2007.

8. Norhalim Haji Ibrahim. Traditional medicine. Fajar Bakti: Selangor. 1997.
9. Normadiyah Nasir et. al. The elements of local beliefs and wisdom in the Memorial of traditional Murut Tahol ethnic medicine in Sabah. *Humanity*. 2017; 24(2): 59-88.
10. Marvin H. The emergence of anthropological theory: History of cultural theories. Hashim Awang (ters). Kuala Lumpur: Dewan Bahasa dan Pustaka. 1984; 2.
11. Rosnah Mustafa et. al. Traditional medicine practice of Sarawak Malay society. *Prosedia-socially and behavioral sciences*. 2014; 316-322.
12. Salmah Omar. Health care of Melanau Islam Bintulu Sarawak society. Thesis PhD. Universty of Malaya:Kuala Lumpur. 2010.

The Spread Area of Malaria Vector in Timor Island, East Nusa Tenggara Province

Muhammad Kazwaini¹, Chatarina U. Wahyuni², Monika Noshirma³

¹Doctoral Program of Public Health, ²Department of Epidemiology, ³Magister Program of Biostatistics, Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

The existence of the breeding habitat of *Anopheles spp.* is an indicator that malaria transmission can occur in these locations. Vector-borne disease transmission areas consist of several factors such as zoogeography, altitude, geography, geology and total area. East Nusa Tenggara Province is an archipelago consisting of three large islands; Flores, Sumba and Timor. Timor Island is surrounded by a row of hills and consists of steep slopes. Plains are generally found in the coastal areas and estuaries. Timor Island also has regional savannah and steppes. The purpose of this study was to map the anopheles adult fauna and the larva breeding habitats in various topography of the Timor Island. The method used in this study was observational, with the technique of a cross-sectional survey research. The most commonly documented breeding habit of *Anopheles spp.* on Timor Island was rice fields and rivers. The malaria vector found was *An. barbirostris*. It is necessary to become aware of the spread area of malaria in relation to the pattern of cropping and irrigation patterns, and to increase the early warning system.

Keywords: Vectors, malaria, *Anopheles spp.*, breeding places.

INTRODUCTION

Indonesia with its large and diverse geographic has more than 30 *Anopheles* species and in approximately 25% of the population residing in malaria endemic areas.¹ The existence of a breeding habitat of *Anopheles spp.* is an indicator that the transmission of the disease can occur in the location. However, regarding the flying ability of the mosquito which is a maximum of two kilometres, the location of the breeding habitat will significantly determine the occurrence of *Anopheles spp.* within the same location. The density of certain *Anopheles spp.* is an indicator that the species has the opportunity to become a vector. This is an important factor because it can determine the frequency of malaria cases as well as the intensity of malaria transmission.²

According to the Indonesian Ministry of Health, the location of vector-borne diseases is determined by the topography and the existence of vectors that can adapt to the environment and local people's lifestyle.³ A study also states that effective malaria control and elimination efforts need sufficient understanding on bionomic traits of each vector species with the geographical area.⁴ Indonesia and Papua New Guinea (PNG) Based on the location of the vector-borne disease transmission possibility, it is necessary to pay attention to several aspects, namely zoogeographic division, altitude, geographical location, geological composition and area.⁵

East Nusa Tenggara Province is an archipelago consisting of three major islands; Flores, Sumba and Timor. Timor Island and the surrounding small islands are generally hilly, many of which consist of steep slopes.⁶ Plains are generally only found in the areas near the coast and river mouths. On the island of Timor, there are also vast areas of savannah and steppe.

The purpose of this study was to map the fauna of *Anopheles spp.* adults and larvae from various breeding

Corresponding Author:

Muhammad Kazwaini
Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Mulyorejo, Surabaya, Indonesia
Email: muhammad.kazwaini-2017@fkm.unair.ac.id

habitats according to the topography of Timor Island, where the selection of regions was based on the number of malaria cases found.

MATERIALS AND METHOD

The method was an observational design with a cross-sectional approach. The sample location was chosen by considering the condition of Timor Island, which had limited or no information available about the malaria vectors of *Anopheles spp.* The study was conducted in Kupang and Timor Tengah Utara (TTU). In Kupang, the study took place in the rice field areas, while in TTU the study was conducted in hilly areas. The data was collected over nine months from March to November 2013, where for each location, the samples were taken three times. The variables were the species and the behavior of the vectors, potential breeding habitats of *Anopheles spp.*, and the physical environment. The data analysis was carried out by studying the data phenomenon examined from the results of the measurements, examinations, observations and mapping. The researchers also carried out an identification of the present *Anopheles spp.* species, calculating density, ovarian dissection, vector status checking, mapping breeding habitat locations and *Anopheles spp.* Species present, as well as determining the results of an ELISA test.

RESULTS

- 1. *Anopheles spp.* on Timor Island:** There are eight *Anopheles* species that have been caught on Timor Island, namely *An. macullatus*, *An. barbirostris*, *An. vagus*, *An. anullaris*, *An. tessellatus*, *An. flavirostris*, *An. indefenitus* and *An. aconitus*. In Susulaku B Village and Popnam Village (hilly areas), the researcher found all eight *Anopheles spp.* species. Meanwhile, in Tebatan Village (rice field area), there was no evidence of *An. Aconitus* while in Tuapanaf Village, there was no *An. tesselatus*.
- 2. Bloodsucking activity of *Anopheles spp.*:** The total number of *Anopheles spp.* caught in the study came was 1,448. The most common species caught across the five study locations was *An. vagus* (n=706) while the least caught was *An. tesselatus* (n=7). The highest number of mosquitoes was found in Tesbatan 2 Village (n=342) while the least was in Popnam Village (n=172). In Tesbatan 2, *Anopheles spp.* started biting from the beginning of the night until the morning. The peak of the biting was 7 p.m. to 9 p.m. and in the early morning, from 2 a.m. to 5 a.m. In Tupanaf, the peak started from 11 p.m. through until 4 a.m. Species domination in Kupang (rice field area) was *An. Vagus* (Table 1).

Table 1: The number of *Anopheles spp.* caught in Kupang and TTU in 2013

Species	Kupang		TTU		Total	%
	Tesbatan 2	Tupanaf	Susulaku B	Popnam		
<i>An. maculatus</i>	19	8	32	18	77	5.32
<i>An. barbirostris</i>	1	41	19	40	101	6.98
<i>An. vagus</i>	342	281	29	54	706	48.79
<i>An. anullaris</i>	100	88	106	26	320	22.11
<i>An. tesselatus</i>	1	0	3	3	7	0.48
<i>An. flavirostris</i>	4	2	4	5	15	1.04
<i>An. indefinitus</i>	80	111	2	15	208	14.37
<i>An. aconitus</i>	0	2	1	11	14	0.97
Jumlah	547	533	196	172	1.448	

In Susulaku TTU (hilly area), the peak of the *Anopheles spp.* biting time was 8 p.m. to 9 p.m. as well as 2 a.m. to 4 a.m. 7 p.m. to 8 p.m and 11 p.m. to 12 p.m. were the lowest times for *Anopheles spp.* getting caught. In Popnam, there were three peak times, namely 7 p.m. to 8 p.m., 10 p.m. to 11 p.m. and 3 a.m. to 4 a.m. In TTU Regency, there was some variance in the species caught in one catching site compared to the others. In Susulaku

B, the dominant species was *An. anullaris*, while in Popnam, it was *An. vagus*.

Six out of all 8 *Anopheles spp.* found were dissected. The most dissected species was *An. vagus* (n=405), while the least was *An. tesselatus* (n=1). The parous rate of all *Anopheles spp.* dissected was 65.15%, in which the species with the most parous rate was *An. indefinitus*. The least was *An. maculatus*.

The types and environmental condition of the breeding habitats of *Anopheles spp.* on Timor Island:

The breeding habitat of the malaria vectors found in the rice fields area were fields, rivers, puddles, springs, wells and drains. Breeding habitats found in the hilly areas were rivers, fields, puddles, swamps, pools and springs.

In the rice field area, the *Anopheles spp.* larvae were mostly found in standing water exposed to direct sunlight. Although in the breeding habitat there was a biota of blue panchax fish (*Aplocheilichthys panchax*), mosquito larvae were still found. In the hilly areas, larvae were found most often in the rivers and fields which were exposed to direct sunlight.

The spread of the breeding habitats of *Anopheles spp.* in Kupang were generally on the edge of the residential areas with a radius of 0-200 metres. Meanwhile, in TTU, the spread was in the radius of 500-2,000 metres or more. These breeding habitats were far from the residential areas even though it was still within *Anopheles spp.* flying range, which reached two kilometres.

DISCUSSION

The spreading pattern of malaria and the height of a location has a close relationship. This observed pattern is more widespread in areas that are at an altitude below 1,000 metres above sea level (m.a.s.l.) and less observed at an altitude above 1,000 m.a.s.l. This is caused by the behaviour of the *Anopheles spp.* which likes to live in lowlands.³ The spread of the breeding habitat of *Anopheles spp.* in Kupang was located on the edge of the residential area with a radius of 0-200 metres. In TTU, the radius was 500-2,000 metres or more. These breeding habitats were far from the residential areas even though it was still within the *Anopheles spp.* flying range, which reaches up to two kilometres.

The observations of the breeding habitat of *Anopheles spp.* larvae were carried out at 34 sample points. There were six different types of habitat, namely swamps, puddles, clean water reservoirs, foot sinks, livestock drinking containers and sewers. This finding is in line with the research conducted by Nurhelmi in 2012. It states that the breeding habitats of the *Anopheles* mosquitoes are also varied, with the mosquitoes generally breeding in rice fields, irrigation channels, ponds, protected swamps, low flow rivers, waterways and protected grassy springs.⁷

In general, mosquitoes prefer to live in a place that is shady, moist and safe. However, with further

observation, each species turns out to have different behaviour. For instance, the mosquitoes living in the lowlands only settle in low altitude places such as the ground, and some also land on the rice fields, river banks, swamps, kale ponds, ditches and so on. The behaviour of the mosquitoes based on the location varies greatly as the female *Anopheles spp.* has the ability to choose a breeding place according to their individual preferences and needs⁸. There are some species that likes to live in places that are exposed to direct sunlight and some prefer shady places. Meanwhile, the mosquitoes living in the highlands are commonly found in grasses, forests and also plants that live on steep cliffs.⁹

The most species caught in the five study locations was *An. vagus* and the least was *An. tessellatus*. It corresponds with a study which states that the breeding habitat of *An. vagus* was in rice fields, ponds and plants.¹⁰ Stoops et al. also found that *An. Vagus* lives lowland rice fields and adjacent to human settlements.¹¹

Anopheles barbirostris was found in both the rice fields and hilly areas of Timor Island, in which the *Anopheles* species was a malaria vector in East Nusa Tenggara.¹² In nature, *An. barbirostris* can inhabit larval habitats such as small ponds, swamps and rice fields. In general, the mosquito likes to lay its eggs in fresh clean water with water plants that arise, float or slightly arise on the surface. In Indonesia, the largest population of the mosquito is associated with rice cultivation or rice fields.¹³ Wigati et al. also found *An. barbirostris* in abandoned fish ponds, small puddles near the coast, rice fields, irrigated waterways and water reservoirs from springs. *An. barbirostris* larvae prefer clear water whose water flow is calm or slightly flowing, such as ponds, springs and other places with water accumulation.¹⁰

An. macullatus has been confirmed as a vector on the Java and Sumatra Islands and has an ecological distribution in both plantation and forest areas in valleys or mountains. Another study also found that *An. macullatus* is also found in a singular hilly area in Jambi Province.¹⁴

In Susulaku B Village, TTU Regency (a hilly area), the peak of *Anopheles spp.* biting times was at 8 p.m. to 9 p.m. as well as 2 a.m. to 4 a.m. Meanwhile, 7 p.m. to 8 p.m. and 11 p.m. to 12 p.m. was the lowest time for being bitten by *Anopheles spp.* In Popnam Village, there were three peaks for biting encompassing 7 p.m. to 8 p.m., 10 p.m. to 11 p.m. and 3 a.m. to 4 a.m. According to a study by Santoso conducted in Purwodadi (2012), the biting times of *Anopheles spp.* also varied, ranging from 11:00 p.m. to 12 p.m.¹⁵ while another study conducted in

Ranoketang Tua Village stated that the peaks occurred at 12 p.m. to 1 a.m; 11 p.m. to 12 p.m. was also a lot, but not as significant as one hour afterwards.¹⁶

CONCLUSION

This study has concluded that the main breeding habitat of *Anopheles spp.* in East Nusa Tenggara was in the paddy fields and rivers. In the selected province, the *Anopheles spp.* found were *An. maculatus*, *An. barbirostris*, *An. vagus*, *An. annularis*, *An. tessellatus*, *An. flavirostris*, *An. indefinitus* dan *An. aconitus*. The vectors of malaria found were *An. barbirostris*, confirmed in East Nusa Tenggara and *An. aconitus*, confirmed on Java Island. The spread of the vector of *An. barbirostris* was found in four study places, including Tesbatan, Tuapanaf, Popnam and Susulaku B Villages. Meanwhile, *An. aconitus* was found in three study places; Tuapanaf, Popnam and Susulaku B Villages.

RECOMMENDATION

The control of larvae in the rice field habitat must be undertaken by regulating cropping and irrigation patterns. The malaria control methods must be based on local data and information specific to each region, because the control programs of some regions were less effective compared to other regions. *Anopheles spp.* which was confirmed as a vector in East Nusa Tenggara, has a habitat ranging from coastal lowland to higher altitude areas, therefore early vigilance must be implemented in all places.

Conflict of Interest: None.

Ethical Clearance: The study passed ethical clearance from Ethical Committee of the Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia.

Source of Funding: This study is self-funded by the researchers.

REFERENCES

1. St Laurent B, Burton TA, Zubaidah S, Miller HC, Asih PB, Baharuddin A, et al. Host attraction and biting behaviour of *Anopheles* mosquitoes in South Halmahera, Indonesia. *Malar J* [Internet]. 2017 [cited 2018 Aug 12];16(310):9. Available from: <https://malariajournal.biomedcentral.com/track/pdf/10.1186/s12936-017-1950-5>

2. Munif A, Sudomo M, Soelaksono S, Agus DP, Maelita R. Korelasi Kepadatan Populasi *An. Barbirostris* dengan prevalensi malaria di Kecamatan Cineam, Kabupaten Tasikmalaya. *Media Litbang Kesehat.* 2003;XIII(3):20–8.
3. Departemen Kesehatan RI. Pedoman Ekologi dan Aspek Perilaku Vektor. Jakarta; 2001.
4. St Laurent B, Supratman S, Budi Setia Asih P, Bretz D, Mueller J, Catherine Miller H, et al. Behaviour and molecular identification of *Anopheles* malaria vectors in Jayapura district, Papua province, Indonesia. *Malar J* [Internet]. 2016 [cited 2018 Aug 12];15(192):8. Available from: <https://malariajournal.biomedcentral.com/track/pdf/10.1186/s12936-016-1234-5>
5. World Health Organization. Handbook for Integrated Vector Management Integrated Vector Management (IVM) Vector Ecology and Management (VEM) Department of Control of Neglected Tropical Diseases (NTD) World Health Organization [Internet]. van den Berg H, Cham K, Ichimori K, editors. Geneva: WHO Library Cataloguing-in-Publication Data; 2012 [cited 2017 Jan 13]. pp. 78. Available from: http://apps.who.int/iris/bitstream/handle/10665/44768/9789241502801_eng.pdf;jsessionid=692784111AB937D1FDD126D7A52D46FE?sequence=1
6. Government of East Nusa Tenggara. Kondisi Geografis [Internet]. Official Website of East Nusa Tenggara Government. 2016 [cited 2017 Jan 13]. p. 1. Available from: <http://nttprov.go.id/ntt2016/index.php/profildaerah1/kondisi-geografis>
7. Nurhelmi N. Faktor risiko tempat perkembangbiakan vektor malaria terhadap kejadian malaria di Kecamatan Wonomulyo Kabupaten Polewali Mandar tahun 2011. Universitas Hasanuddin; 2011.
8. St. Laurent B, Sukowati S, Burton TA, Bretz D, Zio M, Firman S, et al. Comparative evaluation of anopheline sampling methods in three localities in Indonesia. *Malar J* [Internet]. 2018 Dec 8 [cited 2018 Aug 12];17(13):11. Available from: <https://doi.org/10.1186/s12936-017-2161-9>
9. Arsin AA. Malaria Di Indonesia Tinjauan Aspek Epidemiologi. Makassar: Masagena Press; 2012.

10. Wigati W, Yusniar A, Herri A. Beberapa aspek ekologi anopheles spp di Sukabumi Jawa Barat. *Zoo Indones.* 2010;19(2):83–91.
11. Stoops CA, Gionar YR, Shinta, Sismadi P, Elyazar IRF, Bangs MJ, et al. Environmental factors associated with spatial and temporal distribution of *Anopheles* (Diptera: Culicidae) larvae in Sukabumi, West Java, Indonesia. *J Med Entomol* [Internet]. 2007 Jul [cited 2018 Aug 12];44(4):543–53. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17695007>
12. Hoedojo H. Vector of Malaria & Filariasis in Indonesia. *Bul Penelit Kesehat.* 1989;17(2):183–5.
13. Majawati ES. Bionomik *Anopheles barbirostris* Penular Malaria. *J Kedokt Meditek.* 2008;15(39c):5.
14. Ambarita LP, Taviv Y, Purnama D, Betryon B, Pahlepi RI, Saikhu A. Beberapa aspek bionomik *Anopheles maculatus* dan *An. Leucosphyrus* di perkebunan kopi daerah endemis malaria Kabupaten Oku Selatan. *J Ekol Kesehat.* 2011;10(4):229–38.
15. Santoso S, Taviv Y. Keragaman *Anopheles* Di Desa Sungai Tuhi Dan Desa Purwodadi Oku Timur Tahun 2012. *J Pembang Mns* [Internet]. 2013 [cited 2017 Jan 12];7(2):65–78. Available from: <http://balitbangnovdasumsel.com/jurnal/2013>
16. Mandagi C, Masalamate RP, Rompis HA. Analisis Bionomik Nyamuk *Anopheles* di Desa Ranoketang Tua Kecamatan Amurang Kabupaten Minahasa Selatan Tahun 2011. *KESMAS* [Internet]. 2015 [cited 2017 Jan 12];4(1):1–11. Available from: <https://ejournal.unsrat.ac.id/index.php/kesmas/article/view/7233/6741>

Developing Community Resilience as a Supporting System in the Care of People with Mental Health Problems in Indonesia

Retno Lestari¹, Ah Yusuf²

¹Doctoral Program of Public Health, Faculty of Public Health, ²Faculty of Nursing, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

People with mental disorders have complex disabilities which make them need other people's assistance in doing their daily living activities. Community resilience is one of the capacities which is needed to make a healthy environment for mental disorder patients. This study aims to describe how community resilience can be a supporting system in the care of people with mental disorders. A literature review was conducted in order to obtain 98 reference sources. Only 15 articles were eligible to be reviewed. The community resilience's supporting system consists of providing social, physical and economical infrastructures through employment opportunities or financial support and a decent life. Interactions between community members and people with mental disorders become a positive relationship, helping people with mental disorders to carry out their activities and to become independent. It also has an impact on decreasing the symptoms of relapse as well as reducing the level of dependency that cause them to continue to be a burden on their families, communities and global society.

Keywords: *community resilience, mental health, supporting system*

INTRODUCTION

The number of people with mental disorders, which is increasing with the years, is becoming a burden for families, communities and the global health care system. In 2016, the prevalence of psychiatric patients in the United States reached around 44.7 million people who were more than 18 years old. This number indicates that 18.3% of Americans suffer from a type of mental disorder.¹ In Indonesia, the prevalence of severe mental disorders, such as schizophrenia, reached around 400,000 people, or as many as 1.7 per 1,000 population. In addition, the prevalence of emotional and mental disorders as indicated by symptoms of depression and anxiety for those aged 15 years old and over reached about 14 million people or 6% population.²

The community is one of the support systems that can facilitate the recovery of mental disorders with the opportunity to live independently, to participate in community activities, to interact with others and to attach themselves to their daily environment. The community has an important role in creating positive support and wide opportunities for people with mental disorders for them to be fully involved in every event in the community.³⁻⁵

Previous studies explain that people with mental disorders also have awareness and the responsibility to deal with reality and to fulfil their actualisation. They understand expectations, goals, and responses to social needs and are able to work independently. They want to be recognised like any other individual who is able to adapt to society, despite experiencing inconsistencies in their way of thinking. If they only live in the hospital, what they see is only a group of people with mental disorders, and they can feel like life has stopped. Thus, support for people with mental disorders is needed, especially from the community around their homes. When they live with healthy individuals, they can plan for a better future.^{6,7}

The treatment of mental disorders requires integration between adequate mental health services and

Corresponding Author:

Retno Lestari
Doctoral Program of Public Health,
Faculty of Public Health,
Universitas Airlangga, Mulyorejo, Surabaya, Indonesia
Email: retno.lestari-2017@fkm.unair.ac.id

opportunities for the sufferers to develop themselves. The key points are the provision of information about their conditions, the opportunity to develop themselves, the chance to foster hope of them recovering from their mental disorders and the importance of mental health services' role in the community in providing positive emotional control for people with mental disorders.^{8,9}

The existence of positive support from the community can prompt motivation in the patients for them to get up and recover from mental disorders. The forms of support obtained can be varied, such as the existence of positive assessments, being given the opportunity to tell stories, to be listened to by others and to be able to engage in activities that exist in the community.^{7,10} recovery oriented experiences are required which recognise the holistic and diverse needs of individuals. Aim: The aim of the study was to examine the experiences of people living with a mental illness who participated in a recovery oriented program called Recovery Camp. The study aimed to examine how the program may have related and contributed to their mental health recovery. Methods: A descriptive phenomenological approach guided the study. Consenting participants (n = 5

The discovery of various factors affecting individuals and community mental health shows that people with mental disorders who live in the community can recover with community support. This study has intended to describe how community resilience can be used as a support system in the care of people with mental disorders.

METHOD

This study was a systematic review which used some of the literature from 98 articles obtained from Science Direct, Google Scholar, Proquest Health, Medical Complete, Proquest Nursing, Allied Health Source, Proquest Psychology Journals and Proquest Science Journals dating from 2008 to 2018. The inclusion criteria used were health or related research articles published in the last 10 years, research articles on topics about the community as a support system in the treatment of mental disorders, and research articles discussing the concept of community resilience.

Based on a literature review of 98 articles obtained from the listed databases, there were 50 articles that fulfilled the inclusion criteria. However, there were only

15 articles that discussed in detail about community resilience and the ability of the community to support the care of people with mental disorders.

RESULTS

Gillard et al. states that the care of mental illness sufferers has two main keys; a positive personal relationship (oneself) and wider social interactions (others).¹¹ Self-awareness and positive self-acceptance give the individual the ability to reconcile themselves between the outside world and the internal mind. Self-recovery in mental disorders is the concept of balance between internal and external worlds. Table 1 shows the results of a literature review that discusses community resilience and community capacity in supporting the care of people with mental disorders.

DISCUSSION

Conflicts, stress and exposure to hazards can cause crises in the community system. Resilience is the ability of individuals or groups to react and move away from stress or exposure to stressors. Resilience describes the dynamic process of adapting to the crisis situation faced by the people.¹² Resilience can be analogous to the philosophy of a bamboo plant, in which if it is exposed to the wind then it will bend and move, but in the end, it can return to its original position.¹³

Community resilience is the method or ability of a community to show its resilience when facing existing stresses to restore their productivity through daily activities.¹³ Resilient communities have become the nearest supporting system for people with mental disorders. Nowadays, resilience is defined as a process rather than a result. Resilience is the capacity of the system to face or recover from disturbances as well as changes that threaten adaptation or development functions. There are two stages in which resilience is considered to be a process, namely: 1) the disturbance or stressor that significantly affects the system and 2) the resilience capacity system that shows an ability to adjust and recover from the occurrence of trauma.¹⁴

The mechanism of resilience activation occurs throughout three stages, namely liminal suspension, compassionate witnessing and relational redundancy. Liminal suspension means the time of crisis in which individuals mutually reinforce each other in relation to their interpersonal relationships. Compassionate witnessing means how individuals within the

community are bound together and help to fulfil the needs of one another. Relational redundancy means coordination between the sources of the organisation concerned with strengthening resilience. When a critical situation arises, the group of people will gather, interact and perform in a variety of ways that can enable their existing capacity to survive and achieve resilience.¹⁵

Teo et al. found that the mechanism of resilience activation occurs during an exposure to stressor or crisis events. However, the existence of a stressor can generate resources in the community to strengthen interpersonal relationships, especially helping in the recovery of people with mental disorders in the community.¹⁶

Cohen et al. explained that community resilience involves local organisations and existing policies applied locally and regionally when strengthening resilience. Effective leadership is a leader who is able to interact with other community members and who can meet the needs desired by all members of the community. Community leaders have an important role in improving community resilience, primarily by focusing on the needs and demands of the local community.¹⁷

The involvement of a local government is needed in enhancing community resilience, including the development of access to technology that can support sources of social and economic capital. Increasing the productivity of community members through economics supported by local governments can increase resilience.¹⁸

There are several strategies for the reconstruction and revitalisation of sources of social capital after a crisis, including strengthening social networks and communities, building social organisations, and macro-social policies that can improve people's access to resources and power. In the aspect of social capital, social networks are important aspects that can affect mental well-being.^{3,19-21}

Several previous studies have explained that economic resources are the most significant aspect in relation to building resilience. When individuals have suitable jobs and are in line with local needs, this will also increase the adaptive capacity of the community. A resilient community is a community that has the capacity to innovate and provide mutual support to other members of the community, including making a person with a mental disorder able to engage in productive activities in the community.¹⁰

Community resilience is an important focus of attention which can lead to positive attachments between people with mental and community disorders. Resilient communities are able to provide opportunities for sufferers to live like other individuals, who are able to be independent and work for themselves and others.

CONCLUSIONS

Community resilience is the capacity that is owned by the community that becomes an appropriate supporting system in the care of people with mental disorders living in the community. The increase in the provision of social, physical and economic infrastructure along with the interaction between community members and mental disorder patients is positive; helping people with mental disorders to carry out their daily activities and to become independent. This will also have an impact on decreasing the symptoms of relapse as well as reducing the level of dependency that will continue to be a burden on families, communities, and global society.

Conflict of Interest: None.

Ethical Clearance: Not required.

Source of Funding: Self-funded.

REFERENCES

1. National Institute of Mental Health. Mental Illness [Internet]. National Institute of Mental Health. 2017 [cited 2017 Nov 29]. Available from: <https://www.nimh.nih.gov/health/statistics/mental-illness.shtml>
2. Kementerian Kesehatan Republik Indonesia. Riset Kesehatan Dasar. Jakarta, Indonesia; 2013.
3. Somasundaram D, Sivayokan S. Rebuilding community resilience in a post-war context: developing insight and recommendations - a qualitative study in Northern Sri Lanka. *Int J Ment Health Syst* [Internet]. 2013 Jan 11 [cited 2018 Aug 15];7(1):3. Available from: <http://ijmhs.biomedcentral.com/articles/10.1186/1752-4458-7-3>
4. Piat M, Seida K, Sabeti J, Padgett D. (Em) placing recovery: Sites of health and wellness for individuals with serious mental illness in supported housing. *Health Place* [Internet]. 2017

- Sep [cited 2018 Aug 15];47:71–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/28759807>
5. Atallah DG, Contreras Painemal C, Albornoz L, Salgado F, Pilquil Lizama E. Engaging critical community resilience praxis: A qualitative study with Mapuche communities in Chile facing structural racism and disasters. *J Community Psychol* [Internet]. 2018 Jul 1 [cited 2018 Aug 15];46(5):575–97. Available from: <http://doi.wiley.com/10.1002/jcop.21960>
 6. Mizuno E, Iwasaki M, Sakai I, Kamizawa N. Experiences of Community-Dwelling Persons Recovering From Severe Mental Illness. *Arch Psychiatr Nurs* [Internet]. 2015 Apr 1 [cited 2018 Aug 15];29(2):127–31. Available from: <https://www.sciencedirect.com/science/article/pii/S0883941714001770>
 7. Picton C, Patterson C, Moxham L, Taylor EK, Perlman D, Brighton R, et al. Empowerment: The experience of Recovery Camp for people living with a mental illness. *Collegian* [Internet]. 2018 [cited 2018 Aug 15];25:113–8. Available from: <https://doi.org/10.1016/j.colegn.2017.04.005>
 8. Bromley E, Gabrielian S, Brekke B, Pahwa R, Daly KA, Brekke JS, et al. Experiencing Community: Perspectives of Individuals Diagnosed as Having Serious Mental Illness. *Psychiatr Serv* [Internet]. 2013 Jul 1 [cited 2018 Aug 15];64(7):672–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23545784>
 9. Shepherd A, Sanders C, Shaw J. Seeking to understand lived experiences of personal recovery in personality disorder in community and forensic settings - a qualitative methods investigation. *BMC Psychiatry* [Internet]. 2017 [cited 2018 Aug 15];17(1):282. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/28764672>
 10. Hills JM, Michalena E, Chalvatzis KJ. Innovative technology in the Pacific: Building resilience for vulnerable communities. *Technol Forecast Soc Change* [Internet]. 2018 Apr [cited 2018 Aug 15];129:16–26. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0040162517302093>
 11. Gillard S, Turner K, Neffgen M. Understanding recovery in the context of lived experience of personality disorders: a collaborative, qualitative research study. *BMC Psychiatry* [Internet]. 2015 Dec 31 [cited 2018 Aug 15];15(1):183. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26227023>
 12. Henry CS, Sheffield Morris A, Harrist AW. Family Resilience: Moving into the Third Wave. *Fam Relat* [Internet]. 2015 Feb 1 [cited 2018 Aug 15];64(1):22–43. Available from: <http://doi.wiley.com/10.1111/fare.12106>
 13. Kirmayer LJ, Sehdev M, Whitley R, Dandeneau SF, Isaac C. Community Resilience: Models, Metaphors and Measures. *Int J Indig Heal* [Internet]. 2009;5(1):62–117. Available from: <http://journals.uvic.ca/index.php/ijih/article/view/12330>
 14. Abramson DM, Grattan LM, Mayer B, Colten CE, Arosemena FA, Bedimo-Rung A, et al. The resilience activation framework: a conceptual model of how access to social resources promotes adaptation and rapid recovery in post-disaster settings. *J Behav Health Serv Res* [Internet]. 2015 Jan [cited 2018 Aug 15];42(1):42–57. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24870399>
 15. Powley EH. Reclaiming resilience and safety: Resilience activation in the critical period of crisis. Turner N, Gray GC, editors. *Hum Relations* [Internet]. 2009 Sep 13 [cited 2018 Aug 15];62(9):1289–326. Available from: <http://journals.sagepub.com/doi/10.1177/0018726709334881>
 16. Teo WL, Lee M, Lim W-S. The relational activation of resilience model: How leadership activates resilience in an organizational crisis. *J Contingencies Cris Manag* [Internet]. 2017 Sep 1 [cited 2018 Aug 15];25(3):136–47. Available from: <http://doi.wiley.com/10.1111/1468-5973.12179>
 17. Cohen O, Goldberg A, Lahad M, Aharonson-Daniel L. Building resilience: The relationship between information provided by municipal authorities during emergency situations and community resilience. *Technol Forecast Soc Change* [Internet]. 2017 Aug 1 [cited 2018 Aug 15];121:119–25. Available from: <https://www.sciencedirect.com/science/article/pii/S0040162516306564>

18. United Nations Office for Disaster Risk Reduction. Sendai Framework for Disaster Risk Reduction 2015 - 2030 [Internet]. Geneva; 2015 [cited 2018 Aug 15]. Available from: https://www.preventionweb.net/files/43291_sendaiframeworkfordrren.pdf
19. McAnaney H, Tully MA, Hunter RF, Kouvonen A, Veal P, Stevenson M, et al. Individual factors and perceived community characteristics in relation to mental health and mental well-being. *BMC Public Health* [Internet]. 2015 Dec 12 [cited 2018 Aug 15];15:1237. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26655388>
20. Patel RB, Gleason KM. The association between social cohesion and community resilience in two urban slums of Port au Prince, Haiti. *Int J Disaster Risk Reduct* [Internet]. 2018 Mar 1 [cited 2018 Aug 15];27:161–7. Available from: <https://www.sciencedirect.com/science/article/pii/S2212420917302947>
21. Pfefferbaum RL, Pfefferbaum B, Zhao YD, Van Horn RL, McCarter GSM, Leonard MB. Assessing community resilience: A CART survey application in an impoverished urban community. *Disaster Heal* [Internet]. 2016 [cited 2018 Aug 15];3(2):45–56. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/28229014>

Effects of Knowledge of Vitamin D on Attitudes toward Sun Exposure among Middle-Aged and Elderly Indonesian Adults

Rivan Virlando Suryadinata¹, Bambang Wirjatmadi², Merryana Adriani², Sri Sumarmi²

¹Doctoral Program of Public Health, Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia, Airlangga University, Surabaya, Department of Public Health Science, College of Medicine, University of Surabaya; ²Faculty of Public Health, Airlangga University, Surabaya

ABSTRACT

Introduction: Vitamin D deficiency may contribute to certain health problems among senior people. Excessive body weight lowers the vitamin D level. Hypovitaminosis D affects older adults, with a greater risk of infection, disease, type 2 diabetes, cardiovascular disease, stroke, and dementia. However, little is known as to what extent the knowledge of vitamin D's benefits contributes to the attitude toward sunlight exposure among people at risk of hypovitaminosis D.

Aim: The objective was to investigate the effect of knowledge of vitamin D on attitudes toward sunlight among 166 middle-aged and elderly people in East Java, Indonesia.

Method: We conducted an observational study using a case control design. The sample was purposively recruited among visitors consulting the geriatric clinic at a community health centre in Sidoarjo, East Java, Indonesia. Each case and control group consisted of 83 men and women aged 46 years old or older. The assignment of subjects to each group was determined based on their body mass index (BMI). A standardised questionnaire was delivered to the study subjects to obtain data on their knowledge and attitudes related to vitamin D. A Chi square test was performed to assess the difference between the obese group and the non-obese group.

Results: Our study found no significant difference in relation to the knowledge of vitamin D between the two groups ($p=0.436$). However, the two groups showed a significant difference in attitude toward sun exposure ($p=0.030$).

Conclusion: No significant effect was found between knowledge of vitamin D and attitude toward sun exposure among the adults.

Keywords: *knowledge, attitude, geriatric, vitamin D, obesity*

INTRODUCTION

Vitamin D deficiency has affected more than one-third of the population worldwide across all ethnic and age groups.¹ It is indicated by a lower 25(OH)D level, of less than 50 nmol/L in the body.^{2,3} Lifestyle and environmental changes are considered to have a significant contribution toward lower vitamin D levels. Lack of vitamin D is an independent factor of the increased mortality caused by non-communicable diseases such as heart disease, osteoporosis, diabetes, autoimmune and cancer.⁴ The high prevalence of vitamin D deficiency has become a public health concern as it relates to the increased risk of various chronic diseases

Corresponding Author:

Rivan Virlando Suryadinata
Doctoral Candidate, Faculty of Public Health,
Airlangga University, Surabaya
Department of Public Health Science,
College of Medicine, University of Surabaya
Email: rivan.virlando.suryadinata-2017@fkm.unair.ac.id

and the high prevalence of osteoporotic hip fractures among older adults.¹ In addition, excessive body weight increases the risk of vitamin D deficiency which could also negatively affect bone.⁵

Having a vitamin D deficiency increases the risk of frailty among older adults.⁶ Geriatric syndrome and impaired physical activity are usually considered to be multidimensional clinical conditions in the elderly. Geriatric syndrome is characterised by functional decline, low cognitive status, and increased exogenous and endogenous stress.⁷ Functional decline, especially in relation to physical functions, may result in frailty, limited mobility, and death. Although vitamin D can be obtained from food and supplements, having sufficient sun exposure is beneficial in order to stimulate the skin to produce vitamin D.⁴ On the other hand, as the human body ages, the skin's capacity to produce vitamin D3 decreases.⁸ Therefore, the elderly have a higher risk of vitamin D deficiency than younger people.

Lack of knowledge on the importance of sun exposure for vitamin D synthesis in the body may induce an avoidance of sun exposure.^{9,10} Most people prefer to stay, work, and exercise indoors or behind glass that is anti-ultraviolet (UVB) than be directly exposed to sunlight. Wearing closed-off clothing and using regular sunscreen may block the UVB transmission which is intended to prevent sun-related skin aging, reduce the risk of skin cancer, and avoid undue skin discoloration.¹¹ Our study aims to assess the difference between two groups on the knowledge of vitamin D and their attitude toward sunlight exposure.

METHOD

Research design: This study employed an observational research design using a case control method. A structured questionnaire was administered to the study subjects to understand their level of knowledge and attitude relevant to vitamin D.

Population and sample: The population of this study was the visitors of a geriatric consultation clinic at Taman community health centre in Sidoarjo district, in the East Java province of Indonesia. The age of the population was 45 years old or older. The inclusion criteria were no disability, that they were able to read and write, and had no co-morbidity such as cardiovascular disease, stroke,

respiratory disease, or liver disease. The exclusion criteria were that they were unwilling to participate in the study. The participants were recruited using purposive sampling selection. The obese participants were assigned to the case group, while the non-obese participants were assigned to the control group. A threshold body mass index (BMI) level of 27 or higher was set up to classify participants in the obese group. Other male and female participants with lower BMI levels than the threshold were included in the normal weight group. To obtain the BMI level, body weight and height were measured for each participant. The BMI level was calculated through dividing the body weight (kilograms) by the square of the height (meters).

Sample size: To calculate the sample size, we adopted the following formula:

$$n = \frac{N}{1 + N(d^2)}$$

N in a capital letter is the size of the population, while n in a small letter represents the sample size. The confidence level was set at 0.1. The total population in this study was 500 people, based on the average number of monthly visits to the geriatric clinic of the study location in 2017. Therefore, the sample size calculation and the result has been presented in the following equation:

$$n = \frac{500}{1 + 500(0,1^2)} = 83 \text{ orang}$$

The minimum number of study participants for each case and control group was 83 people.

VARIABLES

The study variables were knowledge and attitude. Each variable had an assessment category of poor and good based on the scores obtained from the questionnaire answers. A participant was considered to have good knowledge if his/her total score of knowledge was 6 or higher. A total score below 6 was considered as having poor knowledge. The variable of attitude had 9 questions related to the participant's attitude toward sun exposure. Each item of questions was given a score of 2 for an answer related to a higher risk of vitamin D deficiency. A total score of 10 or higher was marked as having a good attitude, while a lower score than 10 represented a poor attitude.

DATA COLLECTION AND ANALYSIS

Prior to the data collection, the validity and reliability of the standardised questionnaire was tested, involving a convenience sample of 30 homogeneous respondents. To assess the validity of the questionnaire, the Pearson Product Moment Correlation was performed using SPSS software. The test was conducted by correlating the scores of each item of the questionnaire with the total score. Each question with a statistically significant value < 0.05, and count value $r > r$ in the product moment table was concluded as a valid item. The questionnaire reliability was assessed using Cronbach’s coefficient alpha to estimate the internal consistency of the questionnaire items. A minimum Cronbach’s alpha value was determined to be 0.61 to be considered for inclusion in the questionnaire.

The measurement scale used in the present study was ordinal data presented in two categorical variables (poor and good). The data was analysed using the chi-square test to examine the difference between the obese group and the non-obese group on their knowledge of vitamin D deficiency and their attitude toward sun exposure. The difference between the obese and non-obese participants was concluded to be statistically significant when the p-value was 0.05 or less.

RESULTS

Table 1 displays the characteristics of the study participants. Females were the majority in both the obese group (84.3%) and the non-obese group (60.2%). Most of the participants were aged between 56 and 65 years old in both the obese group (45.8%) and the non-obese group (53.0%).

Table 1: The frequency distribution of the participant’s characteristics

Characteristics		Groups	
		Obese n (%)	Non-Obese n (%)
Gender	Female	70 (84.3)	50 (60.2)
	Male	13 (15.7)	33 (39.8)
Age (years)	46-55	29 (34.9)	25 (30.1)
	56-65	38 (45.8)	44 (53.0)
	>65	16 (19.3)	14 (16.9)

Table 2 presents the results of the chi-squared test when analysing the difference in the knowledge score between the obese group and the non-obese group. More

than half of the obese group (57.8%) and the non-obese group (51.8%) have a good knowledge of vitamin D deficiency. The percentage of subjects with a good level of knowledge was slightly higher in the obese group than the non-obese group. The chi-square test generated a p-value of 0.436, indicating that no significant difference between the two groups was observed related to the knowledge of vitamin D deficiency.

Table 2: The chi-squared test results of the knowledge of vitamin D deficiency

Knowledge	Groups		P Value
	Obese n (%)	Non-Obese n (%)	
Good	48 (57.8)	43 (51.8)	0.436
Poor	35 (42.2)	40 (48.2)	
Total	83 (100.0)	88 (100.0)	

The chi-square test on the attitude toward sun exposure has been presented in Table 3. Most of the participants in the obese group showed a poor attitude toward sunlight (57.8%). In the non-obese group, most of the participants had a good attitude toward sun exposure (59.0%). The results of the chi-square test showed a p-value of 0.030, indicating that there is a significant difference between the two groups in relation to their attitude toward sun exposure.

Table 3: The chi-squared test results of the attitude toward sun exposure

Attitude	Groups		P Value
	Obese n (%)	Non-Obese n (%)	
Good	35 (42.2)	49 (59.0)	0.030
Poor	48 (57.8)	34 (41.0)	
Total	83 (100.0)	83 (100.0)	

DISCUSSION

The participants in our study were dominated by those of the female sex whose age was between 56 to 65 years old. The World Health Organisation (WHO) determined 60 years old to be the cut-off standard for the older population.¹² The proportion of middle-aged people in the present study was less than 30% in both groups.

Our study showed no significant difference between the obese group and the non-obese group on the

knowledge of vitamin D deficiency. More than half of the study respondents had a good knowledge score. This result indicates that the importance of having sufficient vitamin D is well understood by both groups. A previous study reported that having a good level of knowledge on vitamin D significantly contributes to the positive behavior in maintaining the vitamin D sufficiency.¹³

Vitamin D has a pivotal role in regulating the absorption of calcium and phosphorus in order to maintain optimum bone mineral density.³ Vitamin D has two forms, namely vitamin D2 and vitamin D3. Vitamin D2 is a 28-carbon molecule derived from ergosterol, which is a component of fungal cell membranes. Vitamin D3 is a 27-carbon derived from cholesterol.¹⁴ Vitamin D3 (cholecalciferol or D3) is synthesised in the skin in response to the effect of sunlight (eUVB) with a wavelength of 295-297 nm.² The UV-B skin irradiation triggers the photolysis of 7-dehydrocholesterol (pro-vitamin D3) to pre-vitamin D3, which is rapidly converted to vitamin D3 at skin temperature.

Vitamin D2 and vitamin D3 are produced from the skin undergo sequential hydroxylation. Hydroxylation firstly occurs in the liver (25 [OH] D) and secondly, takes place in the kidney which leads to the biological form of active 1,25-dihydroxyvitamin D (1.25 [OH] 2D).¹⁵ Furthermore, the 1.25 [OH] 2D will bind to the vitamin D receptor (VDR), which can increase the absorption of calcium and intestinal phosphorus. Vitamin D is also actively involved in bone formation, resorption, mineralisation, and the maintenance of neuromuscular function. In addition, 1.25 [OH] 2D can also inhibit serum parathyroid hormone (PTH) levels through a negative feedback mechanism, by increasing serum calcium levels. This process leads to a regulation of bone metabolism through VDR activation in osteoblast and adult osteoclast formation.¹⁶

In a body with vitamin D deficiency, the small intestine can only absorb approximately 10% -15% of the calcium ingested. In a normal vitamin D level context, the body can absorb 30% - 40% of the calcium from food. Therefore, low levels of vitamin D (25 [OH] D) may hamper calcium absorption, which has some clinical implications, not only in relation to the bone but also some of the major metabolic functions.¹⁵ Vitamin D also has an important function in minimising tissue damage by lowering oxidative stress. Muscles are one of the susceptible tissues easily exposed to free radicals. Muscle tissue is composed of approximately 40% of the total body mass. Various toxicities such as infection,

ischemia, and inflammation may cause further damage to the muscle cells. The damaged muscle cell would release the myoglobin or protein in the muscle into the bloodstream, which is dangerous for the kidneys and may cause kidney failure.¹⁷ A higher amount of free radicals from the muscle damage, more than the antioxidants of the body, would eventually aggravate the organ damage.

Although there was no significant difference regarding the knowledge of vitamin D deficiency, the two groups of this study presented a significant difference in the attitude toward sun exposure. The obese group had a higher proportion of poor attitude, which reflects having less sun exposure than the non-obese group. One possible explanation is that obesity contributes to a low level of participation in physical activity.¹⁸ The elderly with obesity may have a fear of falls and may also have a certain degree of physical immobility that prevents them from taking part in recreational physical activity outdoors¹⁸, thus they have less exposure to sunlight. A previous study reported that the prevalence of vitamin D deficiency is 35% higher among obese people.¹⁹ Poor attitude toward sun exposure to increase the vitamin D sufficiency increases the risk of the elderly with obesity from contracting various non-communicable diseases.

CONCLUSION

Our study presented a non-significant difference in the knowledge of vitamin D deficiency. However, the two groups have a significant difference in their attitude toward sun exposure. Having good knowledge is important to prevent the risk of vitamin D deficiency. However, it may not be sufficient to drive the expected attitude. Therefore, understanding people's constraints in relation to sun exposure is important, and in need of further investigation.

Ethical Clearance: ethical approval was granted by the School of Public Health in Airlangga University, Surabaya.

Source of Funding: self funding.

Conflict of Interest: none.

REFERENCES

- Hilger J, Friedel A, Herr R, Rausch T, Roos F, Wahl DA, et al. A systematic review of vitamin D status in populations worldwide. *British Journal of Nutrition*. 2014;111(1):23-45.

2. Holick MF. Photobiology of vitamin D. Vitamin D (Third Edition): Elsevier; 2011. p. 13-22.
3. Grant WB, Holick MF. Benefits and requirements of vitamin D for optimal health: a review. *Altern Med Rev.* 2005;10(2):94-111.
4. Nair R, Maseeh A. Vitamin D: The “sunshine” vitamin. *Journal of pharmacology & pharmacotherapeutics.* 2012;3(2):118.
5. Vimalaswaran KS, Berry DJ, Lu C, Tikkanen E, Pilz S, Hiraki LT, et al. Causal relationship between obesity and vitamin D status: bi-directional Mendelian randomization analysis of multiple cohorts. *PLoS medicine.* 2013;10(2):e1001383.
6. Shardell M, Hicks GE, Miller RR, Kritchevsky S, Andersen D, Bandinelli S, et al. Association of low vitamin D levels with the frailty syndrome in men and women. *Journals of Gerontology Series A: Biomedical Sciences and Medical Sciences.* 2009;64(1):69-75.
7. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: evidence for a phenotype. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences.* 2001;56(3):M146-M57.
8. MacLaughlin J, Holick MF. Aging decreases the capacity of human skin to produce vitamin D₃. *J Clin Invest.* 1985;76(4):1536-8.
9. Zhou M, Zhuang W, Yuan Y, Li Z, Cai Y. Investigation on vitamin D knowledge, attitude and practice of university students in Nanjing, China. *Public health nutrition.* 2016;19(1):78-82.
10. Alshamsan FM, Bin-Abbas BS. Knowledge, awareness, attitudes and sources of vitamin D deficiency and sufficiency in Saudi children. *Saudi medical journal.* 2016;37(5):579.
11. Boucher BJ. The problems of vitamin d insufficiency in older people. *Aging and disease.* 2012;3(4):313.
12. World Health Organization. Health Statistics and information systems. Proposed Working Definition of an Older Person in Africa for the MDS project Geneva: World Health Organization; 2002 [Available from: <http://www.who.int/healthinfo/survey/ageingdefnolder/en/>].
13. Aljefree NM, Lee P, Ahmed F. Knowledge and attitudes about vitamin D, and behaviors related to vitamin D in adults with and without coronary heart disease in Saudi Arabia. *BMC public health.* 2017;17(1):266.
14. Ahmed MS, Shoker A. Vitamin D metabolites; protective versus toxic properties: molecular and cellular perspectives. *Nephrology Research & Reviews.* 2010;2(1):19-26.
15. Alshahrani F, Aljohani N. Vitamin D: deficiency, sufficiency and toxicity. *Nutrients.* 2013;5(9):3605-16.
16. Suryadinata RV, Lorensia A, Aprilia AP. Profil Vitamin D Pada Pasien Asma Dan Non-Asma Dewasa Di Surabaya (Profile of Vitamin D among adults patients with and without asthma in Surabaya). *The Indonesian Journal of Public Health.* 2017;12(1):106-17.
17. Zutt R, Van Der Kooi A, Linthorst G, Wanders R, De Visser M. Rhabdomyolysis: review of the literature. *Neuromuscular Disorders.* 2014;24(8):651-9.
18. Bruce DG, Devine A, Prince RL. Recreational physical activity levels in healthy older women: the importance of fear of falling. *Journal of the American Geriatrics Society.* 2002;50(1):84-9.
19. Pereira-Santos M, Costa P, Assis A, Santos C, Santos D. Obesity and vitamin D deficiency: a systematic review and meta-analysis. *Obesity reviews.* 2015;16(4):341-9.

The Effects of Age and Body Mass Index on Blood Glucose, Blood Cholesterol, and Blood Pressure in Adult Women

Riza Fikriana¹, Shrimarti Rukmini Devy²

¹Doctoral Program of Public Health, ²Department of Health Promotion and Behaviour Science, Faculty of Public Health, University of Airlangga, Surabaya, Indonesia

ABSTRACT

Introduction: The risk factors of cardiovascular disease include having a high body mass index, hyperglycemia, hypercholesterolemia and increased blood pressure. The purpose of this study was to analyse the effects of age and body mass index (BMI) on blood glucose, blood cholesterol and blood pressure in adult women.

Method: An analytical observation using a cross-sectional method was employed as the study design. The study recruited 60 women aged between 30 to 60 years old to participate, using a purposive sampling technique. The data was analysed using univariate analysis and path analysis.

Result: Age and BMI showed as having the strongest direct effect on the blood pressure. Age also had a direct effect on blood glucose level and blood cholesterol level. The effect of age on blood glucose and blood cholesterol was also mediated by BMI.

Conclusion: Being of an older age had a direct effect on increased blood glucose, blood cholesterol, and blood pressure, while a higher BMI had a direct effect on increased blood pressure. As women get older, maintaining a normal BMI is beneficial to preventing the increase of their blood glucose, blood cholesterol and blood pressure.

Keywords: age, body mass index, blood glucose, blood cholesterol, blood pressure

INTRODUCTION

Cardiovascular disease is a public health problems and the leading cause of death in both developed and developing countries.^{1,2} Globally, the number of deaths due to cardiovascular disease is estimated to have increased from 16.7 million in 2002 to 23.3 million in 2030.³ In Indonesia, coronary heart disease is the second leading cause of death after stroke, contributing to 12.9% of the overall mortality rate.⁴

Several risk factors have been identified as a contributing factor to cardiovascular disease including

age, increased body mass index, hyperglycemia, hypercholesterolemia and increased blood pressure.^{2, 5-8} The risk of cardiovascular disease in females is greater than in males, with the influence of conventional factors such as high blood pressure, high cholesterol, diabetes, excessive body weight, and factors related to psychosocial condition and socioeconomic status.⁹ In addition, hormonal changes throughout a woman's stages of life that affect the cardiac conduction system and the structure and function of the blood vessels, and systemic inflammation could cause cardiovascular disease.^{10, 11} The purpose of this study was to analyse the effect of age and body mass index (BMI) on blood glucose, blood cholesterol and blood pressure in adult women.

METHOD

Study design, setting, and sample size: This study employed an analytical observational design method with a cross-sectional method. The study was conducted

Corresponding Author:

Riza Fikriana

Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Mulyorejo, Surabaya, Indonesia
Email: riza.fikriana-2017@fkm.unair.ac.id

in Malang district, East Java, Indonesia. Using a purposive sampling method, 60 women aged between 30 to 60 years old were recruited to participate in the study.

Variables and the instrument of the data collection:

There were five variables in the study, including age, BMI, blood glucose, blood cholesterol, and blood pressure as described below.

- a. **Age:** The data of age was obtained from the sociodemographic characteristics of the respondents stated during the data collection. Other sociodemographic data included marital status, employment status and co-morbidity.
- b. **Body mass index (BMI):** The body mass index was obtained from the measurement of body weight (kg) and height (m). The formula to calculate the BMI is as follow: (weight (kg) / weight (m))². BMI was classified as underweight (BMI <20 kg/m², normal (BMI= 20-24.9 kg/m²), overweight (BMI= 25-29.9 kg/m²), and obesity (BMI≥30 kg/m²).⁷
- c. **Blood glucose:** The blood glucose was measured based on the capillary blood glucose level (mg/dl) using a glucose meter. For the purpose of this study, blood glucose was measured from a random glucose test. A blood glucose level of less than 200 mg/dl was categorised as normal and a level of 200 mg/dl or higher was classified as hyperglycemia.
- d. **Blood cholesterol:** Blood cholesterol was measured from the total blood cholesterol level obtained from peripheral blood (mg/dl) using a finger-stick cholesterol test. The blood cholesterol level was considered to be normal at less than 200 mg/dl, and hypocholesteremic at 200 mg/dl or higher.
- e. **Blood pressure:** The blood pressure level was measured using a sphygmomanometer. The results of the Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) measurements of each study participant were recorded on an observation sheet. Using the Joint National Committee’s 8 guidelines, the blood pressure level was categorised as normal for the SBP < 120 mmHg and DBP < 80 mmHg, pre-hypertension for the SBP 120 – 139 mmHg and DBP 80 – 89 mmHg, hypertension stage 1 for the SBP 140 – 159 mmHg and DBP 90 – 99 mmHg, and hypertension stage 2 for the SBP ≥ 160 mmHg and DBP ≥ 100 mmHg.¹²

Ethical consideration and the data collection: Before the data collection, all of the study participants were provided with information about the study and the right to withdraw at any time. A written informed consent was submitted by participants to indicate agreement to participate in the study. After filling in the questionnaire with their age, marital status, and current employment status, participants were measured for their blood pressure level, blood glucose level and blood cholesterol level.

DATA ANALYSIS

The data was analysed using descriptive analysis to describe the sociodemographic characteristics and the clinical characteristics of the participants. The data was then analysed using path analysis.

RESULTS

Sociodemographic and clinical characteristics of the study participants: As shown in Table 1, more than half of the subjects (63.3%) were aged between 30 to 45 years old. The majority of the women were married (88.3%) and unemployed (68.3%). Based on their clinical status, the majority of them did not have diabetes mellitus as a co-morbidity as indicated by the high percentage of women (91.7%) with normal random blood glucose level. The majority of the subjects had a normal BMI (45%). Most of the study subjects had a normal blood cholesterol level (51.7%), and normal blood pressure (35%).

Table 1: Sociodemographic characteristics and clinical characteristics of the study participants

Characteristics		Total	
		N	%
Socio-demographic characteristics			
Age (years)	30–45	38	63.3
	≥ 46	22	36.7
Marital status	Married	53	88.3
	Single/Divorce/ Widowed	7	11.7
Employment status	Employed	19	31.7
	Unemployed	41	68.3
Clinical characteristic			
Diabetes mellitus as co-morbidity	Yes	5	8.3
	No	55	91.7

Conted...

Body mass index	Underweight	7	11.6
	Normal	27	45.0
	Overweight	15	25.0
	Obesity	11	18.4
Blood glucose	Normal	55	91.7
	Hyperglycemia	5	8.3
Blood cholesterol	Normal	31	51.7
	Hypercholesterolemia	29	48.3
Blood pressure	Normal	21	35.0
	Pre-hypertension	19	31.7
	Hypertension stage 1	14	23.3
	Hypertension stage 2	6	10.0

Path analysis: As shown in Figure 3, the diagram path presented the results of the path analysis on the effects of age and BMI on blood glucose, blood cholesterol and blood pressure among the women participating in the study. There were four paths with significant relationships. The first significant direct effect was in age (X1. Usia) → blood glucose (Y1.GD). The second significant direct effect was age (X1. Usia) → blood

cholesterol (Y2.KD). The third significant direct effect was age (X1. Usia) → blood pressure (Y3.TD). The fourth significant direct effect was shown in BMI (X2. IMT) → blood pressure (Y3.TD).

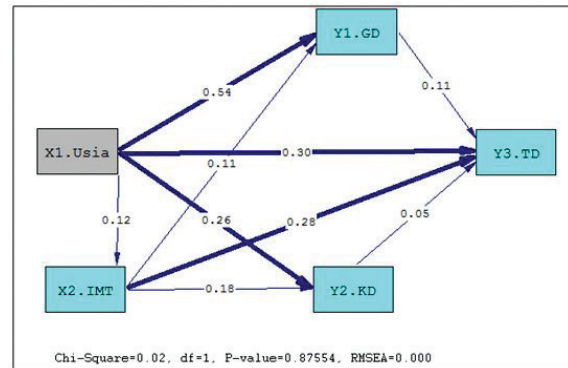


Figure 1: Results of the path analyses with their beta coefficient value

Table 2 presents the results of the path analysis displaying the effect values of age related to blood glucose, blood cholesterol and blood pressure. Each path described the direct or indirect effect of age on blood glucose, blood cholesterol and blood pressure. BMI was entered as the mediating variable.

Table 2: The path effect value of age on blood glucose, blood cholesterol, and blood pressure

No.	Path of variable	Effect value	Total effect
1.	Age → Blood Glucose	0.54	0.553
2.	Age → BMI → Blood Glucose	0.12 x 0.11 = 0.0132	
3.	Age → Blood cholesterol	0.26	0.282
4.	Age → BMI → Blood cholesterol	0.12 x 0.18 = 0.0216	
5.	Age → Blood Pressure	0.30	0.409
6.	Age → Blood Glucose → Blood pressure	0.54 x 0.11 = 0.0594	
7.	Age → Blood cholesterol → Blood Pressure	0.26 x 0.05 = 0.013	
8.	Age → BMI → Blood Cholesterol → Blood Pressure	0.12 x 0.18 x 0.05 = 0.0011	
9.	Age → BMI → Blood Glucose → Blood Pressure	0.12 x 0.11 x 0.11 = 0.0015	
10.	Age → BMI → Blood Pressure	0.28 = 0.034	

The first path showed a direct effect between age (X1) and blood glucose (Y1), while the second path had BMI as the mediator variable (X2). The effect value in the first path was 0.54. The value of this effect was unidirectional. As the women got older, their blood glucose levels tended to increase by 0.54 times. In the second path, the effect value was 0.013. The direction showed an order of effect that indicated that older age with

the BMI increase as the mediation would increase the blood glucose level by 0.013 times. The total effect of the relationship between age and blood glucose was 0.553 times.

The third and fourth paths showed the effect between age (X1) and blood cholesterol (Y2). The third path presented a direct path, while the fourth path had a direction with BMI as the mediating variable (X2). The effect value of the third path was 0.26, while the

fourth path was 0.0216 after being mediated by BMI. The total effect of the relationship between women's age and blood cholesterol level was 0.282. This effect value indicated the unidirectional path which explained that growing older would lead women to have an increased blood cholesterol level by 0.282 times.

The paths from the fifth to the tenth were the pathway between age (X1) and the blood pressure variable (Y3). While the fifth path had a direct line between age and blood pressure level, the sixth path up to the tenth path were each mediated by BMI, blood glucose, and blood cholesterol respectively. The total of the effect value from the fifth to the tenth paths was 0.409. The unidirectional effect value means that the increased age of women would lead to the increasing blood pressure level by 0.409 times.

This finding indicates that the women's age had a strong significant effect on blood glucose, blood pressure, and blood cholesterol respectively. The women's BMI had a significant effect on blood pressure.

DISCUSSION

Age was shown to have a strong effect on blood glucose level, blood pressure level, and blood cholesterol level. The blood glucose level tends to rise along with an increase in age. The results of this study confirmed the findings of previous studies.^{13, 14} Aging has a correlation to the changes in glucose metabolism in the blood system, including insulin resistance and cell dysfunction.^{15, 16} The effectiveness of insulin could be decreasing due to an increase in abdominal fat mass, low physical activity, mitochondrial dysfunction, and hormonal changes.^{17, 18}

The strong effect of age on the women's blood pressure level has been shown in the present study. This finding was consistent with previous studies that reported that increased blood pressure level was significantly associated with increasing age.¹⁹⁻²¹ Aging causes changes in the structure of the arteries, so then the arteries become more rigid.²² The increase in blood pressure may occur due to an unhealthy lifestyle, such as a high salt intake and high sugar consumption.²³ A high level of salt in diet can cause changes in vascular smooth muscle cells, which results in the accumulation of collagen in the walls of the arteries, thus increasing arterial stiffness.²⁴ For women, approaching the menopausal period cause a greater risk of increased

blood pressure level than men. The mechanism of the blood pressure rise involves multiple factors such as decreased oestrogen levels, oxidative stress, endothelial dysfunction, and the influence of the renin angiotensin system and sympathetic activation.²⁵

Another strong effect was also found between the women's age and blood cholesterol level in this study. The aging process results in changes in the cholesterol metabolism of the blood. These changes cause an increase in Low Density Lipoprotein (LDL) cholesterol. The balance between intake, synthesis, absorption, and excretion affects the cholesterol metabolism of the human body.²⁶

Body Mass Index (BMI) affects blood pressure level. This finding supports the results of previous studies that illustrated the significant relationship between BMI and blood pressure.^{19, 23} A high level of BMI affects blood pressure. Practicing a healthy lifestyle and controlling bodily weight should be encouraged in order to prevent an increase in blood pressure.^{25, 27, 28}

CONCLUSION

Age has a significant effect on blood glucose, blood pressure, and blood cholesterol, while BMI has a significant effect on blood pressure. Aging puts women at a greater risk of having an increased level of blood glucose, blood pressure, and blood cholesterol. The risk escalates for older women with a high BMI. To maintain a normal level of blood sugar, blood cholesterol, and blood pressure, the risk factors should be controlled. While aging is inevitable, BMI level can be managed by practicing a healthy lifestyle such as reducing fat, salt, and sugar intake in their diet, promoting physical activity, and maintaining a normal body weight.

Ethical Clearance: Ethical approval was granted by the School of Public Health in Airlangga University, Surabaya.

Source of Funding: self funding.

Conflict of Interest: Authors declared that we have no conflict of interest.

REFERENCES

1. Nangia R, Singh H, Kaur K. Prevalence of cardiovascular disease (CVD) risk factors. *medical journal armed forces india*. 2016;72(4):315-9.
2. Balakumar P, Maung-U K, Jagadeesh G. Prevalence and prevention of cardiovascular disease and diabetes mellitus. *Pharmacological research*. 2016;113:600-9.
3. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS medicine*. 2006;3(11):e442.
4. MoH. Penyakit Jantung Penyebab Kematian Tertinggi, Kemenkes Ingatkan CERDIK (the cardiovascular disease is the highest cause of death, the health minister remind to do CERDIK) Jakarta: Kemenkes RI; 2017 [Available from: <http://www.depkes.go.id/article/view/17073100005/penyakit-jantung-penyebab-kematian-tertinggi-kemenkes-ingatkan-cerdik-.html>].
5. Corella D, Ordovás JM. Aging and cardiovascular diseases: The role of gene–diet interactions. *Ageing research reviews*. 2014;18:53-73.
6. Tragante V, Barnes MR, Ganesh SK, Lanktree MB, Guo W, Franceschini N, et al. Gene-centric meta-analysis in 87,736 individuals of European ancestry identifies multiple blood-pressure-related loci. *The American Journal of Human Genetics*. 2014;94(3):349-60.
7. Lamelas P, Schwalm J, Leong D, Jolly S, Mehta S, Bangdiwala S, et al. Varying Effects of Body Mass Index and Mortality in Different Risk Groups. *The American Journal of Cardiology*. 2018.
8. World Health Organization. *Global atlas on cardiovascular diseases prevention and control*. Geneva: WHO; 2011.
9. Möller-Leimkühler AM. Gender differences in cardiovascular disease and comorbid depression. *Dialogues in Clinical Neuroscience*. 2007;9(1):71-83.
10. Li J, Song C, Li C, Liu P, Sun Z, Yang X. Increased risk of cardiovascular disease in women with prior gestational diabetes: A systematic review and meta-analysis. *Diabetes research and clinical practice*. 2018;140:324-38.
11. Leonard EA, Marshall RJ. Cardiovascular Disease in Women. *Primary Care: Clinics in Office Practice*. 2018;45(1):131-41.
12. Shrout T, Rudy DW, Piascik MT. Hypertension update, JNC8 and beyond. *Current opinion in pharmacology*. 2017;33:41-6.
13. Ko GT, Wai HP, Tang JS. Effects of age on plasma glucose levels in non-diabetic Hong Kong Chinese. *Croatian medical journal*. 2006;47(5):709-13.
14. Suastika K, Dwipayana P, Saraswati IMR, Kuswardhani T, Astika N, Putrawan IB, et al. Relationship between age and metabolic disorders in the population of Bali. *Journal of Clinical Gerontology and Geriatrics*. 2011;2(2):47-52.
15. Kalyani RR, Egan JM. Diabetes and altered glucose metabolism with aging. *Endocrinology and Metabolism Clinics*. 2013;42(2):333-47.
16. Park MH, Kim DH, Lee EK, Kim ND, Im DS, Lee J, et al. Age-related inflammation and insulin resistance: a review of their intricate interdependency. *Archives of pharmacal research*. 2014;37(12):1507-14.
17. Karakelides H, Irving BA, Short KR, O'brien P, Nair KS. Age, obesity, and sex effects on insulin sensitivity and skeletal muscle mitochondrial function. *Diabetes*. 2009.
18. Goulet ED, Hassaine A, Dionne IJ, Gaudreau P, Khalil A, Fulop T, et al. Frailty in the elderly is associated with insulin resistance of glucose metabolism in the postabsorptive state only in the presence of increased abdominal fat. *Experimental gerontology*. 2009;44(11):740-4.
19. Boledovičová M, Hendl J, Lišková L, Slamková A, Matoulek M, Stránská Z, et al. Blood pressure relation to body composition and age: analysis of a nurse-led investigation and consultation program. *Medical science monitor: international medical journal of experimental and clinical research*. 2013;19:612.
20. Jung C-H, Jung SH, Lee B, Rosenberg M, Reaven GM, Kim SH. Relationship among age, insulin resistance, and blood pressure. *Journal of the American Society of Hypertension*. 2017;11(6):359-65. e2.

21. Sun H, Sun M. Age-and gender-dependent associations of blood pressure and serum sodium and potassium—renal and extrarenal regulations. *Journal of the American Society of Hypertension*. 2018;12(5):392-401.
22. Pinto E. Blood pressure and ageing. *Postgraduate medical journal*. 2007;83(976):109-14.
23. Fujisawa M, Ishimoto Y, Chen W, Manuaba IIB, del Saz EG, Okumiya K, et al. Correlation of systolic blood pressure with age and body mass index in native Papuan populations. *Hypertension Research*. 2012;35(9):959.
24. Safar ME. Systolic hypertension in the elderly: arterial wall mechanical properties and the renin–angiotensin–aldosterone system. *Journal of hypertension*. 2005;23(4):673-81.
25. Channanath AM, Farran B, Behbehani K, Thanaraj TA. Association between body mass index and onset of hypertension in men and women with and without diabetes: A cross-sectional study using national health data from the State of Kuwait in the Arabian Peninsula. *Bmj Open*. 2015;5(6):e007043.
26. Morgan A, Mooney KM, Wilkinson SJ, Pickles N, Mc Auley MT. Cholesterol metabolism: A review of how ageing disrupts the biological mechanisms responsible for its regulation. *Ageing research reviews*. 2016;27:108-24.
27. Dua S, Bhuker M, Sharma P, Dhall M, Kapoor S. Body mass index relates to blood pressure among adults. *North American journal of medical sciences*. 2014;6(2):89.
28. Vuvor F. Correlation of body mass index and blood pressure of adults of 30–50 years of age in Ghana. *Journal of Health Research and Reviews*. 2017;4(3):115.

The Antioxidant Activity and Organoleptic Properties of Soursop Leaf Tea (*Annona Muricata L.*) and Moringa Leaf (*Moringa Oliefera L.*) in Combination with Guava Leaf (*Psidium Guajava*)

Roy J. Irawan¹, Trias Mahmudiono²

¹Doctoral Program of Public Health, Faculty of Public Health, ²Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

Soursop leaf tea (*Annona muricata L.*) and drumstick tree leaf tea (*Moringa oliefera L.*) in combination with guava leaves (*Psidium guajava*) are innovative herbal drinks from Indonesia. Soursop, drumstick and guava leaves contain antioxidant compounds such as tannin, saponin, flavonoids, alkaloids, triterpene and quercetin. This study aims to compare the antioxidant activity and organoleptic properties between soursop leaf tea and drumstick tree leaf tea in combination with guava leaves. The study was conducted through analysing the production of tea with an overall drying temperature at 50 °C, 55 °C, 60 °C and 65 °C respectively. The antioxidant activity was measured using the UV-Vis spectrophotometric method (λ 517 nm), while the organoleptic properties were measured using the parameters of taste, colour aroma, and viscosity. The highest antioxidant activity was performed at a temperature of 50 °C, which measured the lowest EC50 value while having the lowest level of organoleptic properties.

Keywords: soursop leaf tea, drumstick leaf tea, guava leaf, drying temperature, antioxidant activity and organoleptic properties

INTRODUCTION

Tea is a popular type of beverage in Asia. The tea drinking culture is a socio-cultural function that bring families closer together.¹ Tea is generally made from the young shoots of tea leaves. The tea leaves have undergone the processing of withering, rolling, grinding, enzymatic oxidation and drying. Tea has been widely recognised as having various benefits not limited to being a regular daily drink, but also health benefits including its use as alternative medicine² or as a cancer drug.³

Tea is believed containing flavonoids which have are antioxidants.⁴ Almost every group of flavonoids has the capacity to act as antioxidants. Flavones and

catechins contain flavonoids that can help to protect the body against reactive oxygen species. They are associated with improved pulmonary functions and the reduction of a chronic cough.⁵ Body cells and tissues are continuously threatened by the damage caused by free radicals and reactive oxygen species, which are produced during normal oxygen metabolism or induced by exogenous damage.⁶

The development of health sciences in relation to the tea production has expanded the use of materials to not only from the tea leaves buds but also from other plants such as soursop leaves, drumstick leaves, avocado leaves and guava leaves. Soursop leaves have been widely used as a herbal medicine to treat various diseases including asthma, diabetes and seizures.⁷ The content of the compounds in the soursop leaves includes steroids/terpenoids, flavonoids, coumarins, alkaloids, and tannins. Moringa leaves can be utilised as a nutritious medicinal ingredient because of its flavonoid content, which serve as antioxidants and anti-inflammatories. Flavonoid

Corresponding Author:

Roy J. Irawan
Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Mulyorejo, Surabaya, Indonesia
Email: roy.januardi.awan-2017@fkm.unair.ac.id

compounds are known to work as antioxidants against cancer, anti-microbials, antivirals, photosynthetic regulators, and growth regulators.⁸ Moringa leaves also contain anthraquinones, alkaloids, saponins, terpenoids, anthocyanins, tannins and carotenoids.⁹

The soursop, drumstick and guava leaves can be used as a herbal tea because the dried leaves are better preserved than fresh leaves. In addition, consuming the dried leaves as a herbal tea is also more practical. In the tea factory, the drying process aims to reduce the water level of the fresh tea leaves. The drying process should maintain the drying temperature, so then the active components of the leaves can be preserved. Therefore, it is important to investigate what is the optimum drying temperature in order to produce good quality tea with organoleptic properties. The aim of this study was to compare the antioxidant activity and organoleptic characteristics between soursop leaf (*Annona muricata* L.) and moringa leaf (*Moringa oleifera* L.) in combination with guava leaf (*Psidium guajava*).

MATERIAL AND METHOD

Materials: Soursop leaves, drumstick leaves and guava leaves were collected. Some of the tools and instruments prepared included a water level test (AOAC, 1995), a qualitative test of the phenolic and flavonoids compounds¹⁰, a quantitative test of antioxidant activity using the EC₅₀ method¹¹, and an organoleptic properties test.¹²

Procedure of the sample preparation:

1. Tea Preparation: First, the soursop, drumstick and guava leaves were left to wither for approximately 24 hours. After the withering process, the leaves were divided into four parts with an equal composition of soursop leaves and combined drumstick and guava leaves. Each part was then dried at 50°C, 55°C, 60°C, and 65°C respectively using an oven for 2 hours. Subsequently, the dried leaves of the different drying temperatures were ground to produce the tea powder. The tea powder of the soursop leaves and the drumstick leaves in combination with guava leaves were then weighed. Every 100 mg of tea powder was packed into a labelled dyed bag, and then each tea bag was brewed in 70°C water for 4 minutes.

2. Determination of Phenolic Compound: Each 100 mg tea bag of a different drying temperature

was put into 100ml of hot water and boiled. After boiling, 5 ml of the tea from each tea bag was collected and put into a test tube. Each test tube with a tea solution had 5 drops of 5% FeCl₃ added. The test tube was shaken hard until the colour of the tea solution changed into blackish-blue, indicating the presence of a phenolic compound.

3. Qualitative Determination of Flavonoid Compounds:

Each 5ml tea (soursop leaf tea and the combination of drumstick leaves and guava leaves) solution was put into a test tube, and then 1 ml HCl concentrated powder was added, and 5 ml amyl alcohol. After the solution was shaken hard, the tea colour could turn orange, indicating the presence of flavonoid compounds.

4. Quantitative Determination of Antioxidants:

To determine the antioxidant activity in each tea bag, two methods were used; the α-diphenyl-β-picrylhydrazyl (DPPH) method and Effective Concentration [EC₅₀].¹³ In the DPPH method, the procedure involves a 4 ml DPPH solution of 0.07 mM put into a test tube. This was added to the 50 μl tea solution. Each tea solution was homogenised with a vortex. Another DPPH solution was left without any treatment applied as the control sample. The UV-VIS Spectrophotometer with a 517nm wavelength at 40 minutes operating time was used to measure the solution. EC₍₅₀₎ (concentration required obtaining a 50% antioxidant effect) is a parameter utilised to measure the antioxidant capacity and to compare the activity of the different compounds. Substances that have high antioxidant activity will have a low level of EC₍₅₀₎.¹⁴

5. Organoleptic Properties Using Organoleptic Panel Testing:

The Organoleptic Panel Testing tool¹² was used to determine the organoleptic properties. The parameters for the organoleptic properties consist of taste, colour, aroma and appearance. The panel of 20 tea experts filled out a descriptive qualitative form in order to describe the organoleptic properties of each tea bag, each with a different drying temperature.

RESULTS AND DISCUSSION

The tea made from soursop leaves in combination with drumstick and guava leaves was based on the method developed in a previous study.¹⁵ The operating

condition of the withered leaves referred to the optimum condition of the soursop leaves, drumstick leaves, and guava leaves in this study. This present study used four variations of drying temperature (50°C, 55°C, 60°C, and 65 °C) to find out the antioxidant activity. Tests performed on the tea bags for the soursop leaves tea and the tea bags of the combined drumstick leaves and guava leaves yielded results of the organoleptic properties and the antioxidant activity, which has been described and discussed below.

Organoleptic Properties: After the drying process, the colour of the leaves turned brownish because of the carbonate group Maillard reaction of the glucose reacted with the nucleophilic amine group of proteins, which produced a distinctive brown colour. The drying process caused the leaves to be oxidised.¹⁶

Both the soursop leaf tea and the combined drumstick leaf and guava leaf tea had a bitter taste, which is an indication of antioxidants. The bitterness of the tea is generally attributable to the combination of catechins, saponins, polyphenols and amino acids, which are recognised as the components of antioxidants.¹⁷ Some flavonoids are very bitter, whereas others are not, depending on the type of glycoside chain. Naringin and neohesperidin are very bitter, whereas hesperidin is tasteless.¹⁸ The bitter taste is also caused by the catechins and tannins, that do not have tanning and clotted proteins.¹⁹

The aroma of the tea was bitter which caused by saponin.²⁰ The components in soursop leaves and combination of drumstick and guava leaves which caused the aroma is the glycosidase enzyme. Based on the results of organoleptic test, all 20 panellists stated that the taste, aroma, colour and viscosity of the soursop leaves tea and the drumstick leaves tea in combination with guava leaves was good. All panellists were generally favourable to consume the soursop leaves tea as well as the drumstick leaves and guava leaves tea.

Antioxidants Activities

1. The phenolic compound of the soursop leaf tea and the combination of drumstick leaf and guava leaf tea.

FeCl₃ reacted with the phenolic groups to form complexes of green, purple and black.²¹ Table 1 displays the presence of phenolic compound in

four different drying temperature teas. The (+) indicates the presence of phenolic compounds in the soursop leaf tea and the combination of drumstick leaf and guava leaf tea.

Table 1: Phenolic compound of the soursop leaf tea and the combination of drumstick leaf and guava leaf tea

No.	Drying Temperature (°C)	Phenolic compound
1.	50	+
2.	55	+
3.	60	+
4.	65	+

2. The flavonoid compound of the soursop leaf tea and the combination of drumstick leaf and guava leaf tea

The flavonoid compounds reacted to the magnesium powder and with the help of concentrated HCl, they formed a complex with green to orange flavonoid groups. The test results were positive when the orange colour emerged from the mahogany flavonoid complex (Robinson, 1995). Table 2 shows the presence of flavonoid compounds in the tested tea. The (+) indicates the presence of phenolic compounds in the soursop leaf tea and the combination drumstick leaf and guava leaf tea.

Table 2: Flavonoid compound of the soursop leaf tea and the combination drumstick leaf and guava leaf tea

No.	Drying Temperature (°C)	Flavonoid compound
1.	50	+
2.	55	+
3.	60	+
4.	65	+

Antioxidants Activity using EC₅₀: The EC₅₀ value is usually used to describe the antioxidant activity of the test material by the DPPH free radical scavenging method.¹³ The EC₅₀ values are inversely proportional to the ability of the antioxidant compounds. The smaller the EC₅₀ value, the stronger the antioxidant ability.¹⁴ The analysis result of the antioxidant activity in the present study showed that the effective concentration

value (EC_{50}) was at the higher drying temperature, so the EC_{50} value was lower. The highest levels of antioxidant activity were 76.06% for the soursop leaf tea and 70.49% for the combination of drumstick leaf and guava leaf tea. The highest level of antioxidant activity for both the soursop leaf tea and the combination of drumstick leaf and guava leaf tea were found from tea bags with a drying temperature of 50°C. Compared to the other drying temperatures of 55, 60, and 65°C, the 50°C drying temperature generated the highest level of antioxidant activity as indicated from the lowest EC_{50} level. However, the soursop leaf tea showed a higher antioxidant activity than the combination drumstick leaf and guava leaf tea. A possible explanation is that the soursop leaf tea has a higher number of phenolic and flavonoid compounds than the combination of drumstick leaves and guava leaves.

CONCLUSION

Drying temperature has a significant influence on determining the antioxidant activity levels of the soursop leaf tea and the combination drumstick leaf and guava leaf tea. The optimal operational drying temperature was 50°C, which produced the highest antioxidant activity and lowest EC_{50} value. The soursop leaf tea has a higher antioxidant level than the combination drumstick leaves and guava leaves at the drying temperature of 50°C. Based on the organoleptic test, the panellists stated that the soursop leaf tea and the combination drumstick leaf and guava leaf tea were both generally good in terms of aroma, colour, taste, and viscosity.

Ethical Clearance: ethical approval was granted by the School of Public Health in Airlangga University, Surabaya.

Source of Funding: self funding.

Conflict of Interest: Authors declared that we have no conflict of interest.

REFERENCES

- Eto H, Dey N, Liu I-C, Mahujchariyawong P, Roy P. Comprehensive Study of Tea Culture and Its Possible Contribution to Creativity Education in Locals. *International Journal of Research in Sociology and Anthropology (IJRSA)*. 2015;1(1):54-64.
- Shih C-C, Huang L-H, Lane H-L, Tsai C-C, Lin J-G, Chen T-L, et al. Use of folk therapy in Taiwan: a nationwide cross-sectional survey of prevalence and associated factors. *Evidence-Based Complementary and Alternative Medicine*. 2015;2015.
- Forester SC, Lambert JD. The role of antioxidant versus pro-oxidant effects of green tea polyphenols in cancer prevention. *Molecular nutrition & food research*. 2011;55(6):844-54.
- Yen G-C, Chen H-Y. Antioxidant activity of various tea extracts in relation to their antimutagenicity. *Journal of agricultural and food chemistry*. 1995;43(1):27-32.
- Tabak C, Arts IC, Smit HA, Heederik D, Kromhout D. Chronic obstructive pulmonary disease and intake of catechins, flavonols, and flavones: the MORGEN Study. *American journal of respiratory and critical care medicine*. 2001;164(1):61-4.
- De Groot H. Reactive oxygen species in tissue injury. *Hepato-gastroenterology*. 1994;41(4):328.
- Zuhud EA. *Bukti Kedahsyatan: Sirsak Menumpas Kanker*. Jakarta: AgroMedia Pustaka; 2011.
- Robinson T. *Kandungan organik tumbuhan tinggi*. Diterjemahkan oleh Kosasih Padmawinata. Bandung: ITB; 1995. 1-6 p.
- Nweze NO, Nwafor FI. Phytochemical, proximate and mineral composition of leaf extracts of *Moringa oleifera* Lam. from Nsukka, South-Eastern Nigeria. 2014.
- Sankhalkar S, Vernekar V. Quantitative and Qualitative analysis of Phenolic and Flavonoid content in *Moringa oleifera* Lam and *Ocimum tenuiflorum* L. *Pharmacognosy research*. 2016;8(1):16.
- Stanojević L, Stanković M, Nikolić V, Nikolić L, Ristić D, Čanadanovic-Brunet J, et al. Antioxidant activity and total phenolic and flavonoid contents of *Hieracium pilosella* L. extracts. *Sensors*. 2009;9(7):5702-14.
- Cartwright L, Snell C, Kelley PH. Organoleptic Panel Testing as Research Tool. *Analytical Chemistry*. 1952;24(3):503-6.

13. Chen Z, Bertin R, Frolidi G. EC50 estimation of antioxidant activity in DPPH assay using several statistical programs. *Food chemistry*. 2013;138(1):414-20.
14. Molyneux P. The use of the stable free radical diphenylpicrylhydrazyl (DPPH) for estimating antioxidant activity. *Songklanakarin J Sci Technol*. 2004;26(2):211-9.
15. Tuminah S. Teh [*Camellia sinensis* OK var. *Assamica* (Mast)] sebagai Salah Satu Sumber Antioksidan. *Cermin Dunia Kedokteran*. 2004;144:52-4.
16. Tamanna N, Mahmood N. Food Processing and Maillard Reaction Products: Effect on Human Health and Nutrition. *International journal of food science*. 2015;2015:526762-.
17. Drewnowski A, Gomez-Carneros C. Bitter taste, phytonutrients, and the consumer: a review-. *The American journal of clinical nutrition*. 2000;72(6):1424-35.
18. Pełkal A, Drózdź P, Biesaga M, Pyrzynska K. Evaluation of the antioxidant properties of fruit and flavoured black teas. *European journal of nutrition*. 2011;50(8):681-8.
19. Narukawa M, Noga C, Ueno Y, Sato T, Misaka T, Watanabe T. Evaluation of the bitterness of green tea catechins by a cell-based assay with the human bitter taste receptor hTAS2R39. *Biochemical and biophysical research communications*. 2011;405(4):620-5.
20. Warisno D. Meraup untung dari olahan kedelai. *Agromedia Pustaka Jakarta*. 2010.
21. Sudjadi S, Rohman A. *Analisa Obat dan Makanan*. Yogyakarta: Pustaka Belajar; 2004.

Parent Communication Regarding Sexual and Reproductive Health of Adolescent: A Qualitative Systematic Review

Fransiska Imavike Fevriasanty¹, Oedojo Soedirham²

¹Doctoral Program of Public Health, Faculty of Public Health, ²Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

Parents have significant influence on the sexual and reproductive health of adolescent. This study aimed to describe parents communication related to the sexual and reproductive health of adolescent. This study present a systematic review of articles related to the topic in the last ten years (2008-2018). The review found 155 articles with 10 articles meeting inclusions criteria. There were five main themes including the reason for sexuality communication, discomfort talking about sexuality, communication barriers, intergenerational comparison and parent as a decision maker. It is recommended to reduce barriers, determine the proper reasons to start communication about sexuality and arrange a comfortable environment for adolescents to express their sexual and reproductive health needs to parents.

Keywords: *parenting, communication, adolescence, sexual health*

INTRODUCTION

The sexual and reproductive health of adolescent attracts global attention as the number of sexually active adolescents has been increasing in these recent years.¹ The population of adolescent was estimated to increase from 1.2 billion to 1.3 billion during 2010 and 2030, and become 18% and 15% of total world population respectively.² The teenagers tend to try new sexual experience as the manifestation of their puberty period. The age of sexual intercourse for the first time can also influence the decision of adolescents to use contraception that triggers sexual debut during his lifetime where sexual debut early in adolescence increases the risk of mouth STIs and unwanted pregnancies.^{2,3} but little is known about its effects beyond adolescence. This study examines the relationship between the age at first intercourse and subsequent contraceptive gaps.

METHODS We identified 3538 sexually active, fertile women participants from the 2006-2008 National Survey of Family Growth. Women were classified as consistent contraceptive users or inconsistent/nonusers. Age at first intercourse with a man was determined by self-report and categorized as <15, 15-17, and ≥18 years. **RESULTS** Twenty-three percent reported gaps in contraceptive use in the year prior to interview. Compared with women who were 18 or older at first intercourse, women who were <15 years of age at the time of first intercourse were nearly two times as likely to report a gap in contraceptive use (adjusted odds ratio: 1.93; 95% confidence interval: 1.23-3.00). A study stated that 33.5% of the adolescents had ever had sexual intercourse while as many as 32.5% had more than one sexual partners and only 26.2% stated that used condom in their last intercourse.⁴

Parental engagement still become an important factor to protect their children to have a negative sexual behaviors, especially in this internet era.⁵ The role of the family is very important to prevent risky sexual behavior in adolescents such as premarital sexual behavior.⁵ Some previous studies stated that adolescents who engage in premarital sex usually come from divorced families or teenagers who lived with his parents where a family function does not run properly⁶⁻⁹. One factor that causes poor family function is due to the lack of communication between parents and teenagers¹⁰.

Corresponding Author:

Fransiska Imavike Fevriasanty
Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Mulyorejo, Surabaya, Indonesia
Email: fevriasanty.imavike.fevriasanty-2017@fkm.unair.ac.id

The few studies that reviewed qualitative studies especially those related to family experiences in communicating with adolescents related to sexual and reproductive health were the hallmarks of this study. The purpose of this current study was to describe results of a qualitative systematic review of parent communication regarding the sexual and reproductive health of adolescent.

METHOD

The study used several approaches qualitative systematic review. The most important of qualitative systematic reviews is the aim to answer research questions about participants' feelings and perceptions so that a detailed process was needed to achieve them.¹¹ The first stage that must be passed from this study is to determine the topic and purpose of the article review. The next step is to determine keywords to search for articles where in this study we use the "word parenting", "family communication", "parent-adolescent relationship", "sexual health", "sexuality", and "qualitative". Further, we determined the inclusion criteria which included 1) research participants were parents, both mother and father and teenager, male or female; 2) age for adolescent participants between 11-20 years; 3) research topics around family experiences and perspectives on adolescence sexual health; and 4) qualitative studies. The topic of LGBT was excluded from this study. Literature collected using data sources: Google Scholar, Science Direct, Proquest Health and Medical Complete, Psychology Journals Proquest, Proquest Science Journals and PubMed, during ten years from 2008 to 2018. Of the 155 papers identified, 58 articles were excluded due to duplication. As many as 20 articles met the inclusion criteria and were re-identified for eligibility until finally ten papers were found for review. The next important step is data extraction and synthesis data from the 10 papers reviewed.

RESULTS

Of the ten research articles reviewed, seven articles discussed parent communication, an article about father involvement in the reproductive health intervention, an article about puberty and an article about the role of parents in child development. In terms of research participants, three studies used mothers as participants in one study using fathers as informants. Five studies used parents

and teenage children as participants and only one study explored the experiences of young women. Regarding the data collection, four studies used focus group discussions, two studies conducted in-depth interviews, while the other studies applied narrative interviews, telephones interviews, audio recorded conversations and combination of written and group discussions.

Bello et al. has assessed the reactions of adolescents and their parents to puberty in urban poor settings in two African countries and compared to the experiences of current adolescents to their parents' generation. The participants was 66 boys and girls (aged 11-13 years) and their parents. The study was conducted by narrative interviews. The themes identified were adolescents' reaction to reviews their pubertal body changes, parental reactions to adolescent pubertal changes, pubertal intergenerational comparison of adolescent behavior.¹²

Cox et al. determined the content that should be included in a Web-based intervention that specifically targets improved mother-child communication with 24 mothers of sixth to eighth-grade students as participants. The focus group interview was used and the theme found were discomfort discussing sex with male children, the influence of mothers' belief, the need for developmentally appropriate information.¹³

Crichton et al. explored the quality of mother-daughter communication about sexual maturation, abstinence and unintended pregnancy in Nairobi, Kenya. A total of 87 girls (aged 12-17 years) and 37 mothers of teenage girls were included. The theme found were Mothers 'and daughters' views and preferences about communication , Mothers 'and Daughters' experiences: facilitators and barriers to communication , message content, how messages are conveyed, the impacts of context on communication.¹⁴

Francis et al. examined women 's attitude, knowledge, beliefs about HPV and cervical cancer prevention, vaccine awareness, and acceptance, and maternal - child communication about STDs and sexual health within an urban community in Johannesburg. This study included 24 women who have at least one child. The themes were maternal-child communication and sexuality, healthcare decision-making and gender roles, understanding of HPV and cervical cancer, vaccine acceptance.¹⁵

Grossman, Jenkins, and Richer gave a unique long examination of parents' perceptions of continuity and

change in middle-school communication from middle school to high school. As many as 23 parents (20 mothers, 3 fathers) were included for interview. The theme found were reason for sexuality communication, comfort talking about sex, talk about dating and relationships, talk about readiness for sex, and talk about sexual risk and protection.¹⁶

Guilamo-Ramos et al. identified and characterized fathers' role in shaping Latino adolescent sexual behavior and the feasibility and acceptability of a father-son intervention. As many as 30 fathers-son dyads were included for in-dept interview. The theme found wer fathers matter latino and can shape adolescent male sexual decision making, Latino fathers influence their sons through specific paternal parenting processes, and a Latino father-son approach is acceptable and feasible.¹⁷

Hutchinson and Cederbaum tried to understand adolescent females' perceptions about how their fathers contributed to their sexual socialization. The total of 234 females' adolescent (aged 19-21 years) were included. Telephone interview (35-55 minutes) was conducted as part of the larger quantitative study. The themes were how fathers were contributed to their daughters 'sexual socialization, how fathers could have had their daughters' sexual socialization, and barriers.¹⁸

Nurachmah et al. investigated parents and their female adolescent communication patterns of sexual and reproductive health in West Kalimantan, Indonesia. As many as 15 adolescent girls (aged 13-15 years) and 14 mothers were included in a focus group discussion. The findings were infrequent mother-daughter communication about sexuality, mothers tend to avoid discussing srh or feel ashamed and that it is not culturally acceptable to talk about sexual matters, topic about body change during puberty as the content of the mother-daughter communication, and both mother and daughters need adequate information about SRH.¹⁹it appears to be inadequately practiced in Indonesia. Given that female adolescents in Indonesia are faced with increased sex-related risks, it is important to understand, from parents and adolescents' perspectives, how parents communicate about SRH to their adolescents. This study was designed to investigate parents and their female adolescent children's patterns of SRH communication in West Kalimantan, Indonesia. A total of 15 adolescent girls (ages 13-15

Ramchandani et al. characterized the messages mothers communicate to young adolescents regarding

abstinence. As many as 15 mother-daughter dyads and 6 mother-son dyads were involved. The findings were that the children need to know what abstinence is, the needs for setting boundaries for abstinence, abstinence is best considering the risks, and suggestion to come to talk to the partents.²⁰

Worthman, Tomlinson, and Rotheram-Borus tried to understand parent ethnotheories about child developmental needs, appropriate parenting and effects of quality of early childcare. As many as 38 mothers were involve to complete written task and group discussion. It was found that early childhood as a crucial, sensitive period. The focus of parental concern and effort were danger, monitor/control, puberty, reproductive risk, peer influence, morality, teachable, inform/advice, and risk-taking.

From the results of the data synthesis of 10 papers, reviewers have identified **five main** theme related parent communication regarding adolescent sexual and reproductive health that is the reason for sexuality communication, discomfort talking about sexuality, barriers of communication, intergenerational comparison and parent as a decision maker. The main theme is presented in Table 1.

Table 1: Data synthesis of papers reviewed

Themes	Papers
Reason for sexuality communication	Francis et al. (2011) ¹⁵ Grossman, Jenkins and Richer (2018) ¹⁶ Ramchandani et al. (2017) ²⁰ Worthman, Tomlinson and Rotheram Borus (2016) ²¹
Discomfort talking about sexuality	Cox et al. (2010) ¹³ Nurachmah et al. (2018) ¹⁹
Barriers of communication	Crichton et al. (2012) ¹⁴ Hutchinson and Cederbaum (2011) ¹⁸
Intergenerational comparison	Bello et al. (2017) ¹²
Parent as decision maker	Guilamo-Ramos et al. (2018) ¹⁷ Ramchandani et al. (2017) ²⁰

DISCUSSION

After the data extraction process and synthetic data, the researchers had identified five main themes contained in the parents' experience of communicating with

teenagers on the topic of sexual and reproductive health. All of these themes reflect the answers to the objectives of this study, namely parents communication regarding the sexual and reproductive health of the adolescent. Communication has an important role in keeping the family functioning properly, as well as the physical and mental health of family members. Communication also plays an important role in the process of making decisions in families. Most problems that arise in the family are because there is a problem in communication between couple²². When communication with a partner does not go well, the child will be affected.

In children with adolescence, communication between parents and adolescents will lead adolescents to improve social and health behavior, in this case sexual and reproductive health. Young women are usually more comfortable talking about privacy about sexuality with mothers than with fathers¹⁰, this is because mothers know more about a woman's body parts and have experienced the same things as young women feel¹⁶.

Regarding the barrier in communication, parents feel insecure about discussing sexuality with adolescents due to the lack of information they have and lack of skill of doing sex al content communication.²³ In terms of generational differences between parents and adolescents, the rapid advancement of technology and the ease of internet access make teenagers prefer to seek information related to sexual and reproductive health through internet media rather than asking parents, even though this phenomenon was not found when the parents were still small first.^{23,24} However, parents are still looking for a decision maker when teenagers experience problems related to sexual and reproductive health.^{17,20}

CONCLUSIONS

The study of qualitative systematic review concludes that parent-adolescent communication about sexual and reproductive health is very important for the adolescents wellness; by reducing the communication barriers, setting the right reasons for initiating communication about sexual topic and arranging a comfortable environment for teenagers to express their sexual and reproductive health needs to parents.

Conflict of Interest: None.

Ethical Clearance: Not required.

Source of Funding: Self-funded.

REFERENCES

1. World Health Organization. Adolescent pregnancy [Internet]. Geneva; 2014 [cited 2018 Aug 13]. Available from: [http://apps.who.int/iris/bitstream/handle/10665/112320/WHO_;](http://apps.who.int/iris/bitstream/handle/10665/112320/WHO_) jsessionid = sequence=1
2. Williamson N. Motherhood in Childhood The State of World Population 2013 [Internet]. New York, NY: United Nations Population Fund; 2013 [cited 2018 Aug 13]. Available from: www.unfpa.org
3. Magnusson BM, Masho SW, Lapane KL. Early age at first intercourse and subsequent gaps in contraceptive use. J Womens Health (Larchmt) [Internet]. 2012 Jan [cited 2018 Aug 13];21(1):73–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21992618>
4. Kugbey N, Ayanore MA, Amu H, Oppong Asante K, Adam A. International note: Analysis of risk and protective factors for risky sexual behaviours among school-aged adolescents. J Adolesc [Internet]. 2018 Oct 1 [cited 2018 Aug 13];68:66–9. Available from: <https://www.sciencedirect.com/science/article/pii/S0140197118301064?via%3Dihub>
5. Tomić I, Burić J, Štulhofer A. Associations Between Croatian Adolescents' Use of Sexually Explicit Material and Sexual Behavior: Does Parental Monitoring Play a Role? Arch Sex Behav [Internet]. 2018 Aug 25 [cited 2018 Aug 13];47(6):1881–93. Available from: <http://link.springer.com/10.1007/s10508-017-1097-z>
6. Noroozi M, Taleghani F, Merghati-Khoei ES, Tavakoli M, Gholami A. Premarital sexual relationships: Explanation of the actions and functions of family. Iran J Nurs Midwifery Res [Internet]. 2014 Jul [cited 2018 Aug 13];19(4):424–31. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25183986>
7. Pilgrim NA, Ahmed S, Gray RH, Sekasanvu J, Lutalo T, Nalugoda F, et al. Family structure effects on early sexual debut among adolescent girls in Rakai, Uganda. Vulnerable Child Youth Stud [Internet]. 2014 Jul 1 [cited 2018 Aug 13];9(3):193–205. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25317199>

8. Sidze EM, Defo BK. Influences of family structure experiences on the risk of premarital sexual initiation during adolescence in Cameroon. *Adv Life Course Res* [Internet]. 2013 Dec [cited 2018 Aug 13];18(4):270–87. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24796711>
9. Goldberg RE. Family instability and early initiation of sexual activity in Western Kenya. *Demography* [Internet]. 2013 Apr [cited 2018 Aug 13];50(2):725–50. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23055236>
10. Sneed CD. Parent-Adolescent Communication About Sex: The Impact of Content and Comfort on Adolescent Sexual Behavior. *J HIV AIDS Prev Child Youth* [Internet]. 2008 Jul 14 [cited 2018 Aug 13];9(1):70–83. Available from: <http://www.tandfonline.com/doi/abs/10.1080/10698370802126477>
11. Butler A, Hall H, Copnell B. A Guide to Writing a Qualitative Systematic Review Protocol to Enhance Evidence-Based Practice in Nursing and Health Care. *Worldviews Evidence-Based Nurs* [Internet]. 2016 Jun [cited 2018 Aug 13];13(3):241–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26790142>
12. Bello BM, Fatusi AO, Adepoju OE, Maina BW, Kabiru CW, Sommer M, et al. Adolescent and Parental Reactions to Puberty in Nigeria and Kenya: A Cross-Cultural and Intergenerational Comparison. *J Adolesc Heal* [Internet]. 2017 Oct [cited 2018 Aug 13];61(4):S35–41. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/28915991>
13. Cox MF, Scharer K, Baliko B, Clark A. Using focus groups to understand mother-child communication about sex. *J Pediatr Nurs* [Internet]. 2010 Jun 1 [cited 2018 Aug 13];25(3):187–93. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20430279>
14. Crichton J, Ibisomi L, Gyimah SO. Mother-daughter communication about sexual maturation, abstinence and unintended pregnancy: Experiences from an informal settlement in Nairobi, Kenya. *J Adolesc* [Internet]. 2012 Feb 1 [cited 2018 Aug 13];35(1):21–30. Available from: <https://www.sciencedirect.com/science/article/pii/S0140197111000698?via%3Dihub>
15. Francis SA, Battle-Fisher M, Liverpool J, Hipple L, Mosavel M, Soogun S, et al. A qualitative analysis of South African women’s knowledge, attitudes, and beliefs about HPV and cervical cancer prevention, vaccine awareness and acceptance, and maternal-child communication about sexual health. *Vaccine* [Internet]. 2011 Nov 3 [cited 2018 Aug 13];29(47):8760–5. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21855591>
16. Grossman J, Jenkins L, Richer A. Parents’ Perspectives on Family Sexuality Communication from Middle School to High School. *Int J Environ Res Public Health* [Internet]. 2018 Jan 10 [cited 2018 Aug 13];15(1):107. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29320447>
17. Guilamo-Ramos V, Bowman AS, Santa Maria D, Kabemba F, Geronimo Y. Addressing a Critical Gap in U.S. National Teen Pregnancy Prevention Programs: The Acceptability and Feasibility of Father-Based Sexual and Reproductive Health Interventions for Latino Adolescent Males. *J Adolesc Health* [Internet]. 2018 Mar 1 [cited 2018 Aug 13];62(3S):S81–6. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29455723>
18. Hutchinson MK, Cederbaum JA. Talking to Daddy’s Little Girl About Sex: Daughters’ Reports of Sexual Communication and Support From Fathers. *J Fam Issues* [Internet]. 2011 Apr 27 [cited 2018 Aug 13];32(4):550–72. Available from: <http://journals.sagepub.com/doi/10.1177/0192513X10384222>
19. Nurachmah E, Afyanti Y, Yona S, Ismail R, Padang JT, Suardana IK, et al. Mother-daughter communication about sexual and reproductive health issues in Singkawang, West Kalimantan, Indonesia. *Enfermería Clínica* [Internet]. 2018 Feb [cited 2018 Aug 13];28:172–5. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29650179>
20. Ramchandani K, Morrison P, Gold MA, Akers AY. Messages About Abstinence, Delaying Sexual Debut and Sexual Decision-Making in Conversations Between Mothers and Young Adolescents. *J Pediatr Adolesc Gynecol* [Internet]. 2018 Apr 1 [cited 2018 Aug 13];31(2):107–15. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29097292>

21. Worthman CM, Tomlinson M, Rotheram-Borus MJ. When can parents most influence their child's development? Expert knowledge and perceived local realities. *Soc Sci Med* [Internet]. 2016 Apr 1 [cited 2018 Aug 13];154:62–9. Available from: <https://www.sciencedirect.com/science/article/pii/S0277953616300958?via%3Dihub>
22. Friedman MM, Bowden VR, Jones EG. *Buku Ajar Keperawatan Keluarga: Riset, teori, dan praktik*. 5th ed. Hamid et al. AYS, editor. Jakarta, Indonesia: EGC; 2010.
23. Ayalew M, Mengistie B, Semahegn A. Adolescent-parent communication on sexual and reproductive health issues among high school students in Dire Dawa, Eastern Ethiopia: a cross sectional study. *Reprod Health* [Internet]. 2014 Nov 7 [cited 2018 Aug 13];11(1):77. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25380684>
24. Lou C, Cheng Y, Gao E, Zuo X, Emerson MR, Zabin LS. Media's contribution to sexual knowledge, attitudes, and behaviors for adolescents and young adults in three Asian cities. *J Adolesc Health* [Internet]. 2012 Mar [cited 2018 Aug 13];50(3 Suppl):S26-36. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22340853>

Five Types of Personality and the Locus of Internal Control in relation to Preeclampsia Pregnancy

Lusiana Meinawati¹, Kusnanto Kusnanto², Oedojo Soedirham³

¹Doctoral Program of Public Health, Faculty of Public Health, ²Faculty of Nursing, ³Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

Preeclampsia is one of the highest mortality factors for pregnant women. Hypertension, one of the main characteristics of preeclampsia, is the second main causes of maternal mortality at 27.1%. During pregnancy, they will face physical and psychological stressors. One of the factors related to stress management is the woman's characteristics and the locus of control. This study aims to identify the relationship between the five types of personality and the locus of internal control in relation to preeclampsia in pregnancy. This study used a cross-sectional design. The population of this study consisted of pregnant women with preeclampsia who came to the independent midwifery practices in Jombang; 135 women total. The sample was selected using the total sampling method. The data was analysed by regression analysis. The independent variables related to preeclampsia included neuroticism ($p=0.003$; $\text{Exp}(B)=11.234$) and the negative internal locus of control ($p=0.000$; $\text{Exp}(B)=11.387$). It is expected that midwifery professionals can provide counselling services effectively and efficiently in relation to performing antenatal care services.

Keywords: *personality, locus of control internal, pregnancy, preeclampsia.*

INTRODUCTION

Preeclampsia is one of the highest mortality factors for pregnant women¹. Hypertension, one of the main characteristics of preeclampsia, is the second main cause of maternal mortality at 27.1%, after haemorrhage (30.3%) and before infection (7.3%)². According to the data of *Survey Demografi Kesehatan Indonesia (SDKI)* in 2007 and 2012, the Maternal Mortality Rate (MMR) in Indonesia was still high, by as many as 228 and 359 per-100,000 live births respectively. This number is still far from the target of the Millennium Development Goals (MDGs) 2015, which aims for 102 per-100,000 live births³.

According to the health profile of Indonesia's East Java Province in 2012 and 2013, the mortality rate was

97.43 per-100,000 live births and 97.13 per-100,000 live births respectively⁴. In Jombang City in 2017, there were 28 maternal deaths following live births. The number increased from 2016, with 17 deaths. The 28 deaths in 2017 were caused by preeclampsia (5 cases), haemorrhage post-partum (4 cases), eclampsia (3 cases), amniotic embolism (2 cases) and an ante-partum bleeding case, while the other 13 was caused by other co-morbidities. These cases must be considered to devise more effective initial assessments and interventions in order to decrease the maternal mortality rate caused by preeclampsia and eclampsia.

Pregnant women are one of the most vulnerable members of a community. During pregnancy, they will face physical and psychological stressors. Good stress management determines the success of the pregnancy. One of the factors related to stress management is the woman's characteristics and how far the woman can control her emotions in relation to overcoming the stress related to the physical alterations caused by pregnancy and for other reasons.

There are five basic personalities according to Goldberg, encompassing openness to experience,

Corresponding Author:

Lusiana Meinawati
Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Mulyorejo, Surabaya, Indonesia
Email: lusiana85@gmail.com

conscientiousness, extraversion, agreeableness and neuroticism, which affects people in the context of solving their problems⁵ The locus of internal control also influences the pregnant women’s condition their commitments are influenced by their personality traits, as they are also known as emotional labour. The purpose of this study is to investigate the dominant personality traits in the company based on the Big Five Personality theory, to assess the level of employees’ commitment to service quality (quality pledge. This study aimed to identify the relationship between the five types of personality and the locus of internal control with preeclampsia pregnancy.

METHOD

This study used a cross-sectional design. The study was conducted in Jombang Regency, from July to September 2016. The population of this study were all of the pregnant women with preeclampsia who came to the selected independent midwifery practices in Jombang, totalling 135 women. The sample was selected using the total sampling method. The instrument used was a questionnaire with a Cronbach’s Alpha value of 0.862. The data was analysed using regression analysis.

RESULTS

Table 1: Demographic characteristics of the respondents (n = 135)

Characteristics	Parameters	n	%
Age (years old)	18-35	73	54.0
	> 35	62	46.0
Pregnancy	Primigravida	44	33.0
	Multigravida	91	67.0
Occupation	Housemaid	27	20
	Factory workers	53	39
	Teacher	55	41
Education	Senior High School	116	86
	College	19	14
Locus Internal Control	Positive	53	39
	Negative	82	61
Personality	Openness to experience	12	8
	Conscientiousness	18	13
	Extraversion	7	5
	Agreeableness	30	22
	Neuroticism	68	52

Table 2: Results of logistic regression analysis

Variable	B	S.E.	Sig.	Exp (B)	95%CI
Neuroticism	2.897	0.432	0.003	11.234	2.899< OR < 43.587
Negative ILC	1.143	0.458	0.000	11.387	1.897< OR < 23.426

Table 1 shows that most of the respondents were 18-35 years old (54%). Most of the women had multigravida (67%). Regarding occupation, most were factory workers (395) and had a senior high school level of education (86%). The most common locus of control had was negative, and the most common personality was neuroticism (52%).

Table 2 shows that the independent variables related to preeclampsia included the personality of neuroticism (p=0.003; Exp(B)=11.234) and the negative internal locus of control (p=0.000; Exp(B)=11.387).

DISCUSSION

- 1. Age:** Based on age, the respondent’s characteristics showed that the majority of the respondents were 18-35 years old. Age is a determinant factor influencing the health status of pregnant women. However, in preeclampsia cases, the mother’s age does not influence occurrence. Instead, it is affected by other factors encompassing the environment, health record, parity, metabolism disorders, psychological conditions, and social-economic status⁷. The many occurrences of preeclampsia at a healthy age are due to most pregnancy and childbirth cases occurring between the ages of 18 and 35 years old. According to the Indonesian Ministry of Health, the age of pregnant women who are at the highest level of risk is mothers who are too young (<20 years) or too old (> 35 years).
- 2. Pregnancy:** The characteristics of the respondents based on their pregnancy showed that most of the respondents had multigravida pregnancy. Cunningham (2014) stated that the risk factors for preeclampsia are nullipara, the environment, socioeconomic conditions, seasonal influences, obesity, gemelli pregnancy, maternal age, impaired metabolism and a family history of

preeclampsia or previous history of preeclampsia. A study conducted by Hindun (2015) showed that primigravida has a greater chance of developing by 2.875 times into preeclampsia compared with non-primigravida.

3. Occupation: The characteristics of the respondents based on their work indicated that most of the pregnant women work as factory workers. The risk factors for preeclampsia include their socioeconomic condition, in which one of the supporting factors is employment⁷. Work as a factory worker is an activity that involves physical activity. In a factory, the conditions are always pressured, which is a factor that causes psychological disorders that affect maternal pregnancy. A study mentioned that mothers who work in the formal sector have better access to information about their health, more actively have a positive attitude and more independently take care actions⁸.

4. Education: The characteristics of the respondents based on education level was that the majority of respondents had a high school level of education. A person's level of education influences how a person makes decisions on the health problems that they experience. The lower the mother's education level, the less the mother has the desire to use health services. A study mentioned that mothers with a higher education level have better access to information about health. It makes them have a better decision-making process related to determining care planning for the duration of their pregnancy⁸.

5. Personality and Locus of Control: The regression analysis results showed that the independent variable allegedly related to the preeclampsia cases was the personality of neuroticism with $\text{Exp}(B)=11.234$. It means that pregnant women with a neurotic personality are 11.387 times more likely to get preeclampsia. The negative ILC has a relationship with preeclampsia with $\text{Exp}(B)$ 11.387. This means that pregnant women with a negative ILC have 11.387 times the probability of having preeclampsia.

Neuroticism is a personality in which a person can evaluate their ability to handle pressure or stress⁹. The positive characteristic of neuroticism is emotional stability. Individuals with emotional stability tend to be calm in facing problems, have self-confidence and firm principles. However, the negative characteristics

of neuroticism are being easily nervous, depressed, not confident and easily changing their mind⁵. A study proved that there is an influence between stress and the occurrence of hypertension in pregnant women¹⁰. This is because they are unable to overcome the problems faced by their mental, physical and emotional health.

The negative attributes of neuroticism as mentioned above show that the pregnant women were not ready to adapt to the physical and psychological alterations of pregnancy. It influences their mental and emotional health, and can affect their cardiovascular condition, increasing their blood pressure and thus, leading to preeclampsia¹¹ who were matched for age and date of delivery. The incidences of diabetes, dyslipidemia, hypertension and cardiovascular events after pregnancy were identified from medical records after the date of delivery to the date of an event or the end of the study.

RESULTS

The median follow-up duration was 9.8 years (interquartile 5.1–12.7 years).

The study showed that there was a relationship between negative locus of control and the incidence rate of preeclampsia. Locus of control is a condition where a person can control him/herself against the problem at hand. When a pregnant woman is unable to adapt to a problem, it means that the pregnant woman has a negative locus of control. The risk factors for preeclampsia are nullipara, the environment, socioeconomic conditions, seasonal influences, obesity, gemelli pregnancy, maternal age, impaired metabolism and a family history of preeclampsia or a history of previous preeclampsia, as well as psychological factors^{7,12}.

CONCLUSION

Based on the results of the study, it showed that out of the five major properties of personality, neuroticism and having a negative internal locus of control were the variables most associated with the incidence rate of preeclampsia. It is expected that a midwifery professional can provide counselling services effectively and efficiently in relation to performing antenatal care services.

Conflict of Interest: None.

Ethical Clearance: The study passed ethical clearance from Ethical Committee of the Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia.

Source of Funding: This study is self-funded by the researchers.

REFERENCES

1. Masoura S, Kalogiannidis IA, Gitas G, Goutsioulis A, Koiou E, Athanasiadis A, et al. Biomarkers in pre-eclampsia: A novel approach to early detection of the disease. *J Obstet Gynaecol (Lahore)* [Internet]. 2012 Oct 4 [cited 2018 Aug 24];32(7):609–16. Available from: <http://www.tandfonline.com/doi/full/10.3109/01443615.2012.709290>
2. Soedarmono YSM. The Indonesian approach to reduce maternal mortality. *ISBT Sci Ser* [Internet]. 2017 Feb 1 [cited 2018 Aug 2];12(1):272–80. Available from: <http://doi.wiley.com/10.1111/voxs.12317>
3. BKKBN. *Survei Demografi dan Kesehatan Indonesia 2012* [Internet]. Jakarta; 2013 [cited 2018 Aug 24]. Available from: www.measuredhs.com.
4. Kementerian Kesehatan Republik Indonesia. *Profil Kesehatan Indonesia Tahun 2016* [Internet]. Jakarta, Indonesia; 2017 [cited 2018 Aug 2]. Available from: <http://www.kemkes.go.id>
5. Fleeson W, Wilt J. The relevance of big five trait content in behavior to subjective authenticity: do high levels of within-person behavioral variability undermine or enable authenticity achievement? *J Pers* [Internet]. 2010 Aug 1 [cited 2018 Aug 24];78(4):1353–82. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20545814>
6. Ma'amor H, Achim N, Yunus NSNM, Hashim N, Haque A. The Influence of Personality Traits Towards Quality Pledge. *Procedia Econ Financ* [Internet]. 2016 Jan 1 [cited 2018 Aug 24];37:73–9. Available from: <https://www.sciencedirect.com/science/article/pii/S2212567116300958>
7. Taylor RN, Roberts JM, Cunningham FG, Lindheimer MD. *Chesley's Hypertensive Disorders in Pregnancy* [Internet]. Elsevier Science; 2014. Available from: <https://books.google.co.id/books?id=eSCOAwAAQBAJ>
8. Padila P. *Buku ajar keperawatan maternitas*. Yogyakarta: Nuha Medika; 2014.
9. John OP, Srivastava S. Paradigm Shift to the Integrative Big Five Trait Taxonomy: History, Measurement, and Conceptual Issues. In: *Handbook of personality: Theory and research* [Internet]. 3rd Editio. New York: Guilford; 2010 [cited 2018 Aug 24]. p. 102–38. Available from: http://moityca.com.br/pdfs/bigfive_john.pdf
10. Alizadeh Z, Feizi A, Rejali M, Afshar H, Hassanzadeh Keshteli A, Adibi P. The predictive value of personality traits for psychological problems (stress, anxiety and depression): Results from a large population based study. *J Epidemiol Glob Health* [Internet]. 2017 Nov 26 [cited 2018 Aug 24]; Available from: <https://www.sciencedirect.com/science/article/pii/S221060061630154X>
11. Kuo Y-L, Chan T-F, Wu C-Y, Ker C-R, Tu H-P. Preeclampsia-eclampsia and future cardiovascular risk among women in Taiwan. *Taiwan J Obstet Gynecol* [Internet]. 2018 Jun 1 [cited 2018 Aug 24];57(3):364–9. Available from: <https://www.sciencedirect.com/science/article/pii/S1028455918301013>
12. Sukfitrianty, Aswadi, Lagu AMHR. Faktor Risiko Hipertensi Pada Ibu Hamil Di Rumah Sakit Hikmah Kota Makassar. *Al-Sihah Public Heal Sci J*. 2016;8(1):79–88.

The Effect of Diabetes Self-Management Education, Based on The Health Belief Model, on the Psychosocial Outcome of Type 2 Diabetic Patients in Indonesia

Rondhianto¹, Kusnanto², Soenarnatalina Melaniani³

¹Doctoral Program of Public Health, Universitas Airlangga, Faculty of Nursing, Universitas Jember;

²Faculty of Nursing; ³Department Biostatistics and Population Study, Faculty of Public Health, Universitas Airlangga

ABSTRACT

Lack of knowledge on disease management may distress type 2 diabetic patients, which could negatively affect their quality of life. The health belief model has been widely used to improve the patient's knowledge, skill, and abilities in relation to self-care. The study aimed to examine the effect of diabetes self-management education, based on the Health Belief Model (HBM), on the psychosocial outcome (self-efficacy, self-care behaviour, distress, and quality of life), and glycemic control (measured by their blood glucose level). A randomised control trial was employed, using a pre-test-post-test design. Our study recruited 120 type 2 diabetic patients who were equally assigned to the intervention group (n= 60) and the control group (n=60). The data was analysed using an independent t test with a significance level of 0.05. After the intervention, the intervention group and control group showed significantly different scores in self-efficacy, self-care behaviour, diabetes distress, quality of life, and blood glucose level. Diabetes self-management education based on the HBM had a significant effect on the psychosocial outcome of patients with type 2 diabetes.

Keywords: health education, health belief model, type 2 diabetes, psychosocial outcome, glycemic control.

INTRODUCTION

Diabetes Mellitus (DM) is a major chronic disease in the world which can cause heart disease, blindness, renal failure and lower extremity amputations.^{1, 2} Globally, the number of people living with type 2 DM was approximately 424.9 million people in 2017.² Type 2 diabetes affected almost 6.7% of the Indonesia population, approximately 10.3 million people, in 2017.² Worldwide, Indonesia is ranked 6th among countries with a high percentage of the population with type 2 DM, after China, India, the United States, Brazil and Mexico.² Diabetes type 2 is the third leading cause of death in Indonesia after stroke (21.1%) and coronary heart disease (12.9%).³

Living with diabetes can be difficult for patients and their families. Diabetic patients can show negative psychological responses, including feeling guilty and hopeless, losing confidence, having a low self-image, and becoming anxious and angry.^{4, 5} Diabetes distress is an additional burden for patients and their families, as a result of the cost incurred due to long-term care and treatments. Appropriate treatment is required to prevent disability, poor productivity, low quality of life and increased mortality.⁶ Patients and their families should acquire the knowledge, skills and self-efficacy related to the proper self-management of DM for successful treatment.^{7, 8} The Health Belief Model (HBM) is a constructed model that has been widely used to predict adherence to self-care behaviour.⁹ It consists of five core components, including perceived severity, perceived susceptibility, cues to action, perceived benefits and perceived barriers. Perceived severity relates to beliefs on the severity level of the disease and the consequences relevant to the illness. Perceived susceptibility represents to what extent the person perceives their risk of having the illness. Cues to action reflects the internal or external

Corresponding Author:

Rondhianto
Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga
Faculty of Nursing, Universitas Jember
Email: rondhianto-2017@fkm.unair.ac.id

indications such as physical symptoms (internal) and medication reminders (external). Perceived benefits involves the individual's perception toward the advantages and accessibility of the actions that they are to take. Perceived barriers includes the negative consequences from the actions taken.⁹ The study aimed to examine the effect of diabetes self-management education, based on HBM, on psychosocial outcome (self-efficacy, self-care behaviour, distress and quality of life), and glycemic control.

METHOD

The study employed a randomised control trial with a pre-test- post-test design. The study population was made up of 382 patients with type 2 DM attending the Patrang community health center (CHC) in Jember district, East Java in Indonesia. The inclusion criteria was that the patients had been diagnosed with type 2 DM within the last six months, who showed compos mentis mindfulness and were generally in good condition. Their age should have been between 40 and 65 years old, they lived within the Patrang CHC service area, and expressed a willingness to participate in the study. Patients with a cognitive impairment (dementia and active psychosis) were excluded. 260 patients met the inclusion and exclusion criteria.

Using the 95% confidence interval ($\alpha = 0.05$) and a statistical power of 80% ($\beta = 0.20$), the sample size for the intervention group and control group was 55 subjects each. To anticipate the participants dropping out, an additional 10% was determined, resulting in 60 subjects recruited for each group. Simple random sampling was applied in order to select the study participants.

The intervention group received a six-week educational program using the HBM approach over six sessions. The control group received their usual daily care. Every educational session lasted for approximately 120 minutes. The intervention group received knowledge about diabetes and self-management activities based on the four main sources of self-efficacy including performance accomplishment, vicarious experience, verbal persuasion, and physiological and emotional arousal. The six intervention sessions were divided into two home visit sessions (sessions 1 and 6) and four group sessions (sessions 2-5). The educational program was prepared based on the national standard for diabetes self-management education and support, and the management and prevention of type 2 DM from

the Indonesian Endocrinology Association (PERKENI). Additional information was obtained from the American Diabetes Association (ADA). The pre-test was conducted before the intervention started, while the post-test was conducted three months after the intervention.

The pre-test and post-test questionnaires used four scales to measure the psychosocial outcome, including the diabetes management self-efficacy scale (DMSES), the diabetes distress scale (DDS), the summary of diabetes self-care activities (SDSCA), and the diabetes quality of life scale (DQOL), in addition to the glycemic control test tool. The DMSES questionnaire used was a modified version by Shi, Ostwald, & Wang (2010) from the van der Bijl instrument.¹⁰ The DMSES questionnaire consisted of 20 items with a Likert scale of 1-5. The results of the validity test showed an r-value of 0.658, and reliability test of $\alpha = 0.975$. The DDS questionnaire of 17 items was adopted from the instrument developed by Polonsky, et al. (2005).¹¹ The results of the DDS validity test showed an r-value that was larger than 0.537, with a reliability test of $\alpha = 0.874$. The SDSCA questionnaire consisted of 12 items with a scoring system of 0 – 7, using the Wu modified version (2009) from the Toobert SDSCA instrument.¹² The SDCA validity test result was $r = 0.632$, with the reliability test being $\alpha = 0.923$. The DQOL questionnaire had 30 items with multiple selection available, scored using the Likert scale. The DQOL result of the validity was $r > 0.36$, and the reliability test $\alpha = 0.956$. The data analysis used an independent t-test to examine the group differences with a significance p-value of $\alpha \leq 0.05$.

RESULTS

Table 1 shows the mean of patient age was 57.60 years. Most of the patients were female (65%), employed (65%), and had an education level of junior high school (41.67%). The average duration of illness among the patients was 45.07 months. The patient characteristics showed no significant difference between the intervention group and the control group. Table 1 displays the baseline score of self-efficacy, self-care behaviour, diabetes distress, quality of life and blood glucose level. The mean scores for self-efficacy, self-care behaviour, diabetes distress, and quality of life were 41.63, 15.13, 39.00, and 65.77 respectively, with no significant difference between the intervention group and the control group. Likewise, the average blood glucose level was 207.62 mg/dl, and no significant difference was observed between the intervention group and the control group.

Table 1: Baseline characteristics of all patients (n = 120) in the intervention group and the control group (n = 60/group)

Variable	All patients (n, %) or mean \pm SD	Intervention group (n, %) or mean \pm SD	Control group (n, %) or mean \pm SD	P-value
Age (years)	57.60 \pm 6.25	57.50 \pm 6.83	57.70 \pm 5.65	0.862
Gender				
Female	76 (63.33%)	42 (70%)	34 (56.67%)	0.132
Male	44 (36.67 %)	18 (30%)	26 (43.33%)	
Employment				
Employed	78 (65%)	38 (63.33%)	40 (66.67%)	0.718
Unemployed/retired/house- wife	42 (35%)	22(36.67%)	20 (33.33%)	
Duration of illness	45.07 \pm 33.05	45.33 \pm 37.45	44.80 \pm 28.28	0.930
Level of education				
Elementary school	39 (32.5%)	18 (30%)	21 (35%)	0.769
Junior high school	50 (41.67%)	24 (40%)	26(43.33%)	
Senior high school	23 (19.17%)	12 (20%)	11 (18.33%)	
Higher education	8 (6.67%)	6 (10%)	2 (3.33%)	
Self-efficacy score	41.63 \pm 8.75	41.83 \pm 9.67	41.43 \pm 7.80	0.803
Self-care behaviour score	15.13 \pm 4.86	14.93 \pm 4.64	15.33 \pm 5.10	0.654
Diabetes distress score	39.00 \pm 6.11	39.33 \pm 6.87	38.67 \pm 5.28	0.552
Quality of life score	65.77 \pm 15.37	66.03 \pm 17.09	65.50 \pm 13.57	0.850
Blood glucose level (mg/dl)	207.62 \pm 63.69	207.62 \pm 63.69	197.37 \pm 65.91	0.078

Table 2 shows that both groups had increased scores for self-efficacy, self-care, and quality of life from the baseline. The diabetes distress score and blood glucose level were reduced in both groups after the intervention. The post-test results show a statistically significant difference in each score of the psychosocial outcome between the intervention group and the control group. A more significant improvement in psychosocial outcome was experienced by the intervention group than the control group, indicating the positive effect of diabetes self-management education using the HBM approach.

Table 2: Comparison of the pre- and post-intervention variables of each group and the results of the independent t-test after the intervention

Variable*	Intervention group (n = 60)		Control group (n = 60)		F	p-value	t	p-value
	Pre	Post	Pre	Post				
Self-efficacy score	41.83 \pm 9.67	61.87 \pm 6.84	41.43 \pm 7.80	56.10 \pm 11.06	11.618	0.001	3.434	0.001
Self-care behaviour score	14.93 \pm 4.64	23.90 \pm 6.49	15.33 \pm 5.10	21.83 \pm 4.43	13.893	0.001	2.039	0.044
Diabetes distress score	39.33 \pm 6.87	28.23 \pm 3.79	38.67 \pm 5.28	35.27 \pm 5.76	22.865	0.001	-7.889	0.001
Quality of life score	66.03 \pm 17.09	92.33 \pm 11.17	65.50 \pm 13.57	77.73 \pm 15.67	6.775	0.010	5.878	0.001
Blood glucose level (mg/dl)	207.62 \pm 63.69	118.25 \pm 23.50	197.37 \pm 65.91	187.37 \pm 52.49	19.625	0.001	-9.310	0.001

*data expressed as mean \pm standard deviation

DISCUSSION

Characteristics of the study participants: The average age of the diabetic patients was 57.6 years old, confirming the previous study stating that insulin retention tends to increase by the age of 45 years old or older.⁴ Individuals older than 45 years old have an increased risk of developing type 2 diabetes by almost 15 times compared to younger individuals.³ Most of the patients with type 2 diabetes in this study were female, again confirming the results of previous studies.^{7, 13} Elderly women may have a higher LDL cholesterol and triglycerida level than men, which affects the decreasing level of their insulin sensitivity.¹⁴ The average duration of illness among the diabetic patients in the present study was 45.07 months, or almost four years. The risk of macrovascular complication from diabetes increased in the fifth year since the diabetes was first diagnosed.¹⁵

In our study, most of the participants in both groups had completed junior high school and were employed. Level of education may influence the individual's acceptance of information and their capacity to manage stressors.^{16,17} Being employed could increase the individual's self-confidence in relation to problem solving, as having a source of income which enable them to access information, appropriate care and better treatment.^{18,19}

Self-efficacy before and after the intervention: The results of the data analysis showed that there was a significant difference in the self-efficacy between the groups after the intervention. Perceived self-efficacy affects the way that someone understands, feels, senses, drives their self-motivation, and takes action, which can generate effects through cognitive, motivational, affective and selection processes.²⁰ Improving the patient's perception of their vulnerability and the disease severity during the health education intervention could help patients to manage the disease, which increases their self-efficacy.^{21, 22}

Self-care behaviour before and after the intervention: The results showed that there were significant differences related to self-care behaviour between the intervention group and the control group. The acquisition of knowledge about the disease and care management of the disease is crucial in helping diabetic patients perform the proper self-care behaviour.⁸ Self-care depends on the patient's ability to make decisions and

daily assessments in order to implement comprehensive diabetes management.¹² Diabetes patients with a good self-care ability can control their blood sugar levels by changing to a healthier lifestyle.²³

Diabetes Distress before and after intervention: The intervention group experienced a more significant decrease in their diabetes distress score than the control group after the educational intervention. Having proper health education can help them to gain self-control so then the patient can maintain an ideal health condition and reduce stress.¹⁹ Acquiring coping strategies to reduce stress could encourage diabetic patients to seek social support from their family, friends, neighbours and co-workers.²⁴ Having cognitive skills would increase the patient's understanding and acceptance of their condition, so as to reduce the level of stress.¹⁹

Quality of life before and after the intervention: An essential key to the quality of life assessment was the satisfaction of self-care. Health workers have an important role in providing proper health education to patients and their families in promoting the self-care of diabetes with complications, in order to achieve an optimal quality of life.^{7,25} The ability to perform self-care and knowing how to reduce the risk of complications could improve quality of life.¹

Glycemic control: The intervention group had a more significantly reduced level of blood sugar than the control group after the HBM educational intervention. Knowledge about diabetes helped the patient to control the disease and to reduce the risk of disability.^{15, 22} The diabetes self-management education (DSME) significantly reduced the patient's fasting blood glucose level, improved their diabetes knowledge, self-management skill and self-efficacy.²⁶

CONCLUSION

This study has highlighted the importance of health education in improving the patient's psychosocial outcome. This educational intervention, along with the HBM approach, has significantly improved self-efficacy, self-care behaviour and quality of life, as well as reducing the level of diabetes distress and their blood glucose level. The diabetes self-management education based on the Health Belief Model is recommended to be used as a health education intervention for patients with type 2 diabetes.

Ethical Clearance: Ethical approval was granted by the School of Public Health in Airlangga University, Surabaya.

Source of Funding: Self funding.

Conflict of Interest: None.

REFERENCES

- American Diabetes Association [ADA]. Standards of Medical Care in Diabetes—2018. *Diabetes Care*. 2018;37.
- International Diabetes Federation [IDF]. *Diabetes Atlas 2017* Brussel: International Diabetes Federation; 2017 [Available from: <https://www.idf.org/e-library/epidemiology-research/diabetes-atlas.html>].
- MoH. *Situasi dan analisis diabetes*. Jakarta: Kementerian Kesehatan RI; 2013.
- Smeltzer SC, Bare BG, Hinkle JL, Cheever KH. *Brunner and Suddarth's textbook of medical surgical nursing*. 12 ed. Philadelphia: Lippincott Williams & Wilkins; 2013.
- Penckofer S, Ferrans CE, Velsor-Friedrich B, Savoy S. The psychological impact of living with diabetes women's day-to-day experiences. *The Diabetes Educator*. 2007;33(4):680-90.
- MoH. *Menkes: Mari Kita Cegah Diabetes dengan CERDIK (Health Minister: Let us prevent diabetes by CERDIK) 2016* [Available from: <http://www.depkes.go.id/article/print/16040700002/menkes-mari-kita-cegah-diabetes-dengan-cerdik.html>]
- Shrivastava SR, Shrivastava PS, Ramasamy J. Role of self-care in management of diabetes mellitus. *Journal of Diabetes & Metabolic Disorders*. 2013;12(1):14.
- Atak N, Gurkan T, Kose K. The effect of education on knowledge, self management behaviours and self efficacy of patients with type 2 diabetes. *Australian journal of advanced nursing*. 2008;26(2):66-74.
- Jones CJ, Smith H, Llewellyn C. Evaluating the effectiveness of health belief model interventions in improving adherence: a systematic review. *Health Psychology Review*. 2014;8(3):253-69.
- Shi Q, Ostwald SK, Wang S. Improving glycaemic control self-efficacy and glycaemic control behaviour in Chinese patients with Type 2 diabetes mellitus: randomised controlled trial. *Journal of clinical nursing*. 2010;19(3-4):398-404.
- Polonsky WH, Fisher L, Earles J, Dudl RJ, Lees J, Mullan J, et al. Assessing psychosocial distress in diabetes: development of the diabetes distress scale. *Diabetes care*. 2005;28(3):626-31.
- Wu SF. Effectiveness of self-management for persons with type 2 diabetes following the implementation of a self-efficacy enhancing intervention program in Taiwan: Queensland University of Technology; 2007.
- Miller TA, DiMatteo MR. Importance of family/social support and impact on adherence to diabetic therapy. *Diabetes, metabolic syndrome and obesity: targets and therapy*. 2013;6:421.
- DeFronzo RA, Ferrannini E, Alberti KGMM, Zimmet P, Alberti G. *International Textbook of Diabetes Mellitus, 2 Volume Set*: John Wiley & Sons; 2015.
- Waspadji S. *Diabetes Melitus, Penyulit Kronik, dan Pencegahannya*. Dalam: *Penatalaksanaan Diabetes Melitus Terpadu Jakarta*: Balai Penerbit Fakultas Kedokteran Universitas Indonesia. 2007.
- Notoatmodjo S. *Promosi kesehatan dan ilmu perilaku*. Jakarta: Rineka Cipta. 2007;20.
- Khan TM, Sulaiman S, Hassali MA. The causes of depression? A survey among Malaysians about perception for causes of depression. *Asian Journal of Pharmaceutical and Clinical Research*. 2008;2(2).
- Lau-Walker M. Importance of illness beliefs and self-efficacy for patients with coronary heart disease. *Journal of Advanced Nursing*. 2007;60(2):187-98.
- Powers MA, Bardsley J, Cypress M, Duker P, Funnell MM, Hess Fischl A, et al. *Diabetes Self-management Education and Support in Type 2 Diabetes: A Joint Position Statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics*. *Diabetes Care*. 2015;38(7):1372-82.

20. Bandura A. Perceived self-efficacy in cognitive development and functioning. *Educational psychologist*. 1993;28(2):117-48.
21. Edberg M. Buku Ajar Kesehatan Masyarakat Teori Sosial dan Perilaku. Alih bahasa: Anwar, dkk, Jakarta: EGC. 2010.
22. Zulman DM, Rosland A-M, Choi H, Langa KM, Heisler M. The influence of diabetes psychosocial attributes and self-management practices on change in diabetes status. *Patient education and counseling*. 2012;87(1):74-80.
23. Gao J, Wang J, Zheng P, Haardörfer R, Kegler MC, Zhu Y, et al. Effects of self-care, self-efficacy, social support on glycemic control in adults with type 2 diabetes. *BMC family practice*. 2013;14(1):66.
24. Wade C, Travis C. *Psychology*. 9 ed. Upper Saddle River, NJ: Pearson Education, Inc; 2007.
25. PERKENI. Konsensus pengelolaan dan pencegahan diabetes melitus tipe 2 di Indonesia 2015. Jakarta: PB. PERKENI; 2015.
26. Steinsbekk A, Rygg L, Lisulo M, Rise MB, Fretheim A. Group based diabetes self-management education compared to routine treatment for people with type 2 diabetes mellitus. A systematic review with meta-analysis. *BMC Health Services Research*. 2012;12(1):213.

How does the Dayak Ngaju Community Treat Malaria? A Qualitative Study on the Use of Traditional Medicine in Central Kalimantan Province, Indonesia

Trilianty Lestaris¹, Soedjajadi Keman²

¹Doctoral Program of Public Health, ²Department of Environmental Health, Faculty of Public Health,
Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

Background: Malaria is an endemic disease present in most tropical countries, including Indonesia. The elimination of Malaria has been among the strategies used to improve the health status of the community. However, most traditional tribes in Indonesia who live in remote areas may opt to use traditional medicine instead of the biomedical services available in health facilities. This study aimed to shed a light on the use of traditional medicine for treating malaria within the Dayak Ngaju community.

Method: This research was designed using a qualitative approach. Five respondents, consisting of a community leader and traditional healers, agreed to participate in the study. The interviews were conducted in the interviewee's house in Gunung Mas district, Central Kalimantan province. Descriptive analysis was employed to explain the phenomena of the use of traditional medicine within the study community.

Results: Three themes emerged as the result of the study, including 1) the community perception of malaria, 2) familial influence on the use of traditional medicine, and 3) access to public health facilities for malaria treatment. People consider malaria to be a mild disease that the traditional healer has adequate knowledge of and capacity to cure. The family has the role of encouraging and deciding on the use of traditional medicine. Despite the use of traditional medicine, Dayak Ngaju community use the biomedical health services when they are accessible.

Conclusion: Traditional medicine is considered to be the first option for seeking care among the Dayak Ngaju community. Providing access to health facilities will promote the use of said facilities and biomedical services for malaria treatment.

Keywords: *Dayak Ngaju, traditional medicine, malaria, qualitative study*

INTRODUCTION

Malaria is an endemic disease in tropical countries, including Indonesia. The physical environment such as air temperature, humidity, sunlight, rain, and water currents are the contributing factors of the breeding habitat for mosquitoes, including *Anopheles* sp, the

host of malaria parasites.¹ According to the World Health Organisation (WHO), approximately 212 million malaria cases occurred in 2015, claiming the lives of 429,000 people worldwide.² Approximately half of all Indonesians live in malaria endemic areas.² The national Annual Parasite Incidence (API) in Indonesia was approximately 0.85 per 1000 population in 2015.³

Central Kalimantan is an endemic area of malaria in Indonesia. Although the Malaria API of Central Kalimantan was approximately 0.42 per 1000 population in 2017, certain areas had a higher API than the national rate.^{3, 4} Malaria cases were particularly found in some districts in Central Kalimantan province, including Gunung Mas, Kapuas, Katingan and Seruyan which

Corresponding Author:

Trilianty Lestaris
Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Mulyorejo, Surabaya, Indonesia
Email: trilianty.lestarisa-2017@fkm.unair.ac.id

especially affect the indigenous population. Their economic activities are mostly related to agriculture, plantations and mining, which leads to various environmental changes and the migration of the population from other provinces or islands of Indonesia. Gunung Mas's topography consist of rivers, tropical forest, and swamp which are an ideal habitat for the *Anopheles sp* mosquito.⁵ The population of Gunung Mas district is dominated by the Dayak ethnic. Dayak Ngaju are one of the Dayak ethnicities that still practice their traditional beliefs in relation to the treatment of infectious disease, including malaria.

With the rapid development of medical science and technology, traditional medicine has also received attention when developing new drugs.⁶ Traditional medicine is still believed to have a strong efficacy in association with recovering from ill health among the Dayak Ngaju community. Some community members would use modern medical treatment, however the isolation and remote location of the Dayak Ngaju community causes most people to rely on traditional medicine for treating communicable diseases.⁵ Remote areas in Indonesia are often underprivileged, in relation to medical and other health staffs.⁷ Therefore, it is common for indigenous people to utilise traditional medicine.⁸ Maintaining cultural beliefs through the use of traditional medicine has received attention for its potential success, acceptability and accessibility.⁶ In the Dayak Ngaju community, the treatment ritual of a certain disease is usually performed by the traditional healer, locally known as the *tabib* or *lasang* or *bahtra*, at the residence of the sick man.

Traditional medicine has been seen by the Dayak Ngaju community as the primary treatment before utilising modern medicine in district hospitals or other modern health facilities. For this community, illness is not only viewed as a symptom of individual biology, but is holistically related to the nature, humanity and God. Therefore, to gain good health when seeking treatment, people should not only use drugs as the treatment but also practice certain traditional rituals involving ancient mantras (*Sangiang* language).⁹ Therefore, the healing process for a disease does not only deal with the biological aspects of the patient, but also the socio-cultural and spiritual aspects.⁹ This research aims to elucidate the beliefs and practices of the Dayak Ngaju community in relation to using traditional medicine as an alternative to malaria treatment.

MATERIAL AND METHOD

A qualitative study design was employed using in-depth unstructured interviews. The researcher (TL) was the research instrument who conducted the interview. The Dayak Ngaju community leader in Kualakurun sub-district was approached by the researcher and was asked to recommend four other key informants to participate in the study. The five respondents consisted of the community leader and four traditional healers (*Bahtra*). The interview was conducted in the Dayak language. The researcher was a native to speaking the language, therefore no language barrier was experienced during the interview. The key informants were asked several questions including: 'What is the concept of health and disease within the Dayak Ngaju Community?' 'How do people perceive the malaria disease?' 'How the traditional medicine is delivered?' and 'What treatment options are used by the Dayak Ngaju community?' Each interview was recorded using an audio-tape and lasted approximately an hour. Each interview was conducted separately at the interviewee's house to ensure that all of the interviewees felt relaxed in telling their experience. The researcher also took brief notes during the interview. The audio records were textually transcribed in the Dayak language and then translated into Bahasa Indonesia (the national language). The data analysis process included listening carefully to the records and reading the interview transcripts repeatedly in order to understand the content. The researchers read the translated interview transcripts separately. Key statements were extracted and highlighted to grasp the meanings. The meanings were consolidated by the researchers in order to produce the themes.

RESULTS

From the data analysis, three themes emerged on the belief and practice of traditional medicine for treating malaria: 1) Dayak Ngaju community perception of malaria, 2) family influence on the use of traditional medicine, and 3) access to public health facilities for malaria treatment.

Dayak Ngaju community perception of Malaria: The Dayak Ngaju community believe that being healthy or ill (*barigas* dan *haban*) is determined by the combined factors of nature/the environment, humanity and spirits. The occurrence of a disease is not only biologically caused by the natural or human factor. It may also affect someone because of supernatural power. Therefore, in

order to cure the disease, it would not only involve herbs and other materials as medicine, but also traditional rituals to satisfy the spirits.

Knowledge of disease is a crucial competency of the traditional healer (*bahtra*) in order to determine the illness and the medication required for the ill person. The competency is obtained usually from knowledge passed down from generation to generation within the *bahtra* family. In the Dayak Ngaju language, malaria is termed “*Sahangen*”, a disease that is considered mild and not dangerous with some common symptoms including fever, bone pain and a prolonged headache. An interviewee, a *bahtra*, said that there is “nothing to worry about malaria. It is *Sahangen*, not dangerous. Everyone can get it including my own children. Especially for elderly, sometimes having fever is just normal. Death is destiny” (P2). Malaria is also considered to be a disease that is necessary for a person to grow in maturity, as an interviewee pointed out: “So somebody gets this malaria. It means (that) he is experiencing *Sahangen*. This is a process toward a person’s maturity. A process of becoming a better human being.” (P5).

The Dayak Ngaju community trust the *bahtra* and their knowledge of malaria. Often, they consider visiting a traditional healer first in order to have an opinion on the severity of the disease and to utilise traditional medicine, as well as the ritual required for healing. They may use this to see whether or not the patient requires going to a modern health facility. Therefore, the traditional healer has a central role in treating malaria. As informed by the community leader, “people go to the *bahtra* when they felt fever and headache. If the *bahtra* says that the person has malaria and assures the patient to use only traditional medicine and a ritual because of the mild condition, then people follow this.” (P1)

Family influences on the use of traditional medicine: Family is very influential in relation to utilising traditional medicine. This is also part of the local wisdom that continues to use a certain plant to treat malaria. Although some people in the family may not fully believe in the use of traditional medicine for various reasons, they would be obliged to obey the decision made by the oldest or the most respected member of the family. The ritual done while providing the traditional medicine also involves the family member with guidance from the *bahtra*. One of the *bahtra* respondents recalled that “some younger people think that using traditional medicine and practices is useless. But what they can do, if the elders say otherwise. We should maintain our tradition, because this is our roots” (P4).

In practice, the traditional medicine of the Dayak Ngaju community involves a ritual of *Sahangen*, or malaria treatment. The patient would be laid down in the living room near to the house entrance. The first cousin of the patient would be requested to burn leaves from any green plants found in the yard, and blow the smoke toward the patient’s body. This practice should be conducted three times a day, in the morning, afternoon and evening. The patient would also be given a drink of medicated water. The medicated water was boiling water, with a special river stone soaked inside. Finally, the traditional healer also applied oil rubbed over the patient’s body.

Access to public health facilities for malaria treatment:

Although the Dayak Ngaju community would go first to the traditional healer for treating malaria, more people now also use the modern medicine available in the community health centre and village health posts. The traditional healers also recognise this phenomenon, and one said that “of course some people would still need to go to community health centre if their fever gets worse. But for people living a distance from the facility, we, the *bahtra*, were always the first to provide help” (P3).

The traditional healer expects that community would preserve the traditional practices as they are inherited from their ancestors. In addition, some of the community still live separately in remote locations which are far from the modern health facility. Encouraging them to solely use modern medicine without considering the traditional practices would put people’s health at risk.

DISCUSSION

To this date, traditional medicine is still a popular option to cure both communicable and non-communicable disease in many countries.^{6, 10, 11} For the Dayak Ngaju community, the use of traditional medicine for curing malaria is rooted in the concept of health and disease, which is a combination of the factors of nature/the environment, humanity, and spirits/God. The concept has continuously evolved over generations, which motivates them to preserve the use of traditional medicine. A similar concept of health and disease was also described in a previous qualitative study about the use of traditional medicine and practices among postpartum women in China.¹² The role of the traditional healer is prominent in diagnosing the patient’s illness. Traditional healers also help the patient’s family in implementing coping strategies during the loss of a patient’s life.

Family also plays a crucial role in preserving traditions and beliefs. Support from the family is a beneficial factor related to seeking care.¹³ The family influence the decision related to selecting between traditional and modern medication and treatment for malaria. The family can understand and work with the traditional healer to encourage the patient to receive the treatment and to do the ritual. The traditional ritual carried out by the family has also been believed to satisfy supernatural powers and help in the recovery from illness, as seen in a previous study.¹¹

Traditional medicine has been the first choice for the Dayak Ngaju community when seeking treatment. The Dayak Ngaju community believe that selecting the treatment of malaria or other illness should relate to the disease's aetiology, which is a combination of natural and personal causes. However, the choice of treatment is influenced by not only the traditional beliefs, but also the availability and accessibility of modern health facilities. According to Notoatmojo (2003), the attitude to take action in relation to health care depends on other supporting factors and conditions, such as the availability of nearby health facilities and support from their family and other parties.¹⁴ Therefore, people eventually go to health facilities to seek malaria treatment, because of the influential support from their family as well as their access to the health facility.

CONCLUSIONS

The concept of health and disease among the Dayak Ngaju community is determined by the traditional belief that illness is caused by the factors of nature, man and spirits. Therefore, a traditional healer is seen as a prominent figure providing first aid, including to treat malaria. Family is a crucial factor in determining the care that is sought. Preserving the culture of using traditional medicine and related practices among people with malaria is also influenced by the decision of the eldest member of the family. Most people of the Dayak Ngaju community also believe that the biomedical health services can be used jointly with traditional medicine. Therefore, access to a modern health facility for this remote population is urgently required.

Ethical Clearance: Ethical approval was granted by the School of Public Health of Airlangga University, Surabaya.

Source of Funding: Self funding.

Conflict of Interest: The authors have declared that we have no conflict of interest.

REFERENCES

1. Mattah PAD, Futagbi G, Amekudzi LK, Mattah MM, de Souza DK, Kartey-Attipoe WD, et al. Diversity in breeding sites and distribution of Anopheles mosquitoes in selected urban areas of southern Ghana. *Parasites & vectors*. 2017;10(1):25.
2. World Health Organization. World malaria report 2015. Geneva: World Health Organization; 2016.
3. The Indonesia Ministry of Health (MoH). Malaria. Infodatin. 2016.
4. Harijanto PN, Gunawan CA, Nugroho A. Malaria Tata Laksana Klinis Dan Terapi (Malaria Clinical and Therapeutical Management). 3 ed. Jakarta: EGC 2017.
5. Gunung Mas District Health Office (DHO). The 2017 Annual Health Report of Gunung Mas District Kuala Kurun: Dinkes Kab. Gunung Mas; 2018.
6. Sheng-Ji P. Ethnobotanical approaches of traditional medicine studies: some experiences from Asia. *Pharmaceutical biology*. 2001;39(sup1):74-9.
7. Efendi F. Health worker recruitment and deployment in remote areas of Indonesia. *Rural and Remote Health*. 2012;12(2008).
8. Hill DM. Traditional medicine in contemporary contexts: Protecting and respecting indigenous knowledge and medicine: National Aboriginal Health Organization Ottawa, ON; 2003.
9. Riwut T, Mantikei S, Riwut N. Maneser panatau tatu hiang (Inheriting the wealth of ancestors): Pusakalima; 2003.
10. Rutebemberwa E, Lubega M, Katureebe SK, Oundo A, Kiweewa F, Mukanga D. Use of traditional medicine for the treatment of diabetes in Eastern Uganda: a qualitative exploration of reasons for choice. *BMC International Health and Human Rights*. 2013;13(1):1.

11. Workneh T, Emirie G, Kaba M, Mekonnen Y, Kloos H. Perceptions of health and illness among the Konso people of Southwestern Ethiopia: persistence and change. *Journal of ethnobiology and ethnomedicine*. 2018;14(1):18.
12. Raven JH, Chen Q, Tolhurst RJ, Garner P. Traditional beliefs and practices in the postpartum period in Fujian Province, China: a qualitative study. *BMC Pregnancy and Childbirth*. 2007;7(1):8.
13. Abe-Kim J, Takeuchi D, Hwang W-C. Predictors of help seeking for emotional distress among Chinese Americans: Family matters. *Journal of Consulting and Clinical Psychology*. 2002;70(5):1186.
14. Notoatmodjo S. *Ilmu Perilaku Kesehatan (Health Behaviour Science)*. Jakarta: PT. Rineka Cipta; 2010.

The Effect of Young Coconut Water against Morning Sickness among Women in the First Trimester of Pregnancy

Tri Ratna Ariestini¹, Windhu Purnomo²

¹Doctoral Program of Public Health, ²Department Biostatistics, Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

Introduction: Morning sickness is experienced by approximately 70% to 90% of women in their first trimester of pregnancy. The slowing motility of the gastric muscles due to the influence of pregnancy hormones causes an increase in the amount of stomach acid that irritates the gastric mucosa. Pregnant women experience nausea, vomiting, bloating, frequent burping, sour taste, bitterness, loss of appetite, and discomfort which causes the loss of fluids and some essential minerals, such as sodium, potassium, calcium, and magnesium.

Method: Using a randomized control trial with pretest posttest method, we employed a total of 74 women in the first trimester pregnancy complaining of nausea and vomiting. The intervention group received a daily dose of young coconut water of 300 ml for a week. The control group received 300 ml of mineral water with added sugar for a week. The morning sickness scores before and after the treatment were analyzed statistically using the independent t-test.

Results: The provision of young coconut water reduces the morning sickness scores at an average of 11.19 in the intervention group, while the control group only have a slide reduction of the average morning sickness score at 20.00. The treatment of the intervention group who consumed young coconut water had a significant effect at p -value = 0.042.

Conclusion: Consuming young coconut water provides a significant effect on decreasing symptoms of morning sickness in the first trimester of pregnancy.

Keywords: young coconut water, morning sickness, the first trimester pregnancy

INTRODUCTION

Morning sickness refers to a condition of nausea, with or without vomiting, which usually affects women during the first trimester of pregnancy.¹ This condition affects about 70% to 90% of pregnant women during the early weeks of pregnancy. Approximately 80% of pregnant women experience nausea, and about 50% had nausea and vomiting.² About 0.3% to 3.6% of pregnant women may develop a severe and excessive nausea and vomiting termed as hyperemesis gravidarum.³

Morning sickness occurs due to the increased production of pregnancy hormones including estrogen, progesterone, and chorionic gonadotropin (HCG) hormone.⁴ Pregnancy hormones affect physiological changes, such as the slowdown of gastrointestinal motility.⁴ The slowdown of gastrointestinal motility results in an increased amount of gastric acid and irritates the gastric mucosa resulting in nausea, vomiting, bloating, and frequent burping, due to the perceived sourness, bitterness, loss of appetite, and discomfort.³ The effect is worse in the presence of heartburn and chest pain with an infection from *helicobacter pylori* in the injured stomach that leads to inflammation of the oesophagus.³ This condition is referred to as gastroesophageal reflux disease (GERD) which influences the poor absorption of water and nutrients from food.⁵ To reduce the symptoms of GERD, various

Corresponding Author:

Tri Ratna Ariestini
Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Mulyorejo, Surabaya, Indonesia
Email: tri.ratna.ariestini-2017@fkm.unair.ac.id

treatments have been applied to pregnant women such as antimietic medication, accrupressure, accupuncture, vitamin B6, and ginger consumption.^{1,6}

Another alternative treatment is the consumption of young coconut water as a medical prevention for conditions similar to morning sickness.⁷ Young coconut water contains potassium that is capable of neutralizing gastric acid reactions and improves muscular motility of the stomach.^{8,9} However, the evidence is scarce on the benefits of using young coconut water to reduce morning sickness in early weeks of pregnancy. Therefore, this study aims to examine the influence of young coconut water in reducing morning sickness among pregnant women during the first trimester of pregnancy.

MATERIALS AND METHOD

This study employed an experimental research design using a pretest-posttest of the randomized control trial method. The research was conducted in Palangka Raya city, Central Kalimantan Indonesia. The study population was first-trimester pregnant women who visited the community health centre between May and November 2016 with complaints of nausea and vomiting. The inclusion criteria was women who were pregnant for 1 – 10 weeks with morning sickness complaints, had a clear residential address, had no history of multiple gestation, and were willing to participate in the study. The exclusion criteria was pregnant women with a history of abortive outcome, absence from the intervention of more than one day, moving out to another city, being hospitalized, and having hyperemesis gravidarum.

The sample size formula is calculated as follows:

$$n = \frac{2(Z_{\alpha} + Z_{1-\beta})^{2\alpha 2}}{\Delta^2}$$

We calculated our sample size based on the results of a previous study on the effect of acupressure treatment on morning sickness among pregnant women, with the mean difference of symptoms between before and after intervention, $\Delta = 0.25$, error type 1 $Z_{\alpha}(5\%) = 1.96$, error type 2 $Z_{1-\beta} = 0.842$.¹⁰ The sample size obtained was 34 subjects for each group. To anticipate the drop out, an additional 10% was applied and 37 subjects were recruited for each group. The study subjects were selected using a simple random sampling method. The intervention group were given a treatment of young coconut water. Young coconut water was collected from green-skinned coconuts

aged 6-8 months, calculated from flowering. Each woman in the intervention group consumed 300 ml of young coconut water every day for seven days. The control group consumed mineral water with one teaspoon of sugar added. To measure the morning sickness score, we used instruments of the *Pregnancy-Unique Quantification of Emesis and Nausea* (PUQE) questionnaire and the *Rodhes Nausea, vomiting, and retching* (RNVR) questionnaire.^{11,12} The anxiety was measured using the *Hamilton Anxiety Rating Scale questionnaire* (HARS).¹³ Other information including the number of pregnancy (gravida) and the history of gastritis during a one year period prior to the pregnancy were collected at the beginning of the research. All pregnant women participating in both groups also consumed a daily intake of vitamin B6 and vitamin B complex provided by the community health centre.

The morning sickness scores from the pretest and posttest were analyzed using the paired t-test. The instrument assesses compliance using an evaluation sheet. The difference of morning sickness scores between the intervention group and the control group were analyzed using the independent t-test.

RESULTS

Characteristics of the research subjects are described in Table 1. The majority of women had a moderate level of anxiety (64.9%) and were in their first pregnancy (64.9%). Most of the women completed senior high school (51.4%), had no history of gastritis (78.4%), and had no paid employment (51.4%).

Table 1: Characteristics of research subjects

No.	Variables Catagory	n	%
1.	Anxiety		
	Not present	2	2.7
	Mild	12	16.2
	Moderate	48	64.9
	Severe/very severe	12	16.2
2.	Number of pregnancy		
	Primigravida	48	64.9
	Multigravida	26	35.1
3.	Level of education		
	Elementary	6	8.1
	Junior high school	18	24.3
	Senior high school	38	51.4
	Higher education	12	16.2

Conted...

4.	History of gastritis		
	Yes	16	21.6
	No	58	78.4
5.	Employment		
	Unemployed/housewife	38	51.4
	Private business	24	32.4
	Government office	12	16.2

The mean difference of morning sickness before and after treatment in each group is presented in table 2. The morning sickness scores in the intervention group showed a higher reduction compared to the control group. Both groups showed a significant difference between the pretest and posttest scores (p -value < 0.05).

Table 2: Morning sickness scores of pretest and posttest using the paired t-test analysis

Group	Measurement		Mean difference (95% CI)	t	r
	Pretest	Posttest			
	Mean (SD)	Mean (SD)			
Intervention	22.76 (1.935)	11.19 (2.665)	11.57 (10.716-12.420)	27.535	0.0000
Control	22.11 (1.505)	20.00 (2.028)	2.11 (1.343-2.873)	5.588	0.0000

The magnitude effect of the treatment is shown in Table 3. The treatment received by the control group and the intervention group in reducing the morning sickness score showed a significant difference. The treatment of the intervention group who consumed young coconut water had a significant effect at p -value = 0.042. Consuming young coconut water provided a significant effect on decreasing symptoms of morning sickness in the first trimester of pregnancy.

Table 3: Effect of treatment on reducing morning sickness score using the independent t-test

Group	Mean (SD)	Mean difference (95%CI)	Statistics	
			t	p
Intervention	11.19 (2.665)	-8.81 [(-9.908) - (-7.713)]	-16.005	0.042
Control	20.00 (2.028)			

To assess the efficacy of the young coconut water compared to the placebo (mineral water with added sugar), we conducted a Man-Whitney test on variables of the anxiety score, the number of pregnancies, and the history of gastritis with the results shown in Table 4. No significant difference was found on the level of anxiety, number of pregnancies, and the history of gastritis among women with morning sickness.

Table 4: The result of Man-Whitney test on variables of the anxiety score, the number of pregnancy, and the history of gastritis on women with morning sickness

Variables	Morning Sickness		p-value
	n	Mean Rank	
Anxiety			
Not present	2	46.75	0.805
Mild	12	34.96	
Moderate	48	36.78	
Severe/very severe	12	41.38	

Conted...

Number of pregnancy			
Primigravida	48	37.78	0.878
Multigravida	26	36.98	
History of Gastritis			
Yes	16	40.53	0.523
No	58	36.66	

DISCUSSION

In our study, most of the women completed a secondary level of education and unemployed. A previous study in

Indonesia using the nationwide data also reported the similar characteristics of women who attended maternal health services,¹⁴ suggesting the representativeness of the study subjects. Most of the women in the present study were in their first pregnancy with a moderate level of anxiety. During the early weeks of pregnancy, women who experienced pregnancy for the first time may have a higher level of anxiety due to changes in their life.¹⁵ The increase of the estrogen, progesterone and chorionic gonadotropin during the first trimester of pregnancy reduces the motility of the stomach muscles and secretes more gastric acid. The gastric acid contains hydrochloric acid (HCL) that has a corrosive nature. The volume of HCL may increase every 4 hours resulting in the stomach power of hydrogen (pH) at 3.5, which may irritate the gastric mucosa. As a result pregnant women may feel symptoms of nausea, vomiting, bloating, discomfort in the stomach and no appetite, especially in the morning when the stomach is empty.^{2,4}

The increase in hormones leading to morning sickness has been suggested as the mechanism to protect the mother and the fetus from toxins which results in nausea, vomiting, loss of appetite and being sensitive to odors.¹⁶ Nausea and vomiting may reduce the level of potassium in the body.² Hypokalemia affects approximately 4.6% to 19.7% of pregnant women.² Hypokalemia may cause glucose intolerance, the functional disorder of heart, kidneys, and neurological interference, and the most severe cases may result in death.

Irritated, injured and inflamed gastric walls would hamper the absorption of water and sugar from food and cause the loss of fluids and some essential minerals, such as sodium, potassium, calcium, and magnesium. Losing fluids and electrolytes may cause headaches, foot cramps, and oedema among pregnant women. Severe dehydration due to lack of food absorption may cause impaired fetal growth, low birth weight (LBW) and even miscarriage.¹⁷

The results of our study showed the effectiveness of consuming young coconut water to reduce the symptoms of morning sickness. Young coconut water contains potassium at amounts of 7300 mg/l, which is sufficient for pregnant mothers who require 4700mg/hr.⁹ Potassium in water becomes a strong base of potassium hydroxide (KOH) when encountered with HCL, then form a neutralizing reaction which produces potassium chloride (KCL) salt and water.¹⁸ Since the potassium chloride salt is derived from strong acids and strong bases, the potassium chloride salt formed is neutral.

The neutralizing reaction will relieve the symptoms of nausea, vomiting, bloating and discomfort.¹⁸ About 98% of potassium is in the intra-cell fluid which is important for muscle activity.¹⁹ Lack of potassium in the body would affect the neo-muscular strength.¹⁹ As the potassium regulates muscle contraction, the motility of the stomach muscles could be maintained by consuming sufficient water containing potassium.⁹ Therefore, young coconut water, which is rich in potassium, has the potential to prevent the symptoms of nausea and vomiting among pregnant women.¹⁷

Young coconut water contains bioactive phytochemicals including tannin, which is a polyphenol compound with the capability of protecting proteins from degradation and from unsaturated fatty acids in the digestive system.²⁰ Tannin is an antidote substance that could break down toxins in the body. It also serves as an anti-bacterial agent which can eliminate *Helicobacter pylori* in the stomach that causes inflammation and chronic ulcers.²⁰ This substance is also known as an anti-inflammatory that reduces inflammation and the burning sensation in the stomach.^{20,21} Other than that, young coconut water also contains five important electrolytes such as sodium, potassium, chloride, calcium and magnesium. These electrolytes play an important role in protecting the body from dehydration and maintaining the electrolyte balance in the body. Drinking young coconut water can quickly restore lost body electrolytes.^{8,9} Therefore, the consumption of young coconut water for pregnant women is not only useful to reduce symptoms of morning sickness, but also helps to prevent dehydration.²²

CONCLUSION

Morning sickness is common during the first trimester of pregnancy. Consumption of young coconut water showed a significant effect in reducing the symptoms of morning sickness among women in the intervention group. Young coconut water could be used as an alternative to the chemical drug in minimizing the nausea and vomiting among pregnant women.

Ethical Clearance: Ethical approval was granted by the institutional review board of the Malang MoH Health Polytechnics.

Source of Funding: Self funding.

Conflict of Interest: The authors have declared that we had/have no conflict of interest.

REFERENCES

1. Viljoen E, Visser J, Koen N, Musekiwa A. A systematic review and meta-analysis of the effect and safety of ginger in the treatment of pregnancy-associated nausea and vomiting. *Nutrition Journal*. 2014;13(1):20.
2. Campbell K, Rowe H, Azzam H, Lane CA. The management of nausea and vomiting of pregnancy. *Journal of Obstetrics and Gynaecology Canada*. 2016;38(12):1127-37.
3. Castillo MJ, Phillippi JC. Hyperemesis Gravidarum. *The Journal of perinatal & neonatal nursing*. 2015;29(1):12-22.
4. Tan A, Foran T, Henry A. Managing nausea and vomiting in pregnancy in a primary care setting. *Australian family physician*. 2016;45(8):564.
5. Zielinski R, Searing K, Deibel M. Gastrointestinal Distress in Pregnancy. *The Journal of perinatal & neonatal nursing*. 2015;29(1):23-31.
6. Matthews A, Dowswell T, Haas DM, Doyle M, O'Mathúna DP. Interventions for nausea and vomiting in early pregnancy. *The Cochrane database of systematic reviews*. 2010(9):CD007575.
7. DebMandal M, Mandal S. Coconut (*Cocos nucifera* L.: *Arecaceae*): in health promotion and disease prevention. *Asian Pacific Journal of Tropical Medicine*. 2011;4(3):241-7.
8. Arsa M. Kandungan natrium dan kalium larutan isotonik alami air kelapa (*Cocos Nucifera*) varietas Eburnia, Viridis, dan Hibrida (Natrium and Kalium of natural isotonic solution of coconut water). Denpasar: Universitas Udayana; 2011.
9. Yong JW, Ge L, Ng YF, Tan SN. The chemical composition and biological properties of coconut (*Cocos nucifera* L.) water. *Molecules*. 2009;14(12):5144.
10. Norheim AJ, Pedersen EJ, Fønnebø V, Berge L. Acupressure treatment of morning sickness in pregnancy. A randomised, double-blind, placebo-controlled study. *Scandinavian journal of primary health care*. 2001;19(1):43-7.
11. Rhodes VA, McDaniel RW. Nausea, vomiting, and retching: complex problems in palliative care. *CA: A cancer journal for clinicians*. 2001;51(4):232-48.
12. Koren G, Boskovic R, Hard M, Maltepe C, Navioz Y, Einarson A. Motherisk—PUQE (pregnancy-unique quantification of emesis and nausea) scoring system for nausea and vomiting of pregnancy. *American journal of obstetrics and gynecology*. 2002;186(5):S228-S31.
13. Thompson E. Hamilton rating scale for anxiety (HAM-A). *Occupational Medicine*. 2015;65(7):601-.
14. Kurniati A, Chen C-M, Efendi F, Berliana SM. Factors influencing Indonesian women's use of maternal health care services. *Health care for women international*. 2018;39(1):3-18.
15. Figueiredo B, Conde A. Anxiety and depression in women and men from early pregnancy to 3-months postpartum. *Archives of women's mental health*. 2011;14(3):247-55.
16. Flaxman SM, Sherman PW. Morning sickness: a mechanism for protecting mother and embryo. *The Quarterly review of biology*. 2000;75(2):113-48.
17. Sumantri S. Pendekatan diagnostik hipokalemia (Hypokalemia diagnostic approach). Departemen Ilmu Penyakit Dalam Fakultas Kedokteran Universitas Indonesia. 2009.
18. Code C, Higgins J, Moll J, Orvis A, Scholer J. The influence of acid on the gastric absorption of water, sodium and potassium. *The Journal of physiology*. 1963;166(1):110-9.
19. Yaswir R, Ferawati I. Fisiologi dan gangguan keseimbangan natrium, kalium dan klorida serta pemeriksaan laboratorium (Physiology and the balance disorder of natrium, kalium, and chloride, and the laboratory test). *Jurnal Kesehatan Andalas*. 2012;1(2).
20. Rachmawati RL, Setiani O, Darundiati YH. Perbedaan Laju Endap Darah Sebelum dan Sesudah Pemberian Air Kelapa Hijau (*Cocos Nucifera* L) pada Pekerja Bagian Pengecatan di Industri Karoseri Semarang (the difference of blood sedimentation rate before and after provision of young coconut water among industrial painting workers in Semarang). *Jurnal Kesehatan Masyarakat (e-Journal)*. 2016;4(3):897-903.
21. Matsui KN, Gut JAW, De Oliveira PV, Tadini CC. Inactivation kinetics of polyphenol oxidase and peroxidase in green coconut water by microwave processing. *Journal of Food Engineering*. 2008;88(2):169-76.
22. Saat M, Singh R, Sirisinghe RG, Nawawi M. Rehydration after exercise with fresh young coconut water, carbohydrate-electrolyte beverage and plain water. *Journal of physiological anthropology and applied human science*. 2002;21(2):93-104.

Factors Affecting the Incidence of Chronic Energy Deficiency among Pregnant Women Attending the Pulubala Community Health Centre

Zuriati Muhamad¹, Sri Sumarmi²

¹Doctoral Program of Public Health, Faculty of Public Health, ²Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

Introduction: Chronic Energy Deficiency (CED) is an indirect cause of maternal death which affects pregnant women in developing countries. The low nutritional status of pregnant women may result in a poor birth outcome. The purpose of this study is to analyse the factors that influence CED incidences in pregnant women.

Material and Method: This quantitative research employed a cross sectional design using a questionnaire, as well as the measurement of mid-upper arm circumference (MUAC) for the data collection methods. Fifty respondents attending the Pulubala community health centre in the Gorontalo district of Eastern Indonesia were recruited to participate.

Results: Most respondents were at the age where there was only a low risk of pregnancy complications, in addition to having poor nutritional knowledge, no previous experience with infectious disease, and having CED. Maternal age and knowledge of nutrition were significantly associated with CED. History of infectious disease had no statistical relationship with CED.

Conclusion: Pregnant women should be provided with nutritional education and micronutrient supplementation in order to improve their nutritional status.

Keywords: *chronic energy deficiency, pregnancy, Indonesia*

INTRODUCTION

Malnutrition affects physical activity and increases the risk of infection among pregnant women, which may result in a poor maternal outcome.¹ According to the World Health Organisation (WHO), worldwide, 30% of women of reproductive age suffered from anaemia, 50% had iron deficiency, and about 20% to 39% of women in low income countries had a low body mass index (<18.5 kg/m²) in 2011.¹ Mid-upper-arm circumference

(MUAC) has been used in various developing countries to identify malnutrition status due to the simplicity of the measurement method and its strong relationship to the low birth weight.² MUAC has also been used as an indicator to determine chronic energy deficiency (CED).

CED reflects poor nutritional status among pregnant women due to a lack of nutrient consumption. CED is considered to be the indirect cause of maternal death.³ In Indonesia, the prevalence of CED among pregnant women aged 15 – 49 years old, as measured in mid-upper-arm circumference, has increased from 33.5% in 2010 to 38.5% in 2013.^{4,5} Similarly, the CED prevalence has also increased among women of reproductive age who are not pregnant from 30.9% in 2010 to 46.6% in 2013.^{4,5} In Gorontalo, a province located in eastern Indonesia, the prevalence of CED was approximately 13.6% in 2017.⁶

Corresponding Author:

Zuriati Muhamad

Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Mulyorejo, Surabaya, Indonesia

Email: zuriati.muhamad-2017@fkm.unair.ac.id

There are various factors influencing the nutritional status of pregnant women, such as dietary intake, physical workload, access to health services, metabolic system, parity, the use of oral contraceptives, household income and breastfeeding.^{7,8} Several changes occur in the body during pregnancy, including an increase in metabolism which requires various nutrients to help the growth of the fetus. Malnutrition may increase the risk of maternal complications among pregnant women including anemia, bleeding, low maternal weight, and susceptibility to infectious diseases due to having a low immune system.^{1,9} CED in pregnancy may affect the healthy development of the fetus and result in congenital defects, low birth weight, being stillborn, and higher infant mortality.¹⁰

To prevent CED among pregnant women, the consumption of a healthy and balanced diet is crucial. Women should be encouraged to consume foods containing adequate protein, iron and calories. Women should be provided with proper knowledge of CED and the nutrition required for pregnancy using the communication of information, education method. The provision of supplementary food including iron tablets, iodine supplements and other vitamins would help to promote healthy pregnancies. The present study aims to examine the effects of maternal age, knowledge on nutrition, and history of infectious disease with the presence of CED.

MATERIAL AND METHOD

The present research employed a cross-sectional design. The selection of subjects as the study sample was conducted using simple random sampling. A total of 50 respondents were recruited among the women attending pregnancy check-ups at the Pulubala community health centre in Gorontalo province. This health facility was selected due to having the highest prevalence of CED compared to other facilities within Gorontalo district. The inclusion criterion was that the participants were pregnant women willing to participate in the study. The data collection was conducted from October to December 2017.

CED was measured based on the MUAC values being lower than 23.5 cm, as suggested by a previous study for Africa and Asian setting.² The data of maternal age, level of knowledge, and history of infectious disease was

obtained from the questionnaire. The data was analysed using descriptive statistics and bivariate analysis.

RESULTS

As presented in Table 1, most of respondents aged between 20 – 35 years old (90%) which was considered to be the range of maternal age with a low risk of pregnancy complications. Most of the respondents had poor knowledge of nutrition (62%), and had no history of infectious disease (90%). The history of infectious disease describes whether the subject ever suffered from tuberculosis (TBC), diarrhea, or both. The majority of pregnant women in this study experienced CED, as indicated by a mid-upper arm circumference higher than 23.5 cm (72.0%).

Table 1: Characteristics of the study subjects

Variables	Number (%)
Maternal age (years)	
High risk (< 20, >35)	5 (10.0)
Low risk (20–35)	45 (90.0)
Knowledge on nutrition	
Poor	31 (62.0)
Good	19 (38.0)
History of infectious disease	
Yes	5 (10.0)
No	45 (90.0)
CED	
Yes (MUAC <23.5 cm)	36 (72.0)
No (MUAC > 23.5 cm)	14 (28.0)

Bivariate analysis was performed to describe the relationship between maternal age, knowledge of nutrition, and history of infectious disease and CED as shown in Table 2. Maternal age and knowledge on nutrition were significantly associated with CED (p-value < 0.001). History of the infectious disease was not significantly associated with CED. The presence of CED among pregnant women in the present study was influenced by maternal age and knowledge of nutrition. Among women with CED, the majority of them were at the age where there is a lower risk of pregnancy complications (100%), had poor knowledge on nutrition (83.3%), and had no previous experience of infectious disease (TBC and diarrhea) during pregnancy (88.9%).

Table 2: The relationship between maternal age, knowledge of nutrition, and history of infectious disease and CED

Variables	CED		X ² count	X ² table	p-value
	Yes (n, %)	No (n, %)			
Maternal age (years)					
Low risk (20 – 35)	36 (100.0)	9 (64.3)	14.286	3.84	0.000
High risk (< 20, >35)	0 (0.0)	5 (35.7)			
Knowledge of nutrition					
Poor	30 (83.3)	1 (7.1)	24.836	3.84	0.00 0
Good	6 (16.7)	13 (92.9)			
History of infectious disease					
No	32 (88.9)	13 (92.9)	0.176	3.84	0.675
Yes	4 (11.1)	1 (7.1)			

DISCUSSION

In our study, although most of the pregnant women were in the low risk maternal age group, (20 – 35 years old) most of them experienced CED. Our study subjects were dominated by those with poor nutritional knowledge. Most of them reported having no previous experience with TBC or diarrhea.

Age has been recognised as a crucial factor of CED.⁹ Based on the results of our study, the high prevalence of CED among women of the appropriate maternal age might relate to other socioeconomic factors¹¹ which were not investigated in the present study. Women from poor households and those with a low level of education would increase the risk of having poor nutritional status. Previous studies also highlighted the importance of maternal age for a positive pregnancy outcome.^{12,13} Being of a younger age than 20 years old or being older than 35 years old was also associated with poor maternal outcome.¹⁴ Age was associated with the use of maternal health care services.¹⁵ Women who had their first child at the age of 19 years old or older would be more likely to use health facilities.¹⁵ Therefore, despite having CED, the appropriate maternal age of the respondents may reduce the risk of them having a poor maternal outcome. For CED reduction, these women should be encouraged to regularly attend their scheduled antenatal care visits and receive all necessary and available supplementary nutritious food.

Knowledge on nutrition is a significant factor in relation to CED, as shown in the bivariate analysis results of the present study. The majority of women with CED had poor knowledge of nutrition. CED was

significantly related to the poor capacity to acquire knowledge due having a low level of education.¹¹ According to Notoatmodjo (2010), knowledge is the result of knowing and occurs after sensing a particular object.¹⁶ By having good knowledge of nutrition, pregnant women may consider selecting more healthy and nutritious food to consume. Knowledgeable women would be more obliged to take the supplements suggested by health workers and be more determined to deliver a healthy baby.¹⁷ As reported in a previous study, providing pregnant women with nutritional education statistically increased the gestational weight by 0.45 kg and lowered the risk of iron deficiency by 30%.¹⁷ Providing supplementary micronutrients and nutritious food, along with the nutritional education, statistically reduced the risk of preterm birth by 19% and increased birthweight by 105 g.¹⁷ Improving the nutritional status of pregnant women with CED, therefore, should adopt a strategy of delivering proper nutritional knowledge to the pregnant women and their families, as well as providing the essential micronutrients supplements and nutritious food. Pregnant women should be educated to select the most nutritious food from the locally available food supply.

Experience with infectious disease among the pregnant women making up the population was not significantly associated with CED, as suggested by our bivariate analysis. In the present study, women with CED reported having no previous experience with infectious disease, especially TBC and diarrhea, which therefore had no significant association with CED. However, previous studies suggested that there was a strong relationship between infectious disease and

malnutrition.^{18,19} Other studies highlighted the significant relationship between infectious disease, including hepatitis virus and tripanosoma cruzi infection, and poor birth outcome.^{20,21}

On the other hand, infection and malnutrition has a complicated interaction, as infectious diseases such as diarrhoea, AIDS and malaria may also cause malnutrition.¹⁹ Poor nutritional status has become the major cause of immunodeficiency due to being underweight, increasing susceptibility to infections. Despite strong evidence from the previous study, a significant relationship between infectious disease and CED did not present itself in the results of this study. A possible explanation for this is the small sample size within a single setting (Pulubala community health centre), which may contribute to this result. Due to the nature of our questionnaire, which only asked about their history of infectious disease in relation to TBC and diarrhoea, the pregnant women joining this study might have had other infectious disease but did not report it. Additionally, the pregnant women might not remember having diarrhoea.

CONCLUSION

Maternal age is a significant factor of CED. Most women of maternal age with low risk of pregnancy complications were reported to have CED. Other socioeconomic factors may confound this result. Knowledge of nutrition was also a significant factor related to CED. Pregnant women and their families should receive more sufficient information about nutrition, including the importance of micronutrient supplementation to generate a positive pregnancy outcome. In addition, upon the provision of nutritional education, women with CED should be provided with nutritious food to encourage them to consume a healthy diet. Although infectious disease was found to be an insignificant factor in this study, as most women reported having no history of TBC and/or diarrhoea, the existing high prevalence of CED in the study setting should be taken into account. Improving the nutritional status of pregnant women with CED would prevent the women from having maternal complications due to infectious disease.

Ethical Clearance: Ethical approval was granted by the School of Public Health in Airlangga University, Surabaya.

Source of Funding: Self funding.

Conflict of Interest: The authors have declared that we had/have no conflict of interest.

REFERENCES

1. World Health Assembly, 65. Nutrition of women in the preconception period during pregnancy and the breastfeeding period: Report by the Secretariat. Geneva: World Health Organization; 2012.
2. Ververs M-t, Antierens A, Sackl A, Staderini N, Captier V. Which anthropometric indicators identify a pregnant woman as acutely malnourished and predict adverse birth outcomes in the humanitarian context? PLoS currents. 2013;5.
3. World Health Organization. The WHO application of ICD-10 to deaths during pregnancy, childbirth and puerperium: ICD-MM: World Health Organization; 2012.
4. Balitbangkes-MoH. Riset Kesehatan dasar Tahun 2010 (2010 Basic Health Research). Jakarta: Kementerian Kesehatan 2010.
5. Balitbangkes-MoH. Riset Kesehatan Dasar Tahun 2013 [The 2013 Basic Health Research]. Jakarta: Balitbangkes MoH; 2013.
6. Dinkes Provinsi Gorontalo. Data of the prevalence of malnutrition among pregnant women in Gorontalo province. Gorontalo Provincial Health Office; 2017.
7. Radhakrishna R, Ravi C. Malnutrition in India: Trends and determinants. Economic and Political Weekly. 2004;671-6.
8. Hasnat Milton A, Smith W, Rahman B, Ahmed B, Shahidullah S, Hossain Z, et al. Prevalence and determinants of malnutrition among reproductive aged women of rural Bangladesh. Asia Pacific Journal of Public Health. 2010;22(1):110-7.
9. Fentie M, Wassie MM, Tesfahun A, Alemu K, Mequanent M, Ayele TA. Chronic energy deficiency and associated factors among adults living with HIV in Gondar University Referral Hospital northwest Ethiopia. BMC Nutrition. 2017;3(1):11.

10. Scott S, Duncan CJ. Malnutrition, pregnancy, and infant mortality: a biometric model. *Journal of Interdisciplinary History*. 1999;30(1):37-60.
11. Ahmed SM, Adams A, Chowdhury A, Bhuiya A. Chronic energy deficiency in women from rural Bangladesh: some socioeconomic determinants. *Journal of biosocial science*. 1998;30(3):349-58.
12. Gabrysch S, Campbell O. Still too far to walk: Literature review of the determinants of delivery service use. *BMC pregnancy and childbirth*. 2009;9.
13. Adeoye IA, Ijarotimi OO, Fatusi AO. What Are the Factors That Interplay From Normal Pregnancy to Near Miss Maternal Morbidity in a Nigerian Tertiary Health Care Facility? *Health Care for Women International*. 2015;36(1):70-87.
14. Cavazos-Rehg PA, Krauss MJ, Spitznagel EL, Bommarito K, Madden T, Olsen MA, et al. Maternal age and risk of labor and delivery complications. *Maternal and child health journal*. 2015;19(6):1202-11.
15. Kurniati A, Chen C-M, Efendi F, Berliana SM. Factors influencing Indonesian women's use of maternal health care services. *Health care for women international*. 2018;39(1):3-18.
16. Notoatmodjo S. *Ilmu Perilaku Kesehatan (Health Behaviour Science)*. Jakarta: PT. Rineka Cipta; 2010.
17. Girard AW, Olude O. Nutrition education and counselling provided during pregnancy: effects on maternal, neonatal and child health outcomes. *Paediatric and perinatal epidemiology*. 2012;26:191-204.
18. Katona P, Katona-Apte J. The Interaction between Nutrition and Infection. *Clinical Infectious Diseases*. 2008;46(10):1582-8.
19. Bhaskaram P. Micronutrient malnutrition, infection, and immunity: an overview. *Nutrition reviews*. 2002;60(suppl_5):S40-S5.
20. Patra S, Kumar A, Trivedi SS, Puri M, Sarin SK. Maternal and fetal outcomes in pregnant women with acute hepatitis E virus infection. *Annals of internal medicine*. 2007;147(1):28-33.
21. Torrico F, Alonso-Vega C, Suarez E, Rodriguez P, Torrico M-C, Dramaix M, et al. Maternal *Trypanosoma cruzi* infection, pregnancy outcome, morbidity, and mortality of congenitally infected and non-infected newborns in Bolivia. *The American journal of tropical medicine and hygiene*. 2004;70(2):201-9.

Implementation of Birth Preparedness and Complication Readiness (BPCR) in High Risk Pregnancies

Ika Mardiyanti¹, Nursalam², Arief Wibowo³

¹Doctoral Program of Public Health, Faculty of Public Health, ²Faculty of Nursing, ³Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

Introduction: Birth Preparedness and Complication Readiness (BPCR) is the Indonesia government program aimed at reducing the Maternal Mortality Rate (MMR) and Infant Mortality Rate (IMR). The program requires the active participation of pregnant women and their families, as well as the community. Health cadres are recruited from the community to help pregnant women and their families in monitoring their health status and recognising the early signs of pregnancy complications. Therefore, this study aimed to examine the effect of the factors related to the health cadre's perception and BPCR implementation in high risk pregnancies.

Method: The study employed an observational analysis with a cross sectional approach. 126 health cadres in Surabaya, Indonesia, were recruited as the study subjects. The data collection was carried out through interviews and observations using a structured questionnaire. The data analysis was conducted using univariate, bivariate and multivariate analysis.

Results: Based on the health cadre's perception, the implementation of BPCR was moderately satisfactory (52.4%). Most of respondents had a moderate understanding of the standard procedure and policy targets (48.4%). Most of the respondents selected moderate when rating the resource's availability (72.2%), interpersonal communication (85.7%), technical support (58.7%) and the attitude of the BPCR implementer (92.1%). From the path analysis, the BPCR implementation was significantly affected by the understanding of the standard procedures and policy targets, the technical support from the public health centres, the interpersonal/organisational communication, the attitude of the implementers, and the availability of resources.

Conclusions: The public health centre should provide a clear standard procedure and effectively communicate the BPCR program to the health cadres, pregnant women and their families, as well as to the community.

Keywords: *birth preparedness and complication readiness, health cadre, high risk pregnancy*

INTRODUCTION

Worldwide, about 20% of pregnancies have the risk of complications.¹ Similarly, the Indonesia Ministry of Health also estimated that approximately 15% of pregnancies in Indonesia have maternal complications ranging from mild to high severity level.² Since 1991, the Maternal mortality

rate (MMR) in Indonesia has decreased from 390 per 100,000 live births to 228 per 100,000 live births in 2007, but then made another increase to 359 per 100,000 live births in 2012.³ East Java is among the provinces in Indonesia with the highest MMR.⁴ Most of the maternal deaths in East Java were caused by eclampsia (31%), bleeding (25%), heart disease (12%), infection (6%) and for other reasons (26%).⁵

Most maternal deaths are preventable.⁶ To reduce maternal mortality, the Indonesia Ministry of Health (MoH) launched the Birth Preparedness and Complication Readiness (BPCR) program. This program aims to improve awareness on the risk of pregnancy complications and was designed for pregnant

Corresponding Author:

Ika Mardiyanti
Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Mulyorejo, Surabaya, Indonesia
Email: ika.mardiyanti-2017@fkm.unair.ac.id

women and their families, health cadres, and health care workers.⁷ Using the BPCR sticker, every pregnant woman is monitored for their health status. The health care worker also provides health counseling and makes a childbirth plan with the expectant mother, their family and the community to improve both maternal and infant health.⁷ The involvement of the family, especially the husband in the maternal health program, significantly influenced the increased use of antenatal care.⁸

Through BPCR, health care workers can detect a high risk pregnancy complication early and suggest a safe childbirth plan to prevent poor maternal and newborn outcomes.⁹ The BPCR strategy has been adopted in various developing countries. Previous studies in Ethiopia, Nigeria, and Nepal have highlighted some factors influencing the success of BPCR implementation.¹⁰⁻¹² Place of living, distance to a health facility, level of education, level of income, knowledge of pregnancy complication signs, employment, attitude and number of antenatal care visits were among factors associated with the implementation of BPCR.¹²⁻¹⁴ In relation to the BPCR implementation in Indonesia, our study was conducted in order to analyse the factors influencing the BPCR in association with high risk pregnancies in Surabaya, Indonesia.

METHOD

This study employed an observational design with a cross sectional approach. The study population was drawn from health cadres in Wonokromo and Sawahan sub-districts in Surabaya, Indonesia. The recruitment of the study subjects was conducted through stratified proportional random sampling. 126 health cadres were invited to participate. The independent variables selected for this study were based on issues collected during the initial survey of BPCR program implementers in Surabaya, including the interpersonal communication between public health centres and the community-based health initiative, resource availability, technical support and training, the attitude of the BPCR implementers, and the understanding of the standard procedures and policy targets. The dependent variable was the implementation of BPCR among women with high-risk pregnancies.

The data was collected using a structured questionnaire and observation sheet. The structured questionnaire used close-ended questions, each with five scales ranging from very poor to excellent, while the observation sheet included a checklist sheet to measure the resource variables of facilities and infrastructure. The

data analysis was carried out using univariate, bivariate and multivariate analyses. The association between the independent and dependent variables was tested using the Chi Square correlation test. Path analysis was performed to assess the effect of the independent variables on the implementation of BPCR.

RESULTS

As shown in Table 1, most of the respondents had a moderate understanding of the standard procedure and policy targets (48.4%). Most of the respondents selected moderate when rating the resource availability (72.2%), interpersonal communication (85.7%), technical support (58.7%), the attitude of the BPCR implementer (92.1%) and BPCR implementation (52.4%).

Table 1: The frequency distribution of the variables of the respondents' perception on the factors influencing BPCR

Variables	Scale	Frequency	Percent (%)
Understanding the standard procedure and policy targets	Very poor	0	0
	Poor	11	8.7
	Moderate	61	48.4
	Good	54	42.9
	Excellent	0	0
	Total	126	100.0
Resource availability	Very poor	0	0
	Poor	35	27.8
	Moderate	91	72.2
	Good	0	0
	Excellent	0	0
	Total	126	100.0
Interpersonal/organisational communication	Very poor	5	4.0
	Poor	5	4.0
	Moderate	108	85.7
	Good	8	6.3
	Excellent	0	0
	Total	126	100.0
Technical support	Very poor	5	4.0
	Poor	47	37.3
	Moderate	74	58.7
	Good	0	0
	Excellent	0	0
	Total	126	100.0

Conted...

Attitude of the BPCR implementers	Very poor	0	0
	Poor	10	7.9
	Moderate	116	92.1
	Good	0	0
	Excellent	0	0
	Total	126	100.0
BPCR implementation	Very poor	8	6.3
	Poor	2	1.6
	Moderate	66	52.4
	Good	50	39.7
	Excellent	0	0
	Total	126	100.0

A bivariate analysis was performed to assess the correlation between the independent variables and the

dependent variables (table is not shown). An understanding of the standard procedure and policy targets was not associated with BPCR implementation ($p\text{-value}=0.529 > \alpha=0.05$). The availability of resources was associated with BPCR implementation ($p\text{-value} = 0.046 < \alpha = 0.05$). Interpersonal/organisational communication was associated with BPCR implementation ($p\text{-value}= 0.000 < \alpha = 0.05$). Technical support was not associated with BPCR implementation ($p\text{-value}=0.263 > \alpha = 0.05$). The attitude of the BPCR implementer was associated with BPCR implementation ($p\text{-value}= 0.000 < \alpha = 0.05$).

The pathway model of the BPCR implementation was employed to assess the effect of each direction of the relationship. Several goodness of fit tests were conducted, and the results suggested that the model fit the data, as presented in Table 2.

Table 2: Results of the Goodness of Fit tests

Goodness of fit test	Index criteria	Value obtained	Remark
Chi Square (X^2)	Count value $X^2 < \text{table value } X^2_{(5\%;1)}$	5,15 < 5,99	Model fit
Significance Probability	$\geq 0,05$	0,076 \geq 0,05	Model fit
Root Mean Square Error of Approximation (RMSEA)	$\leq 0,05$	0,042 \leq 0,05	Model fit
The goodness of fit index (GFI)	$\geq 0,90$	0,987 \geq 0,90	Model fit
The adjusted goodness of fit index (AGFI)	$\geq 0,90$	0,910 \geq 0,90	Model fit
Confirmatory Fit Index (CFI)	$\geq 0,90$	0,982 \geq 0,90	Model fit

The path diagram described the BPCR implementation in Figure 1, regarding implementation. BPCR implementation (Y) had a direct influence on the technical support of the public health centre (X4.support), the attitude of the BPCR implementers (X5.attitude), and had an indirect influence on the understanding of the standard procedures and policy targets (X1.standard), resource availability (X2.resource), and interpersonal/organisational communication (X3.communication). As seen in Figure 1, there are four pathways with significant relationships (as shown by the thick lines), including 1) X1.Standard \rightarrow X4.support \rightarrow Y; 2) X1.Standard \rightarrow Y. Implementation; 3) X1.Standard \rightarrow X3.Communication \rightarrow X4.support \rightarrow Y. Implementation; 4) X5.attitude \rightarrow Y. The pathway from X1.standard to Y had a total effect value of 3.93 and was unidirectional. The pathway from X2.resource to Y had a total effect value of 0.14 and was unidirectional. The pathway from X3.communication to Y had the total effect value of 0.57 and was unidirectional. The pathway from X4.support to Y had a total effect

value of 1.84 and was unidirectional. The pathway from X5.attitude to Y had a total effect value of 1.15 and was unidirectional.

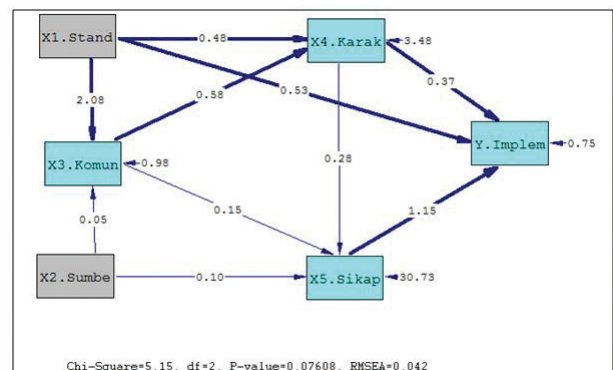


Figure 1: The pathway diagram of the effect value (pathway coefficient)

DISCUSSION

Our results showed that some of the factors describing the cadre’s perception on understanding the standard

procedures and policy targets, the technical support from the public health centre, the interpersonal/organisational communication, the attitude of BPCR implementers and the resource availability was significant in relation to BPCR implementation.

In this study, the interpersonal/organisational communication and the attitude of the BPCR implementers improved BPCR's implementation. According to Azwar (2010), communication in program implementation is crucial, as the extent of the communication received would influence the implementer in decision-making and in creating a conducive working atmosphere.¹⁵ Effective communication is the first step for successful policy implementation.¹⁶ A previous study also suggested that the program policies should be clearly communicated and socialised to the health cadres as the front-line staff, so then they can understand and actively help monitor women with high risk pregnancies.¹⁷ Having a poor understanding of the program could demotivate the program implementer in relation to good performance.¹⁸ Implementers that shown a good attitude would result in good performance, in relation to the program implementation.¹⁹

Communication is also influential to form the attitude of the implementers, as shown in their enthusiasm related to carrying out the needed tasks. Therefore, communication is not just an information delivery activity, but also an attempt to influence and strengthen the target's perceptions and attitude as desired. Good communication will increase the participation of pregnant women, increasing the early detection of a high risk to the pregnancy and preparing for a safe delivery.²⁰

To improve BPCR implementation, the health cadres require good technical support from the public health centre, as shown in the study results. This support can be in the form of formal or non-formal support. Formal support can be obtained from regular supervision via the public health centre, while informal support can be obtained from the daily interaction between the cadres and the village midwives.⁷ Supervision from a technical advisor would improve the implementation performance, as the technical advisor would have the opportunity to do a direct observation while the implementer would have a chance to provide a face to face consultation.¹⁵ Clear standard procedures and policy targets are a strong stimulus for successful policy implementation, leading

to the acceptance and willingness of the implementer to carry out the program.²¹

The resource availability in terms of health workforce and financial support is significant in relation to BPCR implementation in this study. The health workforce is central in implementing the health care program. Therefore, the availability, accessibility, acceptability, and affordability of the health workforce is crucial in promoting the success of the program.²² Sufficient and competent human resources, funds and the infrastructure facilities that are used optimally can facilitate the implementation process.¹¹ Resources such the workforce, finances, facilities, and infrastructure must be made available and sustainable in order to generate the expected outcome.¹⁶ This issue has been well-recognized by the Government of Indonesia who continuously strengthen the health workforce system at all levels with other sectors.²³

BPCR implementation involves activities that require the active participation of husbands, families and cadres (community) in planning safe deliveries and understanding the danger signs of pregnancy complications.²⁴ In Indonesia, the husband's participation as an alert husband or *Suami Siaga* in the safe motherhood program has improved antenatal care attendance and planning for delivery in a health facility.⁸

CONCLUSION

Based on the perception of health cadres on BPCR implementation, several factors including understanding the standard procedures and policy targets, the resource availability, the interpersonal/organisational communication, the technical support from the public health centre, and the attitude of the BPCR implementer has a significant effect on the success of BPCR implementation. The public health centre has a central role in providing and delivering clear procedure and policy targets within and for the BPCR program. Building effective communication between the health cadres and health workers in the public health centre, including the village midwives, can improve the attitude of the program implementers which leads to improved BPCR implementation. However, optimum BPCR implementation is impossible to achieve without sufficient resource availability, especially in relation to the health workforce and financial support.

Ethical Clearance: Ethical approval was granted by the School of Public Health in Airlangga University, Surabaya.

Source of Funding: Self funding.

Conflict of Interest: Nil.

REFERENCES

1. Agarwal S, Sethi V, Srivastava K, Jha PK, Baqui AH. Birth preparedness and complication readiness among slum women in Indore city, India. *Journal of health, population, and nutrition*. 2010;28(4):383.
2. MoH. Profil Kesehatan Indonesia 2015 [Indonesia Health Profile Year 2015]. Jakarta: Kemenkes; 2016.
3. BPS, BKKBN, MoH, ICF International. Indonesia Demographic and Health Survey 2012. Jakarta, Indonesia: BPS, BKKBN, Kemenkes, and ICF International; 2013.
4. MoH. Situasi Kesehatan Ibu di Indonesia (The maternal health situation in Indonesia). Jakarta: Center for Data and Information; 2014.
5. East Java DHO. Profil Kesehatan Jawa Timur (Health Profile of East Java). Surabaya: Dinkes Jatim; 2015.
6. World Health Organization. Strategies towards ending preventable maternal mortality (EPMM) Geneva: World Health Organization; 2015 [Available from: http://apps.who.int/iris/bitstream/10665/153544/1/9789241508483_eng.pdf].
7. MOH. Pedoman Program Perencanaan Persalinan dan Pencegahan Komplikasi (P4K) dengan Stiker (Guidelines for the Birth Preparedness and Complication Readiness Program (P4K) using Sticker). In: Masyarakat DJBK, editor. Jakarta: Departemen Kesehatan RI; 2009.
8. Kurniati A, Chen C-M, Efendi F, Ku L-JE, Berliana SM. Suami SIAGA: male engagement in maternal health in Indonesia. *Health Policy and Planning*. 2017;32(8):1203-11.
9. World Health Organization. WHO recommendations on health promotion interventions for maternal and newborn health 2015: World Health Organization; 2015.
10. Iliyasu Z, Abubakar IS, Galadanci HS, Aliyu MH. Birth preparedness, complication readiness and fathers' participation in maternity care in a northern Nigerian community. *African journal of reproductive health*. 2010;14(1).
11. Karkee R, Lee AH, Binns CW. Birth preparedness and skilled attendance at birth in Nepal: implications for achieving millennium development goal 5. *Midwifery*. 2013;29(10):1206-10.
12. Debelew GT, Afework MF, Yalew AW. Factors affecting birth preparedness and complication readiness in Jimma Zone, Southwest Ethiopia: a multilevel analysis. *The Pan African Medical Journal*. 2014;19.
13. Hailemariam A, Nahusenay H. Assessment of Magnitude and Factors Associated with Birth Preparedness and Complication Readiness among Pregnant Women Attending Antenatal Care Services at Public Health Facilities In Debrebirhan Town, Amhara, Ethiopia, 2015. *Global Journal of Medical Research*. 2016.
14. Kuganab-Lem RB, Dogudugu R, Kanton L. Birth preparedness and complication readiness: a study of postpartum women in a rural district of Ghana. *Public Health Research*. 2014;4(6):225-33.
15. Azwar A. Pengantar Administrasi Kesehatan (Introduction to Health Administration). 3 ed. Jakarta: Binarupa Aksara; 1996.
16. Subarsono A. Analisis kebijakan publik: konsep, teori dan aplikasi: Pustaka Pelajar; 2005.
17. Miltenburg AS, Roggeveen Y, van Elteren M, Shields L, Bunders J, van Roosmalen J, et al. A protocol for a systematic review of birth preparedness and complication readiness programs. *Systematic reviews*. 2013;2(1):11.
18. August F, Pembe AB, Mpembeni R, Axemo P, Darj E. Effectiveness of the home based life saving skills training by community health workers on knowledge of danger signs, birth preparedness, complication readiness and facility delivery, among women in Rural Tanzania. *BMC pregnancy and childbirth*. 2016;16(1):129.
19. Kusumanegara S. Model dan aktor dalam proses kebijakan publik (model and actors in the public policy process): Gava Media; 2010.

20. Wieggers T, Boerma W, de Haan O. Maternity care and birth preparedness in rural Kyrgyzstan and Tajikistan. *Sexual & Reproductive Healthcare*. 2010;1(4):189-94.
21. Van Meter DS, Van Horn CE. The policy implementation process: A conceptual framework. *Administration & Society*. 1975;6(4):445-88.
22. Campbell J, Dussault G, Buchan J, Pozo-Martin F, Guerra Arias M, Leone C, et al. A universal truth: no health without a workforce Geneva: Global Health Workforce Alliance and World Health Organization; 2013 [
23. Kurniati A, Roskam E, Afzal M, Suryowinoto T, Mukti A. Strengthening Indonesia's health workforce through partnerships. *Public Health*. 2015;129(9):1138-49.
24. Kakaire O, Kaye DK, Osinde MO. Male involvement in birth preparedness and complication readiness for emergency obstetric referrals in rural Uganda. *Reproductive Health*. 2011;8(1):12.

Access to Healthcare Facilities in Poor and Underdeveloped Areas in Nusa Tenggara Timur Province

Yendris Krisno Syamruth¹, H. Kuntoro¹

¹Doctoral Program of Public Health, Faculty of Public Health, Universitas Airlangga

ABSTRACT

Background: The equality of access to healthcare facilities corresponds to the degree of public health. The degree of public health in underdeveloped areas and borders is still far behind other regions, one of the provinces which has many underdeveloped regencies is the province of Nusa Tenggara Timur.

Purpose: This study aims to give an overview of access to healthcare facilities from the perspective of resources and community capacity in Nusa Tenggara Timur Province (NTT) by using the perspective of supply and demand.

Method: This study is based on secondary data, which is the 2013 Basic Health Research conducted by the Health Research and Development Agency of the Ministry of Health of Republic of Indonesia. This uses the total population of all households in NTT with multi-stage and clusters sampling techniques, with 10,747 households sampled, which were selected based on the block census of the Central Statistics Agency (BPS).

Result: The most popular healthcare facility among the households is Puskesmas, with a proportion of 86.4%, and the least popular is Poskesdes with a proportion of 5.8%, while public knowledge on Puskesmas or Pustu nationally is 89.8%. The type of transportation that is most often used to go to the Puskesmas is motorbikes, with a percentage of 39% and the lowest is bicycles with 0.1%, but if the healthcare provider is a hospital, the type of transportation that is most often used is public transport, the furthest healthcare provider with travel time > 60 minutes is the hospital and the shortest is < 16 minutes which is Posyandu, while the transportation cost to the healthcare facility is Posyandu, with the cost of < Rp 10.000.

Conclusion: The location of healthcare providers relatively far from households contributes to the knowledge about the availability of health care providers, the travel time, the alternative modes of transportation used, and the costs incurred to reach the healthcare provider. Puskesmas and Posyandu are still the most popular healthcare facilities because they are well-known, cheaper and closer.

Keywords: *accessibility, equity, underdeveloped area, poor area, healthcare facility*

INTRODUCTION

The facts show that Nusa Tenggara Timur Province is one of the underdeveloped provinces, with many poor people, of more than one million, in 2016 (22.10%) and they live in the border and remote islands that have difficulty in getting their rights to health. System-oriented healthcare development is expected to prevent geographical imbalances in order to ensure quality and access to health services in the era of National Health Insurance. In addition, the basic need for a fair and excellent healthcare provider (preventing, promoting, curative, and rehabilitating) can be realized and finally it will enhance the quality of human resources in NTT.

Corresponding Author:

Yendris Krisno Syamruth
Doctoral Student, Faculty of Public Health,
Universitas Airlangga Surabaya,
Jl Mulyorejo kampus C Unair Surabaya, Indonesia
Email: yendris.krisno.syamruth-2017@fkm.unair.ac.id

In order to develop people who live in bucolic and underdeveloped areas, solid support is needed, not only in one aspect, but the support must be integrated with financial support, planning, evaluation, exchange of information and coordination, technology, promotion, and extension of liability in terms of healthcare¹.

The key to development is the degree of public health care, the higher the public health status, the better the development. Nusa Tenggara Timur Province faces some health issues which contribute to the degree of public health, such as the reach of health care for poor and risky people (pregnant women, babies and toddlers) in NTT which is still low, the number of mortality of mother (192 cases), babies (1450 cases) and toddlers (1717 case) is high, the proportion of babies with severe malnutrition and lack of nutrition, including the phenomenon of “*stunting*”, and the increasing trends of non-infectious and infectious diseases (*double burden of diseases*). Life Expectancy in NTT (67.73 years old) is still below the national standard (70,81) in 2017. Generally, all these problems have an impact on NTT’s low quality of human resources development. It is reflected from the Human Development Index (IPM). IPM is an indicator of development in the field of economics, education and health which is calculated based on the rate of life expectancy, average time of education, literacy rate and per capita expenditure. Currently, the IPM of Nusa Tenggara Timur Province is increasing, where in 2009 the IPM is 67,26 and in 2017 the IPM increase to 67,73. In other words, the IPM increase 0,47 within 8 years. The increase of IPM that has been accomplished cannot reach the national average which is 70,81 in 2017. Based on the national data, since 2015 until 2017, NTT still hold on in the 31st position. Access to healthcare facilities in NTT is a crucial factor which needs to be improved.

This study illustrates a basic portrait of the ability of the community to access healthcare facilities that belong to their rights so that basic information can be leveraged.

RESOURCES AND METHOD

This study refers to the results of the 2013 Basic Health Research conducted by the Research and Development Agency of Indonesian Ministry of Health². The sampling technique used is a gradual and cluster with cross-sectional analytic observational survey approaches with selected variables related to community

accessibility to health services and resources that capture the condition of the community in reaching government-owned health facilities. The population in this study is all households in NTT Province and samples are taken from BPS Census Block with a total sample of 10,747 households. The NTT Province in this study was chosen with the consideration of regions that have high lagging, border and archipelago areas compared to other provinces, as well as the front porch of the Republic of Indonesia. At this time a descriptive analysis was carried out to obtain a special description of service accessibility in the district in NTT Province.

RESULTS

Access to healthcare facilities is described in 2 aspects, namely (1) community/household knowledge about the availability of health facilities (public hospitals, private hospitals, Puskesmas or supporting Puskesmas, doctor or clinic, midwife clinic or maternity clinic, Posyandu, and Poskesdes or Poskestren), and (2) affordability of healthcare facilities. Based on the results of Riskesdas 2013, it is known that NTT Province occupies the lowest position in Indonesia in terms of knowledge of the availability of health facilities, as presented in Figure 1.

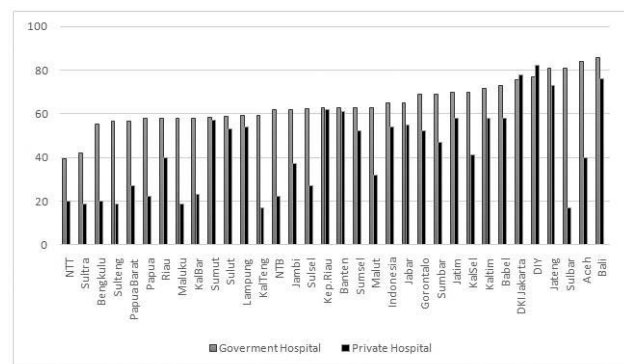


Figure 1: Proportion of Household with knowledge of the availability of Government and Private-owned Hospital based on Province of 2013

Meanwhile, the most popular healthcare facility at Regency level in NTT is Puskesmas/Pustu (86,4 %) ranges from 64,6% in Kabupaten Sikka to 99,6% in Lembata. While the least famous healthcare facility in entire NTT province is Poskesdes/Poskestren (5,8%) ranging from 0% in Timor Tengah Selatan and Sabu Raijua to 23,6% in Manggarai. More detailed information can be found in table 1.

Table 1: Proportion of Household Knowledge on the availability of healthcare facilities based on Regency/ City, Nusa Tenggara Timur, Riskesdas 2013

Regency/City	Keberadaan Fasilitas Kesehatan							
	Public hospital	Private Hospital	Pusk/ Pustu	Doctor/ Clinic	Midwife/ MH	Posyandu	Poskesdes/ Poskestren	Polindes
Sumba Barat	93,1	91,7	95,0	33,7	12,6	82,1	1,8	21,1
Sumba Timur	38,0	43,2	86,4	31,5	12,2	58,1	2,5	31,9
Kupang	23,8	10,9	89,8	8,9	3,0	13,8	0,2	1,0
Timor Tengah Selatan	36,4	8,5	92,8	6,8	0,9	42,2		12,9
Timor Tengah Utara	53,8	2,5	65,9	16,2	0,4	15,7	5,5	60,3
Belu	67,8	51,0	95,0	37,8	29,0	52,0	3,7	53,8
Alor	23,6	0,8	82,9	8,4	4,8	41,7	8,4	
Lembata	80,8	80,1	99,6	63,2	42,1	64,9	1,7	31,5
Flores Timur	72,6	28,2	94,3	40,2	4,8	52,3	5,7	28,4
Sikka	19,4	3,0	64,6	11,4	1,1	25,8	4,8	34,1
Ende	74,1	14,9	95,6	41,7	21,3	62,9	10,9	15,2
Ngada	48,2	1,3	84,4	13,3	6,2	29,3	10,5	31,9
Manggarai	32,7	20,9	80,7	16,2	5,5	35,5	23,6	4,5
Rote Ndao	52,8		96,8	34,6	1,9	31,4	5,1	
Manggarai Barat	1,2	0,6	77,4	5,5		3,9	6,3	8,1
Sumba Tengah	11,0	5,5	83,0	0,5		31,0	9,8	53,0
Sumba Barat Daya	6,6	59,0	73,8	22,7	4,6	27,4	1,2	12,3
Nagekeo	16,4	3,3	77,3	15,8	0,9	24,2	0,7	56,4
Manggarai Timur	15,3	4,4	89,1	6,3	11,7	66,5	12,0	3,6
Sabu Raijua	37,6		98,2	0,2	0	66,4		1,8
Kota Kupang	86,7	63,5	91,4	56,9	44,6	60,8	6,7	6,6
Nusa Tenggara Timur	42,8	23,7	86,4	22,8	10,3	42,1	5,8	21,8

Overview on the access to healthcare facility based on the transportation mode can be found in table 2.

Table 2: Percentage of Transportation Modes that are Used by the Households to Go to Healthcare Facility in Nusa Tenggara Timur, Riskesdas 2013

Healthcare Facility	Transportation Modes								
	Private car	Public transport	On foot	Motor cycle	Bicycle	Boat	Air transport	Others	More than one transport mode
Public hospital	2,3	41,6	1,6	39,9	-	0,3	0,0	0,3	13,9
Private hospital	2,3	39,5	3,9	39,4	-	0,2	0,2	0,2	14,4
Puskesmas/Pustu	1,1	23,6	28,8	39,4	-	0,2		0,1	6,8
Doctor/Clinic	3,5	28,9	7,4	52,1	-	0,1	0,0	0,0	7,9
Midwife/maternity clinic	2,4	30,7	17,7	43,6	-	-	-	0,1	5,5
Posyandu	0,6	3,9	78,0	14,2	-	-	-	0,1	3,2
Poskesdes/ Poskestren	0,5	3,9	80,1	13,1	-	0,2	-	-	2,3
Polindes	0,4	8,5	73,0	15,5	0,1	-	-	0,2	2,2

The table above indicates that the transportation mode that is mostly used by the households in Nusa Tenggara Timur to go to public hospital is public transport (41,6%), and the least used is bicycles, boats, air transport and “others” (each has a percentage of < 0,5%). Most of the 41,6 % respondents who use public transport are from Manggarai Timur dan, while only a few of them come from Kabupaten Kupang (14,1%).

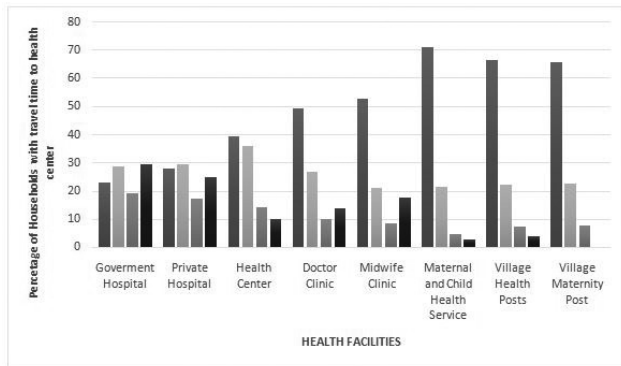


Figure 2: The Percentage of Travel Time of the Household to Go To Healthcare Facilities in Nusa Tenggara Timur, Riskesdas 2013

The above figure indicates that most of people who go to Posyandu (71%) have to travel for ≤ 15 minutes, while those who go to public hospital in Nusa Tenggara Province (29%) have the longest travel time, namely >60 minutes. Most of those who go to the hospital come from Manggarai Timur (96,3%) Regency and only a few of them who come from Alor (3,8%).

Among four categories of travel time to Poskesdes/ Poskestren and Polindes in the entire Nusa Tenggara Timur Province, the dominant category is the category of travel time of ≤15 minutes. The data concerning the accessibility of health care services based on the transport cost can be found in Table 3.

Table 3: Percentage of the Transportation Cost that Incurred by the Households to Go to Public hospital based on Regency/City, Nusa Tenggara Timur, Riskesdas 2013

Healthcare facility	Transport cost (rupiah)			
	10.000 ∨	10.000 ∧	50.000 ∧	200.000 ∧
Public hospital	57,7	37,5	4,1	0,7
Private hospital	65,2	31,2	3,0	0,6

Conted...

Puskesmas/Pustu	92,7	7,1	0,1	0,1
Docter/Clinic	77,9	20,5	1,4	0,2
Midwife/Maternity clinic	80,0	19,2	0,5	0,3
Posyandu	97,2	2,7	0	0,1
Poskesdes/Poskestren	92,1	5,3	0	2,6
Polindes	96,0	2,9	0,1	1,0

The above table shows that more than half of the respondents (57,7%) incur travel costs of Rp. < 10.000,- to go to public hospital. The higher the transportation cost, the fewer people who choose such a transportation mode.

ANALYSIS

Access to healthcare facilities is the ability of each individual to seek health services that she/he needs. The healthcare facilities are generally established in a central regional position with consideration that it is easily accessible to most people. Thabrany, et.al. state that the travel time and distance to the healthcare facilities contributes significantly to the utilization of health funds³. Public accessibility to health services is affected by many factors that are very multidimensional. Accessibility is not only influenced by supply factors, such as the availability of health workers and facilities, but it is also affected by several factors such as geographical conditions and the scope of health insurance availability. These factors can be an obstacle if they are not managed and anticipated properly. Access to health services must be determined by the actual needs (demand) of health services rather than just the ability to pay or geographical location⁴. Formal health services are not enough. Communities in need must have access to health services available within a reasonable period of time. In addition, pursuing equity must go beyond access to medication and treatment, but also must examine variations in health status in different groups in society^{4,5}. Most of the regencies in NTT Province are situated in underdeveloped area, and the rest are situated at the border or remote island, such as Rote Ndao regency, Sumba regency, Belu regency and Alor regency. Some of the factors which hamper the accessibility of the community to fulfill their health rights are the location of the house, economic capacity, the availability of the road network, and modes of transportation which cause intrinsically and extrinsically minimal in service accessibility. These factors, according to Kumar, can affect the degree of public health^{6,7}.

The transportation mode that is mostly used is public transportation, although it is not available at all the time. As an alternative, other transportation modes such as motorbikes are used, considering the limited access of roads and house location⁷⁻⁹. In some cases, sick people who want to find medical treatment have to use any available transportation means^{7,10,11}. The government is still working on the improvement of infrastructure and bridges which are intended to refine access and shorten the travel time which can be achieved, at least in terms of supply^{5,12}.

In order to increase access, an intensive dissemination of information on the availability of healthcare facilities and its utilization must be delivered to the society to satisfy their health needs. In addition, the referral system must be improved, not only at the site of this study. Strengthening the referral system must be carried out through developing several hospitals in several regions in East Nusa Tenggara based on the proximity of the archipelago and keep accelerating Puskesmas accreditation in relatively isolated districts and increasing community participation in services at the Posyandu level. The majority of the respondents chose Puskesmas and Polindes because they are the closest to the respondent's residence. The choice of these two health facilities is related to the economic background of the respondent, the distance to the place of residence, and the availability of transportation in the village.

CONCLUSION

The highest percentage of public knowledge on the availability of government-owned healthcare facilities such as hospital and Puskesmas can be found in Kabupaten Sumba Barat, while the lowest percentage can be found in Manggarai Barat, in the entire NTT province, only 42,8% of the respondents who have knowledge of the availability of healthcare facilities such as hospitals, but 86,4% of the respondents were aware of the availability of Puskesmas, such as knowledge on the availability of healthcare facilities caused by the lack of information and geographical position of the existing healthcare facilities. Such limited knowledge contributes to the choice of transportation mode, which is mostly used to go to the healthcare facility, namely motorbike and public transport, while there are also some respondents who walk to healthcare facilities. The travel time that is spent by the household to get to the government-owned

healthcare facilities is relatively long and therefore, many people go to Posyandu instead (71%) because it is closer than the hospital or Puskesmas. Such choices contribute to the transportation cost which is the cheapest option of transportation cost incurred by most people to go to healthcare facilities. Thus, the lack of knowledge contributes to the type of healthcare facility chosen and which corresponds to the travel time and the cost incurred.

Ethical Clearance: This study had passed ethical clearance issued by Ethical Committee of the Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia.

Source of Funding: This study is self-funded research project.

Conflict of Interest: None.

REFERENCES

1. Nagarajan K V. Rural and remote community health care in Canada: beyond the Kirby Panel Report, the Romanow Report and the federal budget of 2003. *Can J Rural Med.* 2004;9(4):245.
2. Kemenkes RI. Riset Kesehatan Dasar. Badan Penelitian dan Pengembangan Kemenkes RI. [Republic of Indonesia Ministry of Health. Basic Health Research. Republic of Indonesia Ministry of Health Research and Development Agency]. Jakarta. Indonesia; 2013.
3. Thabrany H. Pendanaan kesehatan dan alternatif mobilisasi dana kesehatan di Indonesia. [Health funding and alternative health fund mobilization in Indonesia]. RajaGrafindo Persada; 2005.
4. Harkin AM. Equity of access to health services: some relevant issues in an Irish context. *Institute of Public Health in Ireland*; 2001.
5. Waters HR. Measuring equity in access to health care. *Soc Sci Med.* 2000;51(4):599–612.
6. Kumar N. Changing geographic access to and locational efficiency of health services in two Indian districts between 1981 and 1996. *Soc Sci Med.* 2004;58(10):2045–67.
7. Gabrysch S, Cousens S, Cox J, Campbell OMR. The influence of distance and level of care on

- delivery place in rural Zambia: a study of linked national data in a geographic information system. *PLoS Med.* 2011;8(1):e1000394.
8. Sitorus H, P Ambarita L. Gambaran Aksesibilitas Sarana Pelayanan Kesehatan di Propinsi Kepulauan Bangka Belitung (Analisis Data Riskesdas 2007). [Overview of Accessibility of Health Service Facilities in Bangka Belitung Islands Province (Riskesdas 2007 Data Analysis)]. *SPIRAKEL.* 2011;24–30.
9. Johnston BD. Why is UK performance in child and youth mortality so poor? *Lancet.* 2014;384(9946):837–8
10. George N, Johnson AR, Lobo A, Pousiya S, Agrawal T. Health problems and health seeking behavior among school-going adolescents in a rural area in South Karnataka. *J Indian Assoc Child Adolesc Ment Heal.* 2018;14(2).
11. Schmid T, Kanenda O, Ahluwalia I, Kouletio M. Transportation for maternal emergencies in Tanzania: empowering communities through participatory problem solving. *Am J Public Health.* 2001;91(10):1589–90.
12. Whitehead M. The concepts and principles of equity and health. *Health Promot Int.* 1991;6(3):217–28.

The Effect of Doctor Professionalism on the Quality of Medical Services at a First Level Health Facility

Febri Endra B. S.¹, Stefanus Supriyanto², Rubayat Indradi³, Aditya Rizka R⁴

¹Doctoral Student, Faculty of Public Health, ²Professor, Department of Health Administration and Policy, Faculty of Public Health, Universitas Airlangga Surabaya, Jl Mulyorejo kampus C Unair Surabaya, Indonesia; ³Family and Industrial Medicine Division, ⁴Doctor Profession Program, Faculty of Medicine, University of Muhammadiyah Malang

ABSTRACT

Introduction: Professionalism is part of the Indonesian Code of Medical Ethics. Doctor professionalism can be achieved through mastering competencies that refer to the Standard Competency of Indonesian Doctor (SKDI). Competency is closely related to the quality of service. Service quality can be measured using the SERVQUAL method. Indonesia is currently implementing National Health Insurance where health services are carried out at first level of health facilities (FKTP) and FKRTL with a tiered referral pattern. This study aims to determine the effect of doctor professionalism on the quality of medical services in an FKTP-category clinic.

Method: This study is an analytic observational study with a cross-sectional study design. The population is from one of the FKTP-category clinics in Malang Regency with total sample of 234 people selected through systematic random sampling. The respondent is a patient who has been treated 3 times in selected FKTP. Data analysis is using Somers' d correlation test and linear regression test.

Result: From Somers' d test obtained value of $r=0.317$. The equality value of the quality of medical services obtained $Y=-1.515+X_1 0.187+X_2 0.197+X_3 0.179+X_4 0.216+X_5 0.172$. The equality value of doctor professionalism obtained $Y=-3.275+X_1 0.216+X_2 0.107+X_3 0.123+X_4 0.182+X_5 0.288+X_6 0.174+X_7 0.306$. It is apparent from these equations that professionalism of doctor affected the quality of medical services.

Discussion and Conclusion: The quality of health services refers to the appearance of health services, known as output, which is the final result of doctor and other professional personnel's actions on patients, in the sense of changes in health status and satisfaction both are positive and vice versa. Competency influences job satisfaction of service providers so that it will affect the service quality. Patients feel comfortable and calm when the doctor pays them attention and can answer patients' questions. Further emphasize on the assurance dimension and also the competency area of effective communication may need to be considered.

Keywords: Professionalism, competency, quality of medical service, SERVQUAL

INTRODUCTION

Professionalism is the attitude of a professional, and professional means doing something as a main job called a profession, meaning that the job is not a spare time filler or a mere hobby¹. Professionalism is a part of

the Indonesian Code of Medical Ethics (2012). An article regarding professionalism is contained in the Indonesian Code of Medical Ethics Article 8 "A doctor is obliged, in every medical practice, to provide competent services with full technical and moral freedom, accompanied by compassion and respect for human dignity". Assessment of doctor's professionalism can be done based on the points of view of doctors, patients, and nurses, where doctors assess their level of professionalism as lower than the assessment given by patients².

Arnold (2006) states that doctor's professionalism is demonstrated through clinical competence,

Corresponding Author:

Febri Endra B. S.

Doctoral Student, Faculty of Public Health,
Universitas Airlangga Surabaya,
Jl Mulyorejo kampus C Unair Surabaya, Indonesia
Email: febr.en.budi-2017@fkm.unair.ac.id

communication skills, understanding of ethics and law that are built in the hope to implement the principles of professionalism³. Doctor competency in Indonesia refers to Indonesian Doctor Competency Standards, where doctors must understand and master seven areas of competence, namely: 1) Noble professionalism; 2) Self-awareness and self-development; 3) Effective communication; 4) Management of information; 5) Scientific foundation of medical science; 6) Clinical skills; and 7) Management of health problems. Good competence achievement is expected to provide satisfaction to patients through high-quality health services. High quality of health services is a must to get satisfaction from health service users. For health service users, the quality of health services and their satisfaction is formed from structured activities, not only performance or product quality, but also provides an overall organized image⁴.

The quality of health services needs to be maintained which generally can be stated that what is meant by the quality of health services refers to the level of perfection of health services. On one hand it can cause satisfaction to the patient, meanwhile on the other hand the procedure must be in accordance with the established code of ethics of professional standards⁵. Parasuraman, Zeithmal and Berry in Lupiyoadi (2001) concluded that there are five dimensions of service quality called SERVQUAL which consists of Reliability, Assurance, Tangibles, Empathy, and Responsiveness⁶.

Based on Law No. 40 of 2004, it is stated that every person has the right to social security to be able to fulfill a decent life, have basic needs fulfilled, and upgrade his dignity towards the realization of a prosperous, just, and wealthy Indonesian society. For this reason, based on Law No. 24 of 2011, formed a Social Security Administrative Body (BPJS) which in the health

sector formed Healthcare and Social Security Agency (Healthcare BPJS). The Minister of Health Regulation No. 71 of 2013 states that health service providers in the JKN program are in the form of First Level Health Facilities (FKTP) and Advanced Referral Health Facilities (FKRTL).

RESEARCH METHOD

Research Design: This study is an analytic observational study with a cross-sectional study design. The research was done at FKTP of “X” Clinic in Malang Regency in January - March 2018.

Research Population and Sample: The population and sample of this study were Healthcare BPJS members registered at FKTP “X” Clinic in Malang Regency. The calculation of sample size used the formula of the cross-sectional research sample, the population is known:

$$n = \frac{Z_{1-\alpha/2}^2 p(1-p)N}{d^2(N-1) + Z_{1-\alpha/2}^2 p(1-p)}$$

The sampling technique used systematic random sampling, where there were 234 samples. Selected samples are BPJS members registered at FKTP of “X” Clinic in Malang Regency who have used FKTP at least 3 times.

ANALYSIS OF RESEARCH RESULTS

In this study, data were obtained from interview results based on questionnaires conducted on the Healthcare BPJS members registered at FKTP “X” Clinic in Malang Regency. The data obtained from respondents’ answers will be processed, tabulated, presented in table form and then performed using the Somers’ d correlation test and linear regression test.

RESEARCH RESULTS

The results of the study can be described as follows:

Table 1: Distribution and level of Medical Services Quality at FKTP of “X” Clinic in Malang Regency

Service Quality	n	%
Less qualify	2	0.9
Qualify	184	78.6
Highly qualify	48	20.5
Total	234	100.0

Conted...

Reliability	Average value of each statement	Mean value of dimension
Doctors are very good at administering to your complaints	3.902	3.849
Doctors explain their actions	3.791	
Doctors communicate in a language that you understand	3.880	
Doctors answer questions about your complaints	3.855	
Doctors explain the given prescription or medication	3.816	
Assurance	Average value of each statement	Mean value of dimension
Doctors provide an explanation of how to prevent diseases	3.987	3.950
Doctors listen attentively to your complaints	3.949	
Doctors introduce themselves	4.004	
Doctors ask permission before taking actions	3.915	
The cost you spend is in accordance with what you get	3.897	
Tangibles	Average value of each statement	Mean value of dimension
The atmosphere of the doctor's practice room is very good	3.816	3.880
Neat doctor appearance	3.872	
Medical devices function very well	3.940	
Medical support equipment in the practice room is neatly arranged and in good condition	3.855	
The doctor's practice room is quite private	3.919	
Empathy	Average value of each statement	Mean value of dimension
You feel comfortable to speak to the doctors	3.966	3.906
Doctors try to calm you regarding your complaints	4.030	
Doctors wish you to get well soon	3.936	
Doctors try to explore the causes of your complaints	3.769	
Doctors listen to the story about your complaints	3.829	
Responsiveness	Average value of each statement	Mean value of dimension
Doctors give the freedom to choose an action after an explanation is given	3.966	3.942
Doctors are quick and responsive in taking actions	3.944	
Doctors give you time to ask before taking medical action	3.829	
Doctors are friendly and polite when taking actions	3.970	
Doctors are on time according to the informed practice time	4.000	

Table 2: Distribution and level of the Level of Doctors' Professionalism Based on Achievement of Doctor Competencies According to Healthcare BPJS members at FKTP of "X" Clinic in Malang Regency

Doctor's Professionalism	n	%
Professional	146	62.4
Very Professional	88	37.6
Total	234	100.0

Conted...

Competency Area 1	Average value of each statement	Average value of competency area 1
Doctors give greetings, are friendly and treat patients well	3.927	3.953
Doctors value patients' religion, age and physical condition	3.910	
Doctors are calm and able to communicate with other health workers	4.021	
Competency Area 2	Average value of each statement	Average value of competency area 2
Doctors appreciate other treatment methods	4.043	4.021
Doctors give a positive response to patient's opinion	3.979	
Doctors are aware of their own shortcomings	4.043	
Competency Area 3	Average value of each statement	Average value of competency area 3
Doctors can communicate with a language that is understood by patients	4.137	4.137
Doctors can convey information clearly	4.179	
Doctors deliver counseling in polite language	4.094	
Competency Area 4	Average value of each statement	Average value of competency area 4
Doctors are skilled in managing information from patients	4.081	4.079
Doctors are skilled at using IT devices	4.077	
Competency Area 5	Average value of each statement	Average value of competency area 5
Doctors possess knowledge on health problems related to patient complaints	4.047	4.073
Doctors are able to decide the necessary supporting examinations	4.064	
Doctors are able to determine the prognosis	4.120	
Doctors consider patient's ability to make decisions	4.060	
Competency Area 6	Average value of each statement	Average value of competency area 6
Doctors are skilled in carrying out anamnesis process	4.115	4.097
Doctors are skilled in carrying out physical examinations	4.077	
Doctors can decide a rational supporting examination	4.098	
Competency Area 7	Average value of each statement	Average value of competency area 7
Doctors are able to do IEC related to health promotion suitable for patient's condition	4.081	4.022
Doctors are able to do IEC related to health prevention suitable for patient's condition	4.077	
Doctors are able to do a fast and correct treatment	4.047	
Doctors are able to do IEC related to rehabilitation suitable to patient's condition	4.047	
Doctors make instructions that are easy to understand	3.859	

The five dimensions of SERVQUAL namely RATER have a significant effect on the quality of medical services. This is obtained by the result of regression equation $Y = -1.515 + X_1 0.187 + X_2 0.197 + X_3 0.179 + X_4 0.216 + X_5 0.172$. The professionalism of doctor is influenced by the seven areas of doctor's competency and obtained result of the regression equation $Y = -3.275 + X_1 0.216 + X_2 0.107 + X_3 0.123 + X_4 0.182 + X_5 0.288 + X_6 0.174 + X_7 0.306$.

The result of the Somers' d test showed significant result ($p=0.000$) that professionalism of doctor affected the quality of medical services at FKTP of "X" Clinic in Malang Regency with a value of $r=0.317$.

DISCUSSION

In table 1 it is known that most (78.6%) Healthcare BPJS members at FKTP of "X" Clinic in Malang Regency stated that medical services were already high in quality. Table 1 also shows that the five dimensions of quality have a high average value (3.880–3.950) with the highest average value on assurance dimension (assurance of service quality) with an average value of 3.950 (based on 5 categories of Likert scale).

This study is different from Aida's (2017) study of health services quality in a community health center, where only 58.5% of patients stated that the highest quality of service and the highest SERVQUAL dimension are empathy and tangible dimensions⁷. The result of medical services quality in this study was still higher than Ika's (2012) study which showed 64%-71% of PKMS outpatients stated that services in General Polyclinic of Surakarta Regional Public Hospital were good in quality, with the highest quality of service in the dimensions of responsiveness and empathy⁸.

Quality is the actual proper value of certain service units, both from the technical aspects (knowledge, skills, and medical or health technology) and interpersonal, which is the doctor-patient relationship: communication, empathy and patient satisfaction⁹. Doctors certainly will not be able to provide information related to patient health problems if they do not master the competencies. Mastery of competence in this study is based on the Standard for Indonesian Doctor's Competencies (SKDI) determined by the Indonesian Medical Council in 2012¹⁰.

Based on table 2 it is known that there were no patients at FKTP of "X" Clinic in Malang Regency

who stated that doctors were not professional, 37.6% of patients stated that medical services were carried out very professionally. This professional medical service is certainly supported by a fairly good mastery of competence. In this study the area of competence that was most mastered by doctors in area 3 based on SKDI is the competency area of effective communication, with an average value of 4.137 (based on a 5 category Likert scale). This is in accordance with patient assessment related to the quality of medical services, where the highest mean value is in the assurance dimension, meaning that doctors are able to develop good communication with patients so that they can understand the doctor's explanation, where in the end they will be able to decide the next management step based on previous explanations given by the doctor.

Ina's study (2012) on HR competency with hospital service quality states that positive responses from patients to the quality of doctor services can be known through the statement: "Patients feel comfortable and calm when doctors give their interest and ability to answer patient's questions"¹¹.

Tati's study (2016) of the effect of doctor service quality on patient loyalty states that doctors' technical ability is considered good by patients with a counted mean of technical ability of 38.84 with an ideal average of 27.00¹². This study is in line with Alit's study (2014) which states that 96% of patients assess the competence of doctors as good¹³. Competency influences job satisfaction of service providers so that later it will also affect the quality of service.

The results of the regression test revealed that all dimensions (RATER) had significant roles in the quality of medical services at FKTP of "X" Clinic in Malang Regency. In the regression test result it is known that each SERVQUAL dimension has an equal effect. The result of the Somers' d test revealed that doctor's professionalism has a moderate influence on the quality of medical services at FKTP of "X" Clinic in Malang Regency. This is in line with Alit's study (2014) that competence has a significant relationship with service quality¹³.

CONCLUSION

Doctors' professionalism provides a significant influence on the quality of medical services at FKTP of "X" Clinic in Malang Regency. The dimension that has

the highest influence on the quality of medical services is the assurance dimension (assurance of medical services). The competency area of effective communication has the highest influence on doctor professionalism in providing medical services to patients at FKTP of "X" Clinic in Malang Regency.

Ethical Clearance: This study had passed ethical clearance issued by Ethical Committee of the Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia.

Source of Funding: This study is self funded research project.

Conflict of Interest: None.

REFERENCES

1. Poerwopoespito, F. X. O. S. & Utomo, T. A. T. *Mengatasi krisis manusia di perusahaan: solusi melalui pengembangan sikap mental*. (Grasindo, 2000).
2. Rogers, E. M. *Diffusion of Innovations* 5th ed. A Division of Macmillan Publishing Co Inc. (2003).
3. Stern, D. T. *Measuring medical professionalism*. (Oxford University Press, 2006).
4. Bedi, M. An Integrated Framework For Service Quality, Customer Satisfaction And Behavioral Responses In Indian Banking Industry--A Comparison Of Public And Private Sector Banks. *J. Serv. Res.* **10**, (2010).
5. Azrul, A. *Pengantar Administrasi Kesehatan*. Ed. *Ketiga, Jakarta Bin. Aksara* (1996).
6. Lupyoadi, R. *Manajemen Pemasaran Jasa (Teori dan Praktek)*. Depok: *Salemba Empat* (2001).
7. Andriani, A. Hubungan Mutu Pelayanan Kesehatan dengan Kepuasan Pasien Diruangan Poli Umum Puskesmas Bukittinggi. *J. Endur.* **2**, 45–52 (2017).
8. CAHYANINGRUM, I. K. A. Pengaruh Mutu Pelayanan Kesehatan Terhadap Kepuasan Pasien Rawat Jalan Poliklinik Umum Peserta Pkms (Pemeliharaan Kesehatan Masyarakat Surakarta) Di Rsud Kota Surakarta. (2012).
9. Widayat, R. Being a great and sustainable hospital: beberapa pitfall manajemen yang harus dihadapi. *Gramedia Pustaka Utama: Jakarta* (2009).
10. Indonesia, S. K. D. Peraturan KKI No. 11/2012. *KKI. Jakarta* (2012).
11. Ratnamiasih, I., Govindaraju, R., Prihartono, B. & Sudirman, I. Kompetensi SDM dan Kualitas Pelayanan Rumah Sakit. *Budhi* **11**, (2012).
12. Fatmawati, T. Pengaruh Mutu Pelayanan Dokter Terhadap Loyalitas Pasien di RS PKU Muhammadiyah Bantul. *J. Medicoeticolegal dan Manaj. Rumah Sakit* **5**, 150–156 (2016).
13. Naya, A. The Relationship between Paramedic Competency, Teamwork and Career Development with Quality of Service at Mengwi I Community Health Centre. *Public Heal. Prev. Med. Arch.* **2**, (2014).

Self-Help Group Therapy: The Enhancement of Self-Care Ability and Quality of Life Among the Elderly in Bali, Indonesia

I Wayan Suardana¹, Ah Yusuf², Windhu Purnomo³

¹Doctoral Program of Public Health, Faculty of Public Health, ²Faculty of Nursing, ³Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

Worldwide, the number of people aged 60 years and over has rapidly increased along with the increase in life expectancy. An aging population faces challenges in relation to improving self-care ability and quality of life. This study has aimed to identify the influence of self-help group therapy on the self-care ability and quality of life of elderly people in Bali, Indonesia. We employed a quasi experimental analysis using a pre-test and post-test. A total of 25 retired military officers participated in the study. Two questionnaires (WHO-BREF and WHOQOL-OLD) were adopted to compare the self-care ability and the quality of life results before and after the self-help group therapy was implemented. The data was analysed using an independent t-test. The results showed that the self-help group therapy had a significant effect on the improved self-care ability among the elderly with a mean difference of 0.2, $t = 2.449$ and p-value of 0.02. The self-help group therapy also significantly improved quality of life with a mean difference of 11.7, $t = -8.476$, and p-value of 0.00. Empowering the elderly and their families as well as the community is strongly recommended in order to establish effective self-help group therapy for the elderly.

Keywords: *Self-help group therapy, elderly, self-care, quality of life*

INTRODUCTION

After six decades, the number of people aged 60 years or older has increased fourfold from 205 million in 1950 to 810 million in 2012.¹ Almost two in every three elderly people in the world live in developing countries.¹ Based on the 2010 national census, approximately 18 million or 7.6% of the Indonesian population is aged 60 years old or over. This was projected to reach 12.7% by 2050.² The increased elderly population is related to the increased life expectancy.² However, longer life expectancy has been challenged by health problems, primarily chronic non-communicable diseases.³ Various sociodemographic factors and shifts in disease burden from communicable to non-communicable disease has influenced strategies to improve the health of older adults.

According to the World Health Organization (WHO), improving the health status of the elderly is aimed to promote quality of life, which can be measured through physical health, psychological health and social and environmental relations.³ Promoting the quality of life among the elderly is conducted by empowering older adults with the capability to execute self-care and to maintain healthy daily life activities. A self-help group is a strategy that can be used to empower the elderly, to optimise the role of the elderly in providing mutual support and to share overcoming life problems.⁴ Empowering through creating activities in a group can boost self-confidence and self-esteem, as well as increasing the self-abilities of the elderly.⁵ By joining a self-help group, elderly women can learn skills to carry on their daily activities independently and adopt a healthy lifestyle which lead to an improved quality of life (QOL).⁶

In Indonesia, self-help groups for the elderly are established through a community-based activity for sharing problems and encouragement among members of the group. The integrated coaching post, or *Posbindu*, as one of the community health-based activities for

Corresponding Author:

I Wayan Suardana
Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Mulyorejo, Surabaya, Indonesia
Email: suardanawayan@yahoo.com

monitoring non-communicable disease has been utilised to support the elderly in maintaining their health status and performing self-care.⁷ However, only the elderly who are physically active can attend the integrated coaching post. For the adults who stay alone at home and are unable to perform activities of daily living (ADL) independently, they cannot attend without support from other people. Therefore, this study aims to assess the effect of the self-help group on enhancing self-capability and quality of life among the elderly.

METHOD

To support the study aim, we conducted a quantitative study using a quasi-experimental research design with a pre-test and post-test. The sample of population studied was retired military officers aged 60 years or older who lived in Kuta Utara sub-district in Badung district, Bali, Indonesia. Selecting the retired military officers was based on the assumption that the elderly people would have a better physical condition than another group of people. A simple random sampling method was applied in selecting the study sample, resulting in 25 people recruited to participate in the study.

The data was collected for the pre-test and the post-test using two questionnaires, including the independence scale of Activity Daily Living (ADL) as measured by the Katz index, and quality of life as measured by a combination of the World Health Organisation Quality of Life Assessment (WHOQOL-BREF)⁸ and the WHOQOL older adults module (WHOQOL-OLD).⁹ The data analysis was performed using an independent t-test.

RESULTS

The majority of the study subjects were female (60%), with the mean of the respondent’s age being 73.6 years old. This finding confirmed the results of many reports that females have a longer life expectancy than males. The average age among the study respondents was higher than the current Bali life expectancy at birth which is 72.1 years old.¹⁰ Most of the respondents in our study were widows or widowers (62%). As our respondents were retirees, all of them were no longer engaged in active employment. Most of them lived with their extended families (72%). Most of the respondents had a secondary educational level (76%), while the remaining respondents had a higher education level (24%).

Based on the respondent’s answers to the WHOQOL-BREF and WHOQOL-OLD questionnaires during the pre-test and post-test, the scores of self-care skills and quality of life were analysed using the independent t-test and displayed in Table 1 and 2. A higher self-care score indicated that more self-care skills were unable to be conducted. Before the self-help group therapy, the mean of the self-care scores was 2.52, as shown in Table 1. After the therapy, the mean of the self-care scores was 2.32.

Table 1: The self-skill scores before and after the self-help group therapy

Self-care score	Before		After	
	f	fx score	f	fx score
2.00	17	34	18	36
3.00	3	9	6	18
4.00	5	20	1	4
Total	25	63	25	58
Mean score		2.52		2.32

From Table 2, the mean score of the quality of life increased from 73.2 before to 84.9 after the respondents joined the self-help group therapy. On average, the QOL scores increased by 1.7 points after the self-help group therapy was implemented.

Table 2: The scores for quality of life before and after the self-help group therapy

Quality of life score	Before	After
Minimum score	62	75
Maximum score	90	97
Average score	73.2	84.9

Table 3 shows that the mean change in self-care skills before and after the self-help group therapy was 0.2 with a standard deviation of 0.4 and a standard error of 0.8. The t value was 2.449 on the degree of freedom of 24. The significance level showed a p-value of 0.02, smaller than 0.05. This result explained that Ho was rejected and suggested the significant effect of the self-help group therapy on the ability of the respondents in performing self-care. The significant reduction of self-care therapy after the implementation of the self-help group therapy suggested the effectiveness of the therapy in promoting the respondents’ self-care skills.

Table 3: The results of the t-test analysis on the effect of self-help group therapy on self-care skills

X	SD	SE	t	df	Sig 2 tailed 95 %
0.2	0.40	0.8	2.449	24	0.02

Self-reliance and self-care capability reflects someone’s ability to meet the needs of self-care as shown by their ability to perform daily activities. Activity of Daily Living (ADL) is a routine activity performed by humans. However, due to the aging process, the elderly often experience a decrease in their ADL ability.¹¹ ADL includes self-care such as bathing, dressing, toileting, transferring, continence and feeding.

Table 4 shows that the QOL mean score results had changed by -11.7 after the self-help group therapy, with a standard deviation of 6.91 and standard error of 1.38. The t value was -8.476 on the degree of freedom of 24. Further analysis yielded a p-value of 0.00 ($\alpha < 0.05$). This result concluded that H_a was accepted and H_o was rejected. There was a significant influence from the self-help group therapy on improving the respondent’s QOL. A higher QOL score indicates an improved QOL. The mean change of the ADL score after the self-help group therapy was 0.2, reflecting the awareness among the members of the elderly group to share motivation and to educate one another in order to promote abilities related to self-care and quality of life. The self-help group therapy was effective in improving the respondent’s QOL. Therefore, the activities of the self-help group among the elderly with impaired self-care compliance was very helpful in improving their ADL abilities.

Table 4: The results of the t-test analysis on the effect of the self-help group therapy on quality of life

X	SD	SE	t	df	Sig 2 tail 95 %
-11.7	6.91	1.38	-8,476	24	0.00

DISCUSSION

Most of our study participants were women and widows who lived with their extended families. According to Miller, losing a partner increases the risk of an elderly person experiencing more physical and psychological problems than those who still have a partner.¹² As a result, having no partner increases the

risk of illness and impaired self-care ability, which leads to a low quality of life.¹² Living in an extended family also increases the risk of stress, which also leads to a lower quality of life.¹³ On the other hand, ageing often brings in the consequence of declined anatomy and body functions, which affects self-care ability.¹² Improving the self-care ability would be beneficial for the elderly which also reduces the risk of having further chronic diseases.

Our results showed that the self-care score indicated an improvement of the elderly individual’s ability to do self-care after the self-help group therapy. This result confirmed the results of some of the previous studies on the effectiveness of self-help group therapy on improve the elderly participant’s ability to perform self-care.^{14,15} Caregivers have a potential role in improving the ability of the elderly to perform self-care through various interventions, such as family counselling, emotional support, education, skills training, communication, and self-reliance.¹⁶ A self-care intervention by caregivers who are non-nursing or medical professionals is sufficient to improve the elderly ability to perform self-care.¹⁶

The results of our study also showed that the respondent’s quality of life status had significantly increased after the self-help group therapy, from an average score of 73.2 up to 84.9. A previous study among breast cancer survivors in Iran also reported the significant effect of peer support on improving quality of life.¹⁷ Optimum quality of life among the elderly can be interpreted as having an optimum functional condition which enables them to enjoy a meaningful, valuable, useful and happy life.¹⁸ Having an optimum quality of life can be achieved by providing the elderly with the ability to adjust and accept changes, adapt to functional declines due to ageing, to build a respectful environment, to ensure the rights of the elderly for a fair treatment, and to understand the physiological and psychological needs of the elderly by providing the opportunity and facilities for them to actualise their potential and abilities.¹⁸ Support from their family and close friends can help an elderly person to better adjust and accept their successes or failures in life.

Some suggested development tasks which support the improvement of the elderly’s quality of life includes 1) adjusting to physical decline, 2) adjusting to retirement, 3) adjusting to the death of their spouse, 4) self-acceptance as an elderly individual, 5) maintaining life-satisfaction, 6) redefining the relationship between children and

family, and 7) finding ways to maintain their quality of life.¹⁹ Although this developmental task is common for the elderly, the capability of the elderly in adjusting to changes in their life differs from individual to individual. Self-help group therapy can facilitate the elderly in bettering adjusting to and accepting their condition.¹⁴

The aging process may cause some vulnerable elderly people to experience various physical complaints.¹² Their perception toward the pain feeling also affects their decrease in activity participation and their sleep quality. Sleep disorders were among the conditions complained about by the elderly in this study. A reduction in the number of neurons in the nervous system due to the ageing process causes changes in function, including the sleep cycle regulation. Sleep disorders among the elderly might be exacerbated by the shortening sleep cycle, medication effects, frequent bladder emptying, pain or psychological disorders.¹⁹ Without minimising the importance of medication to help the elderly reduce their physiological and psychological problems, self-help group therapy can be useful in reducing complaints related to the ageing process.¹⁴

CONCLUSION

The declining ADL and quality of life among the elderly with limited mobility affects the ability of the elderly to adjust and accept life changes due to the ageing process. Lack of access to health workers and low caregiver support increases the risk of the elderly having a lower quality of life. Self-help group therapy has been significantly effective in improving the self-care ability and quality of life of the elderly people in our study. Empowering the elderly and their families, as well as the community, is strongly recommended to establish effective self-help group therapy for the elderly of the population. Despite the significant results, it should be noted that our study has some limitations including the small sample size and the limited study setting. Further study is recommended in a more extensive study setting and with a bigger sample size.

Ethical Clearance: Ethical approval was granted by the Faculty of Public Health in Airlangga University, Surabaya.

Source of Funding: Self funding.

Conflict of Interest: The authors have declared that we had/have no conflict of interest.

References

1. United Nations Population Fund. Ageing in the twenty-first century: A celebration and a challenge. New York, NY: UNFPA 2012.
2. MoH. Situasi dan Analisis Lanjut Usia. Jakarta: Kementerian Kesehatan; 2014.
3. World Health Organization. World report on ageing and health: World Health Organization; 2015.
4. Tang Y. Social support of elderly caregivers. *International Journal of Business and Management*. 2009;3(8):81.
5. Pearson C, Thruston M. Understanding the Concept of Family Support Provided by Integrated Multi-Disciplinary Teams. Chester: The University of Chester, Centre for Public Health Research; 2005.
6. Wang HH. A comparison of two models of health-promoting lifestyle in rural elderly Taiwanese women. *Public health nursing*. 2001;18(3):204-11.
7. MoH. Petunjuk Teknis Pelaksanaan Pos Pembinaan Terpadu (POSBINDU) (A technical and operational guideline of the integrated coaching post) 2017 [Available from: <http://www.p2ptm.kemkes.go.id/kegiatan-p2ptm/pusat-/perbedaan-posbindu-dan-posyandu>].
8. World Health Organization. WHOQOL-BREF: introduction, administration, scoring and generic version of the assessment: field trial version, December 1996. Geneva: World Health Organization; 1996.
9. World Health Organization. Whoqol-old Manual. Copenhagen: World Health Organization. 2006.
10. BPS. Hasil Survei Penduduk Antar Sensus 2015 [Result of the 2015 Inter-censal Population Survey]. Jakarta: Badan Pusat Statistik; 2015.
11. Wang J-J, Lin M-F, Tseng H-F, Chang W-Y. Caregiver factors contributing to psychological elder abuse behavior in long-term care facilities: a structural equation model approach. *International psychogeriatrics*. 2009;21(2):314-20.
12. Miller CA. Nursing for wellness in older adults: Theory and practice: Lippincott Williams & Wilkins; 2004.

13. Fuller-Thomson E, Shaked Y. Factors associated with depression and suicidal ideation among individuals with arthritis or rheumatism: findings from a representative community survey. *Arthritis care & research*. 2009;61(7):944-50.
14. Gottlieb BH. Self-help, mutual aid, and support groups among older adults. *Canadian Journal on Aging/La Revue canadienne du vieillissement*. 2000;19(S1):58-74.
15. Benschoff JJ, Harrawood LK, Koch DS. Substance abuse and the elderly: Unique issues and concerns. *Journal of rehabilitation*. 2003;69(2):43-8.
16. Schulz R, Martire LM. Family caregiving of persons with dementia: prevalence, health effects, and support strategies. *The American journal of geriatric psychiatry*. 2004;12(3):240-9.
17. Taleghani F, Babazadeh S, Mosavi S, Tavazohi H. The effects of peer support group on promoting quality of life in patients with breast cancer. *Iranian journal of nursing and midwifery research*. 2012;17(2 Suppl1):S125.
18. Nugroho W. *Perawatan lansia*. Jakarta: Penerbit Buku Kedokteran ECG; 1995.
19. Perry AG, Potter PA. *Buku ajar fundamental keperawatan: Konsep, proses dan praktik*. EGC Jakarta. 2005.

Healthy Nurses for a Quality Health Care Service: A Literature Review

Dodi Wijaya¹, Nyoman Anita Damayanti²

¹Doctoral Program of Public Health, Faculty of Public Health, ²Faculty of Public Health,
Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

Healthy nurses are a key component when providing quality health care. This paper aims to review the factors that may relate to the physical and spiritual health status of nurses, and the extent to which health affects the work productivity of nurses which ultimately, has an impact on the quality of health services. We conducted a literature search via an online database and found 92 articles with keywords related to this topic. After the inclusion and exclusion criteria were applied, 15 articles were included in the analysis. Implementing a health promotion model is beneficial to encourage nurses practicing a healthy lifestyle behaviour and improve their health status. This includes creating a healthy work environment, physical activity, having regular meals as part of a balanced nutritional diet, having sufficient rest, and practising stress management.

Keywords: *healthy nurses, quality health services, health promotion*

INTRODUCTION

The nursing workforce contributes the largest portion to health professionals globally. The important role of nursing workforce in improving health outcomes has been widely recognised.¹ According to the International Council of Nurses (ICN), the nursing workforce is an integral part of the health system, therefore maintaining a sufficient number of nurses is a prerequisite for quality of care.² Nurses should actively focus on creating and maintaining a balance of physical, intellectual, emotional and social welfare, as well as professional and personal synergism in order to provide quality nursing care.³ However, the provision of quality nursing care has been challenged by the poor working environment, long working hours, workplace stress and unhealthy life style of nurses.⁴

Nurses have voiced their frustration at the high demand of quality nursing care when there is a staff shortage.⁵ The workforce shortage including nursing is a common problem in Indonesian public health facilities.⁶ According to the Indonesian Ministry of Health (MoH), as of December 2016, approximately 601,228 health workers including physicians, medical specialists, dentists, nurses, midwives, and pharmaceutical workers work in 15,263 health facilities throughout Indonesia.⁷ Although the nursing workforce is the largest proportion out of the health professionals (49%), the current nursing ratio is 113.4 nurses per 100,000 population.⁷ The nursing workforce density is still far below the national target of 180 nurses per 100,000 population, set for 2019.⁸ Working in a facility with poor staffing could leave the nurses exhausted, which impacts on nursing quality.⁵

The quality of the nurse is determined by the nurse's health status as has an impact on the nurse's productivity when providing health services. Several factors influence the reduction of employee productivity, including education level, physical and spiritual health status, the work environment, leadership, motivation and the equipment utilised.⁹ Poor physical and mental health status, as well as poor working conditions, have been shown to reduce nursing productivity in previous

Corresponding Author:

Dodi Wijaya
Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Mulyorejo, Surabaya, Indonesia
Faculty of Nursing, University of Jember,
Jember, East Java, Indonesia
Email: dodi.wijaya-2017@fkm.unair.ac.id

studies.^{10,11} This study aims to review the factors that may relate to the physical and spiritual health status of nurses, that in turn affect their work and productivity which ultimately has an impact on the quality of the health services that they provide.

METHOD

We searched for articles on online databases including Science Direct, Google Scholar, Proquest Health and Medical Complete, Proquest Nursing and Allied Health Source, Proquest Psychology Journals and Proquest Science Journals. We used keywords such as healthy nurse, quality of nursing care, and nursing productivity. The search engines generated a total of 92 articles. The following inclusion criteria were used to select the articles:

- Articles published in the last 10 years
- The topics relevant to the health of nurses as a support system in the quality of health services.
- Articles published in English or Bahasa Indonesian

After applying the inclusion criteria, 45 articles were selected. However, after studying the content, only 15 articles with a more detail discussion about the healthy behaviour of nurses related to supporting the quality of the provided health services were included in this literature review.

RESULTS

Four studies focused on the health status of nurses in relation to their behaviour in the work place. Eleven studies were concerned with the demographic characteristics and self-perception that influence lifestyle behaviour.

Health Status: Henwood, Tuckett & Turner (2012) conducted a cohort study involving 2,264 nurses in Australia and New Zealand in order to investigate the different effects from the physical activity of nurses in the workplace and their leisure time on their health status. Their study found that compared to nurses with normal working hours and leisure time, the nurses who worked longer with less leisure time were more likely to have a higher body mass index and took more days off due to sickness. They were also more likely to experience sleep problems, depression and anxiety.¹²

Schluter et al. (2011) described the demographics and health condition of 6,308 nurses and midwives in Australia and New Zealand. Their study revealed that approximately 30% of nurses and midwives had never had a health check-up within the last two years. The nurses and midwives also experienced sleep disorder (35.2%), severe depression (22%) and had upper back, neck and lower back pain (26.3%).¹³

Similarly, a study among hospital staff in South Africa reported that about 73% of health workers were obese and half of them had never made effort to reduce their weight. No significant difference of body mass index was found between the medical and non-medical staff members. About one third of the participating health workers had obesity-related non-communicable diseases and stress.¹⁴

A qualitative study of hospital nurses in South Africa reported that night shift nurses complained about being overweight and contracting non-communicable diseases as their main health problems. The nurses also complained about work-related problems such as back pain, exposure to tuberculosis and a stressful work environment. Being too exhausted was the main reason of the nurses for being unable to prepare healthy food and do physical activity.¹⁵

Lifestyle behaviour: Three studies have explored the lifestyle behaviour of nurses using the Pender health promotion model.¹⁶⁻¹⁸ McElligott et al (2009) observed certain weaknesses in relation to managing stress and physical activity among nurses. They found no significant difference between units of care, and demographic characteristics in the nurse's lifestyle and behaviour. The health promotion scores were significantly higher among the critical-care nurses than the medical-surgical nurses.¹⁶ Al-Qahtani (2014) conducted a study in Saudi Arabia which found that the majority of nurses were non-Saudis (98%) with approximately 5 to 10 years of working experience (38%). In assessing the nurse's lifestyle, they found that spiritual needs had the highest average score, while physical activity had the lowest average score.¹⁷ Another study by Nahm et al (2012) found that despite being at a higher risk of health problems such as being overweight/obesity due to the working environment, this issue was rarely addressed by the nurses.¹⁸

A study by Zapka et al (2009) examined the lifestyle of hospital nurses and their bodyweight. They found that

most of the nurses in their study were either overweight or obese, and did not apply weight management behavior. There was a significant relationship between demographic characteristics (age, gender, marital status, education, and history of hypertension), the self-perception of body weight and diet and physical activity behaviours.¹⁹

Two studies examined the relationship between the nurses' personal health practices and the perception of the self as a role model in health promotion. Hurley et al (2017), adopting the Miller and Dollard Social Cognitive theory, used the Self as a Role Model of Health Promotion (SARMHEP) questionnaire. Their study found a significant correlation between practicing a healthy lifestyle and the nurses' perception of self as the role model for health promotion.²⁰ Another study by Bakhshi et al (2015) reported that almost half of the study subjects promoted physical activity in their clinical practice. Perceived health status, the length of their clinical practice experience, clinical specialisation, and actual body weight were significantly associated with physical activity practices. On the other hand, in another study, the nurses described the obstacles preventing them from doing physical activity such as time, cost, exhaustion, low self-efficacy, and a lack of social support. However, the performance level and absenteeism showed no significant difference between nurses who actively did sports and those who did not.²¹

A study by Blake & Harrison (2013) explored the health behaviour of nurses and their attitude related to promoting health. Their study found that nurses with a normal body weight were more likely to achieve the recommended level of physical activity than the underweight or overweight nurses. Most of the respondents (79.1%) confirmed that nurses should be a role model in relation to health behaviour.²² Similarly, another study also found a significant high score in the general perception of health among healthy nurses rather than unhealthy nurses.²³

Malik, Blake, & Batt (2015) conducted a study to compare between registered nurses (RN) and pre-registered nurses (PRN) as health promoters in transforming their knowledge of healthy lifestyle into their attitude, in order to develop interventions for their patients. The RN group significantly had a healthier lifestyle than the PRN group. However, almost half of nurses in the both groups did not meet the recommended

level of physical activity, while about two thirds did not meet the recommended daily consumption of fruit and vegetables.²⁴

Hensel (2011) investigated the relationship between having a healthy lifestyle and self-concept among hospital nurses using the Nurse Self-Concept Questionnaire (NSCQ) and the Health Promoting Lifestyle Profile (HPLP II). The study found that each aspect of the nurse's self-concept was significantly related to the nurse's lifestyle. Communication and leadership were significantly associated with the nurses' health status.²⁵

DISCUSSION

Provision of health care service has the ultimate goal of improving the health status of the population. Satisfactory health care is achieved by the interrelatedness of the fulfilment of community needs and expectations (consumer satisfaction), what should be effectively delivered by the service providers (provider satisfaction) and efficiently organised by the service institution (institutional satisfaction).²⁶ A robust health care system require support from quality nursing care, which can only be delivered by healthy nurses. Healthy nurses represent a level of quality of nursing staff that can be measured in their physical, mental, social and spiritual abilities when providing quality health services.

From the studies reviewed, healthy nurses can be achieved by applying a holistic approach to health and organisational management. A holistic approach of the health promotion model for nurses can be used improve the healthy lifestyle behaviours. It also includes the establishment of a healthy work environment, opportunities to do sufficient physical activity, a regular and balanced diet, sufficient resting time, and stress management. A healthy work environment has a positive impacts on nurses such as increased work productivity, a lower rate of absenteeism, and improved organisational outcomes.^{10,12}

During working hours, nurses carry out physical activities including visiting patients, lifting patients and performing general nursing care which is assumed to be equal to moderate physical activity for 30 minutes.¹² However, the study results showed that the health outcome of nurses doing physical activity only during their working hours was worse compared to nurses who

did physical activity during their leisure time.¹² Some barriers for nurses to doing physical activity during their leisure time included a lack of time due to long working hours, and changes in their shifts.^{12,18} Nurses may also put in less effort to have or maintain the exercise habit.¹⁸ Poor eating habits among nurses in Saudi Arabia was related to being on the night shift rotation and facing high stress due to the high workload.²⁷

Having a sleep disorder may affect the health of the nurses which results in increased medical errors during their working hours at the cost of the patient's safety as well as burnout.²⁸ Nursing care requires a high quality of performance regardless of the long and irregular working hours involved, which causes an increased level of stress.¹³ High psychological demands, low decision authority, and low social support are the predictors of poor health among nurses working in hospitals.²⁹ High workload and staff shortages were the factors related to psychological disorders which were represented by a high rate of absenteeism among nurses.³⁰

CONCLUSIONS

Healthy nurses are crucial in increasing nursing care productivity in order to support a strong health care system. Promoting the health of nurses can be done by implementing a holistic approach to health and organizational management, including providing healthy work environment which enable nurses to adopt healthy lifestyle behavior. Nursing managers play a pivotal role to address these issues in the workplace.

In Indonesia, despite the long standing issue of staff shortage, adopting strategies related to a healthy work environment should be conducted by policy makers, hospital managers and nurse managers. A health promotion strategy should also be conducted in order to encourage the health behaviour of nurses, including doing physical activity, having regular meals with a balanced diet, having sufficient rest and practising stress management.

Ethical Clearance: Ethical approval was granted by the School of Public Health in Airlangga University, Surabaya.

Source of Funding: Self funding.

Conflict of Interest: Nil.

REFERENCES

1. World Health Organization. *The world health report 2006: working together for health: World Health Organization*. 2006.
2. ICN. *Safe staffing key to quality health care Geneva: International Council of Nursing; 2013* [Available from: http://www.icn.ch/images/stories/documents/news/press_releases/2013_PR_13_Safe%20staffing.pdf].
3. American Nurses Association. *Healthy nurse, healthy nation*. 2016.
4. Baer HJ, Glynn RJ, Hu FB, Hankinson SE, Willett WC, Colditz GA, et al. Risk factors for mortality in the nurses' health study: a competing risks analysis. *American journal of epidemiology*. 2010; 173(3):319-29.
5. Forster DA, McLachlan HL, Yelland J, Rayner J, Lumley J, Davey M-A. Staffing in postnatal units: is it adequate for the provision of quality care? Staff perspectives from a state-wide review of postnatal care in Victoria, Australia. *BMC health services research*. 2006; 6(1):83.
6. Kurniati A, Roskam E, Afzal M, Suryowinoto T, Mukti A. Strengthening Indonesia's health workforce through partnerships. *Public health*. 2015; 129(9):1138-49.
7. MoH. *Situasi Tenaga Keperawatan di Indonesia (Nursing workforce in Indonesia)*. In: *Informasi PDD, editor*. Jakarta: Kementerian Kesehatan RI; 2017.
8. Kemenkokesra. *Keputusan Menteri Koordinator Bidang Kesejahteraan Rakyat Republik Indonesia Nomor 54 Tahun 2013 Tentang Rencana Pengembangan Tenaga Kesehatan Tahun 2011-2025 [Decree of the Coordinating Minister for People's Welfare of the Republic of Indonesia Number 54 Year 2013 About the Health Manpower Development Plan 2011-2025]*. Jakarta: Kemenkokesra; 2013.
9. Hasibuan M. *Organisasi dan Motivasi Dasar Peningkatan Produktifitas (Organization and the Basic Motivation to Increase Productivity)*. 6 ed. Jakarta: PT. Bumi Aksara; 2007.
10. Berger AM, Hobbs BB. Impact of shift work on the health and safety of nurses and patients. *Clinical journal of oncology nursing*. 2006; 10(4).

11. Letvak S, Ruhm C, Lane S. The impact of nurses' health on productivity and quality of care. *Journal of Nursing Administration*. 2011; 41(4):162-7.
12. Henwood T, Tuckett A, Turner C. What makes a healthier nurse, workplace or leisure physical activity? Informed by the Australian and New Zealand e-Cohort Study. *Journal of clinical nursing*. 2012; 21(11-12):1746-54.
13. Schluter P, Turner C, Huntington A, Bain C, McClure R. Work/life balance and health: the Nurses and Midwives e-cohort study. *International Nursing Review*. 2011; 58(1):28-36.
14. Skaal L, Pengpid S. Obesity and health problems among South African healthcare workers: do healthcare workers take care of themselves? *South African Family Practice*. 2011; 53(6):563-7.
15. Phiri LP, Draper CE, Lambert EV, Kolbe-Alexander TL. Nurses' lifestyle behaviours, health priorities and barriers to living a healthy lifestyle: a qualitative descriptive study. *BMC nursing*. 2014; 13(1):38.
16. McElligott D, Siemers S, Thomas L, Kohn N. Health promotion in nurses: is there a healthy nurse in the house? *Appl Nurs Res*. 2009; 22(3):211-5.
17. Al-Qahtani MF. Health-promoting lifestyle behaviours among nurses in private hospitals in Al-Khobar, Saudi Arabia. *Journal of the Egyptian Public Health Association*. 2015; 90(1):29-34.
18. Nahm E-S, Warren J, Zhu S, An M, Brown J. Nurses' self-care behaviours related to weight and stress. *Nursing outlook*. 2012; 60(5):e23-e31.
19. Zapka JM, Lemon SC, Magner RP, Hale J. Lifestyle behaviours and weight among hospital-based nurses. *J Nurs Manage*. 2009; 17(7):853-60.
20. Hurley S, Edwards J, Cupp J, Phillips M. Nurses' perceptions of self as role models of health. *Western J Nurs Res*. 2017:0193945917701396.
21. Blake H, Malik S, Mo PK, Pisano C. 'Do as I say, but not as I do': Are next generation nurses role models for health? *Perspectives in public health*. 2011; 131(5):231-9.
22. Blake H, Harrison C. Health behaviours and attitudes towards being role models. *British Journal of Nursing*. 2013; 22(2):86-94.
23. Blake H, Mo PK, Lee S, Batt ME. Health in the NHS: lifestyle behaviours of hospital employees. *Perspectives in Public Health*. 2012; 132(5):213.
24. Malik S, Blake H, Batt M. How healthy are our nurses? New and registered nurses compared. *British Journal of Nursing*. 2011; 20(8):489-96.
25. Hensel D. Relationships among nurses' professional self-concept, health, and lifestyles. *Western J Nurs Res*. 2011; 33(1):45-62.
26. Djojosingito A. Kebijakan Pemerintah Dalam Pelayanan Kesehatan Menyongsong ASEAN Free Trade Area (AFTA) 2003. (*The Indonesia Government policy in health care service to welcome AFTA 2003*). 2001.
27. Almajwal AM. Stress, shift duty, and eating behavior among nurses in Central Saudi Arabia. *Saudi medical journal*. 2016; 37(2):191.
28. Dorrian J, Grant C, Banks S. An industry case study of 'stand-up' and 'sleepover' night shifts in disability support: Residential support worker perspectives. *Applied ergonomics*. 2017; 58:110-8.
29. Pappas NA, Alamanos Y, Dimoliatis ID. Self-rated health, work characteristics and health related behaviours among nurses in Greece: a cross-sectional study. *BMC nursing*. 2005; 4(1):8.
30. Jinks AM, Lawson V, Daniels R. A survey of the health needs of hospital staff: implications for health care managers. *J Nurs Manage*. 2003; 11(5):343-50.

The Support of the Family toward Children with Autism Spectrum Disorder

Siti Maemonah¹, Hamidah², Nyoman Anita Damayanti³, Enung Mardiyana Hidayat⁴, Aida Novitasari⁴,
Qorry Aina⁵, Wina Tryas Fatima⁵

¹Doctoral Program of Public Health, Faculty of Public Health, ²Faculty of Psychology, ³Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia; ⁴Lecturer, ⁵Student, Politeknik Kesehatan Kementerian Kesehatan, Surabaya

ABSTRACT

Autism Spectrum Disorder (ASD) cases have increased worldwide. The family supports are crucial for the development of children with ASD. This study aimed to identify the support from the family toward children with ASD. A descriptive study was conducted involving 14 family members who had children with ASD. The variables of this research included informational, judgmental, instrumental and emotional support. The informational (92.8%), emotional (85.7%), judgmental (57.1%) and instrumental (85.7%) supports from families to children with ASD were good. Future research should undertake the study with a larger sample and examine them using different variables.

Keywords: *autism spectrum disorder; family support*

INTRODUCTION

It is predicted worldwide that 1 out of 160 children suffers from Autism Spectrum Disorder (ASD)¹. This prediction represents the average number and prevalence reported, as it has varied substantially across the total relevant research. A number of corresponding research studies have reported an ultimately higher number². Based on the studies of epidemiology conducted in the last 50 years, the prevalence of ASD appears to have soared globally. Over 1.5% of children were identified with ASD based on an extensive search in 11 different communities across the United States (Arizona, Arkansas, Colorado, Georgia, Maryland, Missouri, New Jersey, North Carolina, South Carolina, Utah, and Wisconsin) in 2012³.

There is no official survey on the number of children with ASD in Indonesia. However, in 2013, the

Indonesian Ministry of Health has presumed that the number of children with autism was over 112 thousand, with an age interval of 5 to 19 years old. This number was generated based on the calculation of autism prevalence being over 1.68 per 1,000 children under 15 years of age⁴. With the overall amount of children aged 5-19 years in Indonesia being over 66 million according to Indonesia's Central Bureau of Statistic in 2010, it generated the aforementioned number of 112 thousand. In 2015, it was expected that there were 12,000 children with autism or 134.000 persons on the autism spectrum in Indonesia⁴.

Based on the criteria of the Diagnostic Statistical Manual III-R of the World Health Organisation (DSM III-R WHO) in 2009, there were no less than 4.000 citizens of Surabaya city identified as suffering from autism⁵. In one of the Schools for Exceptional Children in the city of Surabaya, Galuh Handayani Elementary School in the 2016/2017, it was found that there were 27 students who had been considered as having autism.

Children with ASD require normal treatment, guidance, and individual orientation in order to learn how to socialize and play with their friends. This is so then they can adhere to acceptable age-appropriate behavior in order to not block their development. The growth of

Corresponding Author:

Siti Maemonah
Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Mulyorejo, Surabaya, Indonesia
Email: sitimaemonah71@yahoo.com

children is influenced by their surrounding environment, particularly their family, school and the society where they live through socialization⁶. The life of children is significantly determined by the support of their family. If the supports are good, their growth and development will be relatively stable. On the other hand, if the support is non-existent, their children will experience significant retardation which may impair their mental⁷.

The support of the family is an integral part of social support which categorized into four types, including informational, judgemental, instrumental and emotional⁸. Informational support can be instrumented in the form of the family seeking information regarding the child's health and training the child to study in their daily life. Judgmental support can be realized in the form of the family giving the child the opportunity to do the activities that they find joyful. Instrumental support can be delivered in the form of the family to provide transportation and medication fees, with the family preparing for all of their daily needs. Emotional support can be realized through the family motivating the children to communicate with their friends and caring for their child with affections.

Positive support from their family may help to recover the social function of children with autism⁹. On the contrary, negative support from their family will result in unmanageable children who are unable to be properly orientated, educated and empowered which may result in unwanted behaviors. Unsupported children with autism will also experience a major drawback in achieving their tasks.

This study aimed to identify the support from the family toward children with ASD in Galuh Handayani Elementary School, Surabaya.

METHODS

This study was descriptive research, focused on describing the familial support of children with ASD in Galuh Handayani Elementary School, Surabaya. The process of the data collection was through observations of families with children with ASD. The participants in this research were parents whose children had ASD in grades 1-3 in the academic term of 2017/2018. Fourteen parents of 14 children were involved. The variables of this research included informational, judgmental, instrumental and emotional support.

The instrument of the data collection was a questionnaire with 24 different statements consisting of 6 statements for informational support, 7 statements for emotional support, 5 statements for judgmental support and 6 statements for instrumental support. The assessment method used a Likert scale modified through the following categories: "always" scored 3, "often" scored 2, and "sometimes" scored 1 and "never" scored 0. Later on, the accumulative score was converted into a percentage and interpreted as follows: good 76-100%, enough 56-75% and deficient <56%¹⁰.

The data was processed, tabulated, and analyzed in a descriptive manner. The data was served in the form of frequency distribution table and narrative in order to describe the visualization of familial supports to the children with ASD.

RESULTS

Table 1: Demographic data of family of children with ASD

Demographic Data	n	%
Age		
30-39	8	57.1
40-49	4	28.6
50-59	2	14.3
Sex		
Male	6	42.9
Female	8	57.1
Education		
College	12	85.7
Senior high school	2	14.3
Occupation		
Civil servant	4	28.6
Private employee	3	21.4
Entrepreneur	2	14.3
Unemployed	5	35.7
Sex of child		
Male	10	71.4
Female	4	28.6

As described in Table 1, most of the respondents were aged 30-39 years old (57.1%). The respondents' sexes were mostly female but almost equal to the male with 57.1% and 42.9% respectively. Almost all the respondents graduated from college (85.7%). Also,

unemployed become the most occupation with 35.7%. Meanwhile, the sex of the children was mostly male (71.4%).

Table 2: Family support of children with ASD

Family support	n	%
Informational support		
Enough	1	7.2
Good	13	92.8
Emotional support		
Enough	2	14.3
Good	12	85.7
Judgemental support		
Poor	2	14.3
Enough	4	28.6
Good	8	57.1
Instrumental support		
Enough	2	14.3
Good	12	85.7

Based on Table 2, most of the family provided good informational, emotional, and instrumental supports to their children with 92.8%, 85.7%, and 85.7% respectively. However, in the judgemental support, the good support was still dominant (57.1%), but there was 14.3% poor support which absent in the other three kinds of supports.

DISCUSSION

1. Informational Support: Informational support is comprised of advice, orientation, suggestion or judgment over how an individual performs something¹¹. One of the support given by the family for the growth of the child is to deliver guidance in them developing proper behavior¹².

In this research, it was discovered that almost all of the children with ASD (93%) were equipped with the favorable informational support. The support given by their parents towards the growth of the children with ASD has been visualized in the form of proper behavioral guidance through appropriate orientation and the advice given to them. This was realized by the family by seeking information related to the child’s health, educating the child and training them to deal with their daily activities such as learning how to eat and dress

themselves. This result is in line with research which shows that informational support was in the high category (52.1%)¹³. The particular research identified the connection between familial support and the behavior of children with autism. Out of 23 children with autism with low informational support, 60.9% behaved hyperactively¹³.

Social and informational support, which were both provided by the parental support cluster, were the most frequently reported necessities according to the parents of adolescents with growth disorders¹⁴. This informational support includes the search for information regarding the child’s issue by the parents so then it can be delivered to the right person. This also allows them to give advice so then the impact gained by the parents means that they are able to control the negative behavior of their children.

The family has to deliver it by simplifying sentences that are understandable and not confuse them. Because communication disorders are commonly experienced by children with autism¹⁵. The informational support can also be delivered by giving them the right advice on the subject of their language so then the children favorably understand the advice given to them. This particular pattern implies that the support delivered by the parents guides them to the right behavior through orientation and the advice addressed to them¹⁶.

2. Emotional Support: Emotional support consisted of various expressive forms such as attention, empathy and the feeling of concern towards somebody¹¹. The form of emotional support was giving attention to them, such as greeting them, asking them about their condition, approaching and paying them a visit when the person is in need, asking about the condition of someone’s feeling, listening to their grievances and also understanding and accepting the condition of someone as they are.

It was discovered that almost the entire children with ASD (86%) were provided with good emotional support. This result is can be observed from the approval of the family including the parents. The approval can be contextualized in the form of attention given by the parents to their ASD affected children including by prioritizing

the preparation of food for the children with ASD instead of their siblings who are non-sufferer to ASD and motivate the children upon lack of appetite. This result is against research which showed that the majority (56.25%) the emotional support given to the children with autism was situated in the low category¹³.

The emotional support can be identified by how far the attention is given by each parent boosts the confidence of the children, so the children do not feel inferior while performing social interactions and the family accept the children as they are¹⁶. The approval was in the form of more attention and affection toward them in comparison to other children. The emotional support would cause the supported recipient to feel comfortable due to the assistance that is apparent in the form of motivation, personal tenderness, and love¹¹. These emotions are what the parents perform on a daily basis, by assisting their children during home studying and asking them about their feelings.

3. Judgmental Support: Judgmental support influences the receiving individual to develop feelings of self-appreciation, confidence, and worthiness. The distribution of judgmental support from the parents can leverage the confidence within the children so that then children would not feel inferior upon staying outside of their home. It was identified that the majority of children with ASD (57%) in Galuh Handayani Elementary School are provided with good judgmental support. This result is in line with a study which pointed out that the majority (68.75%) of judgmental support from parents to their children with autism was in the high category¹³.

The parents are entitled to taking on full responsibility for the child's social progress¹⁷. The parents should start trusting their children and not limiting them in performing various things such as dining, showering, and dressing. These particular treats are aimed to enhancing their self-confidence so then they are capable of undertaking bigger tasks. Judgmental support can also be performed through attention and motivating judgment, which may support them in their jobs and tasks, achievements and attitude. As an example, the parents would allow them to participate in

activities that the children find joyful, including swimming and horse-riding, and embarking to school by themselves¹⁶. This judgmental support will be essential when the children are stressed, such as when the tasks that they endure are bigger than their natural abilities¹¹.

4. Instrumental Support: Instrumental support is performed by becoming the person whose help is expected when solving the problem that the children are facing steps forward, which is especially related to adapting to life¹². For example, when the parents provide instrumental support in the form of physiological fulfillment, the children will be motivated while studying at school¹⁸. It was discovered that almost the entire sample population of children with ASD (86%) in Galuh Handayani Elementary School were provided with favorable instrumental support. This result goes against a study which showed that the majority (52.1%) of instrumental support from the parents to their autistic children was situated in the low category¹³. The parents have the responsibility to act as an advocate, which means that the parent has the responsibility to support and advocate for their children's best interests unconditionally¹⁷. The variety of support which may be given by the parents including providing various types of treatment, encouraging them to exercise as part of a routine, and introducing as early as possible to transportation access and public spaces¹⁹. Through the aforementioned support, the aim is to assist in lessening the burden of the child by helping them to undertake particular activities such as studying and performing their daily habitual activities¹⁶. This is so then the parents of children with ASD are able to provide proper assistance to their children to help them to develop an adaptive attitude that is acceptable in the wider social sphere. The parents should be trained to use precise coping strategies which gives them the required coping skills to execute this effectively²⁰.

CONCLUSION

The conclusion of this research is that the informational, emotional, judgmental and instrumental supports from families to children with ASD in Galuh Handayani Elementary School were favorable. Future research should undertake the study with a larger sample and examine them using different variables.

Conflict of Interest: None.

Ethical Clearance: The study passed ethical clearance from the Ethical Committee of the Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia.

Source of Funding: Self-funded.

REFERENCES

1. Elsabbagh M, Divan G, Koh Y-J, Kim YS, Kauchali S, Marcín C, et al. Global Prevalence of Autism and Other Pervasive Developmental Disorders. *Autism Res* [Internet]. 2012 Jun [cited 2018 Sep 5];5(3):160–79. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22495912>
2. Hansen SN, Schendel DE, Parner ET. Explaining the Increase in the Prevalence of Autism Spectrum Disorders. *JAMA Pediatr* [Internet]. 2015 Jan 1 [cited 2018 Sep 5];169(1):56. Available from: <http://archpedi.jamanetwork.com/article.aspx?doi=10.1001/jamapediatrics.2014.1893>
3. National Center on Birth Defects, and Developmental Disabilities. Community Report on Autism From the Autism and Developmental Disabilities Monitoring Network [Internet]. Atlanta, GA; 2014 [cited 2018 Sep 3]. Available from: www.cdc.gov/mmwr
4. Budiman E, Santoso E, Afirianto T. Pendeteksi Jenis Autis pada Anak Usia Dini Menggunakan Metode Linear Discriminant Analysis (LDA). *J Pengemb Teknol Inf dan Ilmu Komput* [Internet]. 2017 [cited 2018 Sep 5];1(7):583–92. Available from: <http://j-ptiik.ub.ac.id>
5. Herawati IC. Surabaya Booming Autis. *Harian Surya*. 2008;
6. Hidayati N. Dukungan Sosial bagi Keluarga Anak Berkebutuhan Khusus. *Insan* [Internet]. 2011 [cited 2018 Sep 3];13(01):12–20. Available from: <http://journal.unair.ac.id/download-fullpapers-artikel-2-13-1.pdf>
7. Hidayat AAA. Pengantar Ilmu Keperawatan Anak. Edisi 2. Jakarta: Salemba Medika; 2005.
8. Malecki CK, Demaray MK. What Type of Support Do They Need? Investigating Student Adjustment as Related to Emotional, Informational, Appraisal, and Instrumental Support. *Sch Psychol Q*. 2003;18(3):231–52.
9. Pancawati R. Penerimaan diri dan dukungan orang tua terhadap anak autis. 2013;53(9):1689–99.
10. Arikunto S. *Prosedur Penelitian Suatu Pendekatan Praktik*. Jakarta: Rineka Cipta; 2006.
11. Sarafino EP, Smith TW. Health psychology : biopsychosocial interactions [Internet]. [cited 2018 Sep 5]. 542 p. Available from: [https://www.wiley.com/en-id/Health + Psychology: + Biopsychosocial + Interactions, + 8th + Edition-p-9781118425206](https://www.wiley.com/en-id/Health+Psychology:+Biopsychosocial+Interactions,+8th+Edition-p-9781118425206)
12. Hurlock EB. *Child Growth and Development*. United States: Kessinger Publishing, LLC; 2010.
13. Fitri A, Saam Z, Hamidy Y. Pengaruh dukungan sosial keluarga terhadap perilaku anak autis di Kota Pekanbaru. *J Ilmu Lingkung* [Internet]. 2016 Nov 15 [cited 2018 Sep 3];10(1):47–57. Available from: <https://ejournal.unri.ac.id/index.php/JIL/article/view/3576>
14. Douma JCH, Dekker MC, Koot HM. Supporting parents of youths with intellectual disabilities and psychopathology. *J Intellect Disabil Res* [Internet]. 2006 Aug 1 [cited 2018 Sep 3];50(8):570–81. Available from: <http://doi.wiley.com/10.1111/j.1365-2788.2006.00825.x>
15. Wall K. *Autism and Early Years Practice* [Internet]. 1 Oliver’s Yard, 55 City Road, London EC1Y 1SP United Kingdom : SAGE Publications Ltd; 2010 [cited 2018 Sep 5]. Available from: <http://sk.sagepub.com/books/autism-and-early-years-practice>
16. Inayah F, Sekar DA. *Bentuk Dukungan Sosial terhadap Anak Autis (Studi Kasus pada Tiga Siswa Autis Di SD Khusus Talenta)*. Universitas Indonesia; 2014.
17. Mangunsong F. *Psikologi dan Pendidikan Anak Berkebutuhan Khusus*. Jakarta: LPSP3 UI; 2011.
18. Riany YE, Cuskelly M, Meredith P. Parenting Style and Parent–Child Relationship: A Comparative Study of Indonesian Parents of Children with and without Autism Spectrum Disorder (ASD). *J Child Fam Stud* [Internet]. 2017 Dec 20 [cited 2018 Sep 5];26(12):3559–71. Available from: <http://link.springer.com/10.1007/s10826-017-0840-3>
19. Wilson M, Hamilton D, Whelan T, Pilkington P. A systematic review of factors related to parents’ treatment decisions for their children with autism spectrum disorders. *Res Autism Spectr Disord* [Internet]. 2018;48(July 2017):17–35. Available from: <https://doi.org/10.1016/j.rasd.2018.01.004>
20. Hall HR, Graff JC. The Relationships Among Adaptive Behaviors of Children with Autism, Family Support, Parenting Stress, and Coping. *Issues Compr Pediatr Nurs* [Internet]. 2011 Mar 22 [cited 2018 Sep 3];34(1):4–25. Available from: <http://www.tandfonline.com/doi/full/10.3109/01460862.2011.555270>

Family Factors Associated with Quality of Life in Pulmonary Tuberculosis Patients in Surabaya, Indonesia

Dhian Satya Rachmawati¹, Nursalam², Arief Wibowo³, Astrida Budiarti⁴, Riza Agustin⁴

¹Doctoral Program of Public Health, Faculty of Public Health, ²Faculty of Nursing, ³Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia; ⁴STIKes Hang Tuah Surabaya, Indonesia

Abstract

Introduction: Pulmonary TB is an infectious disease caused by *Mycobacterium Tuberculosis*. The physical and psychological changes in patients with pulmonary TB can affect the patients's quality of life. The family is a key factor in relation to supporting successful treatment and recovery. This study aims to analyse the factors related to pulmonary TB patients quality of life.

Method: This research used an analytic observational design with a cross-sectional approach. A total of 73 respondents were recruited via the family members of patients with pulmonary TB using a simple random sampling technique. The data was collected using several questionnaires on the sociodemographic characteristics, family development stage, family stress & coping, environmental data and WHOQOL-BREF. The data analysis was performed using a Chi Square test.

Result: The results of this study showed that family factors significantly influence the quality of life of patients with Pulmonary TB, including the type of family ($p=0.000$), their level of education ($p=0.000$), employment ($p=0.001$) and monthly income ($p=0.002$). Other factors including the level of stress and coping and environmental health (healthy housing) were also significantly associated with quality of life ($p < 0.01$). Only the family development stage had no significant relationship with quality of life.

Conclusion: The significant family factors influence the quality of life among pulmonary TB patients, which reflects the need to strengthen the role of the family in promoting successful treatment. A family with social support from the community would help to improve the quality of life of pulmonary TB patients.

Keywords: family, pulmonary TB patients, quality of life, Indonesia

INTRODUCTION

Tuberculosis (TB) is a major communicable disease that claims 100,000 lives worldwide annually.¹ In 2017, Indonesia was ranked the third among listed countries with the highest TB burden.¹ The TB prevalence in Indonesia was estimated to be 600,000 cases with approximately 430,000 new cases per year.² The East Java Province was the top second highest district regarding the number of TB cases with a total number

of 21,606 cases in 2016.² Pulmonary TB is an infectious disease caused by rod-shaped bacteria (basil) known as *Mycobacterium Tuberculosis*.¹ Poor immune system, malnutrition, and HIV positive are among the risk factors of pulmonary TB.² According to the Indonesia Ministry of Health (MoH), the highest prevalence of pulmonary TB is among people older than 45 years old, who have a low level of education, and who are unemployed.³

TB easily infects other individuals through direct contact, coughing, sneezing, and sputum (droplet nuclei) from TB patients. As a result of living closely to TB patients, their families run the risk of TB infection. Because of worries from getting infected, the other family members may limit their contact with the TB patient which results in the individual feeling isolated, depressed and neglected.⁴ TB patients are often socially stigmatised which may affect their adherence to

Corresponding Author:

Dhian Satya Rachmawati
Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Surabaya, Indonesia
Email: dhian.satya.rachmawati-2017@fkm.unair.ac.id

effective treatment.⁴ This psychological problem would increase the patient’s stress, which affect their quality of life. The physiological changes experienced by TB patients affects their physical abilities and deteriorates their quality of life.¹ The World Health Organisation Quality of Life (WHOQOL) defines quality of life as an individual’s perception of life in society in the context of the existing culture and value system, related to their goals, expectations, standards, and concerns.⁵ Quality of life is a very broad concept that is influenced by the physical condition of the individual, their psychological state, level of independence, social relations and environmental condition.⁵

Family factors are significant in relation to the TB cases. A previous study reported the significant association between TB and family-related factors, such as the number of adults in the household, having a single marital status, having a family history of TB, and living in a rented house.⁶ Understanding the family factors affecting the TB cases would improve the support and interventions required in order to promote the successful treatment of pulmonary TB. Therefore, this study aimed to investigate the relationship between family-related factors and quality of life among pulmonary TB patients.

MATERIAL AND METHOD

We employed an analytical observational design with a cross-sectional approach to investigate the relationship between family factors and the quality of life of patients with pulmonary tuberculosis in Surabaya city. This was a preliminary study carried out from March to July 2017. The study population was made up of the families of TB patients who accompanied the patient to the Perak Timur community health centre, Surabaya city, during the study period. The sampling technique used in this research was non-probability sampling using a simple random sampling technique. A total of 89 people attending the community health centre had a TB positive test. 73 people who had a family member with pulmonary TB were selected and agreed to participate in the study.

The questionnaire regarding sociodemographics, family development stage, family stress and coping, environmental data, and the WHOQOL-BREF instrument was used for the data collection. A bivariate analysis using a chi-square test was applied to test the relationship between the independent variables and quality of life.

RESULTS

The sociodemographic characteristics of the respondents have been presented in Table 1. The majority of the respondents were from a traditional family (86.3%). A traditional family, in this study, represents a nuclear family consisting of two parents and their children, while a non-traditional family reflects a single parent family or extended family.⁷ High school was the highest level of education attained by most of the respondents (39.7%). Most of the respondents worked as labourers or factory workers (65.8%), with a monthly income below IDR 1,000,000.

Table 1: Sociodemographic characteristics of the study participants, N = 73

Variables	N (%)
Type of family	
Traditional	63 (86.3)
Non traditional	10 (13.7)
Level of Education	
No schooling	6 (8.2)
Elementary	15 (20.5)
Junior school	14 (19.2)
High school	29 (39.7)
Higher education	9 (12.3)
Employment	
Factory workers	48 (65.8)
Self employed	10 (13.7)
Others	15 (20.5)
Monthly income (IDR)	
< 1,000,000	38 (52.1)
2,000,000-3,000,000	29 (39.7)
> 3,000,000	6 (8.2)

According to Duvall and Milller (1985), family life consists of eight stages, namely 1) new couple, 2) first child birth family, 3) family with pre-school children, 4) family with school children, 5) family with teenage children, 6) family with adult children, 7) middle age family, and 8) elderly family.⁸ As displayed in Table 2, most of the respondents were in the fourth family development stage (19.2%) and the fifth stage (17.8%) respectively. From their answers to the questions related to the level of stress, most of respondents had only a mild level of stress (69.9%), and none of the respondents indicated themselves as having a severe level of stress. The majority of the respondents lived in unhealthy houses (65.8%), but reported having a good quality of life (71.2%).

Table 2: Characteristics of the Respondents Based on the Family Development Stage, Level of Stress, Environmental Health and Quality of Life

Variable	N (%)
Family development stage	
Stage 1	6 (8.2)
Stage 2	3 (4.1)
Stage 3	5 (6.8)
Stage 4	14 (19.2)
Stage 5	13 (17.8)
Stage 6	12 (16.4)
Stage 7	10 (13.7)
Stage 8	10 (13.7)
Level of stress	
Mild	51 (69.9)
Moderate	22 (30.1)
High	0 (0.0)
Environmental health	
Healthy house	25 (34.2)
Unhealthy house	48 (65.8)
Quality of Life	
Poor	21 (28.8)
Good	52 (71.2)

We assessed the family-related variables including the type of family, level of education, employment, monthly income, family development stage, level of stress, and environmental health in relation to quality of life using the chi-square test. From the analysis results shown in Table 3, we found that the type of family, level of education, and monthly income were significantly associated with quality of life. No association was found between the family development stage and quality of life ($\rho= 0.328$). Both the level of stress and the environmental health variables showed a significant association with the quality of life of TB patients.

Table 3: Bivariate analysis of the sociodemographic characteristics, family development stage, level of stress, environmental health, and quality of life

Variables	Quality of Life		p-value
	Poor (n; %)	Good (n; %)	
Type of family			

Traditional	12 (19.0)	51 (81.0)	0.000
Non traditional	9 (90.0)	1 (10.0)	
Level of Education			
No schooling	6 (100.0)	0	0.000
Elementary	15 (100.0)	0	
Junior school	0	14 (100.0)	
High school	0	29 (100.0)	
Higher education	0	9 (100.0)	
Employment			
Factory workers	10 (20.8)	38 (79.2)	0.001
Self employed	8 (80.0)	2 (20.0)	
Others	3 (20.0)	12 (80.0)	
Monthly income (IDR)			
< 1,000,000	5 (13.2)	33 (86.8)	0.002
2,000,000-3,000,000	15 (51.7)	14 (48.3)	
> 3,000,000	1 (16.7)	5 (83.3)	
Family development stage			
Stage 1	0 (0.0)	6 (100.0)	0.328
Stage 2	2 (66.7)	1 (33.3)	
Stage 3	1 (20.0)	4 (80.0)	
Stage 4	2 (14.3)	12 (85.7)	
Stage 5	5 (38.5)	8 (61.5)	
Stage 6	3 (25.0)	9 (75.0)	
Stage 7	4 (40.0)	6 (60.0)	
Stage 8	4 (40.0)	6 (60.0)	
Level of stress			
Mild	0	51 (100.0)	0.000
Moderate	21 (95.5)	1 (4.5)	
High	0	0	
Environmental health			
Healthy house	1 (4.0)	24 (96.0)	0.001
Unhealthy house	20 (41.7)	28 (58.3)	

DISCUSSION

In our study, several factors including the type of family, level of education, employment, monthly income, level of stress, and environmental health were significantly associated with the quality of life of pulmonary TB patients. Chronic disease affected the physical and mental health, which in turn decreased their quality of life.⁹ The quality of life decreased along with the emergence of the general symptoms of pulmonary TB such as coughing, fever with the exertion of sputum and mucus, and weight loss but improved after the

first month of treatment.² Therefore, the family has an important role to the patients' adherence to the whole TB treatment.

The type of family is significant in relation to the quality of life among patients with TB. A traditional family is founded based on the union of parents with or without children. Support from a spouse or children may increase the motivation of pulmonary TB patients to comply the treatment. The spouse can monitor the patients in taking their medication correctly and accompany them to the health facility in order to get their disease checked. In line with our study results, a previous study found that being single parent increased the odds of TB cases by 63% compared to being in a married family.⁶ The risk of TB cases also increased along with the increased number of adults in the household. Having more than 10 adults in the household increased the risk of TB cases by 2.67%.⁶

Level of education was also a significant factor related to the quality of life among TB patients. This result supported the findings of previous studies stating that level of education had a significant relationship with quality of life among patients with TB.^{10,11} Employment is significantly associated with quality of life among the TB patients in our study. Similarly, a previous study in India reported there to be a significant relationship between employment and the quality of life scores of active TB patients after a year of successful treatment.¹² Another factor of income level was significantly related to the quality of life level. In the same vein, a previous study also reported that TB patients considered the level of income as being an important factor in improving quality of life.¹³ These two factors are relevant, as having employment would enable the family of the TB patients to receive a certain level income as a form of sustainable financial support. Having a low income constrains some families in being able to afford enough food for the whole family. Moreover, a low income household only has a limited number of choices when fulfilling the nutritional needs of the family. Lack of nutrition affects the immune system, which increases the risk of having an infectious disease.¹⁴

According to Antonovsky (1979), stress is a response or a mental state from experiencing tension caused by a stressor or unresolved circumstances.¹⁵ Having social support from the social environment would prevent the TB patients from feeling isolated and

lower their level of stress.¹⁵ Quality of life has increased in line with the decreasing of the physical symptoms of TB patients. Stress from a chronic disease is not only experienced by patients with active TB, but also patients with latent TB.¹⁶ In latent TB, the TB symptoms are not visible, so the patients tend to be stressed and anxious about the given diagnosis.¹⁶ The results of a previous study in Indonesia also showed a significant relationship between social support and quality of life as reflected in the decreasing of life satisfaction felt not during the initial diagnosis, but after when undergoing the intensive phase of treatment.¹⁷

A healthy house represents good environmental health. A healthy house has an integrated physical, chemical, biological condition that enables the residents to attain optimal health.¹⁸ Therefore, a healthy house should meet requirements such as to fulfil physiological and psychological needs, and to prevent the transmission of diseases as well as accidents.¹⁸ A healthy house should have adequate lighting, either from natural or artificial light, adequate ventilation for fresh air circulation, and should enable the family members to feel comfort. It also should have a disposal system for garbage and household waste, as well as safe water and food that prevents disease transmission. Having a TB patient in the house increases the risk of TB transmission to other residents. Therefore, having a healthy house would minimise this risk. As reported by a previous study, poor housing conditions significantly reduce the level of quality of life among patients with TB and their families.¹

CONCLUSION

Our study results yielded a significant relationship between all of the family related factors and the quality of life among pulmonary TB patients. The type of family significantly affects quality of life. Being educated and engaged in paid employment was significantly associated with quality of life, as was the family level of stress and coping. However the family development stage showed no association with quality of life. Poor housing condition also affects the quality of life of patients with pulmonary TB. Considering the significant family factors, several strategies to improve the quality of life among these patients and their families should be implemented.

First, the patients should have an adequate level of knowledge and understanding about the disease and

the transmission of TB bacteria, so then they follow the treatment procedures and prevent further transmission. Second, the family should continuously provide a supportive environment with the community to help the patients recover from and fight TB transmission. This effort will minimise the stigma felt by the patients and increase their self-confidence. Community social support is very important in speeding up the healing process, and will increase the dignity of the patients and their families living within the community.

Ethical Clearance: Ethical approval was granted by the School of Public Health in Airlangga University, Surabaya.

Source of Funding: Self funding.

Conflict of Interest: Nil.

REFERENCES

- World Health Organisation. *Global tuberculosis report 2016*. Geneva: World Health Organisation; 2016.
- MoH. *Tuberculosis: temukan, obati sampai sembuh (Tuberculosis: find it, treat it)*. Jakarta: Center for Data and Information; 2016.
- Balitbangkes-MoH. *Riset Kesehatan Dasar Tahun 2013 [The 2013 Basic Health Research]*. Jakarta: Balitbangkes MoH; 2013.
- Courtwright A, Turner AN. Tuberculosis and Stigmatization: Pathways and Interventions. *Public Health Reports*. 2010;125(4_suppl):34-42.
- World Health Organisation. *Whoqol-old Manual*. Copenhagen: World Health Organisation. 2006.
- Lienhardt C, Fielding K, Sillah J, Bah B, Gustafson P, Warndorff D, et al. Investigation of the risk factors for tuberculosis: a case-control study in three countries in West Africa. *International journal of epidemiology*. 2005;34(4):914-23.
- Andarmoyo S. *Keperawatan Keluarga Konsep Teori, Proses dan Praktik Keperawatan (Family nursing concept, theory, and the nursing practice)*. Yogyakarta: Graha Ilmu. 2012.
- Friedmann M. *Family Nursing: Theory and Practice*. Norwalk: Appleton&Lange; 1999.
- Ahmad N, Javid A, Sulaiman SAS, Basit A, Afridi AK, Jaber AAS, et al. Effects of multidrug resistant tuberculosis treatment on patients' health related quality of life: Results from a follow up study. *PloS one*. 2016;11(7):e0159560.
- Duyan V, Kurt B, Aktas Z, Duyan G, Kulkul D. Relationship between quality of life and characteristics of patients hospitalised with tuberculosis. *The International Journal of Tuberculosis and Lung Disease*. 2005;9(12):1361-6.
- Cully JA, Graham DP, Stanley MA, Ferguson CJ, Sharafkhaneh A, Soucek J, et al. Quality of life in patients with chronic obstructive pulmonary disease and comorbid anxiety or depression. *Psychosomatics*. 2006;47(4):312-9.
- Muniyandi M, Rajeswari R, Balasubramanian R, Nirupa C, Gopi P, Jaggarajamma K, et al. Evaluation of post-treatment health-related quality of life (HRQoL) among tuberculosis patients. *The International Journal of Tuberculosis and Lung Disease*. 2007;11(8):887-92.
- Marra CA, Marra F, Cox VC, Palepu A, Fitzgerald JM. Factors influencing quality of life in patients with active tuberculosis. *Health and quality of life outcomes*. 2004;2(1):58.
- Katona P, Katona-Apte J. The Interaction between Nutrition and Infection. *Clinical Infectious Diseases*. 2008;46(10):1582-8.
- Hansel NN, Wu AW, Chang B, Diette GB. Quality of life in tuberculosis: patient and provider perspectives. *Quality of life research*. 2004;13(3):639-52.
- Peddireddy V. Quality of Life, Psychological Interventions and Treatment Outcome in Tuberculosis Patients: The Indian Scenario. *Frontiers in psychology*. 2016;7:1664.
- Pratiwi GD, Maulana Z. Hubungan Dukungan Sosial Keluarga Dengan Mekanisme Koping Pada Pasien TB Paru Yang Sedang Menjalani Proses Pengobatan Di Puskesmas Legok. STIKes Widya Dharma Husada Tangerang. 2014.
- Prüss-Üstün A, Corvalán C. Preventing disease through healthy environments. Towards an estimate of the environmental burden of disease. *Geneva: World Health Organisation*. 2006.

Parenting Style Based on the Mother's Personal Mastery and the Mother-Child Attachment in Relation to Child Feeding Disorders: A Qualitative Study

Ni Putu Sudewi¹, Oedojo Soedirham², Ahmad Suryawan³

¹Doctoral Program of Public Health, Faculty of Public Health, ²Faculty of Public Health,

³Faculty of Medicine, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

Child feeding disorders affect the child's developmental growth due to malnutrition. This study aimed to explore the mother's experience of having children with a feeding disorder in relation to their knowledge and attitude about child feeding. We conducted an observational study with in-depth interviews. Seven mothers of toddlers with eating disorders but without neurological delays agreed to participate. The mothers reported that their children started to have an eating disorder approximately from the age of 2 up to 6 months, and then the disorder worsened by the age of 12 months. Lack of knowledge about the development of child eating behaviour was observed among the mothers. Mothers expressed having anxiety and feeling stressed during feeding times.

Keywords: *child feeding disorder, eating behaviour, personal mastery, mother-child attachment*

INTRODUCTION

Feeding disorders are a common problem during infancy and the early childhood period that can lead to malnutrition and can be potentially life threatening in severe circumstances. This problem has been experienced by parents worldwide, and can cause stress and depression, especially for the mothers. Approximately half of the observed mothers reported having at least one child with a feeding disorder.¹ Feeding disorders affect approximately 20-30% of children with normal development and 80% of children with developmental delays.^{1,2} Vomiting food, eating non-nutritive substances, and food rejection are among the symptoms of feeding disorders in childhood and infancy.³ The disorders have a broad spectrum, ranging from a mild degree such as picky eating and food neophobia to a severe level of disorder as seen in children with autism.¹

Most parents consider that eating is a normal physiological process, but some children may have eating problems. Parents recognise eating in the simple context of the process of ingesting food individually, but they do not include feeding in a specific context that involves the relationship between the child and the adult who feeds them as well as the influence from the family and the surrounding communities.^{4,5} Eating in the feeding context involves several aspects including: 1) the swallowing reflexes and the adequate neurological function to regulate food boluses (solid or liquid) in the oral cavity; 2) tone, control and coordination of muscles during the feeding process; 3) the development of oro-motor functions and skills from the sucking stage to the chewing stage; and 4) the happy feeling and comfortable condition between the child and the adult who is feeding them.⁵

Children with feeding disorders are generally taken to the doctor at preschool age (2-3 years old), with the most complaints being focused on difficulty eating, picky eating (only eating a little and rejecting most types of food) or neophobia (fear of trying new foods).⁶ By the age of 2 years, children begin to reject foods that were previously acceptable because they prefer foods that are physically more attractive, both in colour and texture.⁷ The incidence rate of neophobia is the lowest in

Corresponding Author:

Ni Putu Sudewi

Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Mulyorejo, Surabaya, Indonesia
Email: niputusudewi@gmail.com

the infant period (4-7 months), but then increases rapidly in the age range of 2 to 6 years, especially in relation to the consumption of fruits, vegetables and meat.⁸ Feeding disorders for older children (age 8-11 years old) usually involve emotional eating, because eating is driven by an emotion but not hunger, which leads to excessive eating with a high consumption of sugar, fat, and energy.⁹

Some recent studies have reported that children with picky eating showed a negative reactions related to sensory food, especially related to the texture and aroma.^{7,8} Influences from their family and the environment form the children's taste for certain types of food and eating behaviour.¹⁰ Advertisements on food on the TV also influence the food preferences of children aged 5-7 years old.¹¹ Most of the food rejection cases among children were influenced by the lack of knowledge among their parents that the development of eating behaviour is crucial during the first three years of the child's life.¹⁰

Parenting style affects feeding style and feeding practices in the aspects of demandingness and responsiveness.¹² The parent's knowledge of the child's development is crucial in establishing the self-efficacy and competency of the parent, especially the mother.¹³ Personal mastery is obtained through a continuing learning process and comprised of the ability (skill) and the spiritual condition which forms a creative tension to combine expectations and reality to achieve a solution.¹⁴ Our study aimed to observe the mother's experience of having a child with a feeding disorder in relation to their knowledge of and attitude toward child feeding.

MATERIALS AND METHOD

The present study employed a qualitative method using a structured in-depth interview. The researcher, as the research instrument, asked the respondents the following questions: 1) what is the kind of food and how do you feed your child?; 2) Who has taken care of your child since your baby was born and who feeds him/her (including preparing formula milk or breastmilk); 3) When did you start training your child to eat? How do you know when your baby or child is hungry and full?; 4) When did you realise that your child had a feeding disorder?; 5) What are the signs of a feeding disorder that you noticed in your child? and 6) What do you do and feel when you encounter difficulties related to your child's feeding disorder? Some probing questions included problems during the eating process and the child's reactions during feeding time.

The study participants were recruited from a private health clinic in Surabaya, Indonesia using a purposive sampling. The inclusion criteria were women having a minimum of 1 (one) child under five years old with a feeding disorder within the year before the interview. The exclusion criteria were the mothers of children with neurological developmental and anatomic disorders, and other congenital abnormalities. Prior to the interview, the researcher explained about the study, the data protection, and the right to withdraw from the study. Written informed consent forms were submitted from the participants and their spouses. The interview was conducted either face to face or over the telephone based on the preferences of the participants. The mother's age ranged between 28 and 35 years old. The children's feeding disorders were perceived by the mother. Four participants were full-time housewives, one participant had a small home based business with her husband, one participant worked freelance, and one participant worked full time at a government office. All of the interviews were conducted in Bahasa Indonesian for approximately 60 minutes. The interviews were audiotaped and transcribed for the data analysis.

RESULTS

Based on the analysis of the interview transcripts, three themes emerged, including 1) selecting food and the feeding practice, 2) parenting and caring for the child, and 3) recognising and overcoming the feeding disorder.

Selecting food and the feeding practice: Three women reported providing exclusive breastfeeding (6 months of breastfeeding without other supplementary food). Three women reported feeding their babies by combining breastmilk and formula milk. Only one woman did not breastfeed due to problems with breastmilk production. According to the mothers who exclusively breastfed, their babies were fed regularly every 1.5 up to 2.5 hours. They fed based on what they understood as being the baby's need (crying as a sign of hunger). Some mothers explained that they combined breastmilk and formula milk because of their low production of breastmilk. One woman described that the stressful situation during the first week having the baby was due to difficulties breastfeeding and the inability of the baby to receive bottled milk. All of the mothers stated that 6 months old was the right time for their babies to learn about eating

food other than milk. They continued their belief that a baby crying was a sign asking for food while the baby's refusal of food would mean that they were full. For them, eating is a basic necessity and is a natural process for a human being without the need for learning.

Parenting and caring for the child: The exclusive breastfeeding mothers explained that they care for their babies by themselves without receiving help from other family members. Two women received help from their mothers, especially during their difficulties with child feeding. One woman received help from a competent baby sitter. One woman who fed her baby with formula milk received help from two housemaids.

With current advanced technology, the mothers described the use of smartphones or similar gadgets to help comfort their younger children during feeding time. A woman explained that "every time my baby makes a fuss during meal time, I would let her watch a video from my phone. She would stay calm and open her mouth." Another woman described that meal time was often like "a battle" to get their child eating, and considered that the smartphone was a "master weapon" used to win the battle. One woman said that she had not set up a regular meal time for her child and depended on her child's need. When her child refused to eat her meal, she would let her eat any of her favourite snacks to fill her child's stomach. She considered that the snacks also have "nutrition value", just like a regular meal.

Recognising and overcoming the child's feeding disorder: Almost all of the mothers stated that they recognised the feeding disorder when they started to introduce solid food at age 6 months. Their babies refused to open their mouths during feeding time, and only wanted to have milk. Two women said that they realised her child's feeding disorder as early as the age of 2 years old. Their children refused to eat, or they did not swallow food and quickly regurgitated it instead. Some mothers said that their children only wanted certain foods such as chicken nuggets and instant noodles, or other delicious snacks with a low nutritional value. At first, the mothers assumed that the refusal of food was merely due to learning to adapt to new food. The mothers started to feel stressed out when their children continued this behaviour and their body weight reduced.

To improve their children's appetite and willingness to eat, the mothers used various fun and interesting

ways to distract their children during meal times. The mothers gave them toys to play with, let their children watch cartoons on television, or took their children to eat outside the house. However, the mothers did not try to receive professional help and considered that having a feeding disorder was normal and that it would be over after their child started elementary school.

DISCUSSION

From the themes that emerged in our study, the mothers started to give solid food after the age of 6 months, reflecting their knowledge of the feeding development stages. However, they also emphasised that eating is an automatic process generated by the feeling of hunger due to the basic human need for food. In this case, the mothers interpreted the process of eating in children as "eating" and not "feeding", which does not realise the reciprocal interaction during the feeding process.⁵ Therefore, the mothers did not consider the crucial issue in recognising their baby's cues of hunger or full, and the concept of autonomy and individuality formed by the age of 6 months through to 3 years.² Due to autonomy and individuality, a 6-month-old baby refused to open his mouth when being fed¹⁵, selected certain foods by the age of 18 months (picky eating)^{7,8}, was only interested in advertised foods at the age of 5 – 7 years old¹¹, and had emotional eating by the age of 8-11 years.⁹

The authoritative parenting style is the most appropriate parenting style to prevent inappropriate practices that negatively affect the physiological and psychological health of the child.¹⁶ The occurrence of feeding disorders among children under five is influenced by the parenting style, including the mother-child attachment and personal mastery. In the concept of attachment, being physically close is not enough. In this study, some of the mothers received help in caring for their children either from their relatives or other helpers. According to the Bowlby concept of the Internal Working Model (IWM), the childhood experience with a parent (especially with mother) will affect a person's abilities and sensitivity in relation to caring for a child.¹⁷ The failure to thrive is more influenced by behavioural problems (eating behaviours) than a lack of food, child abuse, and neglect.¹⁷ Less sensitivity among the mothers in this study was observed from the beliefs of the mothers that an interactive relationship between mother and child would only happen after the child developed the ability

of verbal communication. Waiting until after the child can communicate verbally is considered to be too late because the autonomy and individuality of the child has formed at an earlier stage.¹⁷

Because of the lack of understanding and mental unpreparedness, mothers consider caring for their child to be tiring.¹⁸ Moreover, having a child with a feeding disorder causes the mother to feel tired, stressed and depressed.¹⁸ Mothers felt incompetent, desperate, and ashamed, which indicated a lack of self-efficacy.⁴ Feeling incompetent is common among mothers who have little knowledge about child development.¹³ In dealing with child feeding disorders, mothers give up and let their children have foods with a high glucose/salt /fat /calorie content.¹⁸ The importance of the mother's personal mastery was reflected in this study. Most of the mothers in our study had a limited understanding of the development stages of feeding, but did not seek further help or trusted information to overcome the problem. Instead, the mothers let their children shape their own eating behaviour as an automatic process. The mothers were unaware that they are the first teacher for their children to learn life skills from, including eating behaviour.¹⁹ Personal mastery is not just obtained from birth itself, but involves a learning process throughout life.¹⁴

CONCLUSION

Child feeding disorders occur as early as when the child is introduced to solid food. Children should be taught about eating behaviour as early as possible, by recognising the signs of hunger and fullness through reciprocal interactions between the parent or the caregiver and the child. The parent should have an understanding of the concept of personal mastery and the parent-child attachment in order to show compassionate caring toward their children. The parenting style influences the child's eating behaviour, therefore teaching the child appropriate eating behaviours since birth would minimise the occurrence of child feeding disorder. The reciprocal interactions during the first 3 years of life is crucial, including during the feeding time itself. Further research is recommended involving a more diverse population to gain more of an understanding about parenting style in relation to child feeding disorders.

Ethical Clearance: Ethical approval was granted by the School of Public Health in Airlangga University, Surabaya.

Source of Funding: Self funding.

Conflict of Interest: Nil.

REFERENCES

1. Kerzner B, Milano K, MacLean WC, Berall G, Stuart S, Chatoor I. A practical approach to classifying and managing feeding difficulties. *Pediatrics*. 2015;ped. 2014-1630.
2. Steinberg C. Feeding disorders of infants, toddlers, and preschoolers. *British Columbia Medical Journal*. 2007;49(4):183.
3. Uher R, Rutter M. Classification of feeding and eating disorders: review of evidence and proposals for ICD-11. *World Psychiatry*. 2012;11(2):80-92.
4. Kohlhoff J, Barnett B. Parenting self-efficacy: Links with maternal depression, infant behaviour and adult attachment. *Early human development*. 2013;89(4):249-56.
5. Kerwin ME, Eicher PS. Behavioral intervention and prevention of feeding difficulties in infants and toddlers. *Journal of Early and Intensive Behavior Intervention*. 2004;1(2):129.
6. Lafraire J, Rioux C, Giboreau A, Picard D. Food rejections in children: Cognitive and social/environmental factors involved in food neophobia and picky/fussy eating behavior. *Appetite*. 2016;96:347-57.
7. van der Horst K, Deming DM, Lesniasukas R, Carr BT, Reidy KC. Picky eating: Associations with child eating characteristics and food intake. *Appetite*. 2016;103:286-93.
8. Addressi E, Galloway AT, Visalberghi E, Birch LL. Specific social influences on the acceptance of novel foods in 2–5-year-old children. *Appetite*. 2005;45(3):264-71.
9. Topham GL, Hubbs-Tait L, Rutledge JM, Page MC, Kennedy TS, Shriver LH, et al. Parenting styles, parental response to child emotion, and family emotional responsiveness are related to child emotional eating. *Appetite*. 2011;56(2):261-4.
10. Broilo MC, Vitolo MR, Stenzel LM, Levandowski DC. "What can I do when he/she doesn't want to eat?": Maternal strategies for ensure children's

- food consumption in early childhood. *Appetite*. 2017;116:575-83.
11. Halford JC, Boyland EJ, Hughes G, Oliveira LP, Dovey TM. Beyond-brand effect of television (TV) food advertisements/commercials on caloric intake and food choice of 5–7-year-old children. *Appetite*. 2007;49(1):263-7.
 12. Shloim N, Edelson LR, Martin N, Hetherington MM. Parenting styles, feeding styles, feeding practices, and weight status in 4–12 year-old children: a systematic review of the literature. *Frontiers in psychology*. 2015;6:1849.
 13. Hess CR, Teti DM, Hussey-Gardner B. Self-efficacy and parenting of high-risk infants: The moderating role of parent knowledge of infant development. *Journal of applied developmental psychology*. 2004;25(4):423-37.
 14. Berry JM, West RL. Cognitive self-efficacy in relation to personal mastery and goal setting across the life span. *International Journal of Behavioral Development*. 1993;16(2):351-79.
 15. Drewett RF, Kasese-Hara M, Wright C. Feeding behaviour in young children who fail to thrive. *Appetite*. 2003;40(1):55-60.
 16. Vollmer RL, Baietto J. Practices and preferences: Exploring the relationships between food-related parenting practices and child food preferences for high fat and/or sugar foods, fruits, and vegetables. *Appetite*. 2017;113:134-40.
 17. Bretherton I. The origins of attachment theory: John Bowlby and Mary Ainsworth. *Developmental psychology*. 1992;28(5):759.
 18. Dunning MJ, Giallo R. Fatigue, parenting stress, self-efficacy and satisfaction in mothers of infants and young children. *Journal of Reproductive and Infant Psychology*. 2012;30(2):145-59.
 19. Wong DL, Hockenberry MJ, Wilson D. Wong's nursing care of infants and children: Mosby Inc; 2002.

Factors Associated with Onset to Hospital Delay among Stroke Patients in the Emergency Department

Abdulloh Machin¹, Muhammad Hamdan¹

¹Departement Neurology, Faculty of Medicine, Universitas Airlangga, Dr. Soetomo General Hospital;
Universitas Airlangga Hospital

ABSTRACT

Ischemic stroke is the most common neuro-emergency in the world. The only treatment approved for an acute stroke is thrombolysis, which has a narrow window. Thrombolysis to treat acute ischemic stroke is under-utilised. There are many factors associated with delays in treatment. In Indonesia, thrombolysis is not commonly used for acute stroke treatment. The study aimed to know what time is needed from the onset of the stroke condition to the Emergency Department in a stroke patient and the factors associated with the hospital delays. All stroke patients admitted to Dr. Soetomo General Hospital and Universitas Airlangga Hospital between October 2016–March 2017, who agree to participate in the research and were aged >18 y.o. are included. We reviewed all of the subjects for the demographic characteristics, distance to hospital, stroke risk factors and clinical data. All of the subjects will be asked for the time of stroke onset and the time when the patient arrived at the emergency department. We will also measure the stroke using a specialised scale.

Results: There were 107 subjects included in this research. The data was inadequate in 4 subjects. The mean age was 55.97±11.9 years, and there were more women (54.2%) than men. The distance from the patient's home to the hospital was mostly <15 km (65.1%). 63.6% of the subjects were referred from other hospital or clinic. Most of the patients had hypertension (71.4%) and diabetes (31.7%). Onset from the ictus of the stroke to the Emergency Department was 712.3±1324.6 minutes. A factor associated with the delay was the medical services accessed before the patient was referred to the hospital (0.215; p=0.026) and their pre-admission score (0.242; p=0.012)

Conclusion: Time from onset to the Emergency Department was longer than the treatment time window for thrombolysis. The factors associated with the onset of hospital delays was primary medical services and the pre-mRS score.

Keywords: Acute stroke, thrombolysis, hospital delays

INTRODUCTION

Ischemic stroke is the most common neurological emergency in the world ¹. In 2008, stroke was the third leading cause of death ². In the US, there are 780.000 cases of stroke every year, and the cost of stroke treatment in 2008 was an estimated \$65.5 billion ¹. An estimated 88% of stroke patients have an ischemic stroke³. There are many stroke patients who remain functionally dependent after a stroke, although around 50-70% return to their previous functional status. There is a susceptibility to an increased mortality and morbidity after having a stroke¹. Stroke is also the leading cause of morbidity among adults. About 30% of stroke patients need assistance

Corresponding Author:

Abdulloh Machin
Departement Neurology Faculty of Medicine,
Universitas Airlangga, Dr. Soetomo General Hospital,
Universitas Airlangga Hospital
Email: dr.machin95@gmail.com

during their daily activities, and 16% need long-term hospital or home care ^{1,3}.

Thrombolysis using r-TPA is the only drug approved by the FDA for ischemic acute stroke treatment for all patients who meet the inclusion and exclusion criteria ³⁻⁷ by 30 days, 33 (14.7%. There is a strong correlation between arterial recanalisation and the improvement of neurological status in an ischemic stroke patient ¹. Iv-rTPA is recommended to be given within 3 hours of onset according to the NINDS criteria ⁸. Pool analysis from a NINDS-rTPA study concluded that earlier treatment with iv-rTPA correlates with a better outcome. According to the NNT ratio, iv-rTPA will benefit 8 patients out of 15, and for every 15 patients treated with iv-rTPA, only 1 patient will suffer an intracranial haemorrhage ⁴.

Although iv-rTPA is effective as a treatment for acute ischemic stroke, thrombolysis for acute stroke is still under-utilised; especially as there are many patients coming to the hospital beyond the treatment period. There is also the complexity of hospital bureaucracy involved^{1,9,10} in our tertiary care center, the time intervals preceding intra-arterial thrombolysis in order to accelerate and optimize the management of acute strokes. METHODS: Between January 1, 2000, and April 30, 2002, 597 patients with acute stroke were admitted to our stroke center. One hundred forty-eight patients underwent diagnostic arteriography, and 100 (16.8%. Chen et al. revealed that the factors associated with a delay in the community included a referral from another health facility, waking up with a stroke, having a stroke while having sex, the patient's address, transportation, history of stroke or coronary artery disease and the NIHSS score in the emergency department all had no predictive value ¹¹. Tan, et al. conducted a prospective study on 789 stroke patients and revealed that 26% of them had come within 2 hours of onset. A factor associated with hospital delays was a referral from another hospital, the stroke location, the onset of the stroke, the treatment in outpatient clinics and a lack of concern related to seeking help for stroke symptoms¹². Herlitz et al. reviewed existing stroke studies and acute myocardial infarction studies and showed that the onset of symptoms through to treatment for an acute stroke was longer than that for a myocardial infarction¹³ resulting in an infarction. Depending on the extent of the infarction, loss of organ function varies considerably. In both conditions, it is possible to limit

the extent of infarction with early intervention. In both conditions, minutes count. This article aims to describe differences and similarities with regard to the way patients, bystanders and health care providers act in the acute phase of the two diseases with the emphasis on the pre-hospital phase. METHOD: A literature search was performed on the PubMed, Embase (Ovid SP).

The chain of hospital services will prompt a good outcome in stroke patients, beginning with knowledge of stroke symptoms. The CASPR (the California Acute Stroke Pilot Registry) study showed that there was an increase in patients receiving thrombolysis from 4.3% to 28.6% ^{2,14}

Acute stroke services in the emergency department should be conducted in Triage with the same priority as a myocardial infarction or traumatic brain injury regardless of the neurological deficit severity. Service standards for acute stroke care according to the AHA/ASA guidelines are: from ER to meeting a medical doctor is less than 10 minutes; ER to meeting the stroke team is less than 15 minutes; ER to performing a CT scan is less than 25 minutes; ER to CT interpretation is less than 45 minutes; ER to thrombolysis is less than 60 minutes; and ER to admission to a stroke unit is less than 3 hours.

Thrombolysis in Indonesia is less frequently performed because there was no data available to determine the factors causing the ER admission delay in stroke patients. This study aimed to know the average time is from onset to ER admission in acute stroke patients.

METHOD

From October 2016 to March 2017, all acute stroke patients in Dr. Soetomo General Hospital and Airlangga University Hospital who were admitted to the ER were observed. All stroke patients older than 18 years old were included in this study. Stroke patients with mimicking conditions and who had a subdural haematoma were excluded. All patient data was collected including demographic data, the onset of the stroke, the duration of attack in order to know whether the patient had a stroke or a TIA, the distance from the patient's address to the hospital, the medical care received before the patient came to the ER, who was a witness to the stroke ictus, the response of patient after the stroke symptom onset, the patient or witness's knowledge about stroke attacks, the mode of transportation that patients used and the time taken to get

from the patient's home to the ER. We also collected their history of past illness, the NIHSS score when they were admitted to the ER, their pre-mRS (The modified Rankin Scale), mRS and the type of stroke. All of the data was analysed statistically to determine the mean, SD and normality, and we conducted correlational analysis.

RESULTS

We included 107 subjects from the period of November 2016 – March 2017. The mean age of this research was 55.97 ± 11.9 . All of the demographic characteristics have been shown in Table 1. There were more women (54.2%) in this research, most of patients were from Dr Soetomo General Hospital (98%) and most of patients had a low income (89%). Our subjects mostly had a level of education of senior high school level (34%). Most of the patients had an address distance that was less than 15 km (64.5%) from the ER.

Table 1: Demographic characteristics

Variable	n	%
Sex		
Male	49	45.8
Female	58	54.2
Hospital		
Airlangga University Hospital	2	1.9
Dr. Soetomo General Hospital	105	98.1
Income		
< 5 million rupiah	96	89.7
>5-10 million rupiah	8	7.5
>10-20 million rupiah	2	1.9
Education		
No education	11	10.3
Elementary school	27	25.2
Junior High School	22	20.6
Senior High School	34	31.8
Diploma - degree	11	10.3
Post Graduate education	2	1.9
Hospital Distance from Subject home		
<15 km	69	65.1
>15 km	37	35.5
Medical care before ER		
Hospital or outpatients clinics	68	63.6
Home	37	34.6
Unknown	2	1.8

Hypertension was a common risk factor (74.8%) in our research, followed by diabetes (29.9%) and history of acute cerebrovascular accidents (25.5%) (Table 2). We decided that the time taken to come to the ER was less than 15 minutes, 15-29 minutes, 30-60 minutes and more than 60 minutes for the respective groups. The most common time taken to get to the ER was 15-29 minutes. Although most of the patients came to the ER around 15-29 minutes, the mean time needed to get to the ER was 712.12 ± 1324.6 . This means that more patients were actually in the group of over 60 minutes. Some of the patients got to the ER 2-3 days after the stroke attack.

Table 2: Stroke Risk Factors

Variable	n	%
Hypertension	76	71.4
Diabetes Mellitus	33	31.7
TIA	4	3.7
Stroke	27	25.2
Jantung	11	10.3

We used statistical analysis to determine the correlation between the time needed to get to ER and the factors such as age and stroke type. There was the NIHSS score, pre-mRS score, mRS Score, the patient's income, their education level, the distance from the patient's home to the Emergency Department and also the medical care that the patient got before patient arrived at the ER. We used Spearman's correlation to analyse the variables. We found that the variables associated with ictus to hospital delays were pre-mRS Score ($r=0.242$; $p=0.012$), distance from the patient's home $r=0.195$ ($p=0.045$) and medical care before ER ($r=215$; $p=0.026$).

Table 3: Time needed to ER

Variable	Mean \pm SD	p
Onset to ER	712.12 ± 1324.6	0.00
Time needed at ER	239.5 ± 151.3	0.00

Table 4: Correlation between the factors associated with time to ER

Variable	r	p
Age	-0.065	0.51
Stroke type	0.162	0.1
NIHSS 1	0.045	0.649

Conted...

Pre-mRS	0.242	0.012*
mRS	0.034	0.731
Income	0.051	0.605
Education	0.105	0.284
Distance	0.195	0.045*
Medical care before ER	0.215	0.026*

DISCUSSION

Our research showed that women were more common than men, so our data is different to that from the previous research which concluded men suffer stroke attacks more than women^{9,15-17}. Gender is one of the unmodified risk factors for stroke. Our study showed that women are more common. We used a hospital-based study and we recruited our subjects using consecutive sampling. Most of the patients in our study were referred from another hospital, so our patients were selected from other hospitals or clinics. Data from the Ministry of Health in Indonesia also showed that men more commonly suffer a stroke than women¹⁸, but because of the referral system in Indonesia, the patients should go to primary care before being referred to secondary or tertiary care.

The mean age of our subjects was 55.97±11.9, so our subjects were younger than those of Chen, et. The most common stroke patient age was >65 years old. Our data showed that there is a trend for stroke patients to be of a younger age in Indonesia compared with other countries.

The income of our subjects was consistently less than 5 million rupias. This data shows that most of our subjects had a lower income, although the income of the subject didn't correlate with time to ER. Our subject's education mostly was of a lower education level that will affect their awareness of stroke signs and symptoms, also affect their awareness of needing to seek help at a hospital.

The risk factors in our study included hypertension, diabetes, TIA, stroke, and a history of coronary artery disease. Our results are similar to those of another study^{17,19,20}.

The time from ictus to the Emergency Department was 712.12 ± 1324.6. This data shows that our subjects, on average, came to the Emergency Department beyond time window needed for thrombolysis. This delay can be the result of the referral system in our country. The

factors associated with time to ER was only significant in relation to the Pre-mRS score ($r=0.242$; $p=0.012$). This shows that the status before ictus affected the patient coming to the hospital earlier. Another factor associated with time to ER was the medical care received before the patient came to the ER (0.215 $p=0.026$). This result shows that our subject maybe had an awareness about stroke and so they came to the primary medical services, but the referral system also delayed the subject coming to thrombolysis-ready hospitals. Chen et al. found that sex, the subject's address, mode of transportation and history of stroke didn't have a significant association with time to hospital¹¹. This result is similar to our results, although the distance from the patient's home was significant in our study. The distance from the patient's home could significantly shorten the time taken to get to the hospital, but this does not affect anything clinically because the average of our study showed that the time taken to get to the hospital was consistently beyond the thrombolysis time window.

CONCLUSION

We conclude that the time taken to get to the Emergency Department is longer than the thrombolysis treatment window and that the only variables affecting the time taken to get to the ER was the Pre-mRS and the medical care accessed before the Emergency Department. Our study had limitations as it was performed at the tertiary hospital using consecutive sampling. The intervention was performed before thrombolysis became commonly performed in Indonesia.

Conflict of Interest: None.

Ethical Clearance: The study passed ethical clearance from Ethical Committee of the Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia.

Source of Funding: Self-funded.

REFERENCES

1. Willey JZ. *Acute Ischemic Stroke*. In: Lee K, editor. *The NeuroICU Book*. New York; 2102. p. 91–122.
2. Jauch EC, Saver JL, Adams HP, Bruno A, Connors JJB, Demaerschalk BM, et al. Guidelines for the early management of patients with acute ischemic stroke: A guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2013;44:870–947.

3. Biller J, Love Betsy B, Schneck MJ. *Vascular Diseases of the Nervous System: Ischemic Cerebrovascular Disease*. In: Darof RB, Fenichel GM, Jankovic J, Mazziota JC, editors. *Bradley's Neurology in Clinical Practice*. 6th ed. Philadelphia: Elsevier; 2012.
4. The Atlantis and NINDS rt-PA Study Group investigators, E, The Atlantis and NINDS rt-PA Study Group investigators, E. Better outcome with early stroke treatment: A pooled analysis of ATLANTIS, ECASS, and NINDS rt-PA stroke trials. *Lancet*. 2003;in revision:768–74.
5. Derdeyn CP, Chimowitz MI, Lynn MJ, Fiorella D, Turan TN, Janis LS, et al. Aggressive medical treatment with or without stenting in high-risk patients with intracranial artery stenosis (SAMMPRIS): The final results of a randomized trial. *Lancet*. 2014;383(9914):333–41.
6. Trouillas P, Nighoghossian N, Derex L, Adeleine P, Honnorat J, Neuschwander P, et al. Thrombolysis with intravenous rtPA in a series of 100 cases of acute carotid territory stroke: determination of etiological, topographic, and radiological outcome factors. *Stroke*. 1998;29:2529–40.
7. Clark WM, Albers GW, Madden KP, Hamilton S. The rtPA (Alteplase) 0- to 6-Hour Acute Stroke Trial, Part A (A0276g) : Results of a Double-Blind, Placebo-Controlled, Multicenter Study. *Stroke*. 2000;31(4):811–6.
8. Koroshetz WJ. Tissue plasminogen activator for acute ischemic stroke. *N Engl J Med*. 1996;334(21):1405–6.
9. Nedeltchev K, Arnold M, Brekenfeld C, Isenegger J, Remonda L, Schroth G, et al. Pre- and in-hospital delays from stroke onset to intra-arterial thrombolysis. *Stroke*. 2003;34(5):1230–4.
10. Jiang B, Ru X, Sun H, Liu H, Sun D, Liu Y, et al. Pre-hospital delay and its associated factors in the first-ever stroke registered in communities from three cities in China. *Sci Rep*. 2016;6(July):29795.
11. Chen C, Huang P, Yang Y, Liu C, Lin T, Lin R. *Pre-hospital and in-hospital delays after onset of acute ischemic stroke — a hospital-based study in southern taiwan*. 2007;23(11).
12. Tan T-Y, Chang K-C, Liou C-W. Factors delaying hospital arrival after acute stroke in southern Taiwan. *Chang Gung Med J*. 2002;25(7):458–63.
13. Herlitz J, Wireklintsundström B, Bång A, Berglund A, Svensson L, Blomstrand C. Early identification and delay to treatment in myocardial infarction and stroke: differences and similarities. *Scand J Trauma Resusc Emerg Med*. 2010;18:48.
14. Adams HP, Del Zoppo G, Alberts MJ, Bhatt DL, Brass L, Furlan A, et al. Guidelines for the early management of adults with ischemic stroke: A guideline from the American heart association/American stroke association stroke council, clinical cardiology council, cardiovascular radiology and intervention council, and the Atheros. *Stroke*. 2007;38(5):1655–711.
15. Emberson J, Lees KR, Lyden P, Blackwell L, Albers G, Bluhmki E, et al. Effect of treatment delay, age, and stroke severity on the effects of intravenous thrombolysis with alteplase for acute ischaemic stroke: A meta-analysis of individual patient data from randomized trials. *Lancet*. 2014;384(14):1929–35.
16. H.S. Jorgensen, MD; H. Nakayama, MD, Ph.D.; J. Reith, MD; H.O. Raaschou M and, T.S. Olsen, MD P. Factors delaying hospital admission after acute stroke. *Neurology*. 1996;27(3):398–400.
17. Furie KL, Kasner SE, Adams RJ, Albers GW, Bush RL, Fagan SC, et al. Guidelines for the prevention of stroke in patients with stroke or transient ischemic attack: A guideline for healthcare professionals from the American Heart Association/American stroke association. *Stroke*. 2011;42(1):227–76.
18. Badan Penelitian dan Pengembangan Kesehatan. Riset Kesehatan Dasar (RISKESDAS) 2013. Lap Nas 2013. 2013;1–384.
19. Bushnell C, McCullough LD, Awad I a., Chireau M V., Fedder WN, Furie KL, et al. Guidelines for the prevention of stroke in women: A statement for healthcare professionals from the American heart association. *American stroke association. Stroke*. 2014;45(5):1545–88.
20. Goldstein LB, Bushnell CD, Adams RJ, Appel LJ, Braun LT, Chaturvedi S, et al. Guidelines for the primary prevention of stroke: A Guideline for Healthcare Professionals from the American Heart Association. *American Stroke Association. Stroke*. 2011;42(2):517–84.

Analysis of The Influence of Hersey-Blanchard Leadership and Nurse Maturity on Caring Behaviour Performance Based on Patient Perception

Minarni Wartinarsih¹, Stefanus Supriyanto², Sri Widati², Danoe Soesanto³

¹Doctoral Candidate, ²Department of Health Administration and Policy, Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia; ³Department of Public Health & Humaniora, Medical Faculty of Universitas Ciputra, Surabaya, Indonesia

ABSTRACT

The quality of nursing care services in Indonesia need to be improved particularly in caring behavior aspect. One cause for this factor is a lack of caring behaviour. Caring behavior as a form of nursing care toward the patient is described as an act that cares for or respects humanity in relation to those who are unable to meet their needs. This was an observational study with a cross-sectional design. Four inpatient rooms were utilized in this study, and each inpatient room was represented by the head nurse and associate nurse. The data obtained using the questionnaire instrument was analysed using Multinomial Logistic Regression ($\alpha = 0,05$). The results showed that the majority of the Head nurses of the inpatient rooms (37.5%) applying the selling leadership style. The nurse associate's maturity level was M3 (42.5%) and M2 (32.5%). Caring behaviour was mostly moderate (45%). The selling leadership style is the most applied leadership style conducted by the head nurse. The head nurses are less appropriate when it comes to applying the leadership style as it is related to the maturity level of the associate nurses, M3. A good level of caring behaviour is influenced by the leadership. The caring behaviour of the associate nurses can be improved by changing the style of the selling leadership into a participating leadership style, which is more appropriate when paired the maturity level of the nurse associate.

Keywords: *leadership style, nurse maturity level, caring behavior, nurse.*

INTRODUCTION

Quality of health services is the degree of perfection of health that fits with professional and service standards by using the available resources in the hospital in a reasonable, efficient, and effective manner. The services should also be safe and satisfactorily provided, based on norms, ethics, law and the local socio-culture with attention paid to the limitations and capabilities of the government, as well as society¹. The World Health Organisation (WHO) in 2006 launched Quality of Care: "a Process for Making Strategic Choices in the Health

System". The World Health Organisation states that there are six dimensions of health service quality that must be actualised by all countries, namely that health services must be effective, efficient, easily accessible, safe, timely and prioritise patients.

The quality of nursing care services in Indonesia is still unsatisfactory. This can be caused by several factors, among others being organisational factors and the nurse factors themselves in that they show less attention, less caring, are less responsive to the patient's complaints, are less motivating and pay less attention to the therapeutic attitude that would be beneficial for the patients. Caring behaviour as a form of concern from nurses to patients is described as an action that pays attention to or respects fellow human beings who are unable to meet their needs². Caring behaviour is a universal phenomenon that affects the way that humans think, feel and have relationships with others³.

Corresponding Author:

Minarni Wartinarsih
Doctoral Candidate, Faculty of Public Health,
Universitas Airlangga, Surabaya, Indonesia
Email: minarni.wartinarsih-2017@fkm.unair.ac.id

Leadership style is important due to its role in the organisation because the leader's behaviour will strongly influence changes and maintain the culture within the organisation⁴. Situational leadership style focuses on the relationship of leadership behaviour with the employees and was developed from a leadership concept that is oriented to focus on the leader and employee relationship. According to Hersey (1986), there are four styles: telling style, telling style, participating style and delegating style. Employees are a key factor in the organisation because their performance and behaviour will affect on the success or failure of the organization itself⁵. Low maturity level (M1) indicates that the person is unable, unwilling and also not confident. Maturity level M2 indicates being unable but there is a willingness and confidence. Maturity level M3 is being able but unwilling, and not confident. Maturity level M4 is being able, willing and confident.

Nurse's caring behaviour is still widely studied because there is still a high level of patient dissatisfaction related to the services of nurses who work in hospitals. The following is a preliminary survey showing the number of nurses who have not yet applied caring behaviour at X Hospital. The results of the preliminary survey in X Hospital Surabaya in its ICU inpatient room, maternal inpatient room, 3rd Floor inpatient room, and 4th Floor inpatient room showed that the nurse's caring behavior is still low.

METHOD

This study was an analytical observational study with a cross-sectional approach, using a questionnaire as the study tool. The variables studied were leadership style, employee maturity level and associate nurse caring behaviour while the respondents were all Head nurses, all associate nurses and all patients who had been hospitalised for 2 x 24 hours in 4 units of the ICU patient room, maternal hospitalisation, adult hospitalisation and children hospitalisation as well as being able communicate well. This study was conducted in 4 Units of the Inpatient Room at X Hospital in April 2018.

RESULTS

The age of the Head Nurses was all between the ages of 26 years - 30 years old (50%) and ≤ 25 years old (50%). The Head Nurses' age was in early adulthood, meaning that their attitude and behaviour was in a warm,

close and communicative relationship stage according to Erickson (Monk, 2001). This period is a period of transition related to physical, intellectual and social roles. The ages of the Associate Nurses was between 26 years - 30 years old (72.5%) and ≤ 25 years old (27.5%).

The education level of all Head Nurses (ICU room, adult hospitalisation, child hospitalisation and Head of Midwifery) was an associate degree or D3 (100%). Most of the Head Nurses at X Hospital had served as Heads for between 1-2 years (75%). All Head Nurses in the ICU, maternal hospitalisation, adult hospitalisation and child hospitalisation units of X Hospital were female (100%). The leadership style of the Head Nurses based on the Hersey-Blanchard approach showed that almost all of them had Selling (S2) as their leadership style (75%). The level of maturity of the Associate nurses in the four inpatient rooms of X Hospital showed a medium maturity level of M2 (75%). Most of the caring behaviour of the Associate nurses at X Hospital was at the level of moderate caring behaviour (45%). The influence of the Head nurses' leadership style based on the Hersey-Blanchard approach consisted of leadership style (Telling-Directing, Selling-Coaching, Participating and Delegating) on the caring behaviour of the Associate nurses in the 4 inpatient rooms of X Hospital via the following: telling in the 'less' category (50%), the selling leadership style influences the caring behaviour in the 'good' category (70.37%) and the participating leadership style influences the caring behaviour of Associate Nurses in the 'moderate' category (42.86%). The leadership style of the Head Nurses based on the Hersey-Blanchard approach had a significant effect on the Associate Nurses' caring behaviour with a 'good' category of 70.37% ($p = 0.004$), with particularly the selling leadership style having a significant effect on the Associate Nurses' caring behaviour with a 'good' category 38.7 times greater than telling, selling and participating leadership style.

The medium maturity level of the associate Nurses (M2) had more of an impact on the Selling leadership style (40%), the high maturity level of the Associate Nurses (M3) had more of an impact on the Participating leadership style (61.54%) and the very high maturity level of the associate Nurses (M4) had more of an impact on the Delegating leadership style (66.67%). The Associate Nurse maturity level, which included M2, M3 and M4, significantly influenced the Hersey & Blanchard leadership styles by 48.7% ($P=0.002$). The maturity level

of the medium category for the Associate Nurses (M2) influenced Selling leadership style 8.8 times greater than the Participating and Telling leadership style. The high maturity level of the Associate Nurses (M3) had an influence that was 19.8 times greater than the Selling, Telling and Participating leadership styles.

DISCUSSION

The characteristics of the Head Nurses is closely related to their choice of leadership style and is one of the important aspects that plays a role in shaping the behaviour and personality of the Head Nurses leading the inpatient units at X Hospital in achieving their goals. The description of the characteristics of the Head Nurses in this study included age, gender, length of work period and education level. The majority of the Head Nurses in this study were in the age group of < 30 years old. Head Nurses with an age < 30 years old were the early adult age group, and the attitude and behaviour of the Head Nurses was in a warm, close and communicative relationship stage according to Erickson. The education level of the Head Nurses in the 4 inpatient rooms (ICU, maternal, adult and child hospitalisation) was that the majority had a D3 education level (100%). The level of education of a leader will affect their ability to lead a unit in the hospital. If the level of education, experiences, and skills of the Head Nurse exceed those of the associate Nurses, then it is hoped that she will be able to provide guidance and motivate the associate Nurses⁶. The time serving as a Head Nurse in this study included the category of serving for 1-2 years as the majority. A Head Nurse who has served as a Head for a long time will certainly have more experience in leading her subordinates associate and her ability to manage an inpatient unit will be better compared with other who have not served as a Head Nurse for long. An experienced Head Nurse will certainly not experience difficulties leading an inpatient unit compared to nurses who have never previously served as a Head Nurses. The gender of the Head Nurses was all female (100%). Leaders of a different gender, male and female, will certainly have a different fundamental nature. Up to now, there is still a stereotype that a woman is considered to be less capable of being a leader^{7,8}. Female leaders will tend to use their feelings and act gently, while on the contrary, male leaders will tend to use their ability to think and act tougher. Female leaders can act as an agent who bring in changes⁹.

Situational leadership style based on approach of Hersey & Blanchard leadership style theory can be seen from the perception of the associate Nurses and the Head Nurse. The interactions within the same environment between the associate Nurses and Head Nurse will create the perception of the Head Nurse's leadership style on her behaviour. The majority of the Head Nurses in the 4 inpatient rooms of X Hospital use the Selling leadership style. The Selling leadership style applied by the Head Nurse is an appropriate leadership style when applied to employees who have lesser abilities but a high willingness to complete a task, which shows they are an employee with a medium maturity level (M2). The Selling leadership style influences individual performance, which will impact on organisational performance¹¹⁻¹³. In this study, leadership style based on Hersey & Blanchard significantly influences the caring behaviour of the Associate Nurses, but the effect is not as great as the influence of the Associate Nurses' maturity level. Selling leadership style applied by the Head Nurse is in accordance with the maturity level of the nurses in the 4 inpatient rooms of X Hospital. This means that it is consistent with Hersey & Blanchard's leadership style theory¹⁴.

The high maturity level of the Associate Nurses (M3) is more related to the participating leadership style, and the medium maturity level of the Associate Nurses (M2) is more related to the Selling leadership style. There is a match between applied leadership style with the level of employee maturity, which will make it easier to achieve any organisational goals, which also supports Hersey & Blanchard's leadership style theory¹⁴. The Head Nurse, as an effective leader in this theory, must be able to understand the situational dynamics and adjust her capabilities to the existing situation. The adjustment of the leadership style is the ability to determine the leadership style and behaviour needed when leading her subordinates based on a certain situation. The Head Nurse, as a leader in her unit, must be able to identify the maturity level of her subordinate Associate Nurses and have a high level of adaptability when observing a situation^{15,16}.

Based on the results of this study, it is known that the maturity level of the associate Nurses in the 4 inpatient rooms of X Hospital was of the medium maturity level (M2). The employee maturity level in this study also influenced the leadership style, as based on Hersey & Blanchard. According to Hersey & Blanchard, a leader

needs to understand her employees' level of maturity so then the leader will not apply the wrong leadership style in order to improve organisational performance¹⁷. To maximise the relationship of the Head Nurse as the leader with her subordinate associate Nurses, the Head Nurse must clearly determine the outcome, objectives, sub-tasks, and other specific tasks that will be completed by the associate Nurse. Without this clarity, the Head Nurse will find there to be difficulties related to determining the Associate Nurse's maturity level or the leadership style that must be applied to that maturity level. The caring behavior of the associate nurses in 4 inpatient rooms of X Hospital is more influenced by the leadership style rather than the maturity level of associate nurses. This explains the important meaning of head nurse's role as a leader in her unit to be able to influence the performance of associate nurses based on the leadership style that is matching the maturity level of associate nurses. The leadership style of the Head Nurse influences the caring behaviour of the Associate Nurses which is in accordance with the previous research conducted by Sfantou et al.,¹⁸. When leading subordinate associate Nurses, a Head Nurse must be able to distinguish the role between manager and actual leader because it is very contradictory¹⁹.

CONCLUSIONS

Hersey & Blanchard's leadership style has more of an influence on the caring behaviour of the associate Nurses than the maturity level of the Associate Nurses. The maturity level of the employee influences Hersey & Blanchard's leadership style. The higher the employee's maturity level, the more that the delegating leadership style becomes the most appropriate leadership style. Providing training on leadership style, supervising and evaluating performance periodically, providing guidance and support to the Head Nurse in relation to guiding and fostering the Associate Nurses in their role. Therefore, the skills and abilities, and the Associate Nurses' maturity can be improved.

Ethical Clearance: This study had passed ethical clearance issued by Ethical Committee of the Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia.

Source of Funding: This study is self funded research project.

Conflict of Interest: None.

REFERENCES

1. Purwoastuti E, Walyani ES. Mutu pelayanan kesehatan dan kebidanan. Yogyakarta: Pustaka Baru Press; 2015.
2. Rego A, Godinho L, McQueen A, Cunha MP. Emotional intelligence and caring behaviour in nursing. *Serv Ind J.* 2010;30(9):1419–37.
3. Perry AG, Potter PA. Buku ajar fundamental keperawatan; Konsep, proses dan praktik, Vol. 2 Alih Bahasa. Ed Monica Ester Dkk, Jakarta EGC. 2005;
4. Ivancevich JM, Gibson JL. Organizations: behavior, structure, processes. Irwin Professional Pub; 2005.
5. Hameed A, Waheed A. Employee development and its affect on employee performance a conceptual framework. *Int J Bus Soc Sci.* 2011;2(13).
6. Hughes SJ. The mentoring role of the personal tutor in the Fitness for practice' curriculum: an all Wales approach. *Nurse Educ Pract.* 2004;4(4):271–8.
7. Deal JJ, Stevenson MA. Perceptions of Female and Male Managers in the 1990s: Plus ça change... Sex Roles. 1998;38(3–4):287–300.
8. Pounder JS, Coleman M. Women—better leaders than men? In general and educational management it still “all depends.” *Leadersh Organ Dev J.* 2002;23(3):122–33.
9. Stainback K, Kleiner S, Skaggs S. Women in power: Undoing or redoing the gendered organization? *Gend Soc.* 2016;30(1):109–35.
10. Levitt DH. Women and leadership: a developmental paradox? *Adultspan J.* 2010;9(2):66–75.
11. Kombo BW, Obonyo GO, Oloko M. Effects of delegation on employee performance in Savings and Credit Cooperative Societies in Kisii County, Kenya. *Int J Bus Manag.* 2014;2(7):203.
12. Nwokocha I, Iheriohanma EBJ. Nexus between leadership styles, employee retention and performance in organizations in Nigeria. *Eur Sci Journal, ESJ.* 2015;11(13).
13. Parumasur SB, Govender P. Participative management as a critical ingredient for TQM. *J Econ Behav Stud.* 2013;5(11):740.

14. Hersey P, Blanchard KH. *Manajemen Perilaku Organisasi: Pendayagunaan Sumber Daya Manusia*. Penerbit Erlangga; 1995.
15. Furtunescu FL, Domnariu CD. Assessing The Leadership Style In Health Organizations From Romania. In: *Balkan Region Conference on Engineering and Business Education*. De Gruyter Open; 2014. p. 547–50.
16. Vroom VH, Jago AG. The role of the situation in leadership. *Am Psychol*. 2007;62(1):17.
17. Jeyakkumaran SS. An empirical study on transformational leadership and impact on employee performance in high technology industry. 2013;
18. Sfantou DF, Laliotis A, Patelarou AE, Sifaki-Pistolla D, Matalliotakis M, Patelarou E. Importance of Leadership Style towards Quality of Care Measures in Healthcare Settings: A Systematic Review. In: *Healthcare. Multidisciplinary Digital Publishing Institute*; 2017. p. 73.
19. Curtis EA, de Vries J, Sheerin FK. Developing leadership in nursing: exploring core factors. *Br J Nurs*. 2011;20(5):306–9.

The Relationship of Socio-Economic and Genetic Factors with Toddler Stunting at Kenjeran Public Health Center Surabaya

Dwi Ernawati¹, Puji Hastuti¹, Dhian Satya Rachmawati¹, Ari Susanti¹, Christina Yuliasuti¹,
Merina Widyastuti¹, Mieke Izzatul Mahmudah¹

¹School of Health Sciences Hang Tuah, Surabaya, Indonesia; Jl. Gadung No.1, Surabaya, Indonesia

ABSTRACT

Introduction: Stunting is a chronic nutritional problem arising from a malnourished condition that accumulates over a long period of time with a z-score of less than -2 SD. The incidence rate of stunting in Indonesia year to year has increased. The purpose of this study was to analyse the correlation of socioeconomic and genetic factors with the incidence rate of toddlers stunting.

Method: This research used a cross-sectional approach. The study population amounted to 568 toddlers. The sample technique using stratified random sampling and obtained 145 toddlers as the sample. The independent variables were socioeconomic and genetic factors via the questionnaire instrument. The dependent variable was the incidence rate of toddler stunting using the microtoise instrument. Data analysis was conducted using the Spearman rho test. The results of this study indicate that socioeconomic and genetic factors are related to the incidence rate of toddler stunting.

Results and Analysis: The results of the factors are; father's education analysis to stunting toddler $p = 0,002 < \alpha = 0,05$, mother's education to stunting toddler $p = 0,001 < \alpha = 0,05$, father's job to stunting toddler $p = 0,000 < \alpha = 0,05$, mother's activity to stunting toddler $p = 0,013 < \alpha = 0,05$, family income to stunting toddler $p = 0,002 < \alpha = 0,05$ and genetics to stunting toddler incidence $p = 0,000 < \alpha = 0,05$. The implication of this research is that the prevention of toddler stunting can be achieved by giving information about nutritious food with a low price and a method of processing food well that is affordable.

Keywords: *Toddler with stunting, Genetic Factor, Social Economy.*

INTRODUCTION

Stunting is a chronic nutritional problem, arising from a malnourished condition that accumulates over a long period of time¹. Stunting, according to the WHO Child Growth Standard, is based on the length-for-age (L/A) or height-for-age (H/A) index with a limit (z-score) less than -2 SD. Stunting is associated with an increased risk of morbidity and mortality, and stunted growth². Nutritional deficiencies that have received a lot of attention lately include a chronic nutritional problem in the form of short children (stunting).

Based on a preliminary study conducted by the researchers via an interview in February 2018, it showed that the residents around the Kenjeran Public Health Centre have been given counselling about the practice of providing nutritious food for children via an Integrated Service Post by the health workers. However, parents still do not apply the practice of giving healthy or nutritious food to their children correctly. Parents only provide side dishes in the form of tofu and tempeh. The incidence of stunting in toddlers in Indonesia is still very high, which was 35.6% (18.5% very short and 17.1% short) in 2010 and increased in 2013 to 37.2% (18.0% very short and 19.2% short) for those who experienced stunting. According to the results from Basic Health Research 2010, East Java was one of the provinces with a high stunting prevalence of 35.8% (20.9% very short and 14.9% short). The same thing was also shown in the results of the Basic Health Research in 2013, where the prevalence of stunted toddlers in the province of East

Corresponding Author:

Dwi Ernawati
School of Health Sciences Hang Tuah,
Surabaya, Indonesia
Jl. Gadung No.1, Surabaya, Indonesia
Email: Dwiernawati@stikeshangtuah-sby.ac.id

Java was included in the high group, which was between 30-39%³. The results of the preliminary study conducted at Kenjeran Public Health Centre Surabaya on February 15th, 2018 found that the results of stunting children in 2016 had a prevalence rate of 430 toddlers, or 14.78% (0.52% very short and 14.26% short).

One of the causes of stunting is socio-economic, where the family income influences the fulfilment of nutritional adequacy in toddlers which indirectly has an impact on their nutritional growth. Stunted children experience more disruption in carrying out their daily activities compared to children who are not stunted. Stunted children come from families with a low socio-economic status. Being of a low economic status is considered to have a significant impact on the possibility of children being thin and short⁴. Families with a good economic status can get access to better public services such as education, health services, and others so then they can affect the nutritional status of their children. In addition, the family’s purchasing power is increased, so then the family access to food will be better⁵.

A nurse acts as an educator to the parents about the risk factors that causes the incidence of stunting in children, so it can minimise the incidence rate.

METHOD

This study used a non-experimental research design with an analytic observational study type which aimed to determine the relationship between the variables and to explain the relationships found with the cross-sectional approach. This is a type of research that emphasises on the measurement or observation of the independent and dependent variables one at a time, with a follow-up. The instrument used a questionnaire for the socio-economic data and a data questionnaire for the genetic factors related to the incidence rate of toddler stunting. The sampling technique used in this study was probability sampling via the stratified random sampling approach. The study was conducted at Kenjeran Public Health Centre, Surabaya.

RESULTS

The relationship of the socio-economic and genetic factors with toddler stunting at Kenjeran Public Health Centre, Surabaya, as shown in the table 1 below.

Table 1: Characteristic demography of respondents

Father’s Education	Stunting Toddler Category				Total	
	Very Short		Short		N	%
	f	%	f	%		
Low (Junior High School and below)	34	45.3	41	54.6	75	100
Moderate (Senior High School)	15	25.4	44	74.6	59	100
High (Academy/College)	1	9	10	90	11	100
Total	50	34.5	95	65.5	145	100
The value of Spearman’s rho statistic test was 0.002 (p = 0.05)						
Mother’s Education	Stunting Toddler Category				Total	
	Very Short		Short		n	%
	f	%	f	%		
Low (Junior High School and below)	37	45.6	44	54.3	81	100
Moderate (Senior High School)	12	22.2	42	77.7	54	100
High (Academy/College)	1	10	9	90	10	100
Total	50	34.5	95	65.5	145	100
The value of Spearman’s rho statistic test was 0.001 (p = 0.05)						

Conted...

Father's Occupation	Stunting Toddler Category				Total	
	Very Short		Short			
	f	%	f	%	n	%
Merchant/ Entrepreneur	22	52.3	20	47.6	42	100
Fisherman	25	78.1	7	21.8	32	100
Civil Servant/Soldier/Policeman	0	0	4	100	4	100
Private	3	4.8	59	95.1	62	100
Other	0	0	5	100	5	100
Total	50	34.5	95	65.5	145	100
The value of Spearman's rho statistic test was 0.001 ($p = 0.05$)						
Mother's Occupation	Stunting Toddler Category				Total	
	Very Short		Short			
	f	%	f	%	n	%
Unemployed	47	32.1	73	60.8	120	100
Merchant/ Entrepreneur	0	0	11	100	11	100
Civil Servant/Soldier/Policeman	0	0	1	100	1	100
Private	3	25	9	75	12	100
Other	0	0	1	100	1	100
Total	50	34.5	95	65.5	145	100
The value of Spearman's rho statistic test was 0.013 ($p = 0.05$)						
Family Income	Stunting Toddler Category				Total	
	Very Short		Short			
	f	%	f	%	n	%
Low < 2,500,000	43	42.6	58	57.4	101	100
Middle 2,500,000-3,500,000	5	14.3	30	85.7	35	100
High > 3.500.000	2	22.2	7	77.7	9	100
Total	50	34.5	95	65.5	145	100
The value of Spearman's rho statistic test was 0.002 ($p = 0.05$)						
Genetic Factors	Stunting Toddler Category				Total	
	Very Short		Short			
	f	%	f	%	n	%
Normal Parents	22	68.8	10	31.3	32	100
Genetic history of stunting family	15	35.7	27	64.3	42	100
Genetic history of stunting mother	4	11.4	31	88.6	35	100
Genetic history of stunting father	9	25	27	75	36	100
Total	50	34.5	95	65.5	145	100
The value of Spearman's rho statistic test was 0.001 ($p = 0.05$)						

Based on the results of the Spearman rho test, there was a significance value of $p = 0.002$ with a significance level of 0.01 ($p < 0.05$). It can be concluded that there is a relationship between the father's education, mother's education, father's occupation, mother's occupation, family income and genetic factors and the incidence rate of stunted toddlers at Kenjeran Public Health Centre, Surabaya (Table 1).

DISCUSSION

Malnutrition can result in a failure to thrive and stunting in children. It also increases morbidity and mortality, especially in vulnerable to nutrition and disease age groups, which is children under five (toddler). This is the group that suffers the most from malnutrition and the number in the overall population is quite large. Various factors that influence the nutritional status of toddlers includes a lack of food supply, poor quality in the environment, socio-economic conditions (income, level of education, and employment) and family culture, such as family upbringing, as well as knowledge ⁶.

Socio-economy is sub-divided into three; namely education, employment, and family income which will be discussed as follows. The high education level of the parents can change a person's diet, which ultimately affects the nutritional status of the family, including the children⁴. The level of formal education is a factor that determines whether or not someone easily absorbs and pursues the acquired knowledge⁷. This study is in line with the study of Aramico, Sudargo and Susilo (2013), which states that there is a relationship between the father's education and stunting ($p < 0.001$) and OR 3.37. The high education level of the parents can change a person's diet, which ultimately affects the nutritional status of the family. Researchers assume that a low level for the father's education, those who graduated from junior high school or below, can affect nutritional status.

Level of education will affect the knowledge that is possessed by someone. The low level of the mother's education will have an impact on her limited knowledge about a healthy lifestyle and the importance of nutrients for the health and nutritional status of their child⁸. The education of the parents will have a direct influence on childcare patterns, which will then affect the child's food intake. Parents with a better education tend to have the knowledge and ability to implement better knowledge than parents with a low level of education². These results are supported by Medhin's study (2010 in, Ngaisyah and Septriana, 2016) which stated that the mother's education level affects the incidence rate of stunting, showing that there is a significant relationship ($p = 0.000$) and OR 4.06. The level of education will make it easier for a person or society to absorb information and to implement it in their daily behaviour and lifestyle.

A job is work, namely a series of tasks, that generates money for someone⁹. The household's economic status

can be determined by the work performed by the head of the household. The type of work done by the head of the household will determine how much of the household finances will be used to meet the needs of the family¹⁰. Researchers assume that those with jobs that generate less money can cause the household's children to experience a nutritional imbalance. The father's occupation status can also reduce the time spent together with the child, so the attention paid to the child's growth and development will decrease.

The quality of the mother's service in the family is determined by the mastery of information and the factor of adequate time availability. These two factors can be determined by the level of education, social interaction and occupation⁷. Changes in modernity can affect the family institution. The number of women who work outside home is increasing, both for self-actualisation and to meet the household's economic needs¹¹. Researchers assume that mothers who are staying at home and not working can take care and pay attention to the health and needs of their toddlers, which can support their growth better. Meanwhile, mothers who work have less time to pay attention to the growth of their children, so they are at a risk of malnutrition. The lack of nutrition needed by these toddlers is due to the business of the parents and their focus on their work; the attention to their children is thus reduced. A good nutritional intake often cannot be fulfilled by the child because of the family's economic crisis factor¹².

An adequate family income will support the child's growth and development because the parents can provide for their children's needs, both primary and secondary⁷. This study is also in line with the study of Aramico, Sudargo and Susilo (2013) which showed the significant relationship between family income and nutritional status ($p < 0.05$). The value of OR=3.5 95% indicates that families with a low economic status have a 3.5 times greater chance of their child suffering from malnutrition than families with a high economic status. Other studies that are in line with this result explained that the low socio-economic status (household assets) of the respondents has a 21 times greater risk of causing stunting compared to those with a high socio-economic status. Researchers assume that a family income that is below the District/City Minimum Wage has an impact on the growth of the toddler. This leads to the inability of the head of the family to meet the nutritional adequacy of their toddler.

The parents' height is associated with the physical growth of the children. A mother with a short body is one of the factors associated with the incidence rate of stunting. In toddlers, height is influenced by genetic and environmental factors during the growth period¹³. This result is in line with the study conducted by Hanum et al (2014, in Aulia, 2016) which showed that more stunted children have mothers of a short height compared to mothers of a normal height. Researchers assume that the parents' height is related to the incidence rate of stunting.

However, there are still many environmental factors that affect a child's height. In addition, several other studies have shown that the factors of education and work are related to the characteristics of parents, which is a cause of the high number of problems encountered by short toddlers. This study was supported by Mulvani (in Miko and Al-Rahmad, 2017), in that people with a high level of education generally pay more attention to their health problems.

CONCLUSION

Based on the findings in this study and testing the results, it can be concluded that socio-economic and genetic factors have a relationship with the incidence of stunting at Kenjeran Public Health Centre, Surabaya. This research is expected to provide information on the minimum family income required without reducing the supply of balanced nutrition in children. Cheap nutritious food and a good method of food processing is important. In addition, people can understand the incidence rate of stunting experienced by their children and become able to apply good nutrition to their children in an effort to minimise the number of stunting incidences.

Ethical Clearance: This study had passed ethical clearance issued by Ethical Committee of the Sekolah Tinggi Ilmu Kesehatan Hang Tuah Surabaya, Indonesia.

Source of Funding: This study is self-funded research project.

Conflict of Interest: None.

REFERENCES

1. Rahmayana R. Relationship of Mother's Care Pattern with Stunting Events Children Aged 24-59 Months in Asoka II Posyandu Coastal Area Kelurahan Barombong, Tamalate District, Makassar City, 2014. Universitas Islam Negeri Alauddin Makassar; 2014.
2. Kusuma KE, Nuryanto N. Risk factors for the incidence of stunting in children aged 2-3 years (Study in East Semarang District). Diponegoro University; 2013.
3. Ministry of Health/Indonesia. Situasi balita pendek. [Short toddler situation]. Info Datin. 2016;2442-7659.
4. Aramico B, Sudargo T, Susilo J. Socioeconomic relations, parenting, eating patterns with stunting in elementary school students in the district of Lut Bawar, Central Aceh district. *J Gizi dan Diet Indones (Indonesian J Nutr Diet)*. 2016;1(3):121-30.
5. Ni'mah K, Nadhiroh SR. Factors Related to Stunting Events in Toddlers. *Media Gizi Indones*. 2016;10(1):13-9.
6. Linda O, Hamal DK. Relationship between Education and Parent Work and Parenting with Toddler Nutritional Status in Kota and Kabupaten Tangerang, Banten. *Pros Penelit Bid Ilmu Eksakta*. 2011;
7. Pahlevi AE. Determinants of nutritional status in elementary school students. *J Kesehat Masy*. 2012;7(2):122-6.
8. Aulia D. Determinan Stunting pada Anak Usia 24-59 Bulan di Kelurahan Cimahpar, Kecamatan Bogor Utara. [Determinants of Stunting in Children Aged 24-59 Months in Cimahpar Village, North Bogor District].
9. Amaanina Df. Exclusive Asian Relations, Characteristics of Parents and Babies Against Growth and Development 6-Month-Old Babies at Mojolaban Health Center Sukoharjo District, Central Java. Universitas Airlangga; 2016.
10. Merryana Adriani SKM, Kes M, Wirjatmadi B, Gk S. Toddler Nutrition and Health: the role of micro-zinc in the growth of infants. KENCANA Prenada Media Group; 2014.
11. Latifah E, Hastuti D, Latifah M. Effect of breastfeeding and psychosocial stimulation on socio-emotional development of children under five in the mother's family work and not work. *J Ilmu Kel Konsum*. 2010;3(1):35-45.
12. Devi M. Analysis of factors that influence the nutritional status of children in rural areas. *Teknodan Kejuru*. 2012;33(2).
13. Ngaisyah RD. Socio-economic relations with the incidence of stunting in infants in Kanigoro village, Saptosari, Gunung Kidul. *Med Respati*. 2015;10(4).

Cultural Religiosity as the Determinant Factor of a Successful Healthy City in South Kalimantan, Indonesia

Herawati¹, Shrimarti R. Devy²

¹Doctoral Program of Public Health, Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia, School of Nursing, Universitas Lambung Mangkurat; ²Department of Health Promotion & Health Behaviour, Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

The concept and processes of a healthy city vary depends on the region. Each city should be allowed to develop and adapt to the uniqueness, culture and value of the respective society. This study aimed to explore the culture of community in Banjar, South Kalimantan, which related to realize healthy city. Qualitative research was conducted through community observation in the form of a documentation study, including an in-depth interview with several people and the respective community leaders. The data was analysed using the Miles and Huberman Model, including data reduction, data presentation and conclusion. There is the existence of a religious culture of the Banjar people of South Kalimantan. Religious cultures can be integrated into people's lives such as in the execution of healthy behaviour, which can be a determinant of a successful healthy city program.

Keywords: cultural religiosity, healthy city, Indonesia

INTRODUCTION

Health issue is significantly relevance to urban planning. Healthy urban planning could shape healthy social and environmental circumstances and vice versa, poor urban planning may contribute to the eruption of various diseases in the inhabitants within an urban area ¹. Urban issues do not only impact health and environment problems, but also be the key to achieve Sustainable Development Goals (SDGs) of creating favourable, safe and sustainable cities and residences (goal 11) ².

To overcome this health problem, a specific program is required. Public health programs, which maintain various relations between health services, residents and the urban area, are often not executed at a sufficient level. One of the programs initiated by the WHO was the "Healthy City Project" in 1986. This project was later spread, swiftly covering more than

7,500 cities around the world and more than 1,200 cities in Europe have come to the same perspective in order to revitalise the approach to health issues in urban life ^{3,4}pleasant, and green built environment, but also one that creates and sustains health by addressing social, economic, and political conditions. It describes collaborations between city planning and public health creating a contemporary concept of urban governance? a democratically-informed process that embraces values like equity. Models, critiques, and global examples illustrate institutional change, community input, targeted assessment, and other means of addressing longstanding sources of urban health challenges. In these ambitious pages, healthy cities are rooted firmly in the worldwide movement toward balanced and sustainable urbanization, developed not to disguise or displace entrenched health and social problems, but to encourage and foster solutions. Included in the coverage: Towards healthy urban governance in the century of the city Healthy cities emerge: Toronto, Ottawa, Copenhagen The role of policy coalitions in understanding community participation in healthy cities projects Health impact assessment at the local level The logic of method for evaluating healthy cities Plus: extended reports on healthy cities and communities in North and Latin

Corresponding Author:

Herawati
Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga;
School of Nursing, Universitas Lambung Mangkurat
Email: herawati-2017@fkm.unair.ac.id

America, Africa, Europe, Asia, Oceania, and the Middle East Healthy Cities will interest and inspire community leaders, activists, politicians, and entrepreneurs working to improve health and well-being at the local level, as well as public health and urban development scholars and professionals. Part I: Foundations and Historical Backdrop -- Introduction: Aims and Objectives of this Book -- Paleo-Epidemiology, Nomadism and Sedentism: Health and the City -- Urbanisation and Public Health -- Health in Canada in the 1970s and 1980s: Hotbed of Innovation -- Healthy Cities Emerge: Toronto -- Ottawa -- Copenhagen -- Healthy Cities Grow: Development of International, National, Regional, Linguistic Networks -- Eleven Qualities a City Should Strive to Provide (1986).

The concept of a healthy city is both an old-fashioned and new concept. "Old-fashioned" means that human beings have attempted to create healthier cities since the earliest periods of urban civilization. "New" is manifested as the primary medium of health promotion – new public health – in the search of health for all ⁵. Healthy city approaches have long been known as the most popular approach in the promotion of health ⁴.

A healthy city is an operational measure from a social model which aims to overcome negative health determinants ⁶. Health determinants are an important or essential factor used to increase health performance ^{7,8}. The WHO European Healthy Cities Network has from its inception aimed at tackling inequalities in health. In carrying out an evaluation of Phase V of the project (2009-13). The WHO mentioned that a health determinant consists of the following: the social and economic environment and the physical and mental characteristics of the individual ⁹.

The Human Development Index (HDI) data from the district of Banjar in 2015 was situated at rank 9 out of the 13 districts/cities existing in the province of South Kalimantan, and in 2016, the value of the HDI had relatively increased ¹⁰. However, the rank slightly dropped to 10th. One of the primary causes was the health issue present, aside from education and the economy. In 2016, the achievement target of a sanitary and healthy lifestyle in the level of household was still stood in the percentage of 47.6% from the overall amount of 39.765 households observed ¹⁰. Individual behaviour is shaped by culture ¹¹.

Further, every city has the possibility to develop respective parameters in accordance with the situational

uniqueness, culture and values ¹². Nevertheless, the research in this field is exceptionally limited, primarily in the context of the local government ¹. Due to the concept of health, ill perceptions are deeply attached to the concept of culture, and so this pushes researchers to dive further into societal culture, particularly in relation to a healthy attitude in order to realise a healthy city in the District of Banjar, South Kalimantan Province. Through comprehending the particular societal culture of the city in question, it is further expected that precise interventions can be delivered to achieve an optimal level of health ^{13,14}.

Thus, this study aimed to explore the culture of community in Banjar, South Kalimantan, which related to realize healthy city.

METHOD

Observation over the behaviour of society and in-depth interviews with the citizens and public figures of Banjar were conducted. The interviewed public figures consisted of chief of sub-divisions in municipal public health office of Banjar, director of a *pesantren* (Islamic Boarding School), chief-deputy of Healthy City Forum and chief of working cluster of Indrasari Urban Village. The interview was also conducted within wider society amounted to 15 individuals.

The questions prepared for this survey were open-ended. If the participants encountered difficulty when answering the questions or responded only briefly, then the researcher tried to deepen or follow up the information by requesting a further explanation about the participant's previous comment or requesting the participant to provide evidence from what they meant on the first occasion. The frequency and duration of interviews were in accordance with the initial commitment; around 60 to 90 minutes. However, it was limitless and manageable according to the situation and condition of the participants.

An unstructured passive participative observation was performed. The study did not use a default or systematically prepared instrument. A behavioural observation of the society and the condition of the physical environment were also conducted. Through observations, the researcher was equipped with a deeper knowledge in order to comprehend the data context across the entire social situation in order to be equipped with a holistic

and thorough perspective. The data was analysed using the Miles and Huberman Model, including data reduction, data presentation and conclusion.

RESULTS

The study was located in Banjar, one of the regencies in South Kalimantan. The Banjar lays claim to a popular designation called “The Piazza of Mecca”. The district has been visited by numerous scholars and the territory has been dominated by Muslims. However, there are a number of worshippers from various beliefs although on a lesser scale. In 2016, the citizens were made up of 99.20% Muslims, 0.27% followed Protestant Christianity, 0.25% followed Hinduism, and the rest followed Catholic Christianity and Buddhism/Animism with the percentage being 0.12% and 0.07% respectively and with other beliefs being 0.10%.

In 1835, during the government of Sultan Adam Alwasiqubillah, for the first time a sharia law was implemented in the sultanate of Banjar. Nowadays, Banjar has 19 sub-districts with 29 villages or urban villages situated in the city of Martapura. The motto of Banjar contains three key words of *baiman* (have religious atmosphere), *bauntung* (blessed by the God), and *batuah* (have noble characters).

The results show that the society of Banjar has a cultural uniqueness with a depth focused on religious values. In several areas in Banjar district territory, there were a number of Islamic boarding school. The other unique factor of this district was the written Arabic texts in the naming of public offices. This is supported by the result of an interview with one of the public figures in the society who said that:

“Banjar society tends to choose religious education such as in pesantren (Islamic boarding school), which commences from elementary level. The schools become the favourite of Banjar society, as it includes the subject of Arabic”.

Another similar statement came from another public figure, as follows:

“Banjar society views that formal school does not guarantee a wealthy life. It is different when it comes to learning religious subjects, hence worldly matters shall follow. This is a lead into a rewarding life. There are tons of people

in Banjar who did not go to formal school but they were able to become rich or sufficient economically”

South Kalimantan is popularly known as the city of a thousand rivers. One of the rivers is Sungai Barito, which passes through several areas in Banjar. From the observations, the particular river has been frequently used by the society as a means of transportation as well as in the fulfilment of their daily needs such as bathing, laundry washing, and defecating. Numerous people have been misusing it for unwise and deteriorating activities, such as disposing their trash in the river. Based on the results of a series of interviews from a number of informants from the civil sector of society, they revealed that the attitude of using the river for a variety of needs or to dispose of trash has been habituated and committed to over generations and therefore it is difficult to be corrected, primarily for those living in the periphery of the river. These facts can be identified from the account made by an informant from the civil section of society as follows:

“How about it? It has been habituated for so long, therefore it is difficult to be eliminated.”

Meanwhile, what has been conveyed by the public figure is not significantly different. The statement is as follows:

“Well... actually based on our perspective in our religion (Islam), it is crystal clear and comprehensive in detailing the ideas about health. In our culture, there is a saying that relates to ‘cleaning up’. However, because society preserves the river, there are still many people using the river to defecate in.”

Later on, from another public figure (religious), they revealed that among other things:

“There are have been so many students (santri) bathing in the river. Truly it is because such local culture has been difficult to change and eliminate.”

In relation to the previous efforts made by public figures and the local government, this matter has been conveyed by the municipal public health office.

“Truly, it is because socialisation has not been delivered intensively, so it is normal if the participation of society is still lacking due to the minimum level of understanding. The program of a ‘Healthy City’ originally belonged to society,

and the public health office as the authority should only act as a facilitator. The point is how it changes the behaviour of the society, whereas changing the attitude is not so simple.”

There is a willingness and hope from the religious public figures on this matter that the figures are able to assist in transforming society’s attitude to better behaviour as follows:

“Well, our hope is that we are going to be involved because for the time being, there are no invitations from the public health centres, the public health office and the other stakeholders to prompt discussion. If we are being involved, we will be forever grateful to be able to help. Hence, if our students are well-informed on health matters, they will extend this knowledge to others. That way, once they return home, they will be the role model in their villages and of course, be heard by their fellow villagers.”

DISCUSSION

The study discovered that the culture and religious values has been developed and dominated the structure of Banjar society. However, the religious values have not yet impacted holistically on their lives, including on the matter of health.

The pendulum definition or healthy statement has moved away from the medical model and returned to the social model which is not only focuses on individual but also considers the result of social, economic and cultural factors related to society^{15,16}. Many scholars had comprehended the prominence of culture to later on combine cultural content in the public health services¹⁷. According to Leininger, if the cultures of society do not fit with the health discourse, then the culture should be a subject for negotiation and need to be eliminated. However, if it is appropriate and able to support the health problems, then the particular culture should be preserved¹³.

Culture is a pattern of meaning. It is similar to the symbols that are historically distributed; a system of legacy that is consolidated, preserved, and developed by human-beings in the form of knowledge and attitude in their lives which is historically transmitted. One of the manifestations of culture can be contextualised in religion^{18,19}.

Religion is seen of as a structure of various beliefs and the implementation of custom which is integrated into the cultural life of society. It is a working framework used to comprehend and create decisions. Religion can be defined as a system of rational belief through practices and/or as a set of beliefs, rituals and morals^{20,21}. Religion can also be beneficial as a source of power to be abided by in the context of values and attitude. The majority of religions are equipped with a tradition involving certain beliefs and practices related to the afterlife and life attitude, either well or ill^{18,22}.

Islam is a religion which highly encourages human-beings to maintain cleanliness in life, to be healthy and to be environmentally-friendly. There are a number of verses in the Quran and Hadiths of the prophet, which contain various messages related to the encouragements. Health, with its respective paradigm, can be applied when disseminating information regarding the application of Islamic values, hence, there is no gap between the holiness of Islamic teaching with daily life attitude from the perspective of health²³.

CONCLUSION

There is a major power possessed by society, which is the capacity of social capital through culture in form of religious values. This particular matter can support and act as a determinant to actualise a healthy city if the society is capable of realising the particular values involved in the transformation of a healthy lifestyle and the existence of a favourable partnership between society and public figures.

Conflict of Interest: None.

Ethical Clearance: The study passed ethical clearance from Ethical Committee of the Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia.

Source of Funding: Self-funded.

REFERENCES

1. Palutturi S, Darmawansyah D, Nurhayani N. Partnership Pemerintah Pusat, Provinsi dan Kota Terhadap Implementasi Healthy Cities di Indonesia: Studi Kasus di Makasar. Universitas Hasanuddin;
2. Balaban O, Puppim de Oliveira JA. Sustainable buildings for healthier cities: assessing the co-

- benefits of green buildings in Japan. *J Clean Prod* [Internet]. 2017 Oct [cited 2018 Sep 20];163:S68–78. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0959652616001359>
3. Leeuw E de, Simos J. Healthy cities : the theory, policy, and practice of value-based urban planning. 2015. 515 p.
 4. Hu SC, Kuo H-W. The development and achievement of a healthy cities network in Taiwan: sharing leadership and partnership building. *Glob Health Promot* [Internet]. 2016 Mar 19 [cited 2018 Sep 20];23(1_suppl):8–17. Available from: <http://journals.sagepub.com/doi/10.1177/1757975916641566>
 5. Soedirham O. Kota Sehat sebagai Bentuk Sustainable Communities Best Practice. *Kesmas Natl Public Heal J* [Internet]. 2012 Sep 1 [cited 2018 Sep 20];7(2):51. Available from: <http://journal.fkm.ui.ac.id/kesmas/article/view/9>
 6. de Leeuw E. Evidence for Healthy Cities: reflections on practice, method and theory. *Health Promot Int* [Internet]. 2009 Nov 1 [cited 2018 Sep 20];24(Supplement 1):i19–36. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19914985>
 7. Logie C. The case for the World Health Organization's Commission on the Social Determinants of Health to address sexual orientation. *Am J Public Health* [Internet]. 2012 Jul [cited 2018 Sep 20];102(7):1243–6. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22594723>
 8. Ritsatakis A, Ostergren P-O, Webster P. Tackling the social determinants of inequalities in health during Phase V of the Healthy Cities Project in Europe. *Health Promot Int* [Internet]. 2015 Jun 1 [cited 2018 Sep 20];30(suppl 1):i45–53. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26069317>
 9. World Health Organization. WHO | The determinants of health [Internet]. WHO. World Health Organization; 2010 [cited 2018 Sep 20]. Available from: <http://www.who.int/hia/evidence/doh/en/>
 10. Dinas Kesehatan Kabupaten Banjar. Profil Kesehatan Kabupaten Banjar Tahun 2016. Martapura: Dinas Kesehatan Kabupaten Banjar; 2017.
 11. Ellinas C, Allan N, Johansson A. Dynamics of organizational culture: Individual beliefs vs. social conformity. *PLoS One* [Internet]. 2017 [cited 2018 Sep 20];12(6):e0180193. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/28665960>
 12. World Health Organization. WHO Healthy Cities Project: Promoting Health in the Urban Context [Internet]. Geneva: World Health Organization; 2000 [cited 2018 Sep 20]. 1-47 p. Available from: http://www.euro.who.int/__data/assets/pdf_file/0013/101650/E87743.pdf
 13. McFarland M. Medeline Leininger: Culture care theory of diversity and universality. In: Tomey, A. M. & Alligood MR, editor. *Nursing theorists and their work*. St. Louis, Missouri: Mosby, Inc.; 2006. p. 472–96.
 14. Purnell LD. Transcultural health care : a culturally competent approach [Internet]. F.A. Davis; 2013 [cited 2018 Sep 20]. 505 p. Available from: <https://www.fadavis.com/product/transcultural-health-care-competent-purnell>
 15. World Health Organization. Constitution of the World Health Organization. Basic Documents, Forty-fifth edition, Supplement, October 2006 [Internet]. Geneva: World Health Organization; 2006 [cited 2018 Sep 20]. p. 1–20. Available from: http://www.who.int/governance/eb/who_constitution_en.pdf
 16. WHOQOL SRPB Group. A cross-cultural study of spirituality, religion, and personal beliefs as components of quality of life. *Soc Sci Med* [Internet]. 2006 Mar [cited 2018 Sep 20];62(6):1486–97. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/16168541>
 17. Sagar P. Transcultural Nursing Theory and Models: Application in Nursing Education, Practice, and Administration [Internet]. New York: Springer Publishing Company, LLC; 2012 [cited 2018 Sep 20]. Available from: http://lghhttp.48653.nexcesscdn.net/80223CF/springer-static/media/samplechapters/9780826107480/9780826107480_chapter.pdf
 18. Rumun AJ. Influence of Religious Beliefs on Healthcare Practice. *Int J Educ Res* [Internet]. 2014 [cited 2018 Sep 20];2(4):37–48. Available from: www.ijern.com

19. Inbadas H, Inbadas, Hamilton. History, Culture and Traditions: The Silent Spaces in the Study of Spirituality at the End of Life. *Religions* [Internet]. 2016 May 9 [cited 2018 Sep 20];7(5):53. Available from: <http://www.mdpi.com/2077-1444/7/5/53>
20. Molzahn AE, Sheilds L. Why is it so hard to talk about spirituality? *Can Nurse* [Internet]. 2008 Jan [cited 2018 Sep 20];104(1):25–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18286982>
21. Johnson GE, Wright FC, Foster K. The impact of rural outreach programs on medical students' future rural intentions and working locations: a systematic review. *BMC Med Educ* [Internet]. 2018 Dec 14 [cited 2018 Sep 6];18(1):196. Available from: <https://bmcmmededuc.biomedcentral.com/articles/10.1186/s12909-018-1287-y>
22. Haynes A, Hilbers J, Kivikko J, Ratnavyuha D. Spirituality and Religion in Health Care Practice A person-centred resource for staff at the Prince of Wales Hospital Multicultural Health Unit [Internet]. Sydney; 2007 [cited 2018 Sep 20]. Available from: https://www.rch.org.au/uploadedFiles/Main/Content/cultural_services/Spirituality_Staff_Resource.pdf
23. Taufik MT. Pendidikan Kesehatan Bernuansa Agama. Serang: Rineka Cipta; 2007.

The Relationship between Response Time and Patient Survival with Emergency Treatment by the Code Blue Team

Al Afik

Nursing Programme, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta

ABSTRACT

Introduction: Code blue has a considerably prominent role in the management of emergency situations in the hospital setting. Rapid and appropriate management will affect the morbidity and mortality rate of patients during an emergency situation. This study aimed at analysing the relationship between time response and the survival of the patients who received emergency treatment by the code blue team in hospital.

Method: This research used a correlational design with a cross-sectional study approach. The sample of this study was 74 patients who received emergency treatment by the code blue team in RS PKU Muhammadiyah Yogyakarta within the period November 2015 - July 2017. The data was generated from secondary data. The analysis test of the data was undertaken by using a Spearman rank test with a 5% significance level.

Results: The average response time performed by the code blue team in emergency call management was 6.09 minutes and the survival of patients after obtaining the management of the code blue team was that 82.4% died and 17.6% were treated in an intensive room. The result of the Spearman test showed that there is a relationship between the response time and the survival of patients who received emergency management by the blue code team (p-value: 0.04).

Conclusion: The speed response of the code blue team in providing emergency management corresponds to the patient's survival. The faster the patient received treatment, so would the mortality rate decrease.

Keywords: *response time, survival, emergency, code blue*

INTRODUCTION

A patient's heartbeat stopping is one emergency situation which requires immediate treatment. It is expected that heartbeat cessation in the United States that occurred in the hospital setting ranged roughly between 250,000 to 750,000 cases per-annum with the percentage of successful resuscitation action between 0% - 59%¹. A delay in the treatment for heartbeat cessation patients will reduce the number of living patients² the average call rate was only 9.8 calls/ 1000 admissions. Anecdotal

feedback and a group-administered questionnaire conducted in July 2003 demonstrated a number of obstacles to initiating calls and the system was modified in October 2004. Specifically, emergency response calls were separated into Code Blue calls (for cardiorespiratory arrests. Factors which influence the level of successful resuscitation in a case of heartbeat cessation include the early detection ability, the arrival of the emergency group, the immediate activation of Cardiopulmonary Resuscitation treatment (CPR), the distribution of early-stage medication, the time-space between the heartbeat cessation moment and the distribution of defibrillation, the capacity of the emergency team, as well as the experience of team participation on related training courses¹. The outcome of this research unveiled that the time when heartbeat cessation occurs determines the level of sustainable living of the patient. Patients who experience heartbeat cessation on the evening or during the weekend have a lower living sustainability level, except for when in the emergency department and other

Corresponding Author:

Al Afik
Nursing Programme,
Faculty of Medicine and Health Sciences,
Universitas Muhammadiyah Yogyakarta
Email : afik72@umy.ac.id

intensive units (ICU, ICCU, HCU, PICCU, NICU) due to the constant presence of medical officers. Henceforth, the presence of the Code Blue team becomes important when in charge of emergency treatment across the hospital environment. In the presence of the Code Blue team, it is expected that the team can contribute to the enhancement of the patient's living sustainability in an emergency³. The Code Blue team is a group of individuals assigned to perform first hand treatment and precautionary measures on patients who experience heartbeat cessation or breathing disorders in the hospital environment⁴.

The Code Blue Team performs emergency action treatment by involving medical personnel from multi-disciplinary backgrounds. It requires fine coordination and partnership as well as a singularity of perception during the treatment in order to attain maximum results⁵.

MATERIAL AND METHOD

This research was included in the category of quantitative research with a descriptive and correlational study approach which describes the relationship between response time and the patient's survival ability in those who attained emergency treatment from the Code Blue team. The approach of this research was a cross-sectional study. The collection of the research data was performed using secondary data collected from the Code Blue's medical record data in RS PKU Muhammadiyah Yogyakarta. The secondary data was generated from all patients whose received treatment from the Code Blue team between November 2015 to July 2017, amounting to 74 patients. The generated data included their identity, the status of the patient's health, response time and the patient's survival ability after receiving treatment from the Code Blue team. Response time is the time space between the relief request being made to the Code Blue team up to the commencement of the patient's handling in order for them to receive treatment. Survival is the patient's condition after receiving emergency treatment by the Code Blue team, including whether the patient is dead or alive (treated in an intensive care unit). Moreover, characteristic data collection was also performed by the Code Blue team whose personnel were standing by in the hospital. Data analysis was performed by analysing the relationship between response time and the patient's survival ability through the Spearman Rho test with a level of significance of 95%.

RESULTS

The analysis results of the response time and emergency treatment success performed by the Code Blue team is shown in Table 1 below.

Table 1: The Average Response Time and Patient Survival Ability

No.	Variable	Result
1.	Response Time Average	6.09 minutes
2.	Patient's survival after receiving emergency treatment by Code Blue	
	Died	82.4 %
	Treated in an intensive unit	17.6 %

DISCUSSION

Code Blue is one of the emergency services available in a medical hospital, established as an effort and strategy for the prevention of heartbeat cessation incidents, including the activation of the emergency system as well as the delivery of resuscitation actions during an emergency incident. In the enforcement of its system, Code Blue involves a variety of components which consist of human resources including medical and non-medical personnel, favourable facilities and an infrastructure including medical tools and medical drugs, the delivery system of Code Blue which consists of a Standard Operational Procedure as well as control and evaluation mechanisms. During its implementation, emergency activation in a medical hospital will be connected to a medical team assigned to commence with immediate basic and further assistance⁶. The purpose of the Code Blue system is to intercept the occurrence of heartbeat cessation in hospital, to guarantee basic and further living assistance support swiftly and effectively as well as performing post-heartbeat cessation medical treatment in an optimal manner⁷.

An emergency situation is a condition which threatens the life of a person and requires immediate relief. Swift and precise handling will be able to increase the living sustainability of a person, hence able to decrease the rate of mortality. The result of this research unveiled that there is a relationship between response time with the survival ability of patients who received emergency treatment from the Code Blue team. This is in line with the results of the previous research which

stated that response time is considerably influential on the living sustainability of patients who experience an emergency situation⁸ translated by some EMS operations into a goal of a response time of 8 minutes or less for advanced life support (ALS). Emergency calls with a response time of less than five minutes will increase the living sustainability of patients compared to a response time of more than five minutes⁹ this remains speculative and unreported. **OBJECTIVE** To determine the effect of current RTs on survival in an urban EMS system. **METHODS** The study was conducted in a metropolitan county (population 620,000). A response time of less than five minutes will prevent the occurrence of *brain damage*, hence, patients with heartbeat cessation will not experience physical defects, or death. The result of this research shows that early initiation by intervening through Basic Life Support and Advance Cardiac Life Support will repair the survival rate of the patient. Therefore, a delay in performing treatment will lead to a negative effect related to the survival ability of the patient^{10,11}.

The standard response time has not yet determined. However, a recommendation of response time has been delivered among other things; in four minutes, the patient has to be treated by CPR accompanied by the activation of *Automatic External Defibrillation*. Furthermore, in eight minutes, the patient has to receive definitive treatment and other supporting treatment which may elevate the living sustainability of the patient^{12,13}. The enhancement of response time is expected to increase the living sustainability of a patient by as much as 24%¹⁴. A response time with a duration of four minutes is connected to the refinement of Return of Spontaneous Circulation (ROSC)¹⁵. The patient's condition after the resuscitation measure can attain a minimum systolic pressure of 60 mm Hg and with palpability of the carotid pulse without CPR, although there are lethal arrhythmias; Ventricular Fibrillation (VF), Ventricular Tachycardia (VT), Asystole (AS), and Pulseless Electrical Activity (PEA) and the existence of electrical activity that is not palpable by pulse¹⁶. RISC after VF/VT, which is important to take into account, is the condition of hypoxemia and hypotension, as well as immediate diagnosis including medication due to the presence of ST – *Elevasi Myocard Infark* (STEMI). ROSC after PEA/AS, taking into account the condition of hypoxemia and hypotension, makes it necessary to perform therapy on the root cause of cardiac arrest¹⁷. Observations are

required after ROSC in order to determine several supporting aspects that will be physiologically able to preserve the circulation within the body.

The swift handling of a situation by the Code Blue team is influential towards life sustainability for the patient. It requires the favourable partnership of and coordination among the team members in order for the patient's treatment to perform as expected. The result of this research showed that there is no difference within the perception of each Code Blue team member toward the applied Code Blue system. The existence of difference was identified in matters connected to leadership, and the role and responsibility of each discipline of knowledge, experience as a team member of Code Blue, as well as the duration of being certified as Advance Cardiac Life Support (ACLS) personnel. Therefore, the effort of refinement related to providing sustainable training for the Code Blue team becomes significantly important in order to lift up the level of effectiveness and to refine the quality of the team⁵. In a number of hospitals, the performance of Code Blue is rare to be observed and evaluated. The composition of the Code Blue team is often interchangeable based on scheduling and rotation, hence, this enables the probability of a lack of partnership among the team members¹. In reality, coordination and partnership among the team members is one of the most prominent aspects to be undertaken in managing patients, giving favourable result as expected.

CONCLUSION

It was discovered that there is a relationship between response time and the survival of patients who received emergency treatment from the Code Blue team. Treatments for patients who experience an emergency situation should be performed immediately and precisely in order for the success rate of the treatment to be larger. This will impact on the patient's mortality rate

Conflict of Interest: The authors disclose no conflict of interest.

Ethical Clearance: The protocol of this research was approved by the Commission of Ethic, Research, and Health; Health Polytechnic; Ministry of Health; Malang City, in accordance with a recommendation letter over ethical approval (No.003/KEPK-POLKESMA/2017).

Source of Funding: This study was self-funded.

REFERENCES

1. Villamaria FJ, Pliego JF, Wehbe-Janek H, Coker N, Rajab MH, Sibbitt S, et al. Using Simulation to Orient Code Blue Teams to a New Hospital Facility. *Simul Healthc J Soc Simul Healthc* [Internet]. 2008 [cited 2018 Sep 25];3(4):209–16. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19088665>
2. Jones DA, Mitra B, Barbetti J, Choate K, Leong T, Bellomo R. Increasing the use of an existing medical emergency team in a teaching hospital. *Anaesth Intensive Care* [Internet]. 2006 Dec [cited 2018 Sep 25];34(6):731–5. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17183890>
3. Qureshi SA, Ahern T, O'Shea R, Hatch L, Henderson SO. A Standardized Code Blue Team Eliminates Variable Survival from In-hospital Cardiac Arrest. *J Emerg Med* [Internet]. 2012 Jan 1 [cited 2018 Sep 25];42(1):74–8. Available from: <https://www.sciencedirect.com/science/article/pii/S0736467911001387>
4. Price JW, Applegarth O, Vu M, Price JR. Code Blue Emergencies: A Team Task Analysis and Educational Initiative. *Can Med Educ J* [Internet]. 2012 [cited 2018 Sep 25];3(1):e4–20. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26451171>
5. Mahramus T, Frewin S, Penoyer DA, Sole M Lou. Perceptions of Teamwork Among Code Team Members. *Clin Nurse Spec* [Internet]. 2013 [cited 2018 Sep 25];27(6):291–7. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24107752>
6. Graves J. Code Blue Manual [Internet]. Brisbane: Queensland Health; 2007 [cited 2018 Sep 25]. Available from: <http://ars102.weblog.esaunggul.ac.id/wp-content/uploads/sites/5970/2017/03/012.-Code-blue-manual.pdf>
7. Monangi S, Setlur R, Ramanathan R, Bhasin S, Dhar M. Analysis of functioning and efficiency of a code blue system in a tertiary care hospital. *Saudi J Anaesth* [Internet]. 2018 [cited 2018 Sep 25];12(2):245–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29628835>
8. Blanchard IE, Doig CJ, Hagel BE, Anton AR, Zygun DA, Kortbeek JB, et al. Emergency Medical Services Response Time and Mortality in an Urban Setting. *Prehospital Emerg Care* [Internet]. 2012 Jan 5 [cited 2018 Sep 25];16(1):142–51. Available from: <http://www.tandfonline.com/doi/full/10.3109/10903127.2011.614046>
9. Blackwell TH, Kaufman JS. Response time effectiveness: comparison of response time and survival in an urban emergency medical services system. *Acad Emerg Med* [Internet]. 2002 Apr [cited 2018 Sep 25];9(4):288–95. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/11927452>
10. Vukmir RB. Survival from prehospital cardiac arrest is critically dependent upon response time. *Resuscitation* [Internet]. 2006 May [cited 2018 Sep 25];69(2):229–34. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/16500015>
11. Neukamm J, Gräsner J-T, Schewe J-C, Breil M, Bahr J, Heister U, et al. The impact of response time reliability on CPR incidence and resuscitation success: a benchmark study from the German Resuscitation Registry. *Crit Care* [Internet]. 2011 [cited 2018 Sep 25];15(6):R282. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22112746>
12. Valenzuela TD, Roe DJ, Cretin S, Spaite DW, Larsen MP. Estimating effectiveness of cardiac arrest interventions: a logistic regression survival model. *Circulation* [Internet]. 1997 Nov 18 [cited 2018 Sep 25];96(10):3308–13. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/9396421>
13. De Vreede-Swagemakers JJM, Gorgels APM, Dubois-Arbouw WI, Dalstra J, Daemen JAP, Van Ree JW, et al. Circumstances and causes of out-of-hospital cardiac arrest in sudden death survivors. *Heart* [Internet]. 1998 [cited 2018 Sep 25];79:356–61. Available from: <http://heart.bmj.com/>
14. O'Keeffe C, Nicholl J, Turner J, Goodacre S. Role of ambulance response times in the survival of patients with out-of-hospital cardiac arrest. *Emerg Med J* [Internet]. 2011 Aug 1 [cited 2018 Sep 25];28(8):703–6. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20798090>
15. Antonio M, Carmona-Bayonas A, Saldaña J, Navarro V, Tebé C, Salazar R, et al. Factors Predicting Adherence to a Tailored-Dose Adjuvant Treatment on the Basis of Geriatric Assessment in Elderly People With Colorectal Cancer: A Prospective Study. *Clin Colorectal Cancer*. 2018;17(1):e59–68.

16. Rehmani R, Baqir M, Amanullah S. Return of spontaneous circulation and survival at hospital discharge in patients with out-of-hospital and emergency department cardiac arrests in a tertiary care centre. *J Pak Med Assoc* [Internet]. 2007 Jun [cited 2018 Sep 25];57(6):278–81. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17629226>
17. Neumar RW, Otto CW, Link MS, Kronick SL, Shuster M, Callaway CW, et al. Part 8: Adult Advanced Cardiovascular Life Support 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. 2010 [cited 2018 Sep 25]; Available from: <http://circ.ahajournals.org>

The Influence of Nurse's Knowledge Level on Behaviour Changes, Attitude and 5 Moments of Hand Hygiene Compliance

Danoe Soesanto

*Department of Public Health and Humaniora, Universitas Ciputra Surabaya, Indonesia,
UC Town Citraland, Surabaya, Indonesia*

ABSTRACT

Introduction: The five moments of handwashing, established by the World Health Organisation (WHO), are important to break the chain of transmission of disease. Human behaviour is influenced by two factors, namely behavioural factors and factors related to outside behaviour. Behaviour is formed from three factors: predisposing factors (knowledge, attitudes, beliefs and values), supporting factors (physical environment, availability or absence of health facilities) and reinforcing factors (in the form of the nurses' attitude and behaviour). This study aims to determine the effect of the level of knowledge of nurses in nursing homes on their attitude, behaviour and adherence related to the 5 moments of hand hygiene.

Method: This study used a questionnaire to measure the level of knowledge, attitude, behaviour and level of adherence of the nurses concerning the 5 moments of hand hygiene. The research design used an analytic cross-sectional approach. The respondents were all nurses at Panti Werdha Surya, and the sampling technique used was purposive sampling. The study was conducted between January and April 2018.

Results and Analysis: The data was analysed using a multinomial regression test. The results showed the influence of nurses' level of knowledge on attitudinal changes ($p = 0,000$). There was an influence from the nurses' level of knowledge on behavioural change and there was influence from the nurses' level of knowledge on compliance with the 5 moments of hand hygiene ($p = 0,000$) in an effort to prevent the transmission of shingles in nursing homes.

Conclusion: The level of knowledge of nurses needs to be improved continuously, so then changes in attitude, behaviour and adherence take place concerning the 5 moments of hand hygiene. This is as well as providing hand washing and rubbing facilities at each door within the nursing home.

Keywords: *Level of Knowledge, Attitudes, Behaviour, Compliance, Nursing home*

INTRODUCTION

An elderly individual, according to Article 1 number 2-3 Law Number 13 Year 1998 about the Prosperity of the Elderly, is a person who has reached the age of 60. Community groups including the elderly mostly now live in nursing homes, and there is a trend that society is continuously increasing in relation to life expectancy.

The elderly who live in a nursing home are susceptible to contracting infectious disease. This can be caused by the prevalence of organ function decline, the existence of dementia and incontinence, poor oral hygiene, and trouble swallowing¹.

Infectious diseases that commonly affect the elderly in nursing homes include pneumonia, urinary tract infections and skin and soft tissue infections. Pneumonia is still the main cause of morbidity and mortality in adults who are older, and, with an increase in age, it becomes the cause of almost half of all hospitalisations and related deaths^{2,3}. A population census from a statistics agency in 2010 showed that the elderly in Indonesia were counted as being 18,043,712; in other words, 7.68% of 237 million Indonesian citizens were elderly⁴.

Corresponding Author:

Danoe Soesanto
Department of Public Health and Humaniora,
Universitas Ciputra Surabaya, Indonesia
UC Town Citraland, Surabaya, Indonesia
Email: danoe.soesanto@ciputra.ac.id

Hand hygiene is a main and important factor related to preventing the spread of pathogens and antibiotic resistance, whether in hospitals or in nursing homes, because the number of infections that can be transmitted through the hands of a caretaker is vast. Hand hygiene can prevent Health Care Associated Infections (HAIs) and increase the health of the elderly. Hand hygiene is a part of standard care that can decrease infections in the health team and also in the patients⁵. Washing of the hands is one of the effective steps undertaken to break the chain of infection transmission, hence the number of incidences of nosocomial infections and Health Care Associated Infections can be reduced⁶. Research results shows that effective education programs can increase knowledge, positive behaviour, the right practices when conducting prevention policies and infection control⁷. Non-compliance when concerning hand hygiene is a bad behaviour and one that can be controlled during training⁸. Health workers need more information and education on the prevention and control of infection, especially in relation to hand hygiene to increase the quality of the offered health services⁹. There is a relationship between the knowledge of a nurse regarding nosocomial infection with washing of the hands, as observed at the Inpatient installation in Dharmais Cancer Hospital in Jakarta¹⁰. Knowledge and behaviour are factors that relate to nursing practices and the prevention of nosocomial infections in phlebitis events in RSUD, Semarang¹¹.

The knowledge of a nurse about the 5 moments of handwashing is very influential and related directly the practice of handwashing. In the previous research, the knowledge of nurses on hand washing was still categorised as not good according to the results (70.5%)¹². The five moments of handwashing are not implemented well by nurses. This is supported by the research of Koeswo dan Pratama (2015), where it was shown that nurses do not wash their hands in the first moment by 52%, 50% in the second moment, 75% in the third moment, 69% in the fourth moment and 78% in the fifth moment. Previous research done by Pateda dan Rabbani (2013) showed the results that 16.7% of hand washing behaviour was in the good category, 24.4% was in the less good category and 59% was in the bad category. Supporting factors including physical environment and the available health facilities for hand washing that, when realised optimally, can ease the realisation of the positive attitude and behaviour of the health worker when it comes to doing the 5 moments

hand Hygiene¹³. The purpose of this research in general was to acknowledge the impact of the level of education of nurses on the attitude, behaviour and obedience of nurses in Surya Surabaya nursing home concerning the practice of the 5 moments of Hand Hygiene.

METHOD

The research design used was analytical and observational, using a cross-sectional approach. The population in this research included all executive nurse in Surya Nursing Home who had worked there for at least 2 years. The technique used to take samples was saturated sampling, where all the available population became the sample of the research. This research was conducted between January and April 2018. The data was taken using a research instrument in the form of a questionnaire about the characteristics of the nurse, and their level of knowledge, attitude, behaviour and obedience using a Likert scale model (5). Before we did the main body of the research itself, we conducted a validity test and questionnaire about the reliability beforehand. We then analysed the data obtained using a multinomial logistic regression test.

RESULT

Table 1: Characteristics of the respondents and the related variables

Variables	n	%
Sex		
Male	0	0
Female	100	100
Age		
21-30 years old	3	13,64
31-40 years old	18	81,82
41-50 years old	1	4,55
Education		
High School	17	77,27
Diploma 3	5	22,73
Working Time		
0-2 years	2	9,09
3-5 years	6	27,27
6-8 years	12	54,55
9-10 years	2	9,09

Conted...

Level of Knowledge		
Very Good	0	0
Good	1	4,55
Bad	19	86,36
Very Bad	2	9,09
Attitude		
Strongly Agree	1	4,55
Agree	2	9,09
Average	16	72,73
Disagree	3	13,64
Behaviour		
Very Supportive	2	9,09
Supportive	1	4,55
Average	17	77,27
Less Supportive	2	9,09
Level of Obedience		
Very Obedient	0	0
Obedient	1	4,55
Average	9	40,91
Disobedient	12	54,55

In Table 1, the respondents were categorised based on their sex, age, level of education and working time ($n = 22$). All of the respondents were female (100%), and almost all of the executive nurses were aged between 31 years old – 40 years old (81.82%). The level of knowledge of almost all of the executive nurses was that of high school (77.27%) and most of the executive nurse had worked for 6-8 years.

Based on Table 1, we can see that almost all of the nurse's had a level of knowledge about the 5 moments of hand hygiene in the bad category (86.36%), and that only a few of the executive nurses had good knowledge (4.55%). Meanwhile the attitude of the nurses about hand hygiene being able to prevent the transmission of disease showed that most of them stated Agree (72.73%), and only a few of the executive nurses stated Strongly Agree (4.55%). The behaviour of the executive nurses in the context of supporting hand hygiene to prevent the transmission of disease showed that almost all of them stated Average (77.72%), and only a few stated Very Supportive (9.09%). The level of Obedience of the nurses in doing the 5 moments of hand hygiene found that most of them stated Disobedient (54.55%), and only a few stated Obedient (4.55%). This research shows that there is a meaningful

and positive correlation between the level of knowledge of the nurse about the 5 moments of hand hygiene and the obedience of physically doing the 5 moments of hand hygiene, with a strong level of correlation ($r=0,701$; $p=0,021$). This means that the lower the knowledge of the nurse about the 5 moments of hand hygiene, the worse the obedience of the nurse when it comes to doing the 5 moments of hand hygiene. The results of the multinomial logistic regression test showed that the level of knowledge of the nurses about the 5 moments of hand hygiene can only explain the quality change in the level of obedience but also that the impact of knowledge level is significant ($p=0,000$). Regarding the attitude of the executive nurses, there is a meaningful correlation between the attitude of the nurse about the 5 moments of hand hygiene and obedience when it comes to physically doing the 5 moments of hand hygiene, and it was shown that the power of the correlation is weak ($r=0,190$; $p=0,031$). This means that the better the attitude of the nurse about the 5 moments of hand hygiene, the better the level of obedience when physically doing the 5 moments of hand hygiene. The results of the multinomial logistic regression showed that the attitude of the nurses about the 5 moments of hand hygiene can be used to explain the impact of the attitude of the nurse about the 5 moments of hand hygiene by 10.7% and that the impact of the attitude of the nurse related to obedience is significant ($p=0,000$). Regarding the behaviour of the executive nurse and obedience when doing the 5 moments of hand hygiene, there was a meaningful correlation between the behaviour of the nurse and obedience, and the correlation was strong ($r=0,690$; $p=0,001$). This means that the more supporting behaviour that there is from the nurse regarding the 5 moments of hand hygiene, the better the level of obedience. The results of the multinomial logistics regression test showed that the behaviour of the nurses concerning the 5 moments of hand hygiene react with the obedience of the nurse and the 5 moments of hand hygiene by 13.8% and that the impact is significant ($p=0,000$).

DISCUSSION

The respondent's knowledge regarding the 5 moments of hand hygiene is linked to their associated level of obedience ($p=0,000$). The higher the respondent's knowledge about the 5 moments of hand hygiene, the more obedient the nurses were when it came to practising the 5 moments of hand hygiene ($r=0,701$). The impact of the level of knowledge had a big impact

on the obedience of the nurse by 10.1%. This shows that the impact on obedience comes from a different factor other than knowledge (89.9%). The finding of this research supports the previous research done by Al-Khawaldeh, Al-Hussami and Darawad (2015), who stated that education on hand hygiene will affect the knowledge, attitude and behaviour of paediatric nurses and NICUs in Zanjan hospitals¹⁴. Other than that, the awareness of nurses about the right way to wash their hands is a process that pushes them to adhere to hand hygiene situations. Hence, the quality of nursing care is affected by the knowledge, attitude and behaviour of the executive nurses who provide health care. Only a little part of this research was specially related with the nurses, although there is evidence that shows that the obedience of nurses related to doing the 5 moments of hand hygiene can be improved by the application of audits and increased knowledge and supervision, which will cause a change in the culture of the working environment and obedience to promote doing the 5 moments of hygiene the correct way¹⁵.

The research findings show that there is a gap in the level of knowledge of the nurses, which can be overcome with a short and more frequent training system, especially in hospitals. The guidelines on the 5 moments of hand hygiene are well known by nurses and well-promoted in hospitals. This is reflected by the positive attitude of the nurse and non-medical staff. Improving the compliance of the nurses can be done by training continuously¹⁶. The nurses need to remember the lessons from their study experience, because this will be effective at increasing their knowledge and understanding that this will also affect their behavior in a positive way. This means that the importance of the individual's experience has a bigger impact than formal teaching methodology¹⁷.

CONCLUSION

The knowledge, attitude and behaviour of executive nurses has a significant effect on the obedience of executive nurses concerning the 5 moments of hand hygiene. Other than the level of knowledge, attitude and behaviour of the individual nurse, it is suspected that age and working time also affects the obedience of the executive nurse. Training and the periodic delivery of information is needed whether by electronic media or via practice to increase the level of knowledge of nurse is important, so then nurses will be more obedient

at adhering to the 5 moments of hand hygiene. Other things that can increase the obedience of the nurse concerning their adherence to the 5 moments of hand hygiene is by supplying all doors with hand rub to ease the implementation of the 5 moments of hand hygiene.

Ethical Clearance: This study had passed ethical clearance issued by Ethical Committee of the Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia.

Source of Funding: This study is self funded research project.

Conflict of Interest: None.

REFERENCES

1. High KP, Juthani-Mehta M, Quagliarello VJ. Infectious diseases in the nursing home setting: challenges and opportunities for clinical investigation. *Clin Infect Dis.* 2010;51(8):931–6.
2. Curns AT, Holman RC, Sejvar JJ, Owings MF, Schonberger LB. Infectious disease hospitalizations among older adults in the United States from 1990 through 2002. *Arch Intern Med.* 2005;165(21):2514–20.
3. Jackson ML, Neuzil KM, Thompson WW, Shay DK, Yu O, Hanson CA, et al. The burden of community-acquired pneumonia in seniors: results of a population-based study. *Clin Infect Dis.* 2004;39(11):1642–50.
4. Badan Pusat Statistik. Sensus Penduduk Indonesia. Jakarta: Badan Pusat Statistik; [Central Bureau of Statistics. Indonesian Population Census. Jakarta: Central Statistics Agency]. 2010.
5. Centers for Disease Control and Prevention. Hand Hygiene in Healthcare Settings | Hand Hygiene | CDC [Internet]. 2010 [cited 2018 Sep 24]. Available from: <https://www.cdc.gov/handhygiene/>
6. Boyce JM, Pittet D. Guideline for hand hygiene in health-care settings: recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. *Infect Control Hosp Epidemiol.* 2002;23(S12):S3–40.

7. Martín-Madrazo C, Salinero-Fort MA, Abanades-Herranz JC, Arnal-Selfa R, García-Ferradal I, Espejo-Matorral F, et al. Effectiveness of a training programme to improve hand hygiene compliance in primary healthcare. *BMC Public Health*. 2009;9(1):469.
8. Fitzpatrick M, Everett-Thomas R, Nevo I, Shekhter I, Rosen LF, Scheinman SR, et al. A novel educational programme to improve knowledge regarding health care-associated infection and hand hygiene. *Int J Nurs Pract*. 2011;17(3):269–74.
9. Rajcevic S, Djuric P, Grujicic M, Dugandzija T, Cosic G. Knowledge, habits and attitudes of health care workers about hand hygiene. *Healthmed*. 2012;6(4):1418–23.
10. Mada MD, Susilo CB, Nekada Cdy. Hubungan Pengetahuan Perawat Tentang Infeksi Nosokomial Dengan Penerapan Prinsip Steril Pada Pemasangan Infus Di Rs Kristen Lende Moripa, Sumba Barat. [Relationship between Nurse Knowledge of Nosocomial Infection with the Application of Sterile Principles in Infusion Installation in Rs Kristen Lende Moripa, West Sumba]. *Med Respati*. 2013;8(1).
11. Purlinawati R. Faktor-Faktor Yang Berhubungan Dengan Praktik Perawat Terhadap Pencegahan Infeksi Nosokomial Kejadian Phlebitis Di Rsud Kota Semarang Tahun 2014. [Factors Associated with Nurse Practices Against Prevention of Nosocomial Infections in Phlebitis Events in the City of Semarang in 2014]. 2014;
12. Zahidie A, Rabbani F. Impact of water and sanitation and health education interventions on health and hygiene behaviors: a study from a northern Pakistani village. *Pakistan J Public Heal*. 2013;3(1).
13. Sirait A, Saragih RM. Faktor-Faktor Yang Berhubungan Dengan Kejadian Diare Pada Balita Di Desa Simanabun Kec. Silou Kahean Kabupaten Simalungun Tahun 2010. [Factors Related to Diarrhea in Toddlers in Simanabun Village, Kec. Silou Kahean Simalungun Regency in 2010]. 2010.
14. Al-Khawaldeh OA, Al-Hussami M, Darawad M. Influence of nursing students handwashing knowledge, beliefs, and attitudes on their handwashing compliance. *Health (Irvine Calif)*. 2015;7(05):572.
15. Winship S, McClunie-Trust P. Factors influencing hand hygiene compliance among nurses: An integrative review. *Kai Tiaki Nurs Res*. 2016;7(1):19.
16. Al Ra'awji BA, Almogbel ES, Alharbi LA, Alotaibi AK, Al-Qazlan FA, Saquib J. Knowledge, attitudes, and practices of health-care workers regarding hand hygiene guidelines in Al-Qassim, Saudi Arabia: A multicenter study. *Int J Health Sci (Qassim)*. 2018;12(2):3.
17. Kennedy M, Burnett E. Hand hygiene knowledge and attitudes: comparisons between student nurses. *J Infect Prev*. 2011;12(6):246–50.

The Role of Posyandu Cadres in Improving the Growth and Development of Toddlers in RW VII Puskesmas Mojo, Surabaya

Enung Mardiyana Hidayat¹, Rini Ambarwati², Indriatie³

¹Nursing Program, Health Polytechnic of Ministry of Health at Surabaya, Indonesia,
Jl. Pucang Jajar Tengah No.56, Surabaya, Indonesia

ABSTRACT

Introduction: Posyandu cadres have an important role as health care providers who are located near to the targeted Posyandu. When the Posyandu cadre enters information on the KMS (Card Toward Health) is less clear, resulting in the implication of the Posyandu not performing well. The purpose of this research is to analyse the relationship between the Posyandu cadre's role in promoting growth and the development of toddlers in Puskesmas Mojo, Surabaya.

Method: This study used a cross-sectional research design. The population under study in this research were all Posyandu cadres and toddlers registered in the RW VII area, resulting in 38 Posyandu cadres and 38 toddlers. The type of research was analytic, using the Spearman Rank statistical analysis.

Results: The majority of the Posyandu cadres performed well (68.6%), and more than half of the toddlers (71.4%) had good growth based on anthropometric measurements. The majority of the toddlers (74.3%) had normal development in accordance with the pre-screening questionnaire that was developed (KPSP). The statistical test used, the Spearman rank, showed the value of $r = 0.29$, $p = <0.05$, which means that there is a relationship between the role of the cadres and the growth and development of toddlers according to their nutritional status. The role of the cadres with the development of relations based on KPSP was $r = 0.12$, $p = <0.05$, which means that there is a relationship between the role of cadres with the growth and development of toddlers by KPSP. There is a need for sustainable activities by involving the active participation of the parents in the early detection of toddler growth and development. Further studies involving the role of the parents, cadres and toddlers is suggested.

Keywords: *Posyandu Cadres, Growth and Development, Toddlers.*

INTRODUCTION

A real form of community empowerment is the presence of various forms of Community-Based Health Service (UBKM) in each working area of Puskesmas. The Community-Based Health Services (UBKM) with

the most tangible role that has been able to develop in the society is Posyandu. Posyandu consists of a 5 priority program (KB, KIA, nutrition, immunisation, and diarrhoea prevention) and has been proven to possess leverage in decreasing the mortality rate of infants and mothers. The development and improvement of the service quality very much depends on the role of the community, which consists of the cadres. Cadres have a very big function in Posyandu, starting from the succession of the Posyandu, mediating with the supporting institution of the Posyandu, serving as an executive planner, and as an advisor along with a trainer to motivate the community who are taking a part in the activities of their local Posyandu.

Correspondence Author:

Enung Mardiyana Hidayat
Nursing Program,
Health Polytechnic of Ministry of Health at Surabaya,
Indonesia
Jl. Pucang Jajar Tengah No.56, Surabaya, Indonesia
Email: mardiyana.hidayat@gmail.com

The success rate of Posyandu goes along with the hard work of the cadres who have volunteered themselves to organise their local Posyandu. The lack of training to improve their sufficient skills has resulted in a lack of knowledge regarding the role of the cadres, a lack of information and no coordination between the officer and cadres in the operating of Posyandu, which might result in a low attendance number of toddlers. This will also lower the scope of early growth detection in toddlers¹. The role of the cadres is very important as they hold the responsibility of implementing the programs of Posyandu. If the cadres are passive, then the implementation of Posyandu will not be able to run smoothly and result in the undetected nutritional status of toddlers. This will indirectly impact the success rate of the Posyandu program, especially in terms of analysing the growth of toddlers.

In 2013, only 40% of at least 250,000 Posyandu in Indonesia were still active and only around 43% of toddlers' health status was analysed. Meanwhile, the number of active cadres in Posyandu was found to be 205,227². The passiveness of the Posyandu cadres is happening in Posyandu Kecamatan Mojo as well. The lack of presence in relation to the Posyandu cadres' role will surely be impactful, whether directly or not. The direct impact to the child will be the insufficient examination of their growth and development which will impact on the unmonitored health status of the child. The indirect impact for the cadres is the unclearness of KMS filling in, and accordingly the implementation of Posyandu will be irrelevant. The goal of this research is to analyse the role of Posyandu cadres in improving the growth and development of toddlers.

METHOD

The type of research used was an analytical correlation with a cross-sectional research design. The population under research was all Posyandu cadres and toddlers registered in the RW VII working area, which was made up of 38 persons and 38 toddlers. The samples were several cadres and toddlers of RW the VII Puskesmas Mojo working area in Surabaya, with the criteria of the sample being that the cadres were willing to participate and that the 2-3 year-old toddlers were willing to be researched. The active cadres in the Posyandu program numbered 35 respondents, gathered using a *simple randomised sampling* technique.

The independent variable is the role of the Posyandu cadres in improving the growth and development of toddlers in the RW VII Puskesmas Mojo working area of Surabaya and the dependent variable is the growth and development of toddlers in the same working area. For the growth category, there was normal nutrition status, lack of nutrition status, and malnutrition status. Meanwhile, for the development category, there was excessive development, normal or relevant development, and a lack of development or deviation. To determine the value of the relationship between the Posyandu cadres and the monitoring of the growth and development of toddlers, we used the statistical correlation test of *Spearman Rank*.

RESULT AND DISCUSSION

Table 1: Frequency distribution of the Posyandu cadres' characteristics in the RW VII Puskesmas Mojo working area in Surabaya in September–October 2017

Age	Number	Percentage
Early Adult (26 – 35 years old)	3	8.6
Late Adult (36 – 45 years old)	14	40
Early Elderly (46 – 55 years old)	10	28.6
Late Elderly (56 – 65 years old)	6	17.1
Seniors (Above 65 years old)	2	5.7
Total	35	100
Education	Number	Percentage
Elementary School	6	17.1
Junior High School	9	25.7
Senior High School	16	45.8
University	4	11.4
Total	35	100
Period as Cadres	Number	Percentage
Less than a year	-	-
1 – < 5 years	15	42.9
5 – < 10 years	12	34.3
10 – < 15 years	4	11.4
≥ 15 years	4	11.4
Total	35	100

Conted...

Cadres Training	Number	Percentage
Never	26	74.2
1 – 3 times	7	20
4 – 6 times	1	2.9
> 6 times	1	2.9
Total	35	100
Cadres Knowledge	Number	Percentage
Good	25	71.4
Average	8	22.9
Bad	2	5.7
Total	35	100
Sex	Frequency	Percentage
Male	17	48.6
Female	18	51.5
Total	35	100
Age	Frequency	Percentage
>12 – 18 months	6	17.1
>18 – 24 months	7	20

Conted...

>24 – 36 months	22	62.9
Total	35	100
Cadres' Role	Frequency	Percentage
Good	24	68.6
Average	9	25.7
Bad	2	5.7
Total	35	100
Toddlers' Nutrition Status	Frequency	Percentage
Good	25	71.4
Deficient	5	14.3
Bad or malnutrition	5	14.3
Total	35	100
Toddler growth	Frequency	Percentage
Relevant	26	74,3
In Doubt	7	20
Deviation	2	5,7
Total	35	100

Table 2: Cross-tabulation of the cadres' role in relation to the growth and development of toddlers of the age of 1–3 years old based on their nutrition status in the Posyandu RW VII Puskesmas Mojo working area in Surabaya

Role	Nutrition Status						Total	
	Bad		Average		Good			
Role	n	f	N	f	N	f	n	F
Bad	0		2	100	0		2	100
Average	2	22.2	2	22.2	5	55.6	9	100
Good	3	12.5	1	4.2	20	83.3	24	100
Total	5	14.3	5	14.3	25	71.4	100	100

Table 3: Cross-tabulation of the cadres' role and the development of toddlers in the age range of 1–3 years old based on KPSP in the Posyandu RW VII Puskesmas Mojo working area in Surabaya

Role	Nutrition Status						Total	
	Good		Average		Bad			
Role	n	f	n	f	n	f	n	f
Good	0		1	50	1	50	2	100
Average	1	11.1	4	44.4	4	44.4	9	100
Bad	1	4.2	2	8.3	21	87.5	24	100
Total	2	5.7	7	20	26	74.3	35	100

Based on Table 1, nearly half of the cadres, 14 cadres (40%), were 36 – 55 years old. Nearly half, 16 cadres (48%), were high school graduates and nearly half, 15 cadres (42.9%), had been a cadre for 1 - <5 years.

Nearly all, 26 cadres (74.2%), had never been trained as a Posyandu cadre and nearly all, 25 cadres (71.4%), had a good level of knowledge with regards to understanding and improving the growth and development rate of

toddlers. Based on Table 2, it can be seen that there is a tendency of a good cadre role being associated with the good nutritional status of toddlers and vice versa. The results of the statistical test of Spearman Rank was in the number of $r = 0.029$ with $p = < 0.05$, which means that there is a link between the role of the cadres and the growth and development of toddlers based on their nutrition status. Based on Table 3, it can be seen that there is a tendency for a good cadres' role to be followed by good KPSP in the toddlers, and vice versa. The results of the statistical test of Spearman Rank was in the number of $r = 0.012$ with $p = < 0.05$, which means that there is a relationship between the cadres' role and the growth and development of toddlers based on KPSP.

DISCUSSION

The organisation of the Posyandu cadres consists of equal job distribution between the cadres in relation to preparing and implementing. Meanwhile, the organisation of the cadres in relation to the growth and development of toddlers is the measurement of their weight and the measurement of LILA and KMS filling along with KPSP, which are the activities of the cadres in relation to detecting the growth and development of toddlers. The deviation of the toddlers' weight in those who were not weighed was discontinued if a lack of protein was found. They were given additional food, prevented diarrhoea in the toddlers, made OER and supervised and socialised related to the toddlers' health. The Posyandu cadres are the health provider closest to the Posyandu, and so the frequency of meeting with the cadres is more than meeting with any other health assistant. Therefore, the cadres should be active in many activities, not only in the context of implementation but also in subjects related to the organisation, like event planning, note taking and reporting on the cadres' meetings³.

Based on this study, the results show that there is a significant relevancy between the role of the cadres and the growth of the toddler. The analysis of the relationship between the cadres' role and the nutrition status of the toddler shows $r = 0.029$, meaning that there is a relevancy between the cadres' role and the development of the toddler based on their nutrition status.

According to the research of Purwanti and Rasyid (2014), their study also showed the relevancy between the cadres' role and the nutrition status of the toddlers. This happened because the cadres are volunteers chosen

from and by society to work for the health of society. Nutritional activity in the Posyandu is one of the main activities and generally becomes the priority when implementing the Posyandu's activities. Nutritional service in Posyandu is done by the cadres. This activity includes weighing the individual's body mass, recording the weighing result in KMS for the early detection of growth deviation, nutritional socialisation, PMT and vitamin A supplying. In the Posyandu activities, the cadres have a very important role aside from organising the activities of the Posyandu (administrator) and providing education (educator). The cadres also empower the activeness of mothers who have toddlers, prompting them to come to the Posyandu (motivator). Posyandu cadres are the closest health provider in relation to the Posyandu activities, and seeing the cadres directly is done more frequently than seeing any other health assistant⁴.

The role of the cadres is very important because they are responsible for the implementation of Posyandu activities and programs. If the cadres are passive, then the implementation of the program in Posyandu will also move stagnantly, impacting on the nutrition status of infants and toddlers (below 5 years old) as it cannot be detected properly. The presence of the cadres' role is to be able to facilitate society in decreasing the rate of malnutrition. Moreover, it also contributes to decreasing the mortality of mothers and toddlers by utilising the skills and facilities relevant to the improvement of the nutrition status of toddlers⁵. The role of the cadres impacts on the nutrition status of the toddler, meaning that if the cadres' role is high, so does the negative nutrition status of toddlers decrease.

Based on the statistical Spearman Rank test, the result shows that there is a significant relevancy between the cadres' role and the development of the toddlers. The analysis result of the relevancy between the cadres' role and the toddlers' nutritional status shows $r = 0.012$, meaning that there is a relationship between the cadres' role and the growth and development of toddlers based on KPSP.

The development of the toddler may be impacted by many external factors. For instance, the role of society and the health service. One of the roles of society in relation to health services is through Posyandu⁶. Posyandu also has many important roles in relation to optimising the development of the children, given to the

cadres as part of a strategic institution, since through Posyandu, they encounter many health problems such as nutrition and birth control, including the toddlers bearing developmental disorders⁷. The child's development is related to changes in the children, including changes that are physical, cognitive, emotional and even psychosocial. This development shows the quality of the available human resources (SDM) in relation to the next steps. Accordingly, a child is hoped to be able to reach an age-paralleled development phase⁸. The government has undertaken many attempts in relation to this, including implementing the SDIDTK program. Such a program includes an evaluation of the child's development by using KPSP as an obligatory activity in Posyandu.

CONCLUSION

The results have shown that most Posyandu cadres play a good role in relation to improving the growth and development of the toddlers in the Puskesmas Mojo working area in Surabaya. The growth and development of the toddlers can be seen through their nutrition status and KPSP monitoring, which also experienced an improvement and can be thus categorised as well done. The good role of the Posyandu cadres will impact the growth and development of the toddler based on their age. Thus, it is advised that continuous training and briefing for the cadres needs to be done in order to improve the knowledge of the cadres, especially in relation to early growth detection and the development of the toddlers. For the health cadres, it is hoped for all of them to become active in training and briefing so then there will be an improvement in knowledge overall, especially registering the KMS and KPSP given by the Puskesmas.

Ethical Clearance: This research has passed the ethical test conducted at the Ethics Committee of the Health Polytechnic of Ministry of Health at Surabaya.

Source of Funding: This study is a self-funded research project

Conflict of Interest: None

REFERENCES

1. Harisman H. Factors Affecting the Activity of Posyandu Cadres in Mulang Maya Village, South Kotabumi District, North Lampung Regency in 2012. *J Dunia Kesmas*. 2013;1(4).
2. Ministry of Health of Indonesia. East Java Health Profile 2013. Surabaya East Java Provincial Health Office. 2014;
3. Suliasih S. Analysis of Implementation of Documentation of Data on Monitoring of Nutritional Status of Toddlers at Night Posyandu, Working Area of Colomadu I Health Center in 2013. Universitas Muhammadiyah Surakarta; 2013.
4. Wahyutomo AH. Relationship between Characteristics and Role of Posyandu Cadres with Monitoring of Toddler Growth and Development at Kalitidu-Bojonegoro Health Center. Graduate School of Sebelas Maret University Surakarta Thesis Program. Solo; 2010.
5. Purwanti D, Pajeriaty P, Rasyid A. Factors Related to Toddler Nutritional Status in the Madello Health Center Work Area, Barru District. *J Ilm Kesehat Diagnosis*. 2014;5(1):8–13.
6. Siahaan RB. Implementation of Early Childhood Growth Detection Program in Posyandu in the Work Area of Sentosa Baru Health Center, Medan Perjuangan District, 2005. 2006;
7. Ministry of Health of Indonesia. Malnutrition Management Strategy in Indonesia. First Lecture of the Public Health Study Program. 2005;
8. Rohmawati W, Rahmawati NA. The influence of maternal parenting type on toddler growth in Srijaya posyandu, Pucang Miliran village, Tulung sub-district, Klaten regency. *INVOLUSI J Ilmu Kebidanan (Journal Midwifery Sci)*. 2015;2(3).

Analysis of the Implementation of Pregnancy-related Health Care Services Through the Continuum of Care Approach in Puskesmas Bukittinggi City

Evi Hasnita¹, Armita Sri Azhari¹

¹Master Program of Public Health, STIKes Fort De Kock, Indonesia

ABSTRACT

Introduction: Maternal mortality was related to 303,000 complications in pregnancy and childbirth in 2015. In the City of Bukittinggi, the number of maternal deaths in that year was three people. For 2016 to reduce the mortality rate, the WHO and other organisations in various countries advocate for the Continuum of Care program, which provides care in a sustainable and integrated manner.

Method: This research study was qualitative with a phenomenological approach. This research was carried out in the working area of the Bukittinggi City Health Office with the study time being July - October 2017. The data was obtained from in-depth interviews with two kinds of informants, namely key informants and supporting informants. This interview was conducted semi-structurally (semi-structured interviews). The data analysis used the Collaizi method.

Results: The results of the input, processing and output research showed that the Continuum Of Care program for pregnant women and postpartum mothers in the Bukittinggi city health centre was well-implemented because it was supported by the performance of the health workers and supported by the government. It was concluded that the Continuum of Care program at the city health centre of Bukittinggi was well-implemented.

Keywords: *Continuum Of Care, Maternity Services, Postpartum Maternal Health Services.*

INTRODUCTION

Based on the estimation of the UN Secretary-General, the maternal mortality number has decreased by 44 per cent from 385 to 216 per 100,000 survived childbirth. This means that the yearly average rate has decreased by 2.3 per cent. Less than 5.5. per cent of the yearly rate needed to reach the three per four-fold decreasing of the number of maternal deaths in for 2015 in Millennium Development Goal number 5¹. Almost all of the maternal deaths (99 per cent) happened in developing states².

The concept of Continuum of Care was first established in 1970, stating that the period of pregnancy, maternity, postpartum and through to being elderly are all related to various types of nursing service. The purpose of Continuum of Care is to improve the probability of the mother receiving proper care during labour, in addition to professional nursing care before, during, and after labour so then the risk of death or disability will be suppressed for both the mother and the newborn³.

In the city of Bukittinggi, the maternal mortality rate in 2016 was 3 deaths. This number has decreased from 2015, in which the rate was 7 deaths. The maternal mortality number has had a fluctuated graphic since 2014, with the number of 1 death then increasing rapidly in 2015 to 7 deaths, before decreasing in 2016 to 3 deaths. From January 2017 through to June 2017, 1 death in relation to maternal mortality has been recorded. This is pursuant to the purpose of the 2015 SDGs (*Sustainable Development*

Correspondence Author:

Evi Hasnita

Postgraduate Program of Public Health,
STIKes Fort De Kock, Indonesia

Jl. Soekarno Hatta, Bukittinggi, Sumatera Barat, Indonesia

Email: evi.hasnita@yahoo.co.id

Goals) on the third point, which is to ensure a healthy life and to maintain the prosperity of all persons of all ages. Thus, the approach that uses the *Continuum of Care* will be done⁴. The SPM target (Minimum Standards Services) of Bukittinggi is 95%. Accordingly, the K4 coverage of 2016 still needs to be improved in order to reach this target. The goal of this study is to analyse the implementations of the treatment of mother and child by using the continuum of care approach.

METHOD

This research was a qualitative research on the treatments for pregnant women, mothers in labour and postpartum mothers through the approach of *Continuum of Care* during 2016 through to 2017. This research was conducted in the working area of Bukittinggi Public Health Service, between July and October 2017. The informants in this research consisted of the key informants, who know and possess the basic information needed in the research. The key informants of this research were 1 Head of the Public Health Service and 7 Heads of the local Puskesmas. The main informants were 7 people from each Puskesmas in charge of KIA, and 1 person in charge of KIA. The supporting informants consisted of 7 postpartum mothers.

The instrument of the qualitative research study was the researcher herself. Because the researcher is the main instrument in the research, the relationship between the researcher and the informants is an intensive one. The instruments and the supporting utilities used to collect the data were in the form of an interview guide, document examination list, notation utilities (book and pen), recorder and camera.

RESULTS

From the data analysis, the researcher found there to be 3 theme clusters which explain the problem of the researcher. The first theme cluster was about INPUT (program policies, the availability of the human resources, funding, facilities and infrastructure), the second was about PROCESS (the treatment of pregnant women and the treatment of postpartum mothers) and the third cluster was OUTPUT (coverage of the K1-K4 visit, coverage of the mother/child rights fulfillment, the coverage of labour assistance PN/Non PN and the coverage of KF1-KF3 visits).

Input:

1. Policies: Based on the interviews, it can be concluded that the policies about the health assistance in Bukittinggi refer to the vision and mission of the Mayor of Bukittinggi, as there are no specified policies and all of the indicators need have been stipulated in the form of RPJMF, strategic plans and a work plan. The purpose of the health service policy is to improve access to sufficient health services for everyone at each stage of life with the approach of there being one unity of service (*Continuum Of Care*) through a comprehensive intervention (promotive, preventive, curative and rehabilitative)⁵. The researcher has assumed that the analysis of the health service policy in Bukittinggi is being implemented sufficiently by the leader and the program holder of each health care sector, because each sector of health coverage in Bukittinggi has been fulfilled. It shows that the health workers in Bukittinggi work and provide services to the community, pregnant women and postpartum mothers based on the existing standards and indicators.

2. Human Resources (SDM): Based on the interviews, it can be concluded that the availability of human resources to implement the KIA program in Bukittinggi is enough, whether in the Public Health Service Berdasarkan or in the Puskesmas in Bukittinggi. Health workers are the spearhead of the implementation of the health service program. Accordingly, the placement of health assistants needs to be in a strategic position, which therefore shall be ruled on clearly and assertively. The availability of competent resources is not enough if there is no sufficient support in relation to the proper facilities and infrastructures⁶. Based on the assumptions of the researcher, an analysis of the availability of human resources in implementing the KIA program in the working area of Bukittinggi was enough, and the collected data shows that the amount of resources in the working area of public health service and Puskesmas is sufficient.

3. Funding: Based on the interview, it can be concluded that the source of funding for the implementation of the KIA program in the public health service or the Puskesmas came from

APBD, APBN, BOK and BPJS. Meanwhile, for the KIA program, the source of funding was from DAK. The availability of funding is enough for the public health service and Puskesmas. Based on the assumption of the researcher, the availability of funding for the KIA program is enough when from the government in the form of APBD, APBN, BJPS, JKN or BOK. In this case, the public health services or Puskesmas do not receive any other source of funding, such as from entrepreneurs or the private sector, or from any other non-binding source of funding.

4. Facility and Infrastructure: Based on the interview, it can be concluded that the facilities and infrastructure of the KIA program in Bukittinggi Puskesmas is enough. The organiser of the Puskesmas can handle the existing obstacles swiftly, because the sufficiency of facility and infrastructure in the Puskesmas is one of the requirements accredited to the Puskesmas. Most of the Puskesmas in Bukittinggi have been accredited. The researcher assumed that, based on the interview, the analysis on the sufficiency of the facilities and infrastructure of the Puskesmas in Bukittinggi was enough. This statement is supported by the other informants who explained that there have been no complaints or problems while undergoing treatment in the Puskesmas via the midwives.

Process:

1. Health Care for Pregnant Women: Based on the interview, it can be concluded that the health care for pregnant women in the KIA program of the Puskesmas in Bukittinggi has been implemented and going well. There have been no complaints or problems voiced by the visiting patients or from those who taking medication whether in the health service, via the midwife, or in the Puskesmas in Bukittinggi. Pregnancy assistants prioritise continuous care. (*Continuum of Care*). Based on Mansjoer (2000), routine pregnancy checks will help the mother to monitor the growth of the baby⁷. The mother can do this each month to see whether or not the baby is growing normally and is active in the womb. The researcher assumed that from the interview, the analysis of the status of health care for pregnant women in

the Puskesmas in Bukittinggi has encountered no problems. Healthcare for pregnant women in many Puskesmas in Bukittinggi is considered to be enough to fulfil the coverage of health care for pregnant women, such as the K1-K4 visits. The involvement of the cadres and the activeness of the midwife supports the proper implementation of health care for pregnant women.

2. Health Care for Maternity services: Based on the interview, it can be concluded that the health care for maternal services in Puskesmas Bukittinggi has been implemented properly as there have been no complaints or problems in relation to the treatment from the patients helped by the midwives of Puskesmas or those helped by the private midwives in the working area of Puskesmas Bukittinggi. The researcher has assumed that from the interview, there are no problems in relation to the analysis of the healthcare provided for maternal services in Puskesmas Bukittinggi. Most of the maternity ward patients received more assisted care continuously from the same midwife, but there were also those who received care from different midwives, moving from one to another according to the personal preference of the patient.

3. Health Care for Postpartum Mothers: Based on the interview, it can be concluded that the health care for postpartum mothers in Puskesmas Bukittinggi has been implemented properly as there have been no complaints or problems in relation to the service provided from the patients who were helped by the Puskesmas midwives, or those who were helped by the private midwives in the working area of the Puskesmas in Bukittinggi. The following is based on Kikuchi *et al.* (2015), in their study about the *Continuum Of Care* of mother, infants, and toddlers in Ghana⁸. The postpartum period (the first six weeks after birth), especially the first 48 hours, is very important for the health and survival of the mother and infant. A lack of a skilled health care during this period may cause death or illness. The researcher assumed that from the interview, the analysis of the healthcare for postpartum mothers in Puskesmas Bukittinggi aligned with the healthcare of maternal health services.

Output:

1. K1-K4 Visit Coverage: Based on the interview, it can be concluded that K1-K4 visits in the KIA program in Puskesmas Bukittinggi has been implemented properly, as there have been no complaints or problems from the visiting patients. The interview with the informant showed that most of the K1-K4 visits in Puskesmas Bukittinggi were done on routine. The importance of K1 examination is related to the role of the mother in realising the targets of health development, so there is synergy is in relation to the role of the government in suppressing the Maternal Mortality Rate (MMR) and the Infant Mortality Rate (AKB), which are still considered to be high (Kementerian Kesehatan RI, 2014). Based on the assumption of the researcher from the interview, the K1-K4 visits in Puskesmas Bukittinggi are close to fulfilling the coverage needed. The coverage of K1-K4 visits is a policy from the ANC (treatment during pregnancy) program and each mother receives antenatal care in accordance to the existing standard.

2. Coverage of TT Immunisation: Based on the interview, it was concluded that scope of TT Immunisation for mothers in Puskesmas Bukittinggi is complete; the informants were multiparous pregnant mothers who had completed each course of vaccination. The data from the Health Service stated that the average pregnant mother registered in Puskesmas Bukittinggi had completed their TT vaccinations. According to the WHO (2015), if a woman had never had a tetanus immunisation jab before, then she needs at least two injections during her pregnancy (first during the first antenatal visit, second is 4 weeks later). Based on the assumption of the researcher, the importance of knowing about TT vaccination needs to be understood by the mothers, because even though it may be their second pregnancy, after a two-year gap, the mother needs to be vaccinated again.

3. Scope of Birth Assistance from the Health Workers: Based on the interview, it was concluded that maternal services in Puskesmas Bukittinggi were helped by health workers such as Doctors and midwives. Thus, there was no data or reports detailing health assistance provided by a shaman. Based on the assumption of the researcher,

there are no more shaman birth assistance in Bukittinggi, because the data shows that most labours were assisted by a health assistant, which will help the suppression of AKI in Bukittinggi. Labour assisted by a health assistant is realised in a civilized society.

5. Coverage of KF1-KF3 Visit: Based on the interview, it can be concluded that most of the informants have done postpartum visits as per routine, but there are still some who do not go the postpartum visit routinely. The visits are done at least 3 times during the postpartum period. The activities to be done consist of the early detection, prevention, intervention, and handling of postpartum problems⁶. Based on the assumption of the researcher, the awareness of the Bukittinggi people is already very good, as they have done what they were told to do by the health workers and in accordance with health promotion.

CONCLUSION

Overall, the INPUT (program policies, availability of the human resources, funding, facilities and infrastructures) from this research has been fulfilled well so it sufficiently supports the implementation of PROCESS (treatment of pregnant Women, treatment of the maternal services, and the treatment of postpartum mothers). This efficient implementation has resulted in OUTPUT (coverage of K1-K4 visits, coverage of the mother/child rights fulfilment, the coverage of labour assistance PN/Non PN and the coverage of KF1-KF3 visit) which are in accordance with the existing standards that have ensured the prosperity of the people in proper continuance and within the organisation.

Ethical Clearance: This study had passed ethical clearance issued by Ethical Committee of the STIKes Fort De Kock, Indonesia.

Source of Funding: This study is self-funded research project.

Conflict of Interest: None.

REFERENCES

1. World Health Organization. Trends in maternal mortality: 1990 to 2015: Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. 2015.

2. World Health Organization, UNICEF. Trends in maternal mortality: 1990 to 2013: estimates by WHO, UNICEF, UNFPA, The World Bank and the United Nations Population Division: executive summary. 2014;
3. Yeji F, Shibanuma A, Oduro A, Debpuur C, Kikuchi K, Owusu-Agei S, et al. Continuum of care in a maternal, newborn and child health program in Ghana: Low completion rate and multiple obstacle factors. *PLoS One*. 2015;10(12):e0142849.
4. Barat DKPS. Profil Kesehatan tahun 2014. Padang Sumatera Barat. [West DKPS. 2014 Health Profile. Padang, West Sumatra]. 2015;
5. Ministry of Health. Profil Kesehatan Provinsi Jawa Timur Tahun 2008. [East Java Province Health Profile 2008]. 2013;
6. Ministry of Health of Indonesia. Profil kesehatan Indonesia tahun 2013. [Indonesian health profile in 2013] Jakarta Kementerian Kesehatan RI. 2014;
7. Mansjoer A. Kapita selekta kedokteran. [Capita selekta medicine] Jakarta: Media Aesculapius. 2000;86–92.
8. Kikuchi K, Ansah EK, Okawa S, Enuameh Y, Yasuoka J, Nanishi K, et al. Effective linkages of continuum of care for improving neonatal, perinatal, and maternal mortality: a systematic review and meta-analysis. *PLoS One*. 2015;10(9):e0139288.

Feeding Care Patterns of Mothers Working as Shellfish Peelers on Children's Nutritional Status at Integrated Health Posts in Coastal Areas

Meiana Harfika¹, Zhakiyah Saraswati¹, Dya Sustrami¹, Lela Nurlela¹

¹School of Health Sciences Hang Tuah, Surabaya, Indonesia, Jl. Gadung No.1, Surabaya, Indonesia

ABSTRACT

Introduction: Working mothers can influence the nutritional status of their children. Nutritional status is a condition that is influenced by the intake of nutrients in food needed by the body. Nutritional status is very important for the process of growth and development in children. The nutritional status of a toddler is influenced by several factors such as parenting.

Method: The research design used an analytical observation with a cross-sectional approach. Samples were taken using a simple random sampling technique obtained as many as 40 respondents in the mother group, where they all worked as shellfish peelers. The instruments of this study were the Feeding Pattern questionnaire and Nutrition Status assessment using the Anthropometry observation sheet. The data was analysed using the Spearman Rho test.

Results: The results showed that there was a relationship between feeding, the parent working as a shellfish peeler and the nutritional status of the child. The Spearman Rho test results were $\rho = 0,000$ ($\rho < 0.05$).

Discussion: The implication of this research is that there is a relationship between the parenting style of the mother working as a shellfish peeler on the nutritional status of the toddler. It is expected that the research respondents can improve the provision of feeding by paying attention to the nutritional needs of their toddlers.

Keywords: *Toddler Nutritional Status, Eating Pattern, Working Mother.*

INTRODUCTION

Regarding nutritional status prevalence according to the WHO in 2013, globally it was estimated that in 101 million children under the age of five (toddlers), 15.7% are underweight and 6.6% are overweight¹. Nationally, in 2013, the underweight prevalence was that 19.6% were severely malnourished and 13.9% were undernourished². Based on the Millennium Development Goals (MDGs) indicator, the number of severely malnourished children that an area of city must achieve by 2015 is 15.5%³. The East Java Province is still categorised as an area with

one of the highest severely malnourished percentages, at 4.8%⁴. In the 2013, the severely malnourished percentage was 19.6%. In 2014, there was a significant increase, up to 14.8%. Sidoarjo Regency's children under five showed a percentage of severely malnourished children with weight in accordance to age being under the red line weight as much as 1.02% (1.072). This is less than what was 1.22% (1,298 children) in 2013. Based on the weighing of children under five done throughout 2013, the number of malnourished or underweight children was 5.25% (weight according to the age Z-score between > -3 year primary school to < 2 year primary school as per the Kartu Menuju Sehat a card used in Indonesia to keep track of a child's growth monthly), which is on the yellow stream above the red line. The results showed that 91.54% were well-nourished (normal weight), 1.98% were over-nourished (overweight) and 1.22% were severely malnourished (very underweight). For the malnourished percentage, 2014 showed a percentage of

Corresponding Author:

Meiana Harfika
School of Health Sciences Hang Tuah, Surabaya, Indonesia
Jl. Gadung No.1, Surabaya, Indonesia
Email: meianaharfika@stikeshangtuah-sby.ac.id

4.92% which was less than 2013, which was 5.25%⁵. The researcher's interview with the nutritional staff on the 22nd January 2018 at Sedati Sidoarjo's Integrated Health Post revealed that there were 84 Children Under Five Integrated Health Posts in 16 villages, where 3 children under five suffered from severe malnutrition with comorbidities. There were malnourished children in several other villages. From the interview with the Village Midwife (Bidan Desa) in Gisik Cemandi Village, there were 11 children under five (7.3%) out of 150 children under five that were malnourished. The interview with Belanak and Dorang Gisik Cemandi village Integrated Health Posts group revealed that the total number of mother's working as shellfish peelers and stay at home mothers who had children under five were as many as 88 people, separated into 44 (50%) mothers working as shellfish peelers and 44 (50%) stay at home mothers.

The interaction between being malnourished and infection may cause deadly disease cycles and a worsened nutritional status⁶. One of the ways to increase children under five's nutritional status is by giving supplementary feeding. Supplementary feeding may be given to children under five from 6 months up to 23 months and 29 days with a skinny nutritional status, which is measured based on the weight index according to their height and a minus 3 deviation standard (-3DS) to less than minus 2 deviation standard (<-2DS), for 90 days. Supplementary feeding of skinny children under five may be local supplementary feeding and even factory supplementary feeding in the form of breastfeeding companion biscuits (biscuit MP-ASI). Once their weight has reached normal or in accordance to their height, supplementary feeding will be discontinued. Hereinafter, the children may consume the family's balanced nutrition, which will be done under weight monitoring to avoid the chance of children under five falling back into the skinny nutritional status⁷.

A mother's working status certainly affects their children's growth and development. Mothers who work have many options. There are mothers who choose to work at home and there are mothers who choose to work outside or far from home. The latter must be able to manage their time for their family because a mother's main task is to manage household affairs including looking after, managing and guiding children⁸.

Nutrition in children under five must be fulfilled, because nutrition will affect the toddler's growth in future. Stay at home mothers have more time for their

toddlers than working mothers. This is because working mothers must split their time to play the role of a working mother and a housewife. The solution given by the researcher was to give counselling to mothers working as shellfish peelers and stay at home mothers on the correct feeding care patterns to avoid malnutrition in children under five.

Based on the background description and supported by the preliminary studies which have been done, the writer is interested in doing research on the relationship between the feeding care patterns of mothers working as shellfish peelers on children under-five's nutritional status at integrated health posts in coastal areas.

METHOD

The research design used in this research was an analytical observation that looked for a relationship between the variables with a cross-sectional approach. This kind of research emphasises on the independent and dependent data measurements one at a time.

The population in this research was mothers working as shellfish peelers with children under five at Belanak and Dorang Gisik Cemandi village Integrated Health Posts. The sampling technique used in this research was sampling randomly sampled mothers working as shellfish peelers with children under five, thus fulfilling the inclusion criteria of 40 respondents.

The tools used to collect the data were questionnaires for the demographic data and feeding care patterns along with nutritional status observation focused on children between the ages of 12-60 months using an anthropometrical table. Bivariate data analysis was used to find out the relationship between the feeding care patterns of mothers working as shellfish peelers and the children under five nutritional status. This research used a Spearman Rho statistical test.

RESULTS

Table 1: Demographics of the respondents

Mother's Age	Frequency (f)	Percentage (%)
<20 years old	0	0
20-30 years old	24	60.0
>30-40 years old	14	35.0
>40 years old	2	5.0
Total	40	100.0

Conted...

Last Education	Frequency (f)	Percentage (%)
Tidak Sekolah	0	0
Primary School	1	2.5
Junior High School	18	45.0
High School	21	52.5
Graduate	0	0
Total	40	100.0
Family Income	Frequency (f)	Percentage (%)
<Rp1.000.000	3	7.5
>Rp1.000.000-2.000.000	17	42.5
>Rp2.000.000-3.000.000	17	42.5
>Rp3.000.000	3	7.5
Total	40	100.0
Number of Children	Frequency (f)	Percentage (%)
1	19	47.5
2	17	42.5
3	4	10.0
>4	0	0
Total	40	100.0
Mother's Job	Frequency (f)	Percentage (%)
Shellfish Peeler	40	50.0
Total	40	100
Toddlers Age	Frequency (f)	Percentage (%)
12-18 months old	6	15.0
19-25 months old	8	20.0
26-32 months old	9	22.5
33-39 months old	8	20.0
40-46 months old	3	7.5
47-53 months old	2	5.0
54-60 months old	4	10.0
Total	40	100.0

Conted...

Gender	Frequency (f)	Percentage (%)
Male	18	45.0
Female	22	55.0
Total	40	100.0
Birth Order in Family	Frequency (f)	Percentage (%)
First Born	19	47.5
Second Born	17	42.5
Third Born	4	10.0
Fourth Born	0	0
Fifth Born	0	0
Total	40	100.0
Weight	Frequency (f)	Percentage (%)
1-5 kg	6	15.0
6-10 kg	8	20.0
11-15 kg	9	22.5
16-20 kg	8	20.0
21-25 kg	3	7.5
26-30 kg	2	5.0
Total	40	100.0
Height	Frequency (f)	Percentage (%)
65-74 cm	1	2.5
75-84 cm	10	25.0
85-94 cm	15	37.5
95-104 cm	10	25.0
105-114 cm	4	10.0
115-114 cm	0	0
Total	40	100.0
Children's Health History	Frequency (f)	Percentage (%)
Tuberculosis	0	0
Measles	4	10.0
Malaria	1	2.5
Others	0	0
None	35	87.5
Total	40	100.0

Table 2: The Relationship between the Feeding Care Pattern of Mother's working as Shellfish Peelers on their Toddler's Nutritional Status at Gisik Cemandi Sedati Sidoarjo Village Coastal Area Integrated Health Post

		Toddlers Nutritional Status of Working Mother's Status			
		Malnourished	Nourished	Over-Nourished	Total
Toddlers Feeding Care Patterns of Working Mother's	Less or Deficient (<60%)	5	0	0	5
	%	100.0	0	0	100.0
	Enough (60-80%)	0	3	0	3
	%	0	100.0	0	100.0
	Good (>80%)	0	31	1	32
	%	0	96.9	3.1	100.0
	Total	5	34	1	40
	%	12.5	85.0	2.5	100.0
Spearman Rho Value Statistic Test 0,000 ($\rho = 0.05$)					

DISCUSSION

Based on the data on the feeding care patterns of mothers working as shellfish peelers related to their children's under-five nutritional status at Gisik Cemandi Sedati Sidoarjo Village Coastal Area Integrated Health Posts, as shown in the table above, there were 5 respondents (100.0%) that did not conduct good feeding care patterns, resulting in malnutrition in the respondent's toddler. A further 3 respondents (100.0%) that did enough in relation to the feeding care pattern had well-nourished toddlers, and 1 respondent (3.1%) had a good feeding care pattern that resulted in over-nutrition. Nutritional status is a condition that is caused by a balanced status between nutrient intake and the number of nutrients required by the body for the running of its biological functions such as physical growth, development, activities, health care etc. A toddler's nutritional status is affected by many factors, both direct and indirect. Direct causes that affect nutritional status are nutrition intake and any infections suffered by the toddler. Indirect causes include food availability, while keeping in mind the parent's job and income, parenting and care patterns, the available health services and environmental health. The three indirect causes are related to the level of education, knowledge, and family skill⁹. The researcher argues that a working mother must be wise in relation to time management, because her time will be divided between work, childcare and domestic chores. This case is proven by the research results as shown above, on how the mother's that were working as shellfish peelers had toddlers who were malnourished. The mothers in coastal areas stated that there is difficulty when their role as shellfish peelers made them unable to feed their children on time.

The link between the feeding care pattern of mother's working as shellfish peelers on children under five (toddlers), is as shown in the Spearman Rho statistic test result in Table 13; $\rho = 0,000 < \alpha = 0.05$ as a comparison. The coefficient correlation between the variables gained from the statistics test was 0.771, which means that there is a strong correlation. H1 was therefore accepted, statistically showing that there is a relationship between the feeding care patterns of mothers working as shellfish peelers on their toddler's nutritional status at Gisik Cemandi Sedati Sidoarjo Village Coastal Area's Integrated Health Post.

CONCLUSION

Based on the results of this research, the outcome is that regarding nutritional status, the mothers working as shellfish peelers with toddlers did not do well at taking care of their child's nutrition and they lacked a proper feeding care pattern. The toddlers of mothers working as shellfish peelers suffered from malnutrition because the mother's activities were more important than looking after and paying attention to their toddler's nutritional intake.

Ethical Clearance: This study had passed ethical clearance issued by Ethical Committee of the Sekolah Tinggi Ilmu Kesehatan Hang Tuah Surabaya, Indonesia.

Source of Funding: This study is self-funded research project.

Conflict of Interest: None.

REFERENCES

1. Sa'diya LK. Hubungan Pola Makan dengan Status Gizi Anak Pra Sekolah di Paud Tunas Mulia Claket Kecamatan Pacet Mojokerto. *J Kebidanan Midwiferia*. [Relationship between Diet and Nutritional Status of Preschool Children in Paud Tunas Mulia Claket, Pacet District, Mojokerto. *J Midwiferia Midwifery*]. 2016;1(2):69–78.
2. Indonesia KKR. Peraturan Menteri Kesehatan Republik Indonesia No 75 tahun 2013 tentang Angka Kecukupan Gizi yang Dianjurkan bagi Bangsa Indonesia. Kementerian Kesehatan Republik Indonesia. [Regulation of the Minister of Health of the Republic of Indonesia No. 75 of 2013 concerning Recommended Nutrition Adequacy Figures for the Indonesian Nation. Ministry of Health Republic of Indonesia]. 2013;
3. Bappenas. Report on Achievement of the Millennium Development Goals Indonesia 2011 [Internet]. Jakarta: Ministry of National Development Planning; 2010. Available from: [http://www.undp.or.id/pubs/docs/Report on the Achievement of the MDGs in Indonesia 2011.pdf](http://www.undp.or.id/pubs/docs/Report_on_the_Achievement_of_the_MDGs_in_Indonesia_2011.pdf)
4. MoH. Laporan Nasional Riskesdas 2010. Jakarta: Badan Litbangkes Kemenkes RI; [Riskesdas 2010 National Report. Jakarta: Indonesian Ministry of Health Research and Development Agency]. 2010.
5. Kab D. Sidoarjo, 2015. Profil Kesehat Gambaran Derajat Kesehat Masy di Kabupaten Sidoarjo selama tahun. [Health Profile Profile of Community Health in Sidoarjo Regency for a year. 2014]. 2014.
6. UNICEF. Undernutrition contributes to nearly half of all deaths in children under 5 and is widespread in Asia and Africa. UNICEF. 2016.
7. Kesehatan ID. Buku Kesehatan Ibu dan Anak: Gerakan nasional pemantauan tumbuh kembang anak-[BUKU]. Departemen Kesehatan RI bekerjasama dengan JICA (Japan International Cooperation Agency); [Books on Maternal and Child Health: National movement for monitoring child development - [BOOK]. The Indonesian Ministry of Health collaborates with JICA (Japan International Cooperation Agency)]. 2008.
8. Yuliasri TR, Nugraheny E. Perbedaan Ibu Bekerja dan Tidak Bekerja Terhadap Perkembangan Anak. [Differences in Working Mothers and Not Working Against Child Development]. 2015.
9. Helmi R. Faktor-Faktor yang Berhubungan dengan Status Gizi pada Balita di Wilayah Kerja Puskesmas Margototo Kecamatan Metro Kibang Kabupaten Lampung Timur. *J Kesehat*. [Factors Associated with Nutritional Status in Toddlers in the Working Area of Margototo Health Center, Metro Kibang District, East Lampung Regency]. 2016;4(1).

The Relationship between Socioeconomic Status and Personality Type with Depression in Adolescents

Oktavianis¹, Rahmi Sari Kasoema¹

¹Midwifery Programme, STIKes Fort De Kock

ABSTRACT

This study aimed to identify the relationship between socio-economic status and personality type in relation to the occurrence of depression in adolescents. The samples of this study were high school students, as many as 248 persons. The study was carried out in six high schools in Bukittinggi City, Indonesia. This study applied a mixed methodology using a sequential exploratory design. The quantitative study was conducted using questionnaires with a correlational design and the cross-sectional approach. The qualitative study used an in-depth interview as the data collection method. The independent variables in this research were the personality type and socio-economic status. Meanwhile, the dependent variable was depression. The data was analysed using Chi-square analysis. The odd ratio was applied to identify the relationship significance of the independent and dependent variables. The results shows that there were significant relationships between socioeconomic status and depression ($p=0.002$; OR 2.241) and between personality type and depression ($p=0.000$; OR=1.935). The incidence rate of depression within adolescents relates closely to the factor of socioeconomic status and personality type. Therefore, adolescents are expected to understand themselves further to not trigger depressive incidents.

Keywords: *depression, personality type, socio-economic status.*

INTRODUCTION

Depression has attracted global concern in recent decades. Depressive people usually have lower productivity. They will have a negative impact on society, the nation, and the country if it is in a developing stage¹. Depression is the primary cause of suicide and it is ranked in 6th position concerning the primary mortality causes in the United States².

On a global scale, depression is the top cause of disease and vulnerability in adolescents aged 10-19 years old³. The World Health Organisation predicted that depression will be second of world health problem in 2020⁴. The prevalence of depressive disorder in

adolescents generally stands at around 3-9% and this rises to 20-25% in the late stage of adolescence⁵. The results of the CDC survey in the United States mentioned that during 2009-2012, the incidences of depression aged between 12-17 years old stood at 7.6%⁶ 2009-2012. During 2009-2012, 7.6% of Americans aged 12 and over had depression (moderate or severe depressive symptoms in the past 2 weeks).

The Indonesian Basic Health Research (2013) unveiled that the percentage of the population who experience a high-level mental disorder (psychosis/schizophrenia) in Indonesia totalled 1,728 individuals. The prevalence of Indonesian citizens with a high-level mental disorder was 1.7 per-mille. In North Sumatra, the prevalence of residents who experienced high-level mental disorders was 1.9 per-mille, higher than national value. Meanwhile, in Bukittinggi, the prevalence of high-level mental disorder incidents was 0.7 per-mille⁷.

In addition, the prevalence of emotional mental disorders in Indonesia in residents aged between 15-24 years old stood at 6%. Meanwhile, for the area of

Corresponding Author:

Oktavianis

Midwifery Programme, STIKes Fort De Kock,

Jl. Soekarno Hatta,

Kelurahan Mandiangin Koto Selayan,

Bukittinggi, Sumatera Barat, Indonesia

Email: oktavianis231082@gmail.com

North Sumatra, for residents aged 15-24 years old who experienced emotional mental disorder in Bukittinggi city, the prevalence was 1.1%⁷.

Emotional mental health of adolescents needs to be taken into attention⁸. Once neglected, it will trigger major vulnerability in relation to stress and life pressure. Henceforth, the adolescents may experience social, emotional and behavioural issues such as depression, learning troubles, adolescent delinquency, and drug addiction⁹.

Depression is a common mental disorder which has the symptoms of sorrow, a loss of interest or joyfulness, guilt, sleep disorders, a decrease or increase of appetite, tiredness, and a loss of concentration⁴. If the symptoms of depression are not identified as early as possible, it will inflict heavier emotional mental problems including social function and quality of life disorders as well as suicide-based mortality¹⁰.

Adolescents who experience depression will continue to suffer repeatedly into their adult life stage if they are not healed. Depression is characterised by chronic symptoms. Major depression disorder or heavy depression is distinguished by symptoms which interrupts the ability of someone to work, sleep, study, eat, and to enjoy delightful activities¹¹.

The research carried out in Turkey unveils that the middle-lower socio-economic group possess a lower depression level significantly compared to the middle-upper class. Mothers with low and high social levels spend less time with their adolescent children¹².

Considering these issues, this study aimed to identify the relationship between socio-economic status and personality type with the occurrence of depression in adolescents.

METHODS

This study applied a mixed methodology with a sequential exploratory design. The quantitative study was conducted using questionnaires with a correlational design and cross-sectional approach. Meanwhile, the qualitative study used an in-depth interview, also known as an informant-based interview. The sample of this research was adolescents residing in Bukittinggi City from six different schools, as many as 248 correspondents. The collection of the data in this research was using questionnaires. The variable of depression was measured using *Inventori Depresi*

Remaja or Adolescence Depression Inventory scale, while personality type was measured using Jung's Type Indicator Test to find extrovert or introvert personalities.

RESULTS

Table 1: Respondent's Demographic Character (n = 248)

Respondent's Character		f (n=248)	%
Mother's Education			
a.	Elementary Dropped Out	6	2
b.	Elementary	24	10
c.	Middle	25	10
d.	High School	102	41
e.	Diploma	33	33
f.	Bachelor	47	19
g.	Master	6	2
h.	Doctorate	5	2
Father's Education			
a.	Elementary Dropped Out	6	2
b.	Elementary	25	10
c.	Middle	30	12
d.	High School	116	47
e.	Diploma	13	5
f.	Bachelor	42	17
g.	Master	12	5
h.	Doctorate	4	2
Mother's Occupation			
a.	Housewife	146	59
b.	Civil Servant	50	20
c.	Entrepreneur	31	13
d.	Farmer/Labour	5	2
e.	Etc.	16	6
Father's Occupation			
a.	Unemployed	9	4
b.	Civil Servant	56	23
c.	Entrepreneur	98	40
d.	Farmer/Labour	41	17
e.	Etc.	44	18
Housemate/Guardian			
a.	Parents	206	83
b.	Boarding House/House Rent	25	10
c.	Relative	17	7

Conted...

Parental Status			
a.	Complete accompanied	202	81
b.	Complete unaccompanied	26	11
c.	Incomplete	20	8

1. Univariate Analysis

Table 2: Frequency Distribution of the Respondent's Characteristics

Variable	Frequency (n=248)	%
Depression		
a. Depressed	150	60.5
b. Undepressed	98	39.5
Personality type		
a. Extrovert	130	52.4
b. Introvert	118	47.6
Socio-Economic Status		
a. High	122	49.2
b. Low	126	50.8

2. Bivariate Analysis

Table 3: The Relationship between Personality Type and Depression

Variable	Depression				Total	
	No		Yes			
	f	%	f	%	F	%
Extrovert	61	46.9	69	53.1	130	100
Introvert	37	31.4	81	68.6	118	100
Total	98		150		248	

Table 4: The Relationship between Socio-Economic Status and Depression

Variable	Depression				Total	
	No		Yes			
	f	%	f	%	f	%
High	60	49.2	62	50.8	122	100
Low	38	30.2	88	69.8	126	100
Total	98		150		248	

3. Multivariate Analysis: Multivariable analysis was used to oversee the relationship between the independent variable and dependent variable

simultaneously, controlled by an external variable with $p=0.25$ toward bivariate analysis. The statistic test applied was logistical regression analysis with a confidence interval (CI) 95%.

Based on the undertaken bivariate analysis, it can be extract the next variable candidate which may be entered into the next phase.

Table 5: Multivariate Variable Candidate

Variable	p-value	Status
Personality type	0.000	Significant
Socio-Economic Status	0.002	Significant

Based on Table 5, the Multivariate Variable Candidate, all of the variables conformed to the p value < 0.25 . After the logistic regression test was undertaken, the results came up as follows:

Table 6: Analysis Results of the Conditional Logistic Regression

Variable	Coefficient	p-value	OR (Lower-Upper)
Personality type	0.628	0.055	1.874 (0.986-3.561)
Socio-Economic Status	0,993	0.003	2.700 (1.411-5.165)
Constant	-2.441	0.000	0.087

DISCUSSION

1. Univariate Analysis: From the results of the research in Table 2, it attained the data which explains that around 150 students (60.5%) experienced depression and 98 students (39.5%) were did not have depression. According to the WHO (2002), children and adolescents were included as being a vulnerable group for depression due to various symptoms caused by internal and external factors¹³.

The most common adolescent's personality types was the extrovert type, amounting to 130 students (52.4%). Those with the introvert personality type made up 118 students (47.6%). Students with an extrovert personality are equipped with openness of the mind and are sociable. This differs to the introvert type of student, who tend to be closed-

off in personality and eschewed from the social environment. Adolescents with an introvert personality encounter difficulty socialising with their friends. They tend to be unconfident when dealing with their friends ¹⁴.

The socio-economic status of students is largely low, amounting to 126 students (50.8%), with those of a high status numbering 122 students (49.2%).

2. Bivariate Analysis: The relationship of Personality Type with Depression

In Table 3 above, it obtained the data that as many as 61 respondents (46%) had an extroverted personality type and were not experiencing depression. In contrast, 81 respondents (68.6%) with introvert personality type experienced depression. The results of the data analysis unveiled a significant relationship between personality type and depression in adolescents. This was obtained from the value of OR=1.935 (CI 95% 1.151-3.254) and $p=0.000$. The introvert personality type had a 1.9 times higher chance of experiencing depression compared to those with an extroverted personality.

This is in line with the research carried out by Sukmana Putra and Alit Ariyani (2011), which obtained the relationship between personality type and stress level ¹⁵. The risk factors related to the occurrence of depression in adolescents may be driven by the adolescent's personality. With an introverted personality, adolescents are unlikely to open up to their parents. Hence, they are more vulnerable to depression ¹⁰. The personality factor is one of the factors which drives depression in adolescents ¹⁶.

From the interview results conducted with high school students in Bukittinggi, it can be inferred that students are unlikely to socialise with their friends and tend to be closed off.

One of the influential factors for the emergence of stress is personality. Personality can be defined as a set of way of thinking, feeling, and attitude which is often performed in the process of continual adaptation to what is occurring in one's life. People with an introverted personality tend to live in their own world. Their interaction with

their external environment is poor, they have a closed personality and find it difficult to socialise with others. Often, they withdraw into themselves within a crowd ¹⁵.

The researcher's assumption implies that adolescents with an introvert personality type are more likely to experience depression compared to those with an extroverted personality. They are more closed-off compared to those who are extroverts. They tend to be ignorant of the outside world. The helplessness of introverted adolescents to adjusting to their environment and friends at school inflicts a pressured feeling. They then withdraw themselves from social circumstances due to their inability to adapt to the demands of the circumstances in which they live. Their discouragement to join the community is based on their self-judgment as a different person. They are scared to misbehave in their group. Adolescents with this type of introverted personality are expected to be able to socialise within their environment. Levelling up the sense of confidence of adolescents may support introverted adolescents in adjusting to their environment as well as transcending negative thoughts such as rejection from their friends. Positive thinking may increase the sense of confidence of adolescents in order for them to be able to socialise with their friends.

In Table 4 above, it obtained data in which 60 respondents (49.2%) with a high socio-economic status were at a low risk of depression. Meanwhile, 88 respondents (69.8%) respondents with a low socio-economic state experienced depression. The results of the data analysis showed a significant relationship between socio-economic status and depression obtained from the value of OR 2,241 (CI 95% 1,332-3,771) and $p=0,002$. Those with a low socio-economic status had a 2.2 times greater chance of developing depression compared to those of a high socio-economic status.

This research is in line with the research carried out by Koster et al (2006), who mentioned that people with a low socio-economic status have a two times greater chance of encountering depression compared to those of a high-level socio-economic status ¹⁷. A research by Lorant et al. (2003) unveiled

that a low level socio-economic status is statistically correlated to depression¹⁸ more disability, and poorer access to health care. Among psychiatric disorders, depression exhibits a more controversial association with SES. The authors carried out a meta-analysis to evaluate the magnitude, shape, and modifiers of such an association. The search found 51 prevalence studies, five incidence studies, and four persistence studies meeting the criteria. A random effects model was applied to the odds ratio of the lowest SES group compared with the highest, and meta-regression was used to assess the dose-response relation and the influence of covariates. Results indicated that low-SES individuals had higher odds of being depressed (odds ratio = 1.81, $p < 0.001$).

The researcher's assumption implies that the condition of socio-economic status is correlated to the depression rate of high school students across Bukittinggi city. This is driven by the unstable economic situation which provokes negative thoughts among adolescents over their lives. Henceforth, when one's desire is unfulfilled, it inflicts depression on the adolescent. There is a high pressure related to education needs and the need for additional tools to accelerate the learning process of students¹⁹. The failure to comply with these needs due to the economic situation of the parents will trigger anxiety in the adolescents over the potency of dropping out of school. Therefore, this feeling will trigger the feeling of being pressured. Moreover, another factor is the demands of the adolescent's lifestyle. Adolescents have the tendency to imitate their friend's lifestyle. They have the tendency to own what is being owned by their friends²⁰. However, the economic condition of their parents makes them unable to fulfil their demands. This unfulfilled desire will inflict a feeling of disappointment in the adolescents hence, they feel ignored and it triggers a sense of depression.

Adolescents are expected to be able to possess a mature way of thinking when dealing with problems. This is primarily related to their parent's financial condition. The adolescent's anxiety toward their financial condition can better be transcended into a wise attitude and having the willingness to support lowering the burden

of their parents, such as by seeking a scholarship. Adolescents are expected to not be desperate when dealing with their problems.

3. Multivariate Analysis: According to Table 5, the multivariate variable candidate of all variables satisfied the value of $p\ value < 0.25$. After the logistic regression test was performed, it obtained the results as follows. In Table 6, the results of the analysis via *conditional logistic regression* obtained that the most influential variable toward the incident rate of student depression was socio-economic status with $p\ value = 0.003$ and an OR value of 2.700. Socio-economic status changed, by 2.7 times, the incidence rate of depression.

Inferred from the results of the analysis, the multivariate variable of socio-economic status has a greater chance in relation to its correlation to depression. According to the researcher's assumptions, economic condition is considerably influential on the psychological condition of an individual. Life demands gradually increase every day. Henceforth, the unfulfilled livelihood provision of a person will affect their psychological condition, primarily in adolescents.

CONCLUSIONS

Based on the results of this research, it was identified that the incident rate of depression in adolescents correlates closely with socio-economic status and personality type. It is suggested that adolescents should be more aware of their self-concept and understand their family economy, while learning to accept the situation.

Conflict of Interest: None.

Ethical Clearance: The study passed ethical clearance from Ethical Committee of the STIKes Fort De Kock, Bukittinggi, Sumatera Barat, Indonesia.

Source of Funding: Self-funded.

REFERENCES

1. Ahmed H, Hossain M, Aftab A, Soron T, Alam M, Chowdhury MA, et al. Suicide and depression in the World Health Organization South-East Asia Region: A systematic review. WHO South-East Asia J Public Heal [Internet]. 2017 [cited 2018

- Sep 24];6(1):60. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/28597861>
2. Bertolote JM, Fleischmann A. Suicide and psychiatric diagnosis: a worldwide perspective. *World Psychiatry* [Internet]. 2002 Oct [cited 2018 Sep 24];1(3):181–5. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/16946849>
 3. World Health Organization. WHO | WHO calls for stronger focus on adolescent health [Internet]. WHO. World Health Organization; 2014 [cited 2018 Sep 24]. Available from: <http://www.who.int/mediacentre/news/releases/2014/focus-adolescent-health/en/>
 4. World Federation for Mental Health. Depression: A Global Crisis [Internet]. Occoquan, VA; 2012 [cited 2018 Sep 24]. Available from: http://www.who.int/mental_health/management/depression/wfmh_paper_depression_wmhd_2012.pdf
 5. Dulcan MK. *Dulcan's Textbook of Child and Adolescent Psychiatry* [Internet]. American Psychiatric Association Publishing; 2016 [cited 2018 Sep 24]. Available from: <http://psychiatryonline.org/doi/book/10.1176/appi.books.9781615370306>
 6. Pratt LA, Brody DJ. Depression in the U.S. household population, 2009-2012. *NCHS Data Brief* [Internet]. 2014 Dec [cited 2018 Sep 21];(172):1–8. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25470183>
 7. NIHRD. *Indonesia Basic Health Research 2013* [Internet]. Jakarta, Indonesia; 2013. Available from: <http://www.litbang.depkes.go.id/>
 8. Bloch Y, Aviram S, Nurit Faibel B, Jose Govezensky M, Braw Y, Rabany L, et al. The Correlation Between Impaired Attention and Emotional Reactivity in Depressed Adolescent Patients [Internet]. Vol. 25, *The Journal of Neuropsychiatry and Clinical Neurosciences*. 2013 [cited 2018 Sep 24]. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26131019>
 9. Valverde BSCL, Vitalle MS de S, Sampaio I de PC, Schoen TH. Levantamento de problemas comportamentais/emocionais em um ambulatório para adolescentes. *Paid (Ribeirão Preto)* [Internet]. 2012 Dec [cited 2018 Sep 24];22(53):315–23. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0103-863X2012000300003&lng=pt&tlng=pt
 10. Amir N. *Depresi Aspek Neurobiologi Diagnosa dan Tatalaksana*. Jakarta, Indonesia: Fakultas Kedokteran Universitas Indonesia; 2004.
 11. National Institute of Mental Health. *Depression: What You Need to Know* [Internet]. Bethesda, MD: National Institute of Mental Health ; 2011 [cited 2018 Sep 21]. p. 1–36. Available from: https://www.nimh.nih.gov/health/publications/depression-what-you-need-to-know/depression-what-you-need-to-know-pdf_151827_151827.pdf
 12. Anlı İ, Karşlı TA. Perceived parenting style, depression and anxiety levels in a Turkish late-adolescent population. *Procedia - Soc Behav Sci* [Internet]. 2010 Jan 1 [cited 2018 Sep 21];2(2):724–7. Available from: <https://www.sciencedirect.com/science/article/pii/S187704281000131X>
 13. Rao U, Chen L-A. Characteristics, correlates, and outcomes of childhood and adolescent depressive disorders. *Dialogues Clin Neurosci* [Internet]. 2009 [cited 2018 Sep 24];11(1):45–62. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19432387>
 14. Adhikari RP, Upadhaya N, Gurung D, Luitel NP, Burkey MD, Kohrt BA, et al. Perceived behavioral problems of school aged children in rural Nepal: a qualitative study. *Child Adolesc Psychiatry Ment Health* [Internet]. 2015 [cited 2018 Sep 24];9:25. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26131019>

Consumption Patterns, Energy Adequacy, and The Nutritional Status of Softball Players

Ratna Candra Dewi¹, Bambang Wirjatmadi²

¹Doctoral Program of Public Health, Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia, Faculty of Sport Science, Universitas Negeri Surabaya, Indonesia;

²Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

Softball is a competitive sport which requires the players to have a combination of strength, speed and agility. Nutrition and hydration can have a significant impact on the performance of the softball players. The present study aimed to analyse the relationship between consumption patterns, nutritional knowledge, physical activity, and nutritional adequacy with the nutritional status of softball players. An analytic observation within a cross-sectional study design was employed on a sample of 20 softball players from Surabaya State University. The respondents were recruited through simple random sampling. The research variables included energy intake, eating frequency, vegetarian diet, caffeine or soft drink consumption, fast food consumption, food restrictions, infectious disease, nutritional knowledge, energy adequacy and nutritional status. The anthropometric measurements of the athletes were used including body weight and height, consumption pattern data using the 2x24 hours recall method and a food frequency questionnaire, physical activity data using the IPAQ (International Physical Activity Questionnaire) method, and data on knowledge and infectious diseases using a questionnaire. Energy adequacy was calculated by comparing the average energy consumption with the Nutrition Adequacy Rate. Nutritional status was measured using Body Mass Index (BMI). The data was analysed to examine the relationship between the explanatory variables and the dependent variables using the Spearman Rank Correlation Test. Energy intake, eating frequency, and the knowledge of nutrition had a positive significant correlation with energy adequacy. Physical activity was negatively correlated with energy adequacy. Infectious disease was negatively correlated with nutritional status, while energy adequacy was positively correlated with nutritional status.

Keywords: *consumption pattern, athletes, energy adequacy, nutritional status, Indonesia*

INTRODUCTION

Softball requires athletes to have a combination of strength, speed and agility, in addition to sharp focus, quick reactions and a determination to win. An appropriate dietary intake is crucial for softball players to build their physical strength and to improve their athletic performance.¹ Strategies used to enhance the adequacy

of energy can help to maximise exercise and muscle performance. The nutrient intake required by an athlete is determined by the exercise load, the athlete's specific needs, training objectives, body composition, health and the growth of young athletes.² A balanced nutritional diet in accordance with the exercise requirements is beneficial for softball players. The energy and carbohydrate intake of players should be adjusted with the daily exercise load.

Sources of nutrient intake during softball exercise are recommended to come from highly nutritious foods such as cereals, fruits, vegetables, low-fat dairy products, lean meats and poultry, fish, nuts, seeds, nuts and so on. The consumption of food with a low nutritional value such as soft drinks, snacks, cakes, biscuits, and fried foods should be restricted or limited. Meal timing is the key to success. Portion control and inter-meal intervals can help to improve nutrient absorption and regulate appetite.

Corresponding Author:

Ratna Candra Dewi
Doctoral Program of Public Health,
Faculty of Public Health,
Universitas Airlangga, Mulyorejo, Surabaya, Indonesia
Faculty of Sport Science,
Universitas Negeri Surabaya, Indonesia
Email: ratna.can.dewi-2017@fkm.unair.ac.id

To achieve maximum performance in sport, athletes require an optimal training system that includes the availability and adequacy of nutritional intake in accordance with the type of sports being undertaken. An adequate level of nutritional intake is a fundamental prerequisite for athletes, as nutrition and physical exercise result in optimum achievements.³ The present study aimed to analyse the relationship between consumption patterns, knowledge of nutrition, physical activity, and the adequacy of nutritional intake with nutritional status in the context of softball athletes.

METHOD

Our study employed an analytic observational research approach using a cross-sectional design. The population in this study was made up of softball players from the State University of Surabaya. The research sample included 20 active softball players. We applied simple random sampling to recruit the participants.

The variables in this study included energy intake, meal frequency, vegetarian diet, consumption of caffeine/soft drinks, food restrictions, infectious diseases, nutritional knowledge, energy adequacy, and nutritional status. The data of the variables were collected from the measurements of the anthropometric data (body weight and height), consumption pattern data using the 2x24 hours recall method and food frequency questionnaire, physical activity data with the IPAQ (International Physical Activity Questionnaire) method, and questionnaires about their level of nutritional knowledge and history of infectious disease. The level of energy adequacy was calculated by comparing the average energy consumption with the Nutrition Adequacy Rate. Nutritional status was measured using the Body Mass Index (BMI) with the formula weight (kg)/height (m).

The data was analysed using both descriptive and inferential statistics. The Spearman Rank Correlation Test was used to assess the relationship between all of the independent variables and nutritional status. The statistical analysis was done using the SPSS program version 22.

RESULTS

The consumption pattern can be seen using the type of food and eating frequency questionnaire, as shown Table 1. More than half of the respondents (55%) consumed staple food (rice) twice a day. Protein-based foods were meat, poultry or eggs or soya beans in the form of tempeh and tofu consumed twice a day by most of the respondents (60% and 50% respectively). Most of the respondents only ate vegetables once a day (45%).

Most of the respondents consumed fruit twice a week (50%) and milk three times a week (60%).

Table 1: Type of food and eating frequency
n = 20

Type of food	Eating frequency	n (%)
Grains (rice)	2 times a day	11 (55)
	3 times a day	9 (45)
Meat, poultry, eggs	1 time a day	7 (35)
	2 times a day	12 (60)
	3 times a day	1 (5)
Legumes/beans	1 time a day	2 (10)
	2 times a day	10 (50)
	3 times a day	8 (40)
Vegetables	1 time a day	9 (45)
	2 times a day	5 (25)
	3 times a day	6 (30)
Fruits	1 time a day	3 (15)
	2 times a week	10 (50)
	3 times a week	7 (35)
Milk	1 time per day	4 (20)
	3 times a week	12 (60)
	never	4 (20)

Based on the information of the type of food and eating frequency, the researchers calculated the estimated energy intake. Table 2 shows that the average food consumption of the respondents was 2892.25 ± 323.30 kcal with a meal frequency of 1 – 2 times a day. Most respondents rarely had a vegetarian diet (50%) and one focused on fast food (90%), but they often consumed caffeine or soft drinks (50%). Most of them had no dietary restrictions (90%) and had not had any infectious diseases within the last 3 months (65%). The majority of the respondents had good energy adequacy (65%), moderate physical activity (55%), and normal nutritional status (85%).

Table 2: Variables of the respondent’s characteristics

Variables		n (%)	Mean ± SD
Energy intake (food consumption)	2500–2999 kcal	14 (70.0)	2892.25 kcal ± 323.30
	3000–3499 kcal	5 (25.0)	
	3500–4000 kcal	1 (5.0)	

Conted...

Eating frequency	1-2 times a day	11 (55.0)	
	3 times a day	7 (35.0)	
	>3 times a day	2 (10.0)	
Vegetarian diet	Never	7 (35.0)	
	Rarely	10 (50.0)	
	Frequent	3 (15.0)	
Caffeine/soft drink consumption	Never	1 (5.0)	
	Rarely	8 (40.0)	
	Frequent	10 (50.0)	
	Always	1 (5.0)	
Fast food consumption	Rarely	18 (90.0)	
	Frequent	2 (10.0)	
Food restriction	No	18 (90.0)	
	Yes	2 (10.0)	
Infectious diseases	Never	13 (65.0)	
	Rarely	3 (15.0)	
	Frequent	4 (20.0)	
Knowledge of nutrition	Good	12 (60.0)	
	Poor	8 (40.0)	
Energy adequacy	Good	13 (65.0)	
	Poor	7 (35.0)	
Physical activity	low (< 600 MET- minutes a day)	1 (5.0)	
	Moderate (600 - <1500 MET- minutes a day)	11 (55.0)	
	High (1500 - <3000 MET- minutes a day)	8 (40.0)	
Nutritional status	Underweight (BMI: <18.5)	2 (10.0)	
	Normal (BMI: 18.5 - <24.9)	17 (85.0)	
	Overweight (BMI: 25 -<27)	0	
	Obese (BMI ≥27.0)	1 (5.0)	

Remark: MET : Metabolic equivalents; BMI : Body Mass Index

Table 3 shows the relationship between the explanatory variables and energy adequacy. The significant relationship was shown by the p-value <0.05. Each variable of energy intake, eating frequency,

and knowledge of nutrition showed a significant positive correlation coefficient with energy adequacy. Conversely, physical activity had a significant negative correlation coefficient to energy adequacy. A higher level of physical activity will reduce the level of energy adequacy.

Table 3: The relationship between the explanatory variables and energy adequacy

Variables	Correlation Coefficient (r)	p-value
Energy intake	0.619	0.001
Eating frequency	0.736	0.000
Vegetarian dietary	-0.100	0.676
Caffeine/soft drink consumption	0.131	0.582
Fastfood consumption	0.000	1.000
Food restriction	-0.245	0.299
Knowledge of nutrition	0.599	0.005
Physical activity	-0.536	0.015

Table 4 shows that there was a significant negative correlation (p value <0.05) between infectious diseases and energy sufficiency with nutritional status. Getting an infectious disease will lower the participant's nutritional status. The energy adequacy had a positive significant correlation coefficient with the nutritional status. Having better energy adequacy will improve their nutritional status.

Table 4: The relationship between energy adequacy, infectious disease and nutritional status

Variables	Correlation Coefficient (r)	Sig.
Infectious disease	-0.568	0.009
Energy adequacy	0.691	0.001

DISCUSSION

In our study, a higher energy intake, more sufficient eating frequency, and a higher knowledge of nutrition significantly increases the level of energy adequacy. Conversely, a higher physical activity level will lower the level of energy adequacy. This finding signifies the importance of the adequate consumption of nutritious food for softball players. To achieve optimal physical and mental performance, athletes are recommended to consume food with sufficient energy to fulfill their nutritional needs.^{4,5}

Food consumption pattern reflects the quantity and type of food that is commonly consumed in a certain frequency and at particular time intervals.⁶ It relates to the eating habits learned in childhood and tends to remain in adulthood. Selecting foods that are rich in micro nutrients will reduce the risk of nutritional deficiencies that affect health.⁷ The energy required by athletes during exercise can be met through various sources of energy that can be stored in the body from burning carbohydrates and fats with a 5% contribution from protein breakdown.⁸ Carbohydrates can be stored in the muscles and liver as glycogen, which can be used as a source of fuel for the brain and muscles during physical activity.⁹ The right selection of food with fibre, various vitamins and minerals including vitamin B, iron, calcium and folate can help to ensure that the body has enough energy to move and recover from injuries.⁹

Knowledge of nutrition is associated with the consumption of nutritious foods. A previous study reported that good nutritional knowledge was significantly associated with a consumption of a low-fat diet.¹⁰ Another study found that higher nutritional knowledge was strongly associated with reading nutritional information on food products.¹¹ However, parental knowledge about milk products did not predict the amount of milk consumed.¹¹ Nutritional education for school children influenced changes in their dietary behavior after more than 2 years.¹²

Physical activity and exercise contributed to the total daily energy expenditure approximately between 25% and 50%.¹³ Active transportation (walking and cycling) is inversely associated with overweight or obesity.¹⁴ Continuous physical exercise require athletes to maintain a balance between food intake, energy expenditure and additional energy from high physical activity.¹⁵ Specific aspects such as the type of sport, special skills or player position, training schedules and competition calendars, categories and special objectives, which differ from the general population, must be considered when determining the daily energy expenditure.¹⁵

In the second relationship analysis between infectious disease, energy adequacy and nutritional status, both showed a negative and positive relationship respectively. Malnutrition, as well as overnutrition, may affect the immune response to infection.¹⁶ On the other hand, infectious diseases also affect nutritional status, including anorexia, gastrointestinal disease, and other chronic or parasitic infections leading to anemia.¹⁷

Food intake will affect the performance of athletes, where athletes with a poor nutritional status cannot be optimal in their performance.¹⁸ In relation to training, energy adequacy should balance with the increased energy expenditure in order to maintain the athlete's recommended nutritional status.¹⁹ Other physiological conditions that determine the athlete's performance including heart rate, blood pressure, somatotype and hydration status should be taken into account.²⁰⁻²²

Other variables studied in the present research including vegetarianism, caffeine/soft drink consumption, fast food consumption, and food restrictions had no correlation with energy adequacy. However, low vegetable consumption but the high consumption of fast food and caffeine or soft drinks among softball players in the present study should be highlighted. Soft drinks can stimulate the appetite or suppress satiety because of the high glycemic index.²³ A previous study in the United States found a positive relationship between the consumption of soft drinks and energy intake.²⁴ Similarly, fast food has been rapidly accepted, especially among students and young people, due to the convenience, good taste, and quick preparation as well as massive advertisements as reported in studies conducted in India and Australia.^{25,26} Low food intake, an unbalanced household food distribution, and recurrent infections are among the main causes of malnutrition, however, food restriction and poor understanding about food significantly contribute to malnutrition.^{27,28}

CONCLUSION

Softball players are required to achieve optimum performance during both training and competition. A higher energy intake, more sufficient eating frequency, and a higher knowledge of nutrition are significantly correlated with an increased level of energy adequacy. Conversely, a higher level of physical activity will lower the level of energy adequacy. Moreover, suffering from infectious disease as well as having poor energy adequacy is significantly correlated with low nutritional status among softball players. Therefore, managing their consumption patterns and energy adequacy is crucial for softball players.

Ethical Clearance: Ethical approval was granted by the School of Public Health in Airlangga University, Surabaya.

Source of Funding: Self-funding.

Conflict of Interest: Nil.

REFERENCES

1. Hornstrom GR, Friesen CA, Ellery JE, Pike K. Nutrition knowledge, practices, attitudes, and information sources of mid-american conference college softball players. *Food and Nutrition Sciences*. 2011;2(02):109.
2. Burke LM, Hawley JA, Wong SH, Jeukendrup AE. Carbohydrates for training and competition. *Journal of sports sciences*. 2011;29(sup1):S17-S27.
3. MoH. Pedoman Gizi Olahraga Pretrasi (Guidelines of nutrition for sports achievement). Jakarta: Kemenkes RI; 2014.
4. Maughan RJ, Shirreffs SM. IOC Consensus Conference on Nutrition in Sport, 25-27 October 2010, International Olympic Committee, Lausanne, Switzerland. *Journal of sports sciences*. 2011;29:S1.
5. Thomas DT, Erdman KA, Burke LM. American College of Sports Medicine Joint Position Statement. Nutrition and Athletic Performance. *Medicine and science in sports and exercise*. 2016;48(3):543-68.
6. MoH. Standar Antropometri Penilaian Status Gizi Anak (Anthropometric standard to evaluate children's nutritional status). In: Health DGoNaM, editor. Jakarta: Kemenkes RI; 2011.
7. Larson-Meyer DE, Woolf K, Burke L. Assessment of nutrient status in athletes and the need for supplementation. *International journal of sport nutrition and exercise metabolism*. 2018;28(2):139-58.
8. Wiarto G. Fisiologi dan olahraga. Yogyakarta: Graha Ilmu. 2013.
9. British Nutrition Foundation. Nutrition for sport and exercise London: BNF; [Available from: <https://www.nutrition.org.uk/healthyliving/active-lifestyle/eating-for-sport-and-exercise.html?start=1>].
10. Kristal AR, Bowen DJ, Curry SJ, Shattuck AL, Henry HJ. Nutrition knowledge, attitudes and perceived norms as correlates of selecting low-fat diets. *Health Education Research*. 1990;5(4):467-77.
11. Elbon SM, Johnson MA, Fischer JG, Searcy CA. Demographic factors, nutrition knowledge, and health-seeking behaviors influence nutrition label reading behaviors among older American adults. *Journal of Nutrition for the Elderly*. 2000;19(3):31-48.
12. Worsley A. Nutrition knowledge and food consumption: can nutrition knowledge change food behaviour? *Asia Pacific journal of clinical nutrition*. 2002;11:S579-S85.
13. Bouchard C, Blair SN, Haskell WL. Physical activity and health: *Human Kinetics* 1; 2007.
14. Wanner M, Götschi T, Martin-Diener E, Kahlmeier S, Martin BW. Active transport, physical activity, and body weight in adults: a systematic review. *American journal of preventive medicine*. 2012;42(5):493-502.
15. Mielgo Ayuso J, Maroto Sanchez B, Luzardo Socorro R, Palacios Le Blé G, Palacios Gil Antuñano N, Gonzalez Gross MM. Evaluation of nutritional status and energy expenditure in athletes. *Nutricion hospitalaria*. 2015;31(Supl. 3):227-36.
16. Samartín S, Chandra RK. Obesity, overnutrition and the immune system. *Nutrition Research*. 2001;21(1-2):243-62.
17. Schaible UE, Stefan H. Malnutrition and infection: complex mechanisms and global impacts. *PLoS medicine*. 2007;4(5):e115.
18. Papadopoulou SD. Impact of energy intake and balance on the athletic performance and health of top female volleyball athletes. *Medicina Sportiva: Journal of Romanian Sports Medicine Society*. 2015;11(1):2477.
19. Vallières F, Tremblay A, St-Jean L. Study of the energy balance and the nutritional status of highly trained female swimmers. *Nutrition Research*. 1989;9(7):699-708.
20. Flatt AA, Esco MR. Endurance performance relates to resting heart rate and its variability: A case study of a collegiate male cross-country athlete. *J Aust Strength Cond*. 2014;22:39-45.
21. Utami D. Peran fisiologi dalam meningkatkan prestasi olahraga Indonesia menuju sea games. *Jurnal Olahraga Prestasi*. 2015;11(2).
22. Sousa M, Fernandes MJ, Carvalho P, Soares J, Moreira P, Teixeira VH. Nutritional supplements

- use in high-performance athletes is related with lower nutritional inadequacy from food. *Journal of Sport and Health Science*. 2016;5(3):368-74.
23. Schulze MB, Manson JE, Ludwig DS, Colditz GA, Stampfer MJ, Willett WC, et al. Sugar-sweetened beverages, weight gain, and incidence of type 2 diabetes in young and middle-aged women. *Jama*. 2004;292(8):927-34.
24. Rajeshwari R, Yang S-J, Nicklas TA, Berenson GS. Secular trends in children's sweetened-beverage consumption (1973 to 1994): the Bogalusa Heart Study. *Journal of the American Dietetic Association*. 2005;105(2):208-14.
25. Dixon HG, Scully ML, Wakefield MA, White VM, Crawford DA. The effects of television advertisements for junk food versus nutritious food on children's food attitudes and preferences. *Social science & medicine*. 2007;65(7):1311-23.
26. Singh M, Mishra S. Fast food consumption pattern and obesity among school going (9-13 year) in Lucknow District. *IJSR*. 2014;3(6):1672-4.
27. Chakravarthy MV, Joyner MJ, Booth FW. (2002). *An obligation for primary care physicians to prescribe physical activity to sedentary patients to reduce the risk of chronic health conditions*. Mayo clinic proceedings: Elsevier.
28. World Health Organisation. Diet, nutrition, and the prevention of chronic diseases: report of a joint WHO/FAO expert consultation: World Health Organization; 2003.

Compliance with Smoke-Free Legislation and Associated Factors: A Serial Survey in Bali, Indonesia

Ketut Suarjana¹, Artawan Eka Putra², Putu Ayu Swandewi Astuti², Ketut Hari Mulyawan²,
Djazuly Chalidyanto³

¹Doctoral Program, Faculty of Public Health, Universitas Airlangga, Bali Tobacco Control Initiative, School of Public Health, Faculty of Medicine, Universitas Udayana; ²School of Public Health, Faculty of Medicine, Universitas Udayana; ³Doctoral Program, Faculty of Public Health, Universitas Airlangga

ABSTRACT

This study aims to describe the compliance to the smoke-free legislation and to identify the associated factors. A cross-sectional study was conducted to assess the compliance at all smoke-free venues. A number of 5,500 smoke-free venues were involved. The data was collected on a six monthly basis through observation and interviews. The study observed 6,670 buildings. The compliance was 11.8% in the second semester of 2013 (1st) as the baseline, which increased to 62.0% in 2015 (5th). Meanwhile, the most common violations of smoke-free legislation were found to be cigarette butts, the provision of ashtrays and smoking. Factors that were associated with compliance were awareness, knowledge and support of the legislation and the presence of internal monitoring. The compliance with Bali's smoke-free legislation remains suboptimal, despite showing increasing trends over time. Hence, continuous education and supervision should be conducted for venue managers to increase compliance.

Keywords: *smoke-free legislation, smoke-free venue, compliance, Bali Indonesia*

INTRODUCTION

The tobacco epidemic and its products are one of the biggest challenges to public health in the world. Indonesia is the fourth highest country for the population of smokers in the world¹. The Basic Health Research Data in Indonesia (*Riskesdas*) in 2010 showed that the prevalence of smokers aged ≥ 15 years was 34.7% and this increased significantly in 2013 to 39.5%². According to the WHO's official report, it is estimated that the prevalence of smokers in Indonesia will increase again to 42.7% by 2020, where the prevalence of men is estimated to reach 82.5% and women 3.0%³. Also, the

prevalence of smokers is also high in Bali, which was 24.9% in 2007, which increased to 31.0% in 2010, and slightly decreased to 28% in 2013².

The WHO reported that cigarettes kill more than 7 million people per-year in the world, of which 6 million were active smokers and approximately 890,000 were non-smokers but exposed to second-hand smoke. It shows that the smoke not only endanger smokers, but also non-smokers³. Indonesia is the only country in Asia that has not ratified the WHO's FCTC. Nevertheless, tobacco control efforts have been undertaken and the establishment of smoke-free venues in 2011 was one of the important regulation in Indonesia. The legislation is important to reduce the harm from smoking among non-smokers and to provide healthy air to the community. There are seven venues which ruled as smoke-free: health facilities, schools, places of worship, children's playgrounds, work places, public places and public transportation⁴.

Since 2011, Bali also implemented smoke-free legislation, which was the first smoke-free legislation at the provincial level in Indonesia. After 3 years of

Corresponding Author:

Ketut Suarjana
Doctoral Program, Faculty of Public Health,
Universitas Airlangga,
Bali Tobacco Control Initiative, School of Public Health,
Faculty of Medicine, Universitas Udayana
Email: ketut.suarjana-2017@fkm.unair.ac.id

implementation, the legislation has never been evaluated, particularly regarding compliance. Accordingly, this study aimed to describe the compliance to the Bali provincial smoke-free legislation and to identify the associated factors.

METHOD

A cross-sectional study was conducted to assess all smoke-free legislation criterias across five periods, from July 2013 to August 2015. The study was located in Bali, Indonesia, which has more than 14,700 smoke-free venues spread across the nine districts of Badung, Gianyar, Klungkung, Bangli, Karangasem, Tabanan, Jembrana, Buleleng, and Denpasar.

The sample size was determined based on the cluster recommendation ⁶. A total of 5,500 smoke-free venues (1,100 in each period) were included. The sample from each venue was determined by there being 150 schools, 100 health facilities, 400 public places, 100 children’s playground, 150 places of worship, 150 work places, and 50 public transportation vehicles and using systematic random sampling.

The data was collected using a form containing eight indicators: observed smoking (main indicator), the provision of designated smoking venues, the provision of ashtrays, the availability of no-smoking signs, observed cigarette butts, the observed smell of tobacco smoke, observed cigarette selling, and tobacco advertisements, promotions and sponsorships (secondary indicators) ⁶. Smoke-free venues were considered to be compliant if they met the eight compliance indicators, except for public places which were permitted to sell cigarettes and promote them through advertisements. Interviews were conducted with all venue managers. The data was collected by 44 trained enumerators, and was inputted using Epi-Data 3.1, analysed descriptively using STATA-SE 12.1, and tested using the Chi-square test.

RESULTS

Compliance with Smoke-free Legislation in the Provinces and Districts: The study observed 6,670 buildings from within 5,500 non-smoking venues in Bali over five periods. Generally, the surveys indicated an increasing trend of compliance over time, but not all having yet reached the target (80%). For the first period of the survey, compliance remained (11.8%).

However, in the next periods, compliance showed an increasing trend (2nd=17.2%, 3rd=25.9%, 4th=37.8%, and 5th=62.0%). Districts also showed a positive trend in compliance, with the highest being Tabanan (78.3%). There were two districts that showed low compliance; Badung (44.8%) and Gianyar (52.8%). Both districts have more public places such as hotels, restaurants and other public places (Figure 1).

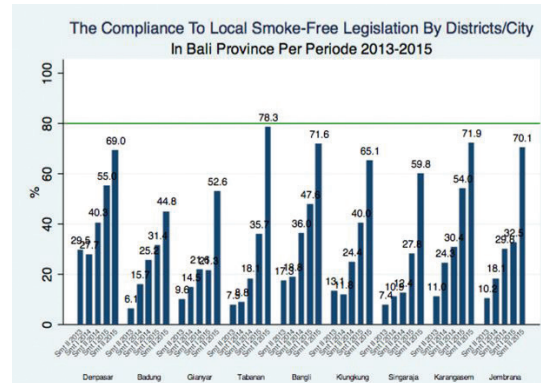


Figure 1: The compliance with smoke-free legislation in Bali by district

Compliance with Smoke-Free Legislation by Venue Type:

Figure 2 shows that the type of venue that has the highest increasing trend of compliance were children playgrounds (6.5%-90%), followed by health facilities (54.2%-88.8%), and education places or schools (12.4%-83.2%). Increased compliance was also shown in public places, although it was not as high as other venues. For example, compliance in restaurants increased from 0.7% in the first survey to 15.6% in the fifth survey. Hotels also showed improved compliance from 0.6% in the first survey to 38.4% in the fifth survey. Traditional markets showed compliance in the fifth survey at 32.3%, while the modern market had the highest compliance among the public places (10.3%-71.7%).

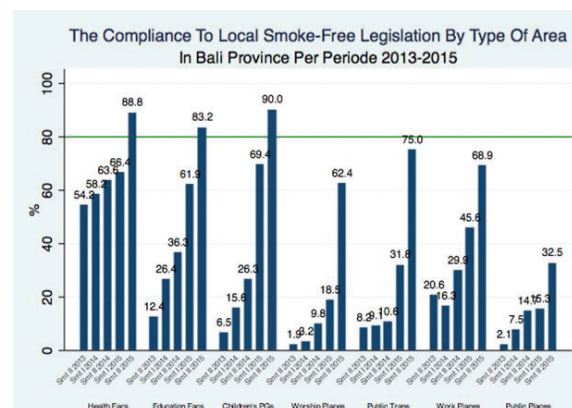


Figure 2: The compliance with smoke-free legislation in Bali by venue

No-Smoking Sign Coverage: In this study, we found that no-smoking sign coverage increased over the five periods of the survey (from 21.2 % to 77.8% respectively). However, compliance had not yet reached the target (100%).

Violations on the Implementation of Smoke-Free Legislation: The violations that were assessed in this study were also based on 8 indicators. The most common 3 violations were the cigarette butts found indoors, the provision of ashtrays and observed smoking indoors. Moreover, no decreasing trend in the violations was found in the five periods of the survey (Figure 3).

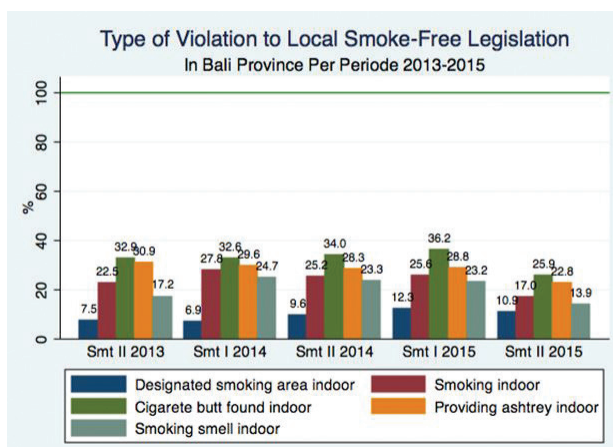


Figure 3: Type of Violation and the Smoke-Free Legislation in the Bali Provinces

Factors Associated with Compliance: The results showed that the factors associated with compliance were awareness regarding the presence of the legislation (PR=3.0), knowledge (PR=3.0), support of the legislation (PR=3.0) and the presence of internal monitoring (PR=2.1) (Table 1).

Table 1: Factors associated with the compliance to Bali’s smoke-free legislation

Factor	Comply		Prevalence Ratio (PR)	95% CI
	No	Yes		
Socialised				
No	2,093 (86.2)	334 (13.8)	ref	
Yes	2,326 (58.9)	1,625 (41.1)	3.0*	2.7-3.3
Knowledge				
Less	3,275 (82.3)	703 (17.7)	ref	
Good	1,142 (47.7)	1,254 (52.3)	3.0*	2.7-3.2
Support				
No	637 (89.1)	78 (10.9)		
Yes	3,770 (67.7)	1,876 (32.3)	3.0*	2.5-3.8

Conted...

Internal monitoring				
No	1,961 (74.8)	662 (25.2)		
Yes	845 (45.8)	1,001 (54.2)	2.1*	2.0-2.3

*p<0.01

DISCUSSION

The results showed that after three years, the overall compliance in Bali was suboptimal. Bali province is a famous tourist destination. Thousands of public places were built to support tourism. Meanwhile, public places are a very challenging venue in terms of policy implementation. Thus, the study was concerned with public places and workplaces ⁷ in which the low compliance was not only taking place in developing countries ⁸ opinions and compliance related to Uganda’s comprehensive smoke-free law among hospitality venues in Kampala Uganda. DESIGN This multi-method study presents cross-sectional findings of the extent of compliance in the early phase of Uganda’s comprehensive smoke-free law (2 months postimplementation; pre-enforcement, but also in developed countries ⁹.

The type of venues that had better compliance were health facilities, schools and children’s playground. The factors associated with compliance were including were strong commitment from the manager, the presence of an internal monitoring system, and better knowledge of the employees regarding smoking harm as well as concerns over patient safety and disruptions to care ¹⁰.

Compliance in public transportation, workplaces and places of worship showed a significant improvement despite still being below target (80%). It has proven that the awareness of community regarding the legislation has started to increase. Waddell et al emphasised the importance of contextual information for community education efforts on smoke-free legislation ¹¹. It is also necessary to change the individual perception regarding the legislation and the harm of second-hand smoke among community, which can affect the compliance and people’s health status ¹². In some schools, many teachers and administration staff members were found to smoke. This is ironic because they are a role model for the students, even though one study showed that the majority of students disagreed with the teachers’ smoking in the classroom and in their offices ¹³.

The venue that had compliance that was as low as public places was places of worship. In Bali, the places of worship were mosques, churches, monasteries, and pagodas. Temples in Bali are a semi-open venue, and many violations occurred, particularly observations of smoking and cigarette butts. Involving religious leaders and local wisdom could be an appropriate strategy in a social religious community like Indonesia, particularly in Bali ¹⁴.

One of the most important indicators in the policy is the availability of no-smoking sign. A study showed that smoke-free compliance in public places was suboptimal due to the absence of no-smoking signage ¹⁵smoking aids, cigarette butts/bidi ends and smoking smell. Moreover, no-smoking signs being displayed had an effect on curbing smoking behaviour in public places ¹⁶. However, our study showed that the coverage of the signs remains below the target (100%). The absence of no-smoking signs could make visitors not aware of and thus violates the legislation, and indicates the absence of an internal monitoring system. Thus, installing no-smoking signs, removing ashtrays, and sweeping away cigarette butts is important to inform society of the descriptive norm that smoking is not a normal behaviour in the community ¹⁷. Other studies have emphasised that enforcement agencies should focus on the comprehensive removal of ashtray equivalents that could act as cues for smoking within a venue ¹⁸.

The better level of compliance in Denpasar, the capital of Bali, was because of the majority venue type being health facilities and government offices. It indicates that the performance of the tobacco control program in Denpasar was better than in other districts. Moreover, the communities in the urban venues had a better education level, were exposed to updated information, and were relatively more controlled. It corresponds with a study stating that the higher potential exposure to policy, the better the compliance level, because exposure to policy is one of the moderators to compliance ¹⁹. However, other studies showed that rural residents were more likely than those in urban settings to support local smoke-free legislation ²⁰.

Based on the interview, the managers exposed to smoke-free legislation had better knowledge, showed more responsibility and supported the legislation's implementation through an internal monitoring system. The system became the significant factor in increasing

compliance. Thus, it is necessary to strengthen the enforcement infrastructure and efforts as well as investing in minimal but essential enforcement resources ²¹. This finding should be followed by innovative monitoring and an implementation program for each type of venue. Another study also emphasised that the education level of the managers was an important determinant to ensure compliance with the smoke-free legislation ²².

Some of the managers, particularly from hospitality venues, were also worried regarding the economic impact of the smoke-free implementation. It was reasonable despite several studies that showed that banning smoking in the business sector has had no significant negative economic impact ²³. However, a study in the US stated that despite clear public health arguments and strong public support, the passing of smoke-free laws had stagnated and exemptions were being used to weaken the existing laws. Hence, the capability to make both a health and business case in support of smoke-free air laws may also bolster the case for expansion ²⁴.

CONCLUSIONS

The compliance with the local smoke-free legislation in Bali remains suboptimal, despite increasing over time. The suboptimal compliance is associated with education coverage, knowledge and the support of managers as well as their responsibility to conduct internal monitoring. The continuous and appropriate approach of education, supervision and mentoring should be done by and for managers and the community. Each district is recommended to establish an effective tobacco control team, which could educate and provide assistance regarding the implementation of smoke-free legislation in its region.

Conflict of Interest: None.

Ethical Clearance: The study achieved ethical clearance from the Ethical Committee of the Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia.

Source of Funding: Self-funded.

REFERENCES

1. Drope J, Schluger NW, Cahn Z, Drope J, Hamill S, Islami F, et al. The Tobacco Atlas [Internet]. Atlanta, Georgia; 2018 [cited 2018 Sep 27]. Available from: www.tobaccoatlas.org

2. NIHRD. Indonesia Basic Health Research 2013 [Internet]. Jakarta, Indonesia; 2013. Available from: <http://www.litbang.depkes.go.id/>
3. World Health Organization. WHO global report on trends in prevalence of tobacco smoking 2015 [Internet]. Geneva; 2015 [cited 2018 Sep 27]. Available from: www.who.int
4. Pusat Data dan Informasi. Perilaku Merokok Masyarakat Indonesia Berdasarkan Riskeddas 2007 dan 2013. Hari Tanpa Tembakau Sedunia. Jakarta, Indonesia: Kementerian Kesehatan Republik Indonesia; 2015. p. 2–12.
5. Centers for Disease Control and Prevention. Evaluation Toolkit for Smoke-Free Policies [Internet]. Atlanta; 2008 [cited 2018 Sep 27]. Available from: <http://www.cdc.gov/tobacco>
6. International Union Against Tuberculosis and Lung Disease. Assessing Compliance with Smoke-Free Laws A “How-to” Guide for Conducting Compliance Studies Second Edition [Internet]. Edinburgh, UK; 2014 [cited 2018 Sep 27]. Available from: https://www.theunion.org/what-we-do/publications/technical/english/compliance-guide_v4smallerfile.pdf
7. Hyland A, Barnoya J, Corral JE. Smoke-free air policies: past, present and future. *Tob Control* [Internet]. 2012 Mar 16 [cited 2018 Sep 27];21(2):154–61. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22345239>
8. Gravely S, Nyamurungi KN, Kabwama SN, Okello G, Robertson L, Heng KKC, et al. Knowledge, opinions and compliance related to the 100% smoke-free law in hospitality venues in Kampala, Uganda: cross-sectional results from the KOMPLY Project. *BMJ Open* [Internet]. 2018 Jan 5 [cited 2018 Sep 27];8(1):e017601. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29306880>
9. Navas-Acien A, Çarkoğlu A, Ergör G, Hayran M, Ergüder T, Kaplan B, et al. Compliance with smoke-free legislation within public buildings: a cross-sectional study in Turkey. *Bull World Heal Organ* [Internet]. 2016 [cited 2018 Sep 27]; Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4750436/pdf/BLT.15.158238.pdf>
10. Schultz ASH, Finegan B, Nykiforuk CIJ, Kvern MA. A qualitative investigation of smoke-free policies on hospital property. *Can Med Assoc J* [Internet]. 2011 Dec 13 [cited 2018 Sep 27];183(18):E1334–44. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22042991>
11. Waddell EN, Farley SM, Mandel-Ricci J, Kansagra SM. Public Support for Smoke-Free Air Strategies Among Smokers and Nonsmokers, New York City, 2010–2012. *Prev Chronic Dis* [Internet]. 2014 Jan 30 [cited 2018 Sep 27];11:130263. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24480633>
12. International Agency for Research on Cancer. Evaluating the effectiveness of smoke-free policies. [Internet]. Vol. 13, 13. 2009. 374 p. Available from: <http://w2.iarc.fr/en/publications/pdfs-online/prev/handbook13/handbook13.pdf>
13. Erdogan N, Erdogan I. Smoking at school: views of Turkish university students. *Int J Environ Res Public Health* [Internet]. 2009 [cited 2018 Sep 27];6(1):36–50. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19440268>
14. Byron MJ, Cohen JE, Gittelsohn J, Frattaroli S, Nuryunawati R, Jernigan DH. Influence of religious organisations’ statements on compliance with a smoke-free law in Bogor, Indonesia: a qualitative study. *BMJ Open* [Internet]. 2015 Dec 14 [cited 2018 Sep 27];5(12):e008111. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26667011>
15. Kumar R, Goel S, Harries AD, Lal P, Singh RJ, Kumar AMV, et al. How good is compliance with smoke-free legislation in India? Results of 38 subnational surveys. *Int Health* [Internet]. 2014 Sep 1 [cited 2018 Sep 27];6(3):189–95. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24876270>
16. Goel S, Sharma D, Gupta R, Mahajan V. Compliance with smoke-free legislation and smoking behaviour: observational field study from Punjab, India. *Tob Control* [Internet]. 2018 Jul [cited 2018 Sep 27];27(4):407–13. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/28798264>

17. Byron MJ, Cohen JE, Frattaroli S, Gittelsohn J, Jernigan DH. Using the theory of normative social behavior to understand compliance with a smoke-free law in a middle-income country. *Health Educ Res* [Internet]. 2016 Oct 10 [cited 2018 Sep 27];31(6):cyw043. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27923863>
18. Thrasher JF, Pérez-Hernández R, Swayampakala K, Arillo-Santillán E, Bottai M. Policy support, norms, and secondhand smoke exposure before and after implementation of a comprehensive smoke-free law in Mexico city. *Am J Public Health* [Internet]. 2010 Sep [cited 2018 Sep 27];100(9):1789–98. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20466952>
19. Fong GT, Cummings KM, Borland R, Hastings G, Hyland A, Giovino GA, et al. The conceptual framework of the International Tobacco Control (ITC) Policy Evaluation Project. *Tob Control* [Internet]. 2006 Jun 1 [cited 2018 Sep 27];15(suppl_3):iii3-iii11. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/16754944>
20. Rayens MK, Hahn EJ, Langley RE, Zhang M. Public Support for Smoke-Free Laws in Rural Communities. *Am J Prev Med* [Internet]. 2008 Jun [cited 2018 Sep 27];34(6):519–22. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18471589>
21. Peruga A, Hayes LS, Aguilera X, Prasad V, Bettcher DW. Correlates of compliance with national comprehensive smoke-free laws. *Tob Control* [Internet]. 2017 Dec 5 [cited 2018 Sep 27];tobaccocontrol-2017-053920. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29208739>
22. Gupta VK, Arora M, Sharma I, Nazar GP, Modi B, Singh D, et al. Knowledge and opinion about smoke-free laws and second-hand smoke among hospitality venue managers in Gujarat and Andhra Pradesh, India. *WHO South-East Asia J public Heal* [Internet]. 2013 [cited 2018 Sep 27];2(3):174–80. Available from: <http://www.who-seajph.org>
23. Tauras JA, Chaloupka FJ, Moor G, Henderson PN, Leischow SJ. Effect of the Smoke-Free Illinois Act on casino admissions and revenue. *Tob Control* [Internet]. 2018 Jan 19 [cited 2018 Sep 27];tobaccocontrol-2017-053966. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29351930>
24. Yousefzadeh MJ, Schafer MJ, Noren Hooten N, Atkinson EJ, Evans MK, Baker DJ, et al. Circulating levels of monocyte chemoattractant protein-1 as a potential measure of biological age in mice and frailty in humans. *Aging Cell*. 2018;17(2).

The association of Pre-Pregnancy Body Mass Index (BMI) and Increased Maternal Weight in the Third Trimester of Pregnancy with Foetal Weight Estimation

Siti Maimuna¹, Andina Firdaus Supriyanto²

¹Doctoral Program of Public Health, Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia; ^{1,2}Department of D3 Nursing, Surabaya Health Polytechnic of the Ministry of Health, Indonesia

ABSTRACT

Poor nutritional status in pregnancy affects foetal growth, which can lead to low birth weight and subsequently have an impact on intergenerational malnutrition. The purpose of our study was to assess the relationship between pre-pregnancy body mass index (BMI) and increased maternal weight in the third trimester of pregnancy with foetal weight estimation. We employed an analytical observation study with a cross-sectional design. We used a total sample of all third trimester pregnant women in Tanggulangin Community Health Centre (CHC) in Sidoarjo, East Java, with a total of 349 women being recruited. The data was secondary, obtained from the maternal and child health status book of the study subjects and medical records. The data was analysed using the Spearman correlation test. Most women with normal pre-pregnancy BMI were multiparous. Pre-pregnancy BMI was significantly correlated with the foetal weight estimation. Low pre-pregnancy BMI increases the risk of low foetal weight. However, our study did not find a significant correlation between maternal weight gain during the third trimester and foetal weight estimation. Most of our study subjects had maternal weight gain of approximately 0.3 – 0.5 kg/week. Improving the nutritional status of women before and during pregnancy is crucial to achieve the recommended foetal weight.

Keywords: *body mass index, third trimester of pregnancy, maternal weight gain, fetal weight*

INTRODUCTION

Low birth weight (LBW) refers to the baby's weight at birth when it is below 2,500 grams.¹ LBW babies have a higher risk of neonatal mortality and morbidity including the risk of non-communicable diseases when they are older.¹ In 2013, approximately 22 million neonates or 16% of the total babies born globally had a low birth weight.² South Asia has the highest prevalence of LBW; an estimated 28% of the babies in the region.¹

The prevalence of LBW in Indonesia was estimated to be 10.2% in 2013, a decrease from 11.11% in 2010.³ Lack of nutrition before and during pregnancy may affect the incidence rate of LBW.² In line with the LBW incidence rate, the prevalence of Indonesian pregnant women with chronic energy deficiency (CED) was estimated to be 15% in 2013.³

Nutrition is important for pregnant women, not only to maintain their health but also to support foetal growth.⁴ The World Health Organisation (WHO) strongly recommends for pregnant women to take iron tablet, folic acid and calcium supplements to prevent LBW, preterm birth, puerperal sepsis and anaemia related to pregnancy.¹ A recent multi-country study found that some significant determinants of the incidence rate of LBW in developing countries included older maternal age, a lack of antenatal care (ANC), a lack of education, low socioeconomic status, and low body mass index (BMI).⁵ A previous study also reported that a low

Corresponding Author:

Siti Maimuna

Doctoral Program of Public Health, Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

Department of D3 Nursing,

Surabaya Health Polytechnic of the Ministry of Health, Indonesia

Email: siti.maimuna@gmail.com

maternal weight marked by a BMI ≤ 19.8 kg/m² had a correlated increased risk of LBW by 1.8 times (95%CI= 1.1-2.9).⁶ This present study, therefore, aimed to examine the relationship between BMI, the maternal weight in the third trimester of pregnancy, and the estimated birth weight among women of the study setting.

METHOD

This study used an observational analytic research design with a cross-sectional approach. The sample population in this study were all third trimester pregnant women who attended Tanggulangin Community Health Centre (CHC) between March 2016 and April 2017. The selection of this setting was based on the 2015 health report of the Sidoarjo District Health Office, indicating that the LBW prevalence was 3.8%, the second highest in the district.⁷ As we applied total sampling, women who had a normal pregnancy and who had a complete record in the Maternal and Child Health status book and medical database were included in this study. In total, our study included 349 pregnant women. To collect the data, we used secondary data obtained from the MCH handbook and the medical records at the Tanggulangin CHC. The data was analysed using the Spearman Correlation test with the help of SPSS version 22.

RESULTS

As displayed in Table 1, 138 women were in their first pregnancy (primiparous), while 211 women were multiparous. The majority of primiparous women were aged between 21-25 years old (63.0%), while most of the multiparous women were aged between 26-30 years old (38.9%). Most of the primiparous and multiparous women were employed (67.4% and 51.2%, respectively), and had a high level of education (78.3 % and 73.5%, respectively). More than half of the primiparous and multiparous women also had normal pre-pregnancy BMI and had a weekly weight increase that was between 0.3 – 0.5 kg. The estimated foetal weight among the respondents was mostly between 2,500 – 3,500 grams (84.1% and 86.3% for primiparous and multiparous respectively).

Table 1: Characteristics of the respondents based on parity

Variables	Primiparous		Multiparous	
	n	%	n	%
Age (years)				
16-20	27	19.6	1	0.5
21-25	87	63.0	36	17.1
26-30	20	14.5	82	38.9
31-35	2	1.4	69	32.7
36-40	2	1.4	19	9.0
41-45	0	-	4	1.9
Employment				
Unemployed	45	32.6	103	48.8
Employed	93	67.4	108	51.2
Education				
Low	30	21.7	56	26.5
High	108	78.3	155	73.5
Pre-pregnancy BMI				
Underweight	47	34.1	38	18.0
Normal	75	54.3	117	55.5
Overweight	11	8.0	42	19.9
Obesity	5	3.6	14	6.6
Increased maternal weight (kg/week)				
0.1–0.29	15	10.9	49	23.2
0.3–0.5	81	58.7	124	58.8
0.6–1.0 kg	42	30.4	38	18.0
Estimated foetal weight (grams)				
2,200–2,400	22	15.9	29	13.7
2,500–3,500	116	84.1	182	86.3
Total	138		211	

Table 2 presents the comparison of the respondent’s characteristics based pre-pregnancy BMI, their increased maternal weight and the estimated foetal weight among the age group. Most of the respondents in all age groups had a normal pre-pregnancy BMI. Except for the age group of 16-20 years old, all of the age groups had a weekly maternal weight increase between 0.3 – 0.5 kg. All of the age groups also had an estimated foetal weight between 2,500- 3,000 grams.

Table 2: Pre-pregnancy BMI, increased maternal weight, and the estimated foetal weight based on age group

Variables	Age group (years) n (%)					
	16-20	21-25	26-30	31-35	36-40	41-45
Pre-pregnancy BMI						
Underweight	6 (21.4)	42 (34.1)	23 (22.5)	11 (15.5)	2 (9.5)	1 (25.0)
Normal	18 (64.3)	65 (52.8)	59 (57.8)	36 (50.7)	13 (61.9)	1 (0.0)

Conted...

Overweight	3 (10.7)	9 (7.3)	18 (17.6)	18 (25.4)	5 (23.8)	0 (0.0)
Obesity	1 (3.6)	7 (5.7)	2 (2.0)	6 (8.5)	1 (4.8)	2 (50.0)
Increased maternal weight (kg/week)						
0.1–0.29	6 (21.4)	14 (11.4)	16 (15.7)	20 (28.2)	7 (33.3)	1 (25.0)
0.3–0.5	9 (32.1)	58 (47.2)	57 (55.9)	43 (60.6)	11 (52.4)	2 (50.0)
0.6–1.0 kg	13 (46.4)	51 (41.5)	29 (28.4)	8 (11.3)	3 (14.3)	1 (25.0)
Estimated foetal weight (grams)						
2,200–2,400	8 (28.6)	13 (10.6)	16 (15.7)	10 (14.1)	3 (14.3)	1 (25.0)
2,500–3,500	20 (71.4)	110 (89.4)	86 (84.3)	61 (85.9)	18 (85.7)	3 (75.0)
Total	28 (8.0)	123 (35.2)	102 (29.2)	71 (20.3)	21 (6.0)	4 (1.1)

In Table 3, pre-pregnancy BMI and increased maternal weight were compared among the groups of women with different estimated foetal weight. Most of the women with LBW (estimated foetal weight between 2200–2400 grams) were underweight (54.9%), while most of the women with a normal estimated foetal weight also had normal pre-pregnancy BMI (57.4%). Most of the women in both estimated LBW and normal foetal weight groups had a weekly maternal weight increase between 0.3–0.5 kg (64.7% and 49.3%, respectively).

Table 3: Pre-pregnancy BMI, increased maternal weight and estimated foetal weight

Variables	Estimated foetal weight			
	2,200-2,400 grams		2,500-3,500 grams	
	n	%	n	%
Pre-pregnancy BMI				
Underweight	28	54.9	57	19.1
Normal	21	41.2	171	57.4
Overweight	2	3.9	51	17.1
Obesity	0	0.0	19	6.4
Increased maternal weight (kg/week)				
0.1–0.29	10	19.6	54	18.1
0.3–0.5	33	64.7	147	49.3
0.6–1.0 kg	8	15.7	97	32.6
	51		298	

We employed the Spearman Correlation test to analyse the correlation between pre-pregnancy BMI and estimated foetal weight as well as the correlation between increased maternal weight and estimated foetal weight. The results showed that the correlation coefficient of pre-

pregnancy BMI and estimated foetal weight was 0.294 (p-value = 0.001). The correlation coefficient value between weekly increased maternal weight in the third trimester and estimated foetal weight was 0.63 (p-value = 0.1). Pre-pregnancy BMI is significantly associated with estimated foetal weight, while increased maternal weight had no association with estimated foetal weight.

DISCUSSION

The results of our study showed that most of the respondents were aged between 21-30 years old, had a high level of education, and were employed. Most of the pregnant women with normal pre-pregnancy BMI were aged between 21-30 years old. Having normal pre-pregnancy BMI in this age range would be more likely to produce positive maternal and neonatal outcomes.⁸ Giving birth below 20 years old or older than 35 years old increases the risk of adverse pregnancy outcomes.⁸ Adolescence pregnancy would increase the risk of maternal and neonatal mortality due to having unstable emotions and a lack of nutrition, while an advanced maternal age of older than 35 years is associated with lower bodily resistance to various communicable and non-communicable diseases.⁹

The results of the present study indicate that most of the multiparous respondents (60.9%) had normal pre-pregnancy BMI. Having a normal BMI is very good for women who are planning for pregnancy.^{10,11} A previous study in Japan reported the increased prevalence of chronic hypertension and hypertension related to pregnancy among women with a BMI that indicated a status of being overweight or obese.¹¹ Women with a higher pre-pregnancy BMI are associated with the onset of pregnancy-induced hypertension.¹¹ Malnourished

pregnant women encounter the risk of LBW and low breastmilk production.¹² In our study, approximately 5.4% of the study subjects were obese before getting pregnant. Obese women in their second pregnancy have a higher risk of preeclampsia, caesarean delivery, and neonatal mortality.¹³

The results of this study indicate that about 65% of multiparous respondents experienced an increase in body weight during the third trimester between 0.3-0.5 kg/week. During the second and third trimesters of pregnancy, normally a woman gains weight by approximately 1 kg/week.¹⁴ Throughout pregnancy, a woman is expected to increase their weight up to 12.5 kg, depending on their pre-pregnancy weight and the type of pregnancy (single or multiple pregnancy).¹⁵ A pregnant woman requires additional calories; 180 kcal in the first trimester, and 300 kcal in the second trimester and third trimester.¹⁶

The results of this study indicated that about 61.1% of the multiparous respondents had an estimated foetal weight of 2500-3500 grams, so normal birth weight can be expected. Similarly, another Indonesian study reported that about 94.8% of pregnant women in their study had an estimated foetal weight of 2500-4000 grams.¹⁷ Foetal weight can be estimated using clinical methods, which is useful for low resource settings.¹⁸ Calculations using the clinical method have been widely used due to simplicity, low cost, and being user friendly. However, it is more suitable for normal pregnancy. To detect abnormalities and the well-being of the foetus, an ultrasound would be required.¹⁸

The Spearman Correlation test yielded a significant association between pre-pregnancy BMI and foetal weight estimation. According to Diouf (2011), pre-gestational BMI is helpful when estimating foetal weight.¹⁹ Women who have a low pre-gestational BMI are more likely to have an incidence of preterm birth by 20% in their first pregnancy and 40% in the second pregnancy.¹³ Pre-pregnancy BMI contributes to the shape of the independent relationship between maternal weight gain and preterm birth.²⁰

Our study did not find a significant correlation between maternal weight gain during the third trimester and foetal weight estimation. However, approximately 81.9% of the study subjects were expected to have normal a foetal weight estimation. Some possible explanations related to this finding were homogeneity or there being less variety in the data. In addition, there

are other external factors that may have influenced the results, such as maternal stress conditions, maternal work, maternal education, maternal age, ANC history, and socioeconomic level.²¹ Low maternal weight gain, especially among underweight women, increased the risk of low birth weight.²¹ Pre-gestational nutritional status and maternal weight gain are closely related to foetal growth and development, and birth weight.²²

Monitoring the nutritional status of pregnant women can be done by regularly measuring the weight gain during pregnancy. Maternal weight gain is used as an indicator to predict maternal and neonatal health outcomes.²³ Women with low maternal weight gain are advised to improve their nutritional intake to achieve a normal weight. Conversely, pregnant women with excessive body weight are recommended to have a balanced diet by reducing their intake of calorific foods and high fat.²¹

CONCLUSION

In our study, most of women were multiparous (n=211). From the characteristics of the study subjects, most of the primiparous women were aged between 21-25 years, while the multiparous women were aged between 26-30 years old. Most of the multiparous women were unemployed (51.2%) and had a high level of education (73.5%). Normal pre-pregnancy BMI was found mostly among the multiparous women (55.5%). Most of the multiparous women had gained weight during the third trimester ranging from 0.3 to 0.5 kg per week and were expected to have a normal foetal weight (2,500-3,500 grams).

Pre-pregnancy BMI showed a significant correlation with the foetal weight estimation, while no correlation was found between increased maternal weight and the foetal weight estimation. Women with normal pre-pregnancy BMI have more chance to have a normal foetal weight than women with lower or higher pre-pregnancy BMI. Therefore, nutritional supplements are highly recommended, not only during the pregnancy period but also during the pregnancy planning stage.

Ethical Clearance: Ethical approval was granted by the School of Public Health in Airlangga University, Surabaya.

Source of Funding: Self-funding.

Conflict of Interest: Nil.

REFERENCES

1. World Health Organization. Global Nutrition Targets 2025: Low birth weight policy brief. Geneva: WHO; 2014.
2. UNICEF. low Birth Weight: Undernourishment in the womb can lead to diminished potential and predispose infants to early death: UNICEF; 2014 [Available from: <https://data.unicef.org/topic/nutrition/low-birthweight/>].
3. Balitbangkes-MoH. Riset Kesehatan Dasar Tahun 2013 [The 2013 Basic Health Research]. Jakarta: Balitbangkes MoH; 2013.
4. Cox JT, Phelan ST. Nutrition during pregnancy. *Obstetrics and gynecology clinics of North America*. 2008;35(3):369-83.
5. Mahumud RA, Sultana M, Sarker AR. Distribution and determinants of low birth weight in developing countries. *Journal of Preventive Medicine and Public Health*. 2017;50(1):18.
6. Ehrenberg HM, Dierker L, Milluzzi C, Mercer BM. Low maternal weight, failure to thrive in pregnancy, and adverse pregnancy outcomes. *American Journal of Obstetrics and Gynecology*. 2003;189(6):1726-30.
7. Sidoarjo DHO. Profil Kesehatan Kab. Sidoarjo Tahun 2015 (The 2015 Sidoarjo Health Profile Report). Sidoarjo 2016.
8. Cavazos-Rehg PA, Krauss MJ, Spitznagel EL, Bommarito K, Madden T, Olsen MA, et al. Maternal age and risk of labor and delivery complications. *Maternal and child health journal*. 2015;19(6):1202-11.
9. Harti LB, Kusumastuty I, Hariadi I. Hubungan Status Gizi dan Pola Makan terhadap Penambahan Berat Badan Ibu Hamil (Correlation between Nutritional Status and Dietary Pattern on Pregnant Mother's Weight Gain). *Indonesian Journal of Human Nutrition*. 2016;3(1):54-62.
10. Cosson E, Cussac-Pillegand C, Benbara A, Pharisien I, Nguyen M, Chiheb S, et al. Pregnancy adverse outcomes related to pregravid body mass index and gestational weight gain, according to the presence or not of gestational diabetes mellitus: A retrospective observational study. *Diabetes & metabolism*. 2016;42(1):38-46.
11. Sugiyama T, Nagao K, Metoki H, Nishigori H, Saito M, Tokunaga H, et al. Pregnancy outcomes of gestational diabetes mellitus according to pre-gestational BMI in a retrospective multi-institutional study in Japan. *Endocrine journal*. 2014;61(4):373-80.
12. Proverawati A, Asfuah S. Buku ajar gizi untuk kebidanan. Yogyakarta: Nuha Medika. 2009;1.
13. Tabet M, Flick LH, Tuuli MG, Macones GA, Chang JJ. Prepregnancy body mass index in a first uncomplicated pregnancy and outcomes of a second pregnancy. *American journal of obstetrics and gynecology*. 2015;213(4):548. e1-. e7.
14. The Indonesia Ministry of Health. Buku Kesehatan Ibu dan Anak (Handbook of Maternal and Child Health). Jakarta: Kemenkes RI & JICA; 1997.
15. Fikawati S, Syafiq A, Karima K. Gizi ibu dan bayi. Jakarta: Rajawali Pers. 2015:89-94.
16. Badriah DL. Gizi Dalam Kesehatan Reproduksi. Cetakan Pertama Bandung: Refika Aditama. 2011.
17. Mardeyanti M, Djulaeha E, Fatimah F. Ketepatan Taksiran Berat Badan Janin Dibandingkan Dengan Berat Badan Bayi Baru Lahir. *Jurnal Ilmu dan Teknologi Kesehatan*. 2013;1(1).
18. Sharma N, Srinivasan KJ, Sagayaraj MB, Lal D. Fetal weight estimation methods—clinical, sonographic and MRI imaging. *International Journal of Scientific and Research Publications*. 2014;4(1):2250-3153.
19. Diouf I, Charles MA, Thiebaugeorges O, Forhan A, Kaminski M, Heude B, et al. Maternal weight change before pregnancy in relation to birthweight and risks of adverse pregnancy outcomes. *European journal of epidemiology*. 2011;26(10):789-96.
20. Carnero A, Mejía C, García P. Rate of gestational weight gain, pre-pregnancy body mass index and preterm birth subtypes: a retrospective cohort study from Peru. *BJOG: An International Journal of Obstetrics & Gynaecology*. 2012;119(8):924-35.
21. Nohr EA, Vaeth M, Baker JL, Sørensen TI, Olsen J, Rasmussen KM. Combined associations of prepregnancy body mass index and gestational weight gain with the outcome of pregnancy—. *The American journal of clinical nutrition*. 2008;87(6):1750-9.
22. Papathakis PC, Singh LN, Manary MJ. How maternal malnutrition affects linear growth and development in the offspring. *Molecular and cellular endocrinology*. 2016;435:40-7.
23. Sulistyoningsih H. Gizi untuk kesehatan ibu dan anak. Yogyakarta: Graha Ilmu. 2011;52:57-8.

The Effectiveness of Bay Leaf Extract (*Syzygium Polyanthum*) in Inhibiting the Growth of *Candida Albicans*

Suratiah¹, Dewa Ayu Ketut Surinati¹, Dewa Made Ruspawan¹

¹*Polytechnic of Health Denpasar, Indonesia, Jl. Sanitasi No.1 Sidakarya, Denpasar, Indonesia*

ABSTRACT

Introduction: Fluor albus is derived from secretion of a woman's vagina and might be undergone by all women throughout the life cycle. Color and odor changes occur because of pathogenic microorganisms infecting it. The most common pathogenic microorganisms in fluor albus are *Candida albicans*. Bay leaves are easy to obtain and have been reported to contain effective antimold activities to inhibit the growth of *Candida albicans*. This research is aimed to know the effectiveness of bay leaf extract on inhibition of the growth of *Candida albicans* and to know which extract is effective in inhibiting *Candida albicans*.

Method: This research is in vitro experimental research with randomised group design. In this research there were eight kinds of extracts as treatment with three replications. Data were analyzed using ANOVA.

Results: The results showed that extraction with soaking in water for 24 hours had the highest inhibition on *Candida albicans* (12 no), and the young bay leaves extract dissolved by ethanol had the highest antioxidant capacity 11.273.41mg/L GAEdaAC).

Conclusions: Bay leaves have potency as alternative resources to inhibit the growth of microorganism in fluor albus occurrence. It is suggested to test the effectiveness of young bay leaves extracted with ethanol on *Candida albicans* on women with fluor albus.

Keywords: *Bay leaves, Candida albicans.*

INTRODUCTION

Fluor albus, or often referred to as vaginal discharge, is vaginal secretion in women. Leucorrhoea in women is physiological due to an increase in estrogen and progesterone hormones. Leucorrhoea is a thin and white mucus released through the vagina. This vaginal discharge usually comes out more and thicker during before and after menstruation, and when sexually aroused. However, if it is excessive and lacking in cleaning, it causes the area to become moist so that it tends to be attacked by bacteria or fungi. Humid and wet areas tend to be a medium for breeding pathogenic microorganisms.

Nearly 50% of the entire female population is affected by pathological vaginal discharge¹. The results of research conducted by Lingga (2011), stated that 75% of women in the world were affected by vaginal discharge and 45% of them had experienced it twice or more and 75% of Indonesian women experienced a once-in-a-lifetime vaginal discharge².

Leucorrhoea is also the most common complaint expressed by women, where vaginal discharge may be a sign of abnormalities in the female reproductive organs. Leucorrhoea can be divided into two types, namely physiological and pathological. Physiological leucorrhoea is a natural vaginal discharge, which occurs before and after menstruation and when there is an increase in sexual stimulation. Pathological leucorrhoea is a vaginal discharge that occurs continuously accompanied by the presence of odor and discoloration in the liquid.

Corresponding Author:

Suratiah, M. Biomed
Polytechnic of Health Denpasar, Indonesia
Jl. Sanitasi No.1 Sidakarya, Denpasar, Indonesia
Email: suratiahpoltekkesdps@gmail.com

Color changes and odors smelled are due to the presence of pathogenic microorganisms (bacteria, fungi and viruses) that infect the vaginal discharge. The fungus that is the most common pathogenic microorganism in vaginal discharge is *Candida albicans*. *Candida albicans* is a type of fungus that grows in two forms: stem cells (blastospore) and pseudohyphae. This false hyphae that will continue to grow and multiply so that it will interfere with the organs on which it grows. Pseudohyphae live in groups or colonies which will cause unpleasant odors and give color to leucorrhoea and cause pathogenic or pathological leucorrhoea.

Pathological leucorrhoea will disturb the comfort of women. Itchiness that is felt tends to cause women to be anxious and scratching, which will have an impact on injury or blisters, which results in further infection. This situation results in a woman seeking help in treatment. The usual treatment is antifungals with the class of micostatin. But some practitioners also offer a variety of products to overcome this. Among them are many who use traditional medicine wherein the ingredients are all from nature, such as from growing plants. One of the most convenient and very easy to obtain is bay leaf.

Bay leaf (*Syzygium polyanthum*) is a leaf that is very easy to find by the community and commonly used as a cooking spice. Bay leaves have been shown to have antifungal properties. The content of chemical compounds contained in bay leaves include: flavonoids, tannins, essential oils, citral and eugenol³. Bay leaves are reported to contain antifungals which are very effective for inhibiting the growth of *Candida albicans*.

The formulation of the problem is: Is Bay Leaf Extract effective in inhibiting the growth of *Candida albicans*? The aim was to determine the effectiveness of bay leaf extract in inhibiting the growth of *Candida albicans* by testing the growth inhibition of *Candida albicans* by extracting water solvent, decoction, 95% ethanol and hexane and testing the ability to counteract free radicals with DPPH (2,2-diphenyl-1-picrylhydrazyl). The benefits obtained are in providing scientific information about the advantages of bay leaves in inhibiting the growth of *Candida albicans* fungi and providing information to the public to be able to utilize bay leaves, which are easily accessible, as an antifungal

in inhibiting the growth of *Candida albicans* fungi as a cause of infection in vaginal discharge (Fluor Albus).

METHOD

This research is an experimental laboratories study in vitro with a randomized block design⁴. with eight experimental treatments, namely young bay leaf extract with 24-hours of water immersion (ESAM); young bay leaf extract with boiling for 1 hour (ESRM); young bay leaf extraction with ethanol solvent (ESEM); young bay leaf extraction with hexane solvent (ESHM); old bay leaf extract with 24-hours soaking in water (ESAT); extracting old bay leaves with boiling for 1 hour (ESRT); old bay leaf extract with ethanol solvent (ESET); and old bay leaf extract with hexane solvent (ESHT).

Phase I of the research was conducted at the Food Technology Laboratory of Udayana University Denpasar and the Health Laboratory (Labkes) of Denpasar City. The implementation of this laboratory research was for three months from July to October 2017. The number of samples was determined by the Federer formula: $(t-1)(n-1) \geq 15$, $N = 3$ times replication. So, the number of samples was $8 \times 3 = 24$.

RESULTS AND DISCUSSION

a. Bay Leaf Extract: The making of the bay extract was started by sorting out by separating the old leaves and young leaves and the damaged leaves (dry, discolored or pockmarked). Damaged leaves will be discarded and not used and these are shown in the picture below. Old leaves will look darker and young leaves will look brighter. After being sorted, then washing is done and they are then dried with the aim of removing the water content in the bay leaf.

This drying process was undertaken to make it easier to carry out extraction because the water will interfere with the solvent in dissolving the active compound in the bay leaf; therefore, the water must be evaporated first by drying. After drying, it was then taken to the Udayana University Food Technology laboratory for extraction. The making of bay leaf extract in this study used several solvents including water, ethanol and hexan. The name of the sample along with the type of solvent can be seen in the table below.

Table 1: Name of the sample, type of solvent and solvent properties

No.	Sample name	Solvent	Solvent properties	Sample making method
1	ESAM	Water	Polar	Soak in water for 24 hours and extract.
2	ESRM	Water	Polar	Boil with water for 1 hour and extract.
3	ESEM	Ethanol	Polar	Extract with the addition of ethanol.
4	ESHM	Hexan	Non-polar	Extract with hexane addition.
5	ESAT	Water	Polar	Soak it in water for 24 hours and extract.
6	ESRT	Water	Polar	Boil with water for 1 hour and extract.
7	ESET	Ethanol	Polar	Extract with the addition of Ethanol.
8	ESHT	Hexan	Non-polar	Extract with Hexan addition.

Laboratory Test Results

a. Inhibition of bay leaf extract against

Candida albicans: This study showed that young bay leaf extract with 24-hour immersion treatment (ESAM) had the highest level of inhibition against *Candida albicans* (12mm). Other treatments did not show inhibition of the fungus. The inhibitory power of bay leaf extract against *Candida albicans* fungi can be seen in the table below.

Table 2: Inhibition of bay leaf extract against *Candida albicans*

No.	Sample name	Average inhibitory power (mm) *
1.	ESAM	12
2.	ESRM	0
3.	ESEM	0
4.	ESHM	0
5.	ESAT	0
6.	ESRT	0
7.	ESET	0
8.	ESHT	0
9.	Control	12

Description *): an average of three replications using Sabouroud media dextrose agar.

From the table above, the results can be concluded so that statistical tests are not carried out.

b. Antioxidant capacity: This study showed that young bay leaf extract using ethanol solvent (ESEM) had the highest antioxidant capacity

(11,273.41mg / L GAEAC) followed by old bay leaf extract with ethanol solvent (ESET) of 11,080.32mg / L GAEAC. Young and old bay leaf extracts which were soaked for 24 hours (ESAM and ESAT) had the lowest antioxidant capacity (70.94 and 291.22mg / L GAEAC, respectively). The average antioxidant capacity can be seen in Figure 1.

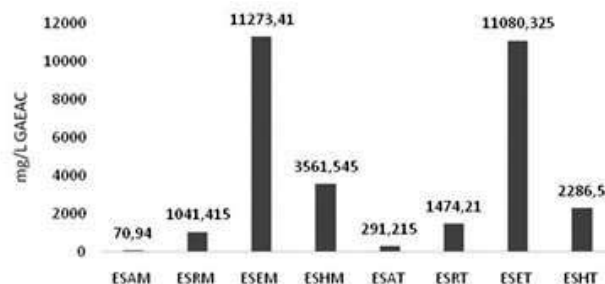


Figure 1: Antioxidant capacity of bay leaves

Description: GAEAC = Gallic acid equivalent antioxidant capacity

DISCUSSION

Bay leaves (*Syzygium polyanthum*) are rich in tannins, flavonoids and essential oils (0.05%) which consist of eugenol and cytral. The chemical components of the bay leaf have a functional role, including antimicrobial, anti-inflammatory, anti-fungal and analgesic compounds⁵.

Extraction of bay leaves aims to separate the active compounds from their original ingredients so that they have maximum functional activity. The extraction process uses a solvent to dissolve the active compound in the material according to the characteristics of the active compound to be separated. Polar solvents (such as water and ethanol) can separate active compounds in materials that are hydrophilic, while non-polar solvents (such as

hexane) are only able to dissolve active compounds that are hydrophobic. Shriner et al. (1980) state that polar solvents will dissolve polar solutes and non-polar solvents dissolve non-polar solutes or a so-called “like dissolve like” process⁶.

Candida albicans is known as a facultative anaerobic organism (it can live without the need for oxygen). The fungus lives in a fairly large range of pH 4.5 to 6.5, with optimal growth temperatures of 28-37°C. *Candida albicans* fungi can be inhibited by the addition of young bay leaf extract soaked for 24 hours (ESAM). From Table 1 above, ESAM samples (young bay leaf extract soaked with water for 24 hours) showed high inhibitory power against *Candida albicans* by 12mm as well as control inhibitory power (micostatin). Other samples showed no inhibitory power against *Candida albicans*.

This result is very interesting because the simple extraction method is by soaking in water for 24 hours, by which the young bay leaf extract can provide an inhibitory effect on *Candida albicans*. It is suspected that antimicrobial compounds, especially antifungal (*Candida albicans*), have polar (hydrophilic) properties that are easily soluble in water, and are found in young bay leaves. This is in line with research conducted by Hendradjatin (2009) who found soaked bay leaves (infusion of bay leaves) have an inhibitory effect on *V. cholerae* (minimum concentration of 3.12%), and pathogenic *E. coli* (minimum concentration of 12.5%).

Control inhibitory power (micostatin) against *Candida albicans* fungi is also high. Mikostatin is often used to reduce fungal growth. Koneman et al. (1988) revealed that the presence of the inhibition zone showed evidence that these microorganisms were susceptible to the influence of these types of antibiotics⁸. The greater the inhibition zone, the greater the effectiveness of these antibiotics in the treatment of these microorganisms.

The antioxidant capacity of an ingredient is the ability of compounds in these ingredients to reduce free radicals. The ability of these antioxidant compounds is much influenced by the presence of hydroxyl compounds found in these materials, such as phenolic compounds. These components can inhibit oxidation reactions and are able to capture free radicals⁹.

Extraction using ethanol on young and old bay leaves is able to dissolve the antioxidant compounds in bay leaves more optimally than using non-polar hexane

solvents. This shows that most of the antioxidants in bay leaves have high polarity (hydrophilic). The ability of ethanol to dissolve antioxidant compounds in bay leaves is also more optimal than by dissolving with water or boiling. Dissolving antioxidant compounds in bay leaves with water for 24 hours produces very little antioxidant capacity, as well as boiling.

Interestingly, this study shows that the high antioxidant capacity of bay leaf extract samples was not directly proportional to its ability to inhibit *Candida albicans*. ESEM and ESET samples with the highest antioxidant capacity did not have inhibitory power against *Candida albicans*. In contrast, ESAM samples having the lowest antioxidant capacity, actually have inhibitory power against *Candida albicans*.

CONCLUSIONS

Extraction with 24-hour immersion (ESAM) had the highest level of inhibition against *Candida albicans* (12mm). Young bay leaf extract using ethanol (ESEM) solvent had the highest antioxidant capacity (11,273.41mg / L GAEAC). Future studies can continue this research in subsequent clinical trials to see the effectiveness of selected extracts on *Candida albicans* found in women with pathological female vaginal discharge.

Ethical Clearance: Not required.

Source of Funding: This study is self-funded research project.

Conflict of Interest: None.

REFERENCES

1. Iskandar SS. Awak Keputusan bisa Mengakibatkan Kematian dan Kemandulan. [Beware of Leucorrhoea Can Result in Death and Infertility]; 2013.
2. Yulizar Y, Ariyanta HA, Abduracman L. Green synthesis of gold nanoparticles using aqueous garlic (*Allium sativum* L.) Extract, and its interaction study with melamine. *Bull Chem React Eng Catal.* 2017;12(2):212–8.
3. Dalimartha S. Jenis-jenis Tumbuhan Obat Indonesia. [Types of Indonesian Medicinal Plants]. Trubus Agriwidya, Jakarta. 2002;

4. Yitnosumarto S. Perancangan Percobaan, Analisis dan Interpretasinya. [Experiment Design, Analysis and Interpretation]. Gramedia Pustaka Utama Yogyakarta. 1993;26.
5. Robinson T. Kandungan organik tumbuhan tinggi. [High plant organic content]. Bandung ITB. 1995;14(3):1–6.
6. Fuson RC, Shriner RL. The systematic identification of organic compounds, a laboratory manual.. 1966;
7. Hendradjatin AA. Efek antibakteri infusa daun salam (*Eugenia polyantha*) secara in vitro terhadap *V. cholerae* dan *E. coli* enteropatogen. [Antibacterial effect of infusion of bay leaf (*Eugenia polyantha*) in vitro on *V. cholerae* and *E. coli* enteropathogen]. Maj Kedokt Bandung. 2009;36(2):89–96.
8. Koneman EW, Allen SD, Janda WM, Schreckenberger PC, Winn WC. Diagnostic microbiology. nonfermentative gram-negative bacilli Philadelphia Lippincott-Raven Publ. 1997;253–320.
9. Burda S, Oleszek W. Antioxidant and antiradical activities of flavonoids. *J Agric Food Chem.* 2001;49(6):2774–9.

The Presenting Symptoms as a Predictor of the Hospital Arrival Time Intervals of Patients with Acute Coronary Syndrome

Tony Suharsono¹, Shynatry Ayu Andhika¹, Ahmad Hasyim Wibisono¹, Tina Handayani¹

¹Department of Nursing, Faculty of Medicine, Universitas Brawijaya, Malang, Indonesia

ABSTRACT

The hospital arrival time intervals of Acute Coronary Syndrome (ACS) patients is calculated from the onset of pain to arriving at the hospital. Various factors may affect the hospital arrival time interval including the presentation of symptoms. The purpose of this study was to analyse the relationship between the variables of presenting symptoms and the hospital arrival time intervals among ACS patients at Karsa Husada Batu Hospital and Dr. Soepraoen hospital in Malang, East Java, Indonesia. The research method employed was an analytical observation with a cross-sectional approach. Using a purposive sampling technique, a total sample of 26 ACS patients were recruited. The study was conducted between February and May 2018 (3 months). The significance of the association was set up as having a p-value of less than 0.05. From the data analysis, we found that the presenting symptom variables of provocation, radiation, severity, accompanying symptoms and time were significantly associated with the hospital arrival time interval. Quality and location were not significantly associated with the hospital arrival time interval. ACS patients who experienced pain symptoms with triggers, felt the pain spreading, had a higher level of severity, had accompanying symptoms, and felt continuous pain might have a shorter hospital arrival time interval than their counterparts. Presenting symptoms is a crucial factor to reduce the hospital arrival time interval. Therefore, patients and their families should recognise all aspects of the ACS symptoms.

Keywords: *Acute coronary syndrome, presenting symptoms, hospital arrival time interval*

INTRODUCTION

Acute coronary syndrome (ACS) is an incident in the coronary arteries caused by thrombosis due to unstable atherosclerotic rupture. It includes ST-segment elevation myocardial infarction (STEMI), non-ST-segment elevation myocardial infarction (NSTEMI) and unstable angina (UA). ACS, along with coronary artery disease (CAD), accounted for approximately seven million deaths per year between 1990 and 2010 in the

Asia-Pacific, with more than half of the deaths taking place in less developed countries.¹ In the United States, coronary heart disease (CHD) is the major cause of cardiovascular disease (45.1%) which accounts for one in seven deaths annually or more than 360,000 deaths per year.² By the end of 21st century, the CHD prevalence is estimated to increase by 120% among women and by 137% among men in developing countries.² Among hospitalised patients in Indonesia, cardiovascular disease accounted for the highest proportion of deaths from non-communicable diseases (9.5%) in 2010.³

ACS patients require immediate treatment to avoid further damage to the tissue. However, many patients arrive too late at the hospital or delayed to seek treatment.⁴ Previous studies showed that pre-hospital delays are common around the world. Pre-hospital delays range from approximately under 2 hours in Spain, 2 hours and 10 minutes in China, 2.2 hours in the US, 6 hours in India, and 7.8 hours in Jordan.⁵⁻⁹ The hospital

Corresponding Author:

Tony Suharsono
Doctoral Program of Public Health,
Faculty of Public Health,
Universitas Airlangga, Mulyorejo, Surabaya, Indonesia
Department of Nursing, Faculty of Medicine,
Universitas Brawijaya Malang, Indonesia
Email: suharsono.fk@ub.ac.id

arrival time interval is calculated from the onset of pain until the patient’s arrival at the hospital.

Presenting symptoms are one of influential factors related to the pre-hospital delay of ACS patients. Public awareness related to the severity and urgency of the presenting symptoms of ACS is generally low.⁸ Nurses and paramedics reported that patients usually confuse the presenting symptoms with digestive disorders or gastrointestinal problems. Additionally, cardiologists viewed that the pre-hospital delay was usually because of the patients’ misinterpretation about the presenting symptoms of ACS, thus only getting the medical examination after the symptoms worsened.⁸ Another study found that patients with a history of severe pain and a history of other diseases were more likely to have a shorter pre-hospital delay.¹⁰ Therefore, our study aimed to explore the relationship between the presenting symptoms and the hospital arrival time of the ACS patients who were hospitalised in two different hospitals in Malang, Indonesia.

METHOD

We applied an analytical observation design with a cross-sectional approach. The sampling technique employed was non-probability sampling in which the study subjects were purposively selected and recruited. The study population was ACS patients who were admitted to the emergency department and hospitalised in Karsa Husada Batu General Hospital and Dr. Soepraoen district hospital in Malang, Indonesia. The data collection was conducted for 3 months starting between February and May 2018. Our study recruited 26 ACS patients. We utilised primary and secondary data for the purpose of this study. The primary data was obtained from structured interviews with the respondents, while the secondary data was generated from medical records. The data was analysed statistically using the Fisher test, except for the presenting symptom variables of quality and severity which were examined using the Chi-square test and the Spearman test respectively. All statistical tests used SPSS 23.0 for the Windows Evaluation Version program. The significance level was set up at 95% (p-value < 0.05).

RESULTS

Table 1 describes the characteristics of the respondents. Most of the respondents were older than 55 (53.8%), male (69.2%) and married (84.6%). More than half of the

respondents had completed their education at elementary or junior school level and worked in the private sector or were self-employed. The majority of respondents were diagnosed with non-ST-segment elevation myocardial infarction (NSTEMI) (84.6%). Health insurance was the major type of hospital payment used by the respondents (73.1%). Most of the patients were on their first attack (73.1%) and were admitted directly to the emergency department without a medical referral (73.1%). At the time of attack, most of the respondents were at home (92.3%) and with their family (84.6%).

Table 1: Characteristics of the study subjects (n= 26)

Variables	n	%
Age		
<55 years	12	46.2
>55 years	14	53.8
Gender		
Female	8	30.8
Male	18	69.2
Education		
No education	2	7.7
Primary/junior school	14	53.8
High school	6	23.1
Junior college	2	7.7
Higher education	2	7.7
Medical diagnosis		
STEMI	4	15.4
NSTEMI	22	84.6
Payment of hospital		
Self-pay	7	26.9
Health insurance	19	73.1
Occupation		
Unemployed	6	23.1
Government employee	7	26.9
Private/self-employed	13	50.0
Marital status		
Married	22	84.6
Single/divorced/widow	4	15.4
Number of attack		
First	19	73.1
Second	5	19.2
Third or more	2	7.7
Referral		
Yes	7	26.9
No	19	73.1

Conted...

Situation		
Alone	3	11.5
With family	22	84.6
With community	1	3.8
Place of attack		
At home	24	92.3
At prayer room	1	3.8
On a travel	1	3.8

Table 2 presents the distribution of the respondents based on the presenting symptoms. The majority of the respondents reported that the symptoms were without any triggers (53.9%) by feeling a heavy pressure (50.0%) that was substernal (53.8%). The majority of respondents experienced non-spreading symptoms (53.8%) with a severity level between 7 to 10 (57.7%). Most of them reported having no accompanying symptoms (57.7%) with the present symptoms being intermittent (on-off) (53.8%).

Table 2: Distribution based on the presenting symptoms (n=26)

Variables of the Presenting symptoms	n	%
Provocation		
With triggers	12	53.9
Without triggers	14	46.1
Quality		
Burning	9	34.6
Heavy pressure	13	50.0
Sharp/stabbing	4	15.4
Location		
Substernal	14	53.8
Left chest	12	46.2
Radiation		
Non-spreading	14	53.8
Spreading	12	46.2
Severity		
Scale of 1,2,3	0	0
Scale of 4,5,6	11	42.3
Scale of 7,8,9,10	15	57.7
Accompanying symptoms		
No	11	42.3
Yes	15	57.7
Time		
Continuous	12	46.2
Intermittent	14	53.8

From Table 3, most of the respondents (n=19) had a hospital arrival time of more than 120 minutes. This means that they came to hospital over 2 hours after the feeling of pain began. However, from the raw dataset, it was found that the average time interval was 7.6 hours (not shown in the table). Among the variables of the presenting symptoms, five variables including provocation, radiation, severity, accompanying symptoms, and time showed a significant association with hospital arrival time.

Table 3: The summary of the relationship between the presenting symptoms and the hospital arrival time of the ACS patients

Variables of presenting symptoms	Hospital arrival time		p-value
	<120 minutes n (%)	>120 minutes n (%)	
Provocation			
With triggers	0 (0.0)	12 (63.2)	0.005
Without triggers	7 (100.0)	7 (36.8)	
Quality			
Burning	2 (28.6)	7 (36.8)	0.902
Heavy pressure	4 (57.1)	9 (47.4)	
Sharp/stabbing	1 (14.3)	3 (15.8)	
Location			
Substernal	5 (71.4)	9 (47.4)	0.261
Left chest	2 (28.6)	10 (52.6)	
Radiation			
Non-spreading	6 (85.7)	6 (31.6)	0.021
Spreading	1 (14.3)	13 (68.4)	
Severity			
Scale of 1,2,3	0 (0.0)	0 (0.0)	0.006
Scale of 4,5,6	1 (14.3)	10 (52.6)	
Scale of 7,8,9,10	6 (85.7)	9 (47.4)	
Accompanying symptoms			
No	7 (100.0)	8 (42.1)	0.010
Yes	0 (0.0)	11 (57.9)	
Time			
Continuous	6 (85.7)	6 (31.6)	0.021
Intermittent	1 (14.3)	13 (68.4)	

DISCUSSION

From the sociodemographic characteristics of the present study, most of the ACS patients were male,

aged older than 55 years old, educated up to primary school/junior school level, were currently married, and were employed. For the presenting symptoms of ACS, most of the respondents complained about feeling a heavy pressure that occurred substernal but that did not spread to other areas of the body. While most of the respondents reported arriving at the hospital 2 hours after the presentation of symptoms, the average hospital arrival time was 7.6 hours. This high average hospital arrival time is quite alarming for the patient safety. An arrival time of more than 4 hours after the onset of the symptoms delays thrombolytic therapy, which reduces the opportunity for reperfusion.⁴ A study in Ireland reported that the average hospital arrival time of ACS patients was 4.06 hours, ranging from 2.7 hours for STEMI patients, 4.51 hours for N-STEMI patients, and 5.5 hours for AU patients.¹¹

Our study results found that the variables of provocation, radiation, severity, accompanying symptoms, and time were significantly associated with the hospital arrival time. Other variables of location (location of pain) and quality did not show a significant association with hospital arrival time. The variable of provocation reported that most of the respondents (n=14) experienced pain symptoms without a trigger. When the arteries constrict due to atherosclerosis, the heart may still get enough oxygen to pump blood when at rest. On the other hand, exercise increases the work of the heart and the narrowed arteries may not be able to supply enough oxygen to the heart. A person with a narrowed coronary artery may experience unstable angina while exercising or working hard.¹²

Most of the study respondents (n=14) also reported the pain not spreading to other areas around the chest such as the neck, back, arms, and upper arms. Three out of four patients diagnosed with STEMI experienced a spreading of the pain. Ischemic chest pain is classically described as spreading from the chest to one or both arms. A person with the presenting symptom of pain spreading from the chest to the shoulder or both arms is more likely to have ACS by 4 times.¹¹ However, no association was found between the spread of chest pain with hospital arrival time interval.¹¹

In our study, almost half of the respondents experienced pain symptoms on a scale of 7, 8, 9 or 10. A study by O'Donnell et al. found that the faster onset of ACS (marked by the presence of chest pain, symptoms that appear suddenly, persistent symptoms, and symptoms of severe pain) had a shorter hospital

arrival time interval of less than 2 hours.¹⁴ Patients with fast onset ACS are more likely to immediately seek help from the hospital than patients with slow onset ACS.¹⁴ Another study also reported that 20% of ACS patients immediately went to hospital after experiencing an increased level of pain.¹⁰

The presence of accompanying symptoms is associated with the hospital arrival time interval. This finding supports the results of a previous study, stating that ACS patients with accompanying symptoms of chest pain and diaphoresis were more likely to arrive at the hospital faster than those without accompanying symptoms.¹⁵ The sicker patients may seek treatment more quickly than lesser pained patients.

In our study, most of the respondents reported intermittent pain symptoms (n=14). Continuous pain is associated with a shorter hospital arrival time interval. This result confirmed the previous finding that continuous symptoms are significantly associated with shorter delay times related to hospital arrival in all groups (STEMI, NSTEMI, and AU).¹¹ In an ACS patient with typical angina, a feeling of tension is present in the retrosternal area, spreading to the neck, jaw, inter-scapular area, left arm, shoulder or epigastrium.¹⁶ In contrast, non-cardiac chest pain tends to be in the middle or lower abdominal area, in the chest area especially in the left ventricular apex or costochondral meeting and then spreading to the lower extremities.¹⁶

CONCLUSIONS

In this present study, more respondents arrived at the hospital after 120 minutes of presenting symptoms. The average hospital arrival time interval was 7.6 hours after the patients started to feel pain. The presence of triggers, the spreading of pain, the high level of severity, and the accompanying symptoms as well as continuous pain were associated with a shorter hospital arrival time interval. To reduce the hospital arrival time interval, patients and their families should be educated about the presenting symptoms. However, factors other than the presenting symptoms that may affect the hospital arrival time interval should be considered in future studies.

Ethical Clearance: Ethical approval was granted by the School of Public Health in Airlangga University, Surabaya.

Source of Funding: Self-funding.

Conflict of Interest: Nil.

REFERENCES

1. Jan S, Lee SW, Sawhney JP, Ong TK, Chin CT, Kim H-S, et al. Catastrophic health expenditure on acute coronary events in Asia: a prospective study. *Bulletin of the World Health Organization*. 2016;94(3):193.
2. Benjamin EJ, Blaha MJ, Chiuve SE, Cushman M, Das SR, Deo R, et al. American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics-2017 update: a report from the American Heart Association *Circulation*. 2017;135(10):e146-e603.
3. Pusdatin-MoH. Gambaran Penyakit Tidak Menular di Rumah Sakit di Indonesia Tahun 2009 dan 2010 (Non Communicable Disease Situation in Indonesia Hospital Between 2009 to 2010). *Buletin Jendela Data dan Informasi Kesehatan* 2012;2(II-2012):13.
4. Doggen CJ, Zwerink M, Droste HM, Brouwers PJ, Houweligen GK, van Eenennaam FL, et al. Prehospital paths and hospital arrival time of patients with acute coronary syndrome or stroke, a prospective observational study. *BMC emergency medicine*. 2016;16(1):3.
5. McKinley S, Dracup K, Moser DK, Riegel B, Doering LV, Meischke H, et al. The effect of a short one-on-one nursing intervention on knowledge, attitudes and beliefs related to response to acute coronary syndrome in people with coronary heart disease: a randomized controlled trial. *International journal of nursing studies*. 2009;46(8):1037-46.
6. Peng YG, Feng JJ, Guo LF, Li N, Liu WH, Li GJ, et al. Factors associated with prehospital delay in patients with ST-segment elevation acute myocardial infarction in China. *The American journal of emergency medicine*. 2014;32(4):349-55.
7. Rivero F, Bastante T, Cuesta J, Benedicto A, Salamanca J, Restrepo J-A, et al. Factores asociados al retraso en la demanda de atención médica en pacientes con síndrome coronario agudo con elevación del segmento ST. *Revista Española de Cardiología*. 2016;69(3):279-85.
8. Patel A, Mohanan P, Prabhakaran D, Huffman MD. Pre-hospital acute coronary syndrome care in Kerala, India: A qualitative analysis. *Indian heart journal*. 2017;69(1):93-100.
9. Darawad MW, Alfasfos N, Saleh Z, Saleh AM, Hamdan-Mansour A. Predictors of delay in seeking treatment by Jordanian patients with acute coronary syndrome. *International emergency nursing*. 2016;26:20-5.
10. Mussi FC, Mendes AS, Queiroz TLd, Costa ALS, Pereira Á, Caramelli B. Pre-hospital delay in acute myocardial infarction: judgement of symptoms and resistance to pain. *Revista da Associação Médica Brasileira*. 2014;60(1):63-9.
11. McKee G, Mooney M, O'Donnell S, O'Brien F, Biddle MJ, Moser DK. Multivariate analysis of predictors of pre-hospital delay in acute coronary syndrome. *International journal of cardiology*. 2013;168(3):2706-13.
12. Katz MJ, Crane LR. Cardiac Patient Care: Coronary Artery Disease (CAD): Wild Irish Medical Education; 2018 [Available from: <https://wildirismedicaleducation.com/courses/coronary-artery-disease-continuing-education>].
13. Swap CJ, Nagurney JT. Value and limitations of chest pain history in the evaluation of patients with suspected acute coronary syndromes. *Jama*. 2005;294(20):2623-9.
14. O'Donnell S, McKee G, Mooney M, O'Brien F, Moser DK. Slow-onset and fast-onset symptom presentations in acute coronary syndrome (ACS): new perspectives on prehospital delay in patients with ACS. *The Journal of emergency medicine*. 2014;46(4):507-15.
15. Goldberg RJ, Steg PG, Sadiq I, Granger CB, Jackson EA, Budaj A, et al. Extent of, and factors associated with, delay to hospital presentation in patients with acute coronary disease (the GRACE registry). *The American journal of cardiology*. 2002;89(7):791-6.
16. Irmalita JD, Andrianto SB, Tobing D, Firman D, Firdaus I. *Pedoman tatalaksana sindrom koroner akut*. 3 ed. Jakarta: PERKI; 2015.

Factors Influencing the Husband's Participation in Pregnancy Care in Surabaya City, Indonesia

Nurul Fitriyah¹, Windhu Purnomo², Noviasari Reksohadi²

¹Doctoral Program of Public Health, ²Department of Biostatistics and Demography, Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

Pregnancy is an event starting from conception and ending with the onset of labour. To promote the maternal outcome of healthy mothers and babies, husbands are encouraged to increase their participation in pregnancy care. This study aimed to analyse the determinants of the husband's participation in pregnancy care. This study employed an observational analytic research methodology with a cross-sectional design. The study sample size was 20 pregnant women attending Mulyorejo public health centre in Surabaya city, Indonesia. The sample was selected using the random sampling technique. The respondents were the husbands of the recruited pregnant women. The data was collected using a self-reported questionnaire. The statistical test used was multiple logistic regression analysis. The results of the data analysis showed that the knowledge of pregnancy care and level of education were significantly associated with the husband's participation in pregnancy care (OR= 0.014 and OR=0.033, respectively). The variables of level of income and parity had no significant relationship with the husband's participation in pregnancy care. Motivating husbands to increase their support of pregnancy care is crucial to improving the positive maternal and neonatal health status.

Keywords: husband's participation, pregnancy care, antenatal care

INTRODUCTION

By 2012, the Maternal Mortality Rate (MMR) in Indonesia was still high at 359 per 100,000 live births. It decreased to 305 per 100,000 live births in 2015.¹ Meanwhile, the rate of attending the minimum four antenatal care (ANC) visits has decreased from 87.48% in 2013 to 85.35% in 2016.¹ The 2012 Indonesian Demographic and Health Survey (IDHS) reported that approximately 79% of men accompany their pregnant spouses to ANC.² This report also presented that about 68% of pregnant women selected health facilities as their place of delivery.²

To improve maternal and child health status, the Indonesia Ministry of Health (MoH) strongly

recommends a minimum of four ANC check-ups by health professionals.³ During ANC, the health professional measures the body weight and height, blood pressure and mid-upper arm circumference, and fundal height. Pregnant women receive tetanus toxoid immunisation, iron tablet, and health counselling.³ Health professionals provide health education especially related to pregnancy care, danger signs in pregnancy, childbirth preparedness, early breastfeeding initiatives and exclusive breastfeeding, neonatal care, and family planning advice.³ Pregnancy care is intended to help the mother maintain her health and the health of her foetus through promoting self-care behaviour such as bathing, cutting of the nails, cleaning their intimate organs, breast care, brushing their teeth, having the recommended prenatal care, adopting nutrition management, regularly doing pregnancy exercises and adequate rest.^{3,4}

Husbands are advised to accompany their wives during ANC.³ The husband is expected to recognise any signs of pregnancy complications and to actively arrange transport and the place for delivery.⁵ Knowing the danger signs in pregnancy is crucial to obtain immediate treatment and to prevent severe morbidity and mortality.^{6,7} Some studies highlighted the reasons

Corresponding Author:

Nurul Fitriyah
Doctoral Program of Public Health,
Faculty of Public Health,
Universitas Airlangga, Mulyorejo, Surabaya, Indonesia
Email: fitri2111@gmail.com

of maternal death including delays in managing complications during labour due to delays of the husbands in making the decision to seek medical help in a health facility.^{8,9} A lack of communication between the husband and wife also affects the pregnancy outcome.¹⁰ A previous study on *Suami Siaga* or Alert Husband in Indonesia found that husbands who were engaged in discussions to arrange transport, a place of delivery, blood transfusion, and delivery cost were more likely to accompany their wives to ANC and tended to have their wives give birth in a health facility.¹¹

Surabaya is one of the biggest cities in Indonesia, with a population of approximately 2.9 million in 2015.¹² Surabaya has successfully decreased the maternal mortality rate from 119.15 per 100,000 live births in 2013 to 85.72 per 100,000 live births in 2016.¹³ In addition, approximately 96.6% of pregnant mothers had an ANC visit at least once.¹³ This success was partly contributed to by the Surabaya 1000 First Days of Life program, which aimed to educate engaged or newly married couples about reproductive health.¹³ Considering the significant role of the husband in promoting maternal health, the purpose of this study was to examine the determinants of the husband’s participation in pregnancy care in Surabaya city.

METHOD

We employed an observational analytic research study using a cross-sectional design. The study took place in the Mulyorejo sub-district of Surabaya City, East Java between October and November 2017. The sample population was 39 pregnant women attending Mulyorejo public health centre during the study period. Using a random sampling technique, we recruited 20 respondents to participate in the study.

The data collection was conducted using a self-reported questionnaire targeting the husbands of the pregnant women participating in the study. The independent variables included knowledge of pregnancy care, level of education, level of income, and parity. The dependent variable was the husband’s participation in pregnancy care (0=less participate, 1=fully participate). The data was statistically analysed using multiple logistic regression.

RESULTS

As shown in Table 1, most of the husbands fully participated in pregnancy care (65%). Most of them

also had good knowledge of pregnancy care (65%). The majority of husbands had a high level of education or had at least graduated from senior high school (70%) and had a high level of income. Most of them had 1 – 2 children (60%).

Table 1: Characteristics of the husbands

Variable	n	(%)
Husband’s participation		
Full participation	13	(65)
Lesser participation	7	(35)
Knowledge of pregnancy care		
Good	13	(65)
Poor	7	(35)
Level of education		
High education	14	(70)
Low education	6	(30)
Level of income		
High	15	(75)
Low	5	(25)
Parity		
1-2	12	(60)
3-4	8	(40)

Table 2 displays the relationship between the independent variables and the husband’s participation in pregnancy care. Knowledge of pregnancy care and level of education had an inverse association with the husband’s participation in pregnancy care. Husbands with a higher knowledge of pregnancy care were 71 times less likely to participate in pregnancy care (OR=0.014) than husbands with less knowledge of pregnancy care. Husbands with a high level of education were 30 times less likely to participate in pregnancy care (OR=0.033) than those with a low level of education. The other variables of level of income and parity had no significant association with the husband’s participation in pregnancy care.

Table 2: Multiple logistic regression of the husband’s participation in pregnancy care

Variables	Husband’s participation		p-value	OR
	Less participation n (%)	Full participation n (%)		
Knowledge of pregnancy care				
Low	1 (8.0)	12 (92.0)	0.004	0.014
High	6 (86.0)	1 (14.0)		

Conted...

Level of education				
Low	5 (83.0)	1 (17.0)	0.011	0.033
High	2 (14.0)	12 (86.0)		
Level of income				
Low	3 (60.0)	2 (40.0)	0.191	
High	4 (27.0)	11 (73.0)		
Parity				
1-2	3 (25.0)	9 (75.0)	0.258	
3-4	4 (50.0)	4 (50.0)		

DISCUSSION

Knowledge of pregnancy care: The results of the logistic regression analysis showed that knowledge of pregnancy care was significantly associated with participation in pregnancy care. However, the higher the knowledge, the less they participated in pregnancy care (OR=0.014). Participation in pregnancy care was measured by the husband’s active support of their wife in maintaining a healthy life style throughout pregnancy, such as taking vitamin A and iron tablets, controlling their sugar and salt intake, eating nutritious food, and accompanying their wives to ANC visits. According to Baston and Jennifer (2012), pregnant women should gain weight, least 11-15 kg throughout pregnancy, eat healthy food, and consume supplementary food such as vitamin A, D, folic acid, and iron tablets.⁵ Pregnant women are restricted when consuming salt, no more than 6 grams a day, > 300 mg of caffeine per day, and no smoking or being exposed to smoke.⁵

Husbands may think that their wives also have good knowledge about pregnancy care, and therefore they expect their wives to know what to do without their involvement. A previous study in Kenya reported that the men’s reluctance to participate in prenatal care was due to the perception about the exclusive female role in pregnancy support.¹⁴ Another previous study in Indonesia reported that the husbands were busy at work, which limited their participation in prenatal care.¹⁵ On the other hand, the husband’s advice for their pregnant wives on not working too much had been considered sufficient participation in pregnancy care.¹⁵

The husband’s participation in pregnancy care may positively influence maternal health. The wives would be emotionally supported and motivated to maintain

their health by undertaking activities that are beneficial for pregnancy.¹⁶ The husband is the closest relative to the wife, and therefore has an important role in helping their wife to manage a healthy pregnancy.¹⁷

Based on this result, to promote the husband’s participation, despite the importance of knowledge in pregnancy care, improving the husband’s motivation to participate in prenatal care should be encouraged. Acquiring knowledge may lead to behaviour change, therefore motivating the husbands to take part in pregnancy care should be promoted.¹⁸

Level of education: Education is a strong predictor of ANC utilisation as reported in many studies.^{11,19,20} In this present study, level of education was significantly associated with the husband’s participation in pregnancy care. A study in Egypt found that the woman’s level of education was significantly associated with an awareness of the danger signs of pregnancy.¹⁹ The higher level of the husband’s education was associated with the provision of financial support to allow them to attend prenatal care as reported by a study in Myanmar (OR= 6.08; 95% CI: 1.48–25.97).²¹

Using the datasets from a nationwide survey, a previous Indonesia study found that a higher level of women’s education increased the chance of delivery in a health facility by 2.6 times (95% CI: 1.4–4.6), however, no significant association was found between the husband’s education level and their presence at ANC.¹¹ However, the results of our study showed that the high level of education reduced the chance of the husbands to participate in pregnancy care. Husbands with a high level of education were those who had completed at least the secondary level of education. This finding suggests that there might be other more influential factors such as culture and belief that affect the willingness of the husband to participate pregnancy care.²² Future studies are recommended to include the aforementioned factors when assessing the husband’s participation in maternal health care.

Other non-significant variables; income level and parity: Previous studies in Indonesia and elsewhere highlighted the significant relationship between level of income and parity with the involvement of the husband being involved in maternal health.^{11,20} Having a higher level of income increased the probability of the likelihood of the husbands participating in ANC

visits. Facility-based delivery decreased along with the increase of parity.¹¹ A study conducted in a sub-district of Sumatra, Indonesia, described the mother's resistance to having an ANC check-up because of being ashamed for having more than three children, being afraid of being scolded by the midwives, and feeling confident from their previous pregnancy.¹⁵ However, the results of our study found there to be an insignificant relationship between the factors of level of income and parity, and the husband's participation in pregnancy care. The small sample recruited in this study may affect this result.

Having more children means that the husbands have more responsibility when it comes to taking care of their families. The husbands may experience stress due to financial problems and were worry about the future and their abilities as the household leader which may affect their relationships with their wives and other family members.²³

In a patriarchal community, a husband as the household leader has the obligation to meet the family's needs, including taking care of his pregnant wife. Despite the insignificant factor of income related to the husband's participation in pregnancy care, the financial aspect is important to ensure the women's access to maternal healthcare. Adequate access to maternal health care is important to achieve positive maternal and neonatal outcomes.²⁴ To support their wives, husbands are expected to ensure that their wives having sufficient nutritional intake and other supplementary food for pregnancy, and have enough exercise and rest. The husbands should also provide their pregnant wives with comfortable clothes and shoes that enable smooth blood circulation.²⁵ Maternal complication may occur from mild to severe.²⁶ Some common complaints of pregnant women include headache, nausea and vomiting, urination, diarrhoea, and stiffness in the hands and feet (swelling and leg cramps). Therefore, the husband's support is important to help the wives feel comfortable and stay healthy.

CONCLUSION

The husband's knowledge of pregnancy care and level of education are significant factors involved in influencing the husband's participation in pregnancy care, as described from the results of our study. However, both level of income and parity were found to have no significant relationship with the husband's participation

in pregnancy care. A good understanding of pregnancy care, however, does not always motivate the husbands to participate. Similarly, a high level of education does not always promote the husband's increased participation in pregnancy care. Other factors of culture and belief may have an important roles in encouraging the husbands to be more attentive to their wives needs during pregnancy.

Health professionals in this area and other similar settings should promote health education and counselling about prenatal care by involving the husbands. Husbands who accompany their wives to a health facility for ANC should be invited to be with their wives during any health examinations. By doing so, the husbands will understand the health status of their pregnant wives and will have the opportunity to discuss with the health professionals about planning the delivery and family planning after childbirth. We recommend for future studies to include the factors of culture, belief, and access to health professionals in examining the husband's factors in association with their participation in pregnancy care.

Ethical Clearance: Ethical approval was granted by the School of Public Health of Airlangga University, Surabaya.

Source of Funding: Self-funding.

Conflict of Interest: Nil.

REFERENCES

1. MoH. *Profil Kesehatan Indonesia 2016 [Indonesia Health Profile Year 2016]*. Jakarta: Kemenkes RI; 2017.
2. BPS, BKKBN, MoH, ICF International. *Indonesia Demographic and Health Survey 2012*. Jakarta, Indonesia: BPS, BKKBN, Kemenkes, and ICF International; 2013.
3. MoH. *Buku Kesehatan Ibu dan Anak (Handbook of Maternal and Child Health)*. Jakarta: Kemenkes RI & JICA; 1997.
4. Gamelia E, Sistiaroni C, Masfiah S. Determinan Perilaku Perawatan Kehamilan. *Kesmas. National Public Health Journal*, 2013; 8(3): pp.133-8.
5. Baston H, Hall J. *Antenatal: Churchill Livingstone*. 2009.

6. Hailu M, Gebremariam A, Alemseged F. Knowledge about obstetric danger signs among pregnant women in Aleta Wondo District, Sidama Zone, Southern Ethiopia. *Ethiopian journal of health sciences*, 2010; 20(1).
7. Durham R, Chapman L. *Maternal-newborn nursing: The critical components of nursing care*. FA Davis; 2013.
8. Mize L, Pambudi E, Koblinsky M, Stout S, Marzoeki P, Harimurti P, et al. ... and then she died: Indonesia maternal health assessment 2010 [Available from: <https://openknowledge.worldbank.org/bitstream/handle/10986/2837/533270ESW0Whit10Box345625B01PUBLIC1.pdf?sequence=1>].
9. Knight HE, Self A, Kennedy SH. Why are women dying when they reach hospital on time? A systematic review of the 'third delay'. *PloS one*, 2013; 8(5): e63846.
10. Mullany BC, Becker S, Hindin M. The impact of including husbands in antenatal health education services on maternal health practices in urban Nepal: results from a randomized controlled trial. *Health education research*, 2007; 22.
11. Kurniati A, Chen C-M, Efendi F, Ku L-JE, Berliana SM. Suami SIAGA: male engagement in maternal health in Indonesia. *Health Policy and Planning*, 2017; 32(8): pp.1203-11.
12. Surabaya DCRO. *Statistik Kependudukan Kota Surabaya (The Surabaya Demography Statistics) Surabaya*. Dispendukcapil (Surabaya Demography and Civil Registration Office); 2018 [Available from: <http://dispendukcapil.surabaya.go.id/statistik/index.php>].
13. Surabaya DHO. *Laporan Kinerja Tahun 2016 (The 2016 Performance Report)*. In: Surabaya DK, editor. Surabaya: DKK Surabaya; 2017.
14. Kwambai TK, Dellicour S, Desai M, Ameh CA, Person B, Achieng F, et al. Perspectives of men on antenatal and delivery care service utilisation in rural western Kenya: a qualitative study. *BMC pregnancy and childbirth*, 2013; 13: p.134.
15. Harahap R, Siregar M. Pengaruh Karakteristik Ibu Dan Dukungan Suami Terhadap Pemeriksaan Kehamilan Di Kecamatan Angkola Timur Kabupaten Tapanuli Selatan. *Jurnal Ilmiah PANNMED Vol.* 2014; 8(3).
16. Septiani R. Pengetahuan, Sikap Ibu Hamil Dan Dukungan Suami Dengan Keikutsertaan Ibu Hamil Dalam Kelas Ibuhamil Di Puskesmas Kota Metro Lampung. *Jurnal Kesehatan*. 2016;4(2).
17. Irianti B, Halida E, Huhita F, Prabandari F, Yulita N, Yulianti N, et al. Asuhan Kehamilan Berbasis Bukti. F. Husin, Penyunt.) Jakarta: Sagung Seto; 2014.
18. Adhikari T, Sahu D, Nair S, Saha KB, Sharma RK, Pandey A. Factors associated with utilization of antenatal care services among tribal women: A study of selected States. *The Indian journal of medical research*, 2016; 144(1): p.58.
19. Rashad WA, Essa RM. Women's awareness of danger signs of obstetrics complications. *Journal of American Science*, 2010; 6(10): pp.1299-306.
20. Yargawa J, Leonardi-Bee J. Male involvement and maternal health outcomes: systematic review and meta-analysis. *Journal of Epidemiology and Community Health*, 2015; 69(6): p.604.
21. Wai KM, Shibanuma A, Oo NN, Fillman TJ, Saw YM, Jimba M. Are Husbands Involving in Their Spouses' Utilization of Maternal Care Services?: A Cross-Sectional Study in Yangon, Myanmar. *PLoS ONE*, 2015; 10(12): e0144135.
22. Gabrysch S, Campbell O. Still too far to walk: Literature review of the determinants of delivery service use. *BMC pregnancy and childbirth*, 2009; 9.
23. Jannah N. Buku ajar asuhan kebidanan kehamilan. Yogyakarta: Andi. 2012:122-3.
24. Wright J. *Essential Package of Health Services Country Snapshot: Indonesia*. Bethesda, MD: Health Finance & Governance Project. 2015.
25. Bartini I. Antenatal care: Asuhan Kebidanan pada Ibu Hamil Normal. Nuha Medika. 2012.
26. Firoz T, Chou D, von Dadelszen P, Agrawal P, Vanderkruik R, Tunçalp O, et al. Measuring maternal health: focus on maternal morbidity. *Bulletin of the World Health Organization*, 2013; 91(10): pp.794-6.

Exploration of the Daughters' Feelings Related to Accepting their Mother's Condition of Having Breast Cancer in East Java, Indonesia

Sirli Mardianna Trishinta¹, Retty Ratnawati², Septi Dewi Rachmawati³

¹*School of Nursing, Universitas Tribhuwana Tungadewi, Malang,* ^{2,3}*Faculty of Medicine, Universitas Brawijaya, Malang, Indonesia*

ABSTRACT

Having the mother diagnosed with breast cancer may create difficulty for the family in relation to accepting it, especially for the daughter who cares for the sick person. This qualitative study aimed to explore the experience of the daughters of women with breast cancer and to understand the meaning of acceptance. The study employed a phenomenological approach by involving eight participants whose mothers were hospitalised with breast cancer in East Java. The data collection was conducted through a semi-structured interview. The data was transcribed verbatim and analysed using the Braun & Clarke method. Two themes emerged, namely (1) feeling the mothers' feelings, and (2) being sincere and surrendering to God. This findings reflect the empathy of the daughters and their faith and cultural background as Javanese Muslims. Health professionals are recommended to provide mental and spiritual support for the daughters to help them in the acceptance process.

Keywords: *acceptance, breast cancer, mother-daughter, feelings*

INTRODUCTION

Breast cancer is one of the leading causes of death among women around the world.¹ Among all cancer cases, breast cancer contributed to 43.3% of new cases and 12.9% of deaths.¹ In Indonesia, the estimated mortality rate of female breast cancer was 41% out of the female breast cancer incidence rate of 48,998 cases in 2012.² According to the Indonesian Ministry of Health (MoH), East Java ranked with the second highest number of breast cancer cases in Indonesia.³

Upon being diagnosed with breast cancer, the patients develop physical and emotional changes which

can affect their family members. Psychological changes also affect the family well-being from providing complex care for the patients with breast cancer.⁴ Providing family support for breast cancer patients includes family attitude, actions and the acceptance of the patient's condition.⁴ Acceptance is the stage when someone accepts the fact that the loved one has physically gone, and acknowledges the reality that is experienced.

Nurses as the professional caregiver have the role of preventing negative internalisation and facilitating the acceptance process.⁵ Nurses may emphasise giving empathy to the patients and their families by looking at the situation from the person's perspective, and adjusting to their diverse responses.⁵ Based on our preliminary study in the chemotherapy room of Dr. Soepraoen's Hospital in Malang, Indonesia, breast cancer accounted for 88% of cancer cases. All cancer patients were accompanied by their adult daughters.

A previous study reported that adult daughters who care for their mothers with cancer experienced active coping adaptations, omission behaviour, self-

Corresponding Author:

Sirli Mardianna Trishinta
Doctoral Program of Public Health,
Faculty of Public Health, Universitas Airlangga,
Mulyorejo, Surabaya, Indonesia
Faculty of Public Health,
Universitas Tribhuwana Tungadewi Malang
Email: sirli.sinta@yahoo.com

blaming behaviour, and difficulties in care.⁶ Their study underscored the need for nurse-adjusted interventions in order to consider the unique psychosocial characteristics of the adult daughters as the primary caregiver for their mothers when fighting breast cancer. Understanding the daughter's acceptance of the mother's condition with breast cancer will help the nurses to make appropriate adjustments in the nursing intervention. Therefore, our study aimed to explore the meaning of the daughter's acceptance from their experience of caring for their mothers with breast cancer.

METHOD

This present study used a phenomenological approach to describe the phenomenon. Eight daughters who cared for their mothers with breast cancer at Dr. Soepraoen Hospital, Malang, Indonesia were recruited. Other inclusion criteria when selecting the study participants included being of an age between 20 to 40 years, living together with the mother, having completed at least a secondary level of education, and having cared for their mothers who had been diagnosed with breast cancer of a minimum stage 2 for at least 2 months. The participants were given information about the study and their right to withdraw from the study at any time. All participants submitted written consents before the interview.

The data collection was conducted using a semi-structured interview with the researchers acting as the main instrument. The interviews were conducted throughout May 2017 at the participants' homes for their convenience. The interviews lasted about 60 minutes each, and they were tape-recorded and transcribed into text. The researcher also made notes to help to complete the data. The data was analysed through several steps as suggested by Braun & Clarke (2013), including getting familiar with the data, coding, selecting the themes, analysing the themes, determining the themes, and formulating the results.⁷ The data was validated by applying the transferability, dependability, confirmability, and credibility as suggested by Lincoln and Guba (1985).⁸

RESULTS

The characteristics of the study participants have been shown in Table 1. Most of the respondents were aged between 26-30 years old (62.5%), had completed senior high school (62.5%), and were housewives

(37.5%). Most of the respondents had not yet married (62.5%) and lived in the Malang district (50.0%).

Table 1: Sociodemographic characteristics of the study participants

Variables		N (%)
Age	– 25	2 (25.0)
	26 – 30	5 (62.5)
	> 31	1 (12.5)
Education	Senior high school	5 (62.5)
	Higher education	3 (37.5)
Employment	Unemployed	2 (25.0)
	Housewife	3 (37.5)
	Self employed	1 (12.5)
	Employed	2 (25.0)
Marital status	Single	5 (62.5)
	Married	3 (37.5)
Place of residence	Malang district	4 (50.0)
	Pasuruan district	1 (12.5)
	Blitar district	1 (12.5)
	Malang city	1 (12.5)
	Probolinggo district	1 (12.5)

As shown in Table 2, most of the mothers of the participants (50%) had been diagnosed with breast cancer for 6 – 12 months. Most of the patients had been undergoing surgery and chemotherapy (87.5%). The majority of the patients relied on medical treatment only (62.5%).

Table 2: Characteristics of the mothers of the study respondents

Variables		N (%)
Duration of the illness since diagnosed (months)	3–6	2 (25.0)
	6–12	4 (50.0)
	>12	2 (25.0)
Stages of cancer	Stage 2	3 (37.5)
	Stage 3	2 (25.0)
	Stage 4	3 (37.5)
Intervention	Chemotherarapy	1 (12.5)
	Chemotherapy and surgery	7 (87.5)
Type of treatment	Medicine only	5(62.5)
	Medicine and alternative	3 (37.5)

From the analysis of the interview transcripts, two themes emerged, namely 1) feeling the mother's feelings, and 2) being sincere and surrendering to God. Each theme had two subthemes, as described below.

Theme 1: Feeling the mother's feelings

Most of the participants revealed that their close relationship with their mother made them feeling their mother's suffering upon being diagnosed with breast cancer. At this point, the daughters expressed their feelings in relation to dealing with the painful reality and their empathy toward their mother's condition.

Subtheme 1: facing the painful reality: Being diagnosed with breast cancer is a painful reality for any woman and their closest relatives. The daughters described their feelings of helplessness, yet they were also trying to endure the suffering. The first category that emerged in this subtheme was unpleasant shocks. The participants felt disbelief after learning that their mothers had developed breast cancer.

"The doctor said (that) my mother had a breast cancer. I was so shocked" (P1, line 49).

"How come my mother can get this disease?" (P7, line 98).

The second category reflects the participants' helplessness at accepting their mother's illness, as represented in the following statement.

"It is hard to accept (this reality), but what can I do?" (P1, line 58).

Subtheme 2: Being empathic to their mother's conditions: In this subtheme, the participants described their feeling of worry over their mother's condition. The first category in this subtheme was being worried about their mother's illness. The participants expressed their worry about their mother's chance of survival.

"I am afraid that my mother will never recover". (P8, lines 33 and 99).

"I can't imagine if she will leave us so soon". (P3, line 77).

In the second category, the participants expressed their extraordinary feeling of empathy for the painful condition that their mothers were suffering from.

"When she complained about the extreme pain, it is hard to tell how much I could feel it". (P 1 line 175)

"I felt (that) I could not see her suffering". (P5, line 150).

The third category in this subtheme was that the participants told the researcher about harbouring their sadness due to their mother's condition.

"I often secretly cried". (P6, line 166)

"I tried to be strong in front of her". (P7, line 118).

Theme 2: being sincere and surrendering to God

The participants described their experience in going through the illness and caring for their mothers with breast cancer with sincerity. The condition also enhanced their faith, as they surrendered to God with hope.

Subtheme 1: going through the illness: In dealing with the reality of their mother's condition, the participants expressed how they tried to accept the illness. They considered that the illness was a part of the life process, and that they must sincerely care for their mothers.

"I tried to accept this with my heart and care for her with sincerity". (P4, line 153)

"Life is like this... just go with it". (P1, line 223; P5, line 252)

Subtheme 2: Surrender to God: In this subtheme, the first category was asking for help from God. They believed that all diseases are from God as a trial in the lives of human beings (P 2). They also believed that all diseases have a cure and that only God can provide the cure.

"*Bismillah* (A Muslim's word which means in the name of God), I give up this fate to God. He create diseases, so He also provides the cure". (P7, line 134, 243, 278).

The participants also stated that they have increased their spirituality as a way of hoping for a miracle cure for their mother's survival, as well as to gain strength when caring for the sick person (P1, P4, and P7).

The second category was patience in caring. In understanding the severity level of the illness and the long clinical course of breast cancer, the participants expressed the need for patience when caring for the mothers.

“We expect the best for her, so we must be patient”. (P2, line 301).

The third and the fourth category in this subtheme was the decision to surrender to God and preparing for the worst. The participants considered that despite all efforts and treatment, anything could happen if God is willing. Therefore, they should prepare themselves to accept whatever situations they face ahead.

“Just surrender, whatever will be...” (P5, line 231; P8, line 255).

“Anytime we can lose her, so just get ready”(P5, line 204).

DISCUSSION

Feeling the mother’s feelings: This theme reflects the inner resistance of the participants in understanding their mother’s breast cancer. This first stage of grieving helps someone to overcome and survive. At this stage, rejection is usually only a temporary defence. Denial helps to accelerate the feelings of sadness.⁹ In the next stage, there is anger. Anger is an emotion that is most often used to manage loss. When diagnosed with a terminal illness, a person may express anger at themselves, their relatives, health workers, and even God.¹⁰ For the family, they feel sad at the possibility of losing their loved ones.¹¹

The daughter of a woman with breast cancer can feel loss due to the mother’s physical changes and the possibility of death.¹² After experiencing the loss, some may develop a stage of depression, and then start to accept the new life condition.^{9,13} Many factors influence the whole process including self-understanding, expectations, environmental barriers, social attitude, emotional stress, advice from others with good self-adjustment, self-perspective, and self-concept.¹⁴ The family’s acceptance influences the self and social adjustment.¹⁵ In social adjustment, in the acceptance stage, the family will be able to accept, pay attention, have feelings of tolerance, show empathy and sympathy and want to help the sick person, which is the beginning of the healing process.¹⁴

Being sincere and surrendering to God: Sincerity, in other words, reflects the nature of being genuine, and letting go, which refers to the process of releasing all forms of feeling. Sincerity is also understood as an acceptance condition.^{16,17} In this study, being sincere

is interpreted as acceptance by the participants. In Javanese culture, the ethnicity of the study participants, sincerity is defined as accepting the conditions with a whole heart.¹⁶ In addition, as Muslims, the participants may also intend to have the pure intention of expecting God’s approval from doing deeds including caring for their sick mothers. This concept is similar to the concept of letting go, as proposed by Corey (2005). Letting go relates to the release of emotions that interferes with one’s social relationships.¹⁸

Surrender was interpreted by the participants in relation to their cultural background as Javanese Muslims. It referred to their helplessness in facing God’s supremacy. In this culture, a human being should submit to God’s rules and decisions.¹⁹ Therefore, a person should worship God and pray when expecting help from God.²⁰

Being sincere and submissive is a mental condition that relates to the ideology of being a servant of God. Developing sincerity and surrendering their hope to God is a spiritual approach that can be used by the daughters to cope with their mother’s condition. Although most people may express their acceptance of the sick person because of the family relationship, the response may be different. This response explains how the pattern of a family can adapt to the different individual’s situation.²¹

Families with a member that has been diagnosed with cancer have an exhaustive experience with many sacrifices from various aspects of life to make.²² This situation demands that the family be prepared for the worst condition, feel frustration, and accept the threat of loss.²³ The acceptance of the family, especially the daughters’ girls, will provide them with the “energy” and confidence to try to improve each of their abilities.^{6,21}

CONCLUSION

Two themes that emerged in this study were (1) feeling the mothers’ feelings and (2) being sincere and surrendering to God, reflecting the participant’s journey when facing the reality of their mothers experience with breast cancer and coping with the conditions. As daughters, the participants feel dreadful upon learning of their mother’s diagnosis of breast cancer but then developed acceptance through their faith in God and their principles related to life in the Javanese culture. Therefore, we suggest that nurses and other health professionals in the hospital should provide mental and spiritual support for the family members, especially the daughters who care for their sick mothers.

Ethical Clearance: Ethical approval was granted by the School of Public Health in Airlangga University, Surabaya.

Source of Funding: Self-funding.

Conflict of Interest: Nil.

REFERENCES

1. World Health Organization. GLOBOCAN 2012: Estimated cancer incidence, mortality and prevalence worldwide in 2012. Geneva: WHO; 2014.
2. Youlden DR, Cramb SM, Yip CH, Baade PD. Incidence and mortality of female breast cancer in the Asia-Pacific region. *Cancer biology & medicine*. 2014;11(2):101.
3. MoH. Situasi Penyakit Kanker (The Situation of Cancer Disease). In: Pusdatin-MoH, editor. Jakarta: Kemenkes RI; 2015.
4. Dsouza SM, Vyas N, Narayanan P, Parsekar SS, Gore M, Sharan K. A qualitative study on experiences and needs of breast cancer survivors in Karnataka, India. *Clinical Epidemiology and Global Health*. 2018;6(2):69-74.
5. Telford K, Kralik D, Koch T. Acceptance and denial: implications for people adapting to chronic illness: literature review. *Journal of advanced nursing*. 2006;55(4):457-64.
6. Sumner LA, Wellisch DK, Kim Y, Spillers RL. Psychosocial Characteristics of Adult Daughters of Breast Cancer Patients: Comparison of Clinic and Community Caregivers Samples. *Journal of psychosocial oncology*. 2015;33(5):561-75.
7. Braun V, Clarke V. What can “thematic analysis” offer health and wellbeing researchers? *International journal of qualitative studies on health and well-being*. 2014;9.
8. Lincoln YS, Guba EG. *Naturalistic inquiry*. Beverly Hills, CA: Sage Publications; 1985.
9. Kübler-Ross E, Kessler D. *On grief and grieving: Finding the meaning of grief through the five stages of loss*: Simon and Schuster; 2014.
10. Jacobs GA. *Community-based psychological first aid: A practical guide to helping individuals and communities during difficult times*: Butterworth-Heinemann; 2016.
11. Leonidou C, Giannousi Z. Experiences of caregivers of patients with metastatic cancer: What can we learn from them to better support them? *European Journal of Oncology Nursing*. 2018;32:25-32.
12. Coyne E, Wollin J, Creedy DK. Exploration of the family’s role and strengths after a young woman is diagnosed with breast cancer: Views of women and their families. *European Journal of Oncology Nursing*. 2012;16(2):124-30.
13. Bateman AL. Understanding the process of grieving and loss: A critical social thinking perspective. *Journal of the American Psychiatric Nurses Association*. 1999;5(5):139-47.
14. Hurlock EB. *Developmental psychology*: Tata McGraw-Hill Education; 2001.
15. Schulman-Green D, Feder S, editors. *Integrating Family Caregivers into Palliative Oncology Care Using the Self-and Family Management Approach*. Seminars in oncology nursing; 2018: Elsevier.
16. Hadjam MNR. Validitas Konstruk Ikhlas: Analisis Faktor Eksploratori terhadap Instrumen Skala Ikhlas. *Jurnal Psikologi*. 2011;38(2):199-214.
17. Goddard C. Sabar, ikhlas, setia—patient, sincere, loyal? Contrastive semantics of some ‘virtues’ in Malay and English. *Journal of Pragmatics*. 2001;33(5):653-81.
18. Corey G. *Theory and practice of counseling and psychotherapy*: Nelson Education; 2015.
19. Rahmawati S. *Pemahaman Teologi Kaum Gay Komunitas Adinata Family Di Surabaya*: Doctoral dissertation: UIN Sunan Ampel Surabaya; 2015.
20. Idrus M. *Makna agama dan budaya bagi orang jawa*. UNISIA. 2007;30(66).
21. Wittenberg E, Reb A, Kanter E, editors. *Communicating with Patients and Families Around Difficult Topics in Cancer Care Using the COMFORT Communication Curriculum*. Seminars in oncology nursing; 2018: Elsevier.
22. Klassen AF, Raina P, McIntosh C, Sung L, Klaassen RJ, O’donnell M, et al. Parents of children with cancer: Which factors explain differences in health-related quality of life. *International Journal of Cancer*. 2011;129(5):1190-8.
23. Khanjari S, Langius-Eklöf A, Oskouie F, Sundberg K. Family caregivers of women with breast cancer in Iran report high psychological impact six months after diagnosis. *European Journal of Oncology Nursing*. 2014;18(6):630-5.

Mapping Customers: A Case Study of a University Hospital in Indonesia

Purwaningsih¹, Nyoman Anita Damayanti², Nasronudin³, Thini Nurul Rochmah²

¹Doctoral Program of Public Health, Faculty of Public Health, ²Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia

ABSTRACT

Hospitals as health providers seek to understand the customers' needs concerning the healthcare services. The success of the hospital management depends on how the hospitals meet the customer's needs by understanding the situation and conditions of the customers, including knowing where the customer lives. This study aimed to obtain a geographical map of the hospital's customer's residences based on the sub-districts in Surabaya city. A formal survey method was employed by using the secondary data obtained from the Medical Record Unit of Airlangga University Hospital. The sample size of the data was 10% of the number of patients from each year; 2015, 2016, and 2017. Simple random sampling technique was employed by using computer-generated selection. The data was entered into GIS mapping software. The results were shown in the form of a geographical map to observe the customer's distribution. The use of customer mapping is useful to support the leaders of the hospital management in making a business plan, including the expansion of the healthcare services offered and increasing the number of customers from other potential areas of residence.

Keywords: mapping, hospital customers, geographical information system, trade competition

INTRODUCTION

Healthcare service is one of the growing sectors in economy. Despite various negative opinions against free trade in healthcare, liberalisation in the health sector has enabled there to be consequences for national policy makers and health providers when it comes to meeting the population needs.¹ To survive the trade and service competition, health service institutions should understand the customer's needs. Customers are central to the service business and should be involved in the production process.² They have a crucial role in bridging with the providers so then the service product is known and accepted by the wider community.² Likewise, hospital services also depend on the value of

the customers, both internal and external. In general, a customer as defined by the dictionary as a person or an entity who purchases goods or services produced or delivered by a business.

Despite the different conditions that sets them apart from other general customers, patients are the customers of a hospital or given health provider who receive the service after payment. By definition, a patient is a person receiving healthcare and medical treatment under a physician's supervision.³ Patients, as the hospital customers, are different from other business customers because of their diseases or injuries that make them vulnerable, afraid, pained, where they become drug dependence, feel fatigued and experience confusion. On the other hand, in certain circumstances, patients have to make complex decisions about life and death in a short period of time. Buying hospital services is intended to improve their health status. However, in some cases, the outcome of the service is uncertain due to multifactorial influences.

As a business entity and healthcare provider, the hospital should be able to provide the required treatment that is unique for each individual based on the diagnosis

Corresponding Author:

Purwaningsih
Doctoral Program of Public Health,
Faculty of Public Health,
Universitas Airlangga, Mulyorejo, Surabaya, Indonesia
Email: purwaningsih@fkp.unair.ac.id

given by the physician. The service starts from the time of the patient's admission, throughout the hospital stay, until their discharge from the hospital. Providing satisfactory healthcare service to the patients leads to higher customer satisfaction which is associated with adherence to the medical treatment provided and the continuity of care.⁴ Therefore, understanding the customers' background and expectations is crucial for the hospital in order to meet their needs and to satisfy their patients. Mapping the patient's location of residence is one way to understand the customer's background. By mapping the patient's location, the hospital will find it easier to observe the distribution of customer territory based on their real situation on a local map. Social mapping is conducted to find information related to the sociodemographic characteristics in a specific area in order to support the decision-making process.

The use of social mapping in decision-making is beneficial to inform individuals of the current position of society and to plan what actions are required. Airlangga University Hospital is a public healthcare entity that provides secondary and tertiary levels of care, established in 2011. It is located at the heart of Surabaya city, the second largest city in Indonesia. The city population was nearly 2.95 million in 2015.⁵ There are 59 hospitals and 103 specialist clinics that provide secondary and tertiary levels of healthcare.⁶ Since the implementation of the national health insurance (NHI) scheme in 2014⁷, other private and public hospitals also affiliate with the NHI agency in order to receive more patients. Other than that, all public and private hospitals are allowed to receive self-payment from patients. Although Airlangga University Hospital is a public entity with a non-profit orientation, the hospital should apply a strategic business plan to provide the customers with excellence and to improve the hospital business performance as indicated by an increased patient volume. Creating a social map of the hospital customers would help the hospital to plan health services that comply with the medical care standards as well as having a better customer orientation. Therefore, this paper aimed to describe the geographical distribution of the hospital's customers through the map-making process and its implications for hospital decision-making.

METHOD

The map-making process was done by using Geographical Information System (GIS) software.

The general purpose of mapping was to obtain a geographical description and to estimate the potential of the region. The hospital customer map allows for there to be observations of the patient volume from each sub-district and the potential services offered by the hospital.

The process was initiated by collecting the secondary data of the patients admitted to Airlangga University Hospital between 2015-2017. The source of the data was the patient's medical records. We generated the data from 10% of the number of patients each year, with an equal composition of patients admitted to the emergency department, outpatient units and inpatient units. The data sampling was done through computerised simple random sampling. As not all of the patient's residence information contains a zip code, the data collected was based on the sub-districts within the administrative territory of Surabaya city.

RESULTS AND DISCUSSION

Surabaya city is administratively divided into 31 sub-districts with a total land area of 350.5 square kilometres.⁵ Airlangga University Hospital is located in Mulyorejo sub-district. In this study, we included the data of 5,647 patients admitted between 2015-2017. The details of the sample size from 2015 to 2017 were 795, 1,735, and 3,117 respectively. From this data, we observed a remarkable annual increase of patient volume by 218% in 2016 and 170% in 2017. Overall, about 89% (n=5,024) of the sample subjects were from Surabaya city, while 11% were patients from other cities.

The hospital customer maps of 2015, 2016, and 2017 from Surabaya city were generated three maps. The legend on the right of the map presents the number of patients from each sub-district. We applied four scale categories based on the number of patients in each sub-district in shades of grey colour, as follows: 1) Very light grey: 0-50 patients; 2) Light grey: 51-150 patients; 3) Dark grey: 151-300 patients; 4. Very dark grey: > 301 patients.

From the first map, two sub-districts contributed 51-150 patients, while five sub-districts contributed 151-300 patients. The largest number of patients was contributed by Mulyorejo and Kenjeran sub-district. This map reflects that in 2015 the major customers of the hospital are the people living nearby to the hospital.

In the second map, there were 3 sub-districts that were light grey, 5 sub-districts that were dark grey, and 1

sub-district that was very dark grey. The largest number of patients were from Mulyorejo sub-district and other nearby sub-districts. The increased number of patients from 2015 to 2016 seems to largely be from the same sub-districts near to the hospital. A significant increase in the number of patients was also observed from Rungkut sub-district.

As shown in the third map, there were 4 sub-districts that were dark grey and 3 sub-districts that were very dark grey. In 2017, most of the customers of the Airlangga University Hospital came from Tambaksari sub-district, Mulyorejo sub-district and Gubeng sub-district. These three sub-districts are among the sub-districts where there is a high proportion of the population from the middle and upper level of income in Surabaya city.⁵ It reflects the increased acceptance of the hospital of patients across all levels of income, which in turn increases the market potential of Airlangga University Hospital.

As shown from the first to third map, the expansion of the utilisation of Airlangga University Hospital was represented by the increased number of patients annually. Within the area of 10 kilometres, there are 10 other government and private hospitals with a bed capacity ranging between 100-600. Most of the hospitals are teaching hospitals which have been operating for 5-30 years. As a business entity, Airlangga University Hospital is competing with those hospitals when it comes to providing a quality healthcare service, especially for the population of Surabaya city itself. In 2015-2016, the branding of Airlangga University Hospital targeted the lower and middle income population. It was expanded to target the upper income population as well in 2017.

According to McCarthy et al. (2016), the benefits of patient mapping are to support the planning of healthcare solutions by the multidisciplinary stakeholders in order to improve the hospital's performance and patient satisfaction, as well as to alleviate the current constraints in the healthcare service.⁸ Mapping involves a simple and appropriate visualisation of information that will help stakeholders to engage in the service, to collectively determine the objective and to monitor progress.⁹ The results of the customer mapping can be used by the executive board of Airlangga University Hospital as a tool to support the development of a marketing strategy plan. The hospital's marketing strategy is useful to determine the customer's needs, which can be implemented through

three stages including the selection of customer targets, the identification of customer expectations and the decisions of the marketing strategies. Based on these strategies, Airlangga University Hospital could prepare specific facilities based on the needs or expectations of the targeted customers. In addition, the hospital also requires applying quality control with a competitive price, while providing a comfortable environment for the patients to improve their experience when using the services of the hospital.

CONCLUSIONS

Customer mapping is important to support the hospital management when developing a business strategic plan. The map contains the geographic distribution of hospital patients, which can visually inform the stakeholders of the situation and condition of the hospital customers. The map is useful to help develop marketing strategies with an ultimate goal to increase patient volume. From the maps generated from the medical record data of 2015-2017, the market share of Airlangga University Hospital has been expanded from the low and middle income communities to the upper income communities as well. From the customer mapping results, Airlangga University Hospital should continue improving their service quality, competitive pricing, and promoting the utilisation of the hospital services while providing a comfortable environment for a better customer experience. This can be achieved by improving the quality of the human resources, providing an efficient and effective care service, and setting a hospitality standard in addition to the standard operating procedures.

Ethical Clearance: Ethical approval was granted by the School of Public Health in Airlangga University, Surabaya.

Source of Funding: Self-funding.

Conflict of Interest: Nil.

REFERENCES

1. Davis L, Erixon F. The health of nations: conceptualizing approaches to trade in health care. ECIPE Policy Brief; 2008.
2. Prahalad CK, Ramaswamy V. Co-creating unique value with customers. *Strategy & leadership*. 2004;32(3):4-9.

3. Deber RB, Kraetschmer N, Urowitz S, Sharpe N. Patient, consumer, client, or customer: what do people want to be called? *Health Expectations*. 2005;8(4):345-51.
4. Shirley ED, Sanders JO. Patient satisfaction: implications and predictors of success. *JBJS*. 2013;95(10):e69.
5. Government of Surabaya City. Rencana Pembangunan Jangka Menengah Daerah (RPJMD) Kota Surabaya 2016 – 2021. Surabaya 2015.
6. Surabaya DHO. Laporan Kinerja Tahun 2016 (The 2016 Performance Report). In: Surabaya DK, editor. Surabaya: DKK Surabaya; 2017.
7. Mboi N. Indonesia: On the Way to Universal Health Care. *Health Systems & Reform*. 2015;1(2):91-7.
8. McCarthy S, O'Raghallaigh P, Woodworth S, Lim YL, Kenny LC, Adam F. An integrated patient journey mapping tool for embedding quality in healthcare service reform. *Journal of Decision Systems*. 2016;25(sup1):354-68.
9. Antonacci G, Reed JE, Lennox L, Barlow J. The use of process mapping in healthcare quality improvement projects. *Health services management research*. 2018;31(2):74-84.

Structural Model of the Factors Related to the Family Resilience of Stroke Patients in Indonesia

Nikmatul Fadilah¹, Kusnanto², Nursalam², Minarti³, Asnani³

¹Doctoral Program of Public Health, Faculty of Public Health, ²Faculty of Nursing, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia; ³Diploma III Nursing Program Campus Sutopo, Polytechnic of Health, Ministry of Health, Surabaya, Indonesia

ABSTRACT

This study aimed to develop a family resilience model to improve the quality of life of families with stroke patients. A cross-sectional quantitative study was employed to measure the data from 130 families. Structural equation modelling (SEM) was used to examine the relationship between the variables. The analysis method of Partial Least Square (PLS) was used to evaluate if the proposed model is suitable for the data based on goodness-of-fit. The family resilience model focused on the quality of life of a stroke-impaired family has been compiled with the variable modelling comprising of family crisis, stress management, and family resilience. The achievement of high family resilience was followed by improving the quality of family life with stroke in the domains of physical health, psychological, social and environmental. Family health efforts related to primary health care is expected to increase family resilience and quality of life.

Keywords: family resilience, family crisis, post-stroke patient, quality of life

INTRODUCTION

Some sequelae of stroke, such as hemiparesis, lisp, swallowing difficulties, aphasia and confusion, commonly occur in stroke patients. Such alterations can cause stress to the stroke patients and to their family, who will look after them during follow-up care at home. The alteration of the physical condition of post-stroke patients especially that which leads to disability, will cause them to face obstacles in activities of daily living, making them dependent and affecting their quality of life¹.

Basic health research (*Riskesdas*) data from 2013 showed that the prevalence of stroke disease in Indonesia increases with age. The highest number of stroke cases diagnosed was in those aged 75 years old and over (43.1%). The prevalence of stroke based on sex was dominated by men (7.1%) compared to women

(6.8%). Data from the East Java Health Office in 2012 states that the most common in-patient diseases for type A hospitals was stroke with 5,103 people. This was the same with type B, C, and D hospitals with 6,575 people, 3,573 people and 548 people respectively².

Families experienced anxiety and had symptoms of sadness, palpitations and insomnia. Another threatening stressor for the family was the alteration of their economic status³. Bakas et al. states that the family usually ignore their health condition and generally, the health care providers also do not give them too much attention during the treatment⁴. The family should get attention and support from the health care providers regarding their needs in order to keep healthy, so they can give optimum support to their family in terms of information, and emotional support and appreciation⁵.

The family must be prepared from the early acute phase of the disease up to their discharge from hospital, including the follow-up treatment at home. A study concluded that the family will be motivated and ready to provide care at home through discharge planning⁶. In relation to stress management through health education efforts, of which discharge planning is one, it can enhance effective and adaptive coping of the family³. Effective and adaptive coping can lead the

Corresponding Author:

Nikmatul Fadilah

Doctoral Program of Public Health, Faculty of Public Health, Universitas Airlangga, Mulyorejo, Surabaya, Indonesia
Email: nikmatul.fadilah-2017@fkm.unair.ac.id

family to achieving strong family resilience and making them feel comfortable.

The purpose of this study was to establish a structural model of the factors related to family resilience in relation to stroke patients in Indonesia.

METHOD

The study used a cross-sectional design. The sample size was 130 family members determined by rule of thumb and Structural Equation Modelling (SEM). The sampling method used multi-stage sampling. The instruments were questionnaires created by the researchers, based on the family adjustment and adaptation response (FAAR) model and the theory of chronic sorrow towards the family crisis in determining the factors related to the family’s resilience to managing their changed quality of life.

Descriptive data analysis was used to identify the factors related to family resilience and quality of life through a distribution table, complete with the frequency and percentage of the measured aspects. Inferential analysis was used to test the empirical model and research hypothesis through SEM, both variance and component-based, namely Partial Least Square (PLS). The structural model was analysed. The variable indicators were stroke patient characteristics (X1), caregiving family member characteristics (X2), health care service facilities (X3), family crisis (X4), family stress management (X5), family resilience (Y1) and family quality of life (Y2). The model analysis was used to identify the value of variation possible in implementation, and the effect of the communal value and the structural equation was also obtained.

RESULTS

Outer Model Analysis

a. Convergent Validity: There are several aspects of the variables which were invalid, including all stroke patients characteristics indicators,

Analysis of the Structural Model (Inner Model)

allfamily characteristics indicators, health care service facility (affordability), and family crisis (stressor and daily conflicts). However, some variables were valid including health care service facility (service quality), family crisis (obstacles, family source, and coping behaviour), as well as all indicators of family stress management, family resilience, and the quality of life.

b. Construct validity and reliability

Table 1: The results of the construct validity and construct reliability test

No.	Variable	AVE	Composite Reliability
1.	Stroke patient characteristics	0.264595	0.426210
2.	Family characteristics	0.277548	0.019303
3.	Health care service facility	0.602949	0.738556
4.	Family crisis	0.355683	0.240245
5.	Family Stress management	0.564901	0.784398
6.	Family resilience	0.668866	0.857929
7.	Quality of life	0.483143	0.778375

Table 2 shows that the AVE value in the variables of family stress management, health care services and family resilience have a value of more than 0.5, while in the variables related to the family characteristics and stroke patient characteristics, family crisis and quality of life have a value of less than 0.5. The table also shows that the construct variable has a composite reliability value greater than 0.7 in the variables of family stress management, health care service, family resilienceandfamily quality of life. The other three, encompassing family characteristics, stroke patient characteristics and family crisis, have a value of less than 0.7.

Table 2: The results of the Structural Model T-test (Inner Model)

Correlations among variables	Original Sample (O)	T Statistics (O/STERR)	Note
Stroke patient characteristics →Family crisis	0.221435	0.813264	No correlation
Family characteristics→Family crisis	0.093529	0.516141	No correlation

Conted...

Health care service facility → Family crisis	0.235837	1.569035	No correlation
Family crisis → Family Stress management	0.598633	2.899285	Significant correlation
Family Stress management → Family resilience	0.834907	22.16833	Significant correlation
Family resilience → Quality of life	0.785455	18.20447	Significant correlation

Goodness of Fit Test

Table 3: R square Value

No.	Relationship among variables	R Square
1.	Stroke patient characteristics, Family characteristics, Health care service facility → Family crisis	0.128
2.	Family crisis → Family stress management	0.358
3.	Family stress management → Family resilience	0.697
4.	Family resilience → Quality of life	0.617
	Q ² = 0.93503	
	GoF = 0.454809 (large)	

Based on the R square values, the biggest value is family stress management towards family resilience with a value of 0.697, while the smallest influence is the stroke patient characteristics, family characteristics and health care facilities towards family crisis with a value of 0.128.

DISCUSSION

Stroke patient characteristics towards family crisis:

The results of the study show that the stroke patient’s characteristics do not affect the family crisis. Inferential analysis concluded that the characteristics of the stroke patients do not affect family crisis. The family has the moral obligation to deliver care to the stroke patient as this gesture reflects the social structure of Asian society, including Indonesia. Xu & Ou stated that Chinese culture determines that the younger family members are responsible for the care of the older ones, particularly the most elderly members⁷. The social and cultural condition of the respondents in this research were almost identical to that of Xu & Ou, whereby the culture of family in Asian society remained solid⁷.

The Characteristics of the Family Towards Family Crisis:

The characteristics of the patient’s family does not affect family crisis. Family, as the patient’s caregiver, sees that the needs and health condition of their stroke-affected family member is to be prioritised over their own needs. The position of wife or daughter guarantees

that they sustain their function as a caregiver to their husband and parents. A study conducted by Cao et al also determined the position of the wife as the primary caregiver for the stroke patient⁸. Also, the respondent’s level of education is therefore quite sufficient for the caregiver to comprehend and execute their role as a caregiver adequately. The supporting statement over such a situation was conveyed by a study that the higher the level of education of the caregivers, the better they can comprehend something including their role as caregiver, as instructed by health officials⁹ understand more about their work conditions, and identify any links to negative outcomes among their senior clients. Ninety-eight paid caregivers (eighty-five female and thirteen male.

Regarding the health problems, the demands of the caregiver to be consistently delivering care to the stroke patient sometimes leads them to pay more attention to their own health situation over the patient’s healthcare needs, or they tend to ignore scheduled visitations to medical officials during the recovery phase of the stroke-affected family⁴.

Healthcare Facility Towards Family Crisis: Families in this research were primarily in an urban society (Surabaya city) with a relatively short mileage involved and reliable access to transportation, widely available to reach out to a medical facility. Similar was also conveyed by a study that families with a stroke patient member had been generating benefits from a nearby health facility in the form of medication and treatment¹⁰ recovering stroke patients (11 male, 8 female.

The families conveyed that the quality of the healthcare service received through medication and the treatment of their family member was favourable (98.5%). Most of the families had been involved during the treatment of their family member with a stroke since hospitalisation, and stated that they received counseling at the hospital. The research of Lutz stated that patients and the family of the strokepatient did not comprehend the role that they were to be charged with after the *discharge planning*¹⁰ *recovering stroke patients (11 male, 8 female)*. A study expressed the distinct condition that *discharge planning* increases the readiness of the family to deliver care at home¹¹.

Family Crisis Toward Family Stress Management:

The outcome of this research shows that family crisis caused by daily conflict was infrequent (86.2%), family hindrance was in the mild category (82.3%), and there was an average level of family stressor (62.3%). The research of Ostwald inferred that a stroke attack was a significant predictor of stress for the stroke patient and their family. The surge of stress was triggered by the malfunction of their family role. The main stressor for stroke patients and their family was the economic factor (100%)³.

Family resource was mostly adequate (81.5%) and the coping behaviour of the family was in both the plausible (50.8%) and sufficient category (45.4%). Family resources can be defined as an economic and psychological power (life motivation). A study carried out in Hong Kong mentioned that religious tradition and the philosophy of the local culture has contributed to the reconstruction of post-stroke life purpose¹² including Hong Kong. The stroke event leaves stroke survivors experiencing great distress as they struggle to regain physical ability and develop a frame of meaning. In a Chinese context, several religious traditions and secular philosophies including Buddhism, Daoism, Christianity, and Confucianism contribute to reconstruction of a meaningful post-stroke self. Symbolic interactionism interpreted by Charmaz (1987). Social resources or the available environmental and spiritual resources will reconnect the richness of spiritual belief and spiritual practice for the stroke patient. The condition of stroke society in this research was identical with the research carried out in Hong Kong. Asian society, including Indonesia and Hong Kong, is deeply attached to culture and spiritual belief, related to caring for a suffering family member, primarily an elderly member as the devotion of the younger to the older member particularly.

Family Stress Management Towards Family Resilience:

The result shows that the stress management of the family influences family resilience. The support of the patient's family was realised through an intense discussion of the patient's disease, transferring support/motivation, constantly caring for the patient and establishing a comfortable environment, as well as complimenting patient's participation during treatment. It corresponds with a study stating the family support during hospitalisation is important for stroke patients. Nevertheless, informational support did not clearly mentioned the actual condition of the stroke severity because the patient was in the acute phase of treatment⁵.

The family data related to facilitating the activities of stroke patients in their neighbourhood was nearly equal with a distribution of less than 36.9%. It requires extra energy for the caregiver and additional facilities, such as a wheelchair, to be able to mobilise a stroke patient with a disorder of the limbs. This condition resembles the findings of Chow and Becker that stroke attack may cause a physical disorder. The development of a change in the patient's life motivation may trigger distress¹² including Hong Kong. The stroke event leaves stroke survivors experiencing great distress as they struggle to regain physical ability and develop a frame of meaning. In a Chinese context, several religious traditions and secular philosophies including Buddhism, Daoism, Christianity, and Confucianism contribute to reconstruction of a meaningful post-stroke self. Symbolic interactionism interpreted by Charmaz (1987).

Family Resilience Towards Quality of Life:

The research outcome pointed out that family resilience is influential towards the quality of the family and made it as the greatest score in comparison to the other domains. This particular condition shows that families have the ability to organise their internal factors maximally. The data from the family with stroke resilience pointed out that psychological resilience was the indicator with the greatest percentage (83.1%). Families who reached a higher resilience had a higher probability of achieving family goals; to be a happy, harmonious, wealthy, and qualified family¹³.

The results of the research into life quality pointed out that almost all of the respondents were equipped with prime psychological health (97.7%), with a major part being prime social relationships (78.5%) and having a supporting environment (66.9%). The lowest percentage

was the physical health of the prime caregiver (58.5%). Psychological health attained by the family at a higher level shows the fact that the family has the ability to manage the patient's emotions to produce positive self concepts and a feeling of satisfaction towards the achieved skills in relation to the fulfilment of the family needs (delivering care to the family member with a stroke). This family satisfaction is actual proof that the family is able to achieve one of the family life goals, which is to care for a family member who has suffered from a stroke.

CONCLUSION

The model of family resilience towards quality of life has been arranged with a constituting model variable consisting of family crisis, stress management, and family resilience. The fine ability to judge if a family crisis has resulted in unfavorable stress management was shown through the ability to respond to physical treatment, deliver internal support, and facilitate the stroke patient's activities in their surroundings. The attainment of family resilience is followed by an increase in life quality for families with stroke in a variety of domains including physical fitness, psychology, social aspects and the environment.

Conflict of Interest: None.

Ethical Clearance: The study passed ethical clearance from Ethical Committee of the Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia.

Source of Funding: Self-funded.

REFERENCES

1. Dobkin BH. Strategies for stroke rehabilitation. *Lancet Neurol* [Internet]. 2004 Sep [cited 2018 Oct 10];3(9):528–36. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/15324721>
2. Badan Penelitian dan Pengembangan Kesehatan. Riset Kesehatan Dasar (RISKESDAS) 2013. *Lap Nas* 2013. 2013;1–384.
3. Ostwald SK, Bernal MP, Cron SG, Godwin KM. Stress Experienced by Stroke Survivors and Spousal Caregivers During the First Year After Discharge from Inpatient Rehabilitation. *Top Stroke Rehabil* [Internet]. 2009 Mar 5 [cited 2018 Oct 10];16(2):93–104. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/19581196>
4. Bakas T, Clark PC, Kelly-Hayes M, King RB, Lutz BJ, Miller EL, et al. Evidence for Stroke Family Caregiver and Dyad Interventions. *Stroke* [Internet]. 2014 Sep [cited 2018 Oct 10];45(9):2836–52. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25034718>
5. Creasy KR, Lutz BJ, Young ME, Stacciarini J-MR. Clinical Implications of Family-Centered Care in Stroke Rehabilitation. *Rehabil Nurs* [Internet]. 2015 Nov [cited 2018 Oct 10];40(6):349–59. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25648522>
6. Potthoff S, Kane RL, Franco SJ. Improving hospital discharge planning for elderly patients. *Health Care Financ Rev* [Internet]. 1997 [cited 2018 Oct 10];19(2):47–72. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/10345406>
7. Xu J, Ou L. Resilience and quality of life among Wenchuan earthquake survivors: the mediating role of social support. *Public Health* [Internet]. 2014 May [cited 2018 Oct 10];128(5):430–7. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24792190>
8. Cao V, Chung C, Ferreira A, Nelken J, Brooks D, Cott C. Changes in activities of wives caring for their husbands following stroke. *Physiother Can* [Internet]. 2010 [cited 2018 Oct 10];62(1):35–43. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21197177>
9. Lindquist LA, Tam K, Friesema E, Martin GJ. Paid caregiver motivation, work conditions, and falls among senior clients. *Arch Gerontol Geriatr* [Internet]. 2012 [cited 2018 Oct 10];55(2):442–5. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22360830>
10. Lutz BJ, Young ME, Cox KJ, Martz C, Creasy KR. The crisis of stroke: experiences of patients and their family caregivers. *Top Stroke Rehabil* [Internet]. 2011 [cited 2018 Oct 10];18(6):786–97. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22436315>
11. Kamalakannan S, Gudlavalleti Venkata M, Prost A, Natarajan S, Pant H, Chitalurri N, et al.

- Rehabilitation Needs of Stroke Survivors After Discharge From Hospital in India. *Arch Phys Med Rehabil* [Internet]. 2016 Sep [cited 2018 Oct 10];97(9):1526–1532.e9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/26944710>
12. Chow EOW, Nelson-Becker H. Spiritual distress to spiritual transformation: Stroke survivor narratives from Hong Kong. *J Aging Stud* [Internet]. 2010 Dec 1 [cited 2018 Oct 10];24(4):313–24. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S0890406510000605>
13. Lutha SS, Cicchetti D. The construct of resilience: implications for interventions and social policies. *Dev Psychopathol* [Internet]. 2000 [cited 2018 Oct 10];12(4):857–85. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/11202047>

A Gender Analysis of Traditional Contraceptive Use in Sikka District, East Nusa Tenggara, Indonesia

Rut Rosina Riwu¹, Sarci Magdalena Toy¹, Daniela L. A. Boeky¹, Conrad L. H. Folamauk²

¹Faculty of Public Health, ²Faculty of Medicine, University of Nusa Cendana

ABSTRACT

Introduction: This study aimed to describe traditional contraceptive methods and to analyse whether a gender gap exists in the concept of traditional contraceptive use.

Method: This research used a descriptive method by way of an in-depth interview technique. The 10 respondents selected consisted of three *hattra* (traditional contraceptive service providers) and six women and one man as the service recipients. This research was carried out in Talibura, Sikka District. The gender analysis technique used was the *Longwe technique*.

Results: The traditional contraceptive methods available were concoctions and a massage with herb oils to “reverse the womb”. The use of concoctions consisted of a mixture of medicinal herbs and dried ant-lions. It was found that there was no gender gap in the use of traditional contraception as the husband and wife both consume the concoctions given by *hattra*. No side effects were experienced during the use of traditional contraception.

Conclusions: Traditional contraception may be emerging as a new solution to help the government in suppressing population growth, especially in rural areas. A further qualitative research on its effectiveness and community satisfaction is required before introducing this new type of contraception worldwide.

Keywords: *contraception, traditional, method, gender, analysis*

INTRODUCTION

One of the factors that commonly occurs regarding the contraception in remote areas is the difficulty encountered when it comes to accessing health facilities due to their unreachable distance or due to the cultural factor adopted in each region. The deep patriarchal culture in almost every region in Indonesia is often used to treat women badly, as they are the victim of gender disparity. Women tend to be unconditionally obedient to their husbands over the use of contraceptive tools, therefore it is unsurprising if the dominant participants of the family planning programs are women instead of men¹.

The sub-district of Sikka in the East Nusa Tenggara province is an area that is popularly known for its

richness of medicinal herbs that are used in traditional medication. Indigenous people inhabiting the Sikka sub-district in East and Mid Flores are the ones mentioned as an integral part of Mukan ethnicity. There are a number of tribes made up of small ethnic minorities such as Sikka, Krowe, Mukang, and Muhang.

The local society in Talibura District is dominated by the Krowe Muhan ethnic, who to this day, continue to preserve the heritage of their ancestors' traditional medications. There are a variety of plants that are manufactured for concoction, including for abortions. The local community tends to be more in favour of using herb-made contraception. However, regarding the decision-making process, the utilisation of sad herbs is often inseparable from the prevailing gender disparity due to the deep influence of the patriarchal culture.

This qualitative study was aimed at galvanising the existing traditional contraceptive method in Taliburi sub-district, Sikka District and analysing the gender disparity involved in performing the use of traditional contraceptive methods.

Corresponding Author:

Rut Rosina Riwu

Faculty of Public Health, University of Nusa Cendana

Email: ruth.riwu@staf.undana.ac.id

METHOD

This qualitative research used the in-depth interview method on two types of informant. The first was the *hattra* of the Krowe Muhang ethnicity as the key informant and the second was the users of the traditional conception, both women and men (participants). The in-depth interview with the *hattra* was aimed at gathering the information on the method of traditional contraception that has been available and provided recently. Meanwhile, the in-depth interview with the participants was aimed at observing whether or not gender disparity exists within the use of traditional contraception.

Longwe's gender analysis framework used in this research was utilised to identify the five different dimensions including control, participation, critical awareness, access, and well-being when using traditional contraception. The more awareness there is of equality over the use of contraception, the more empowered that the women will be within the community¹⁻³.

DATA ANALYSIS

The data regarding the interview outcome was transcribed in the form of an interview transcription which later on was used in the process of the analysis. The framework of qualitative data analysis was used which consisted of five steps, including reading, coding, displaying, reducing and interpreting⁴.

RESULTS

Informant profile: key informant and the method of traditional contraception: The respondents selected consisted of three informants (*hattra* as the traditional contraceptive service providers) and six women and one man as the service recipients. The key informants were aged above 40 years and had undergone traditional medication training and contraceptive practice for more than 15 years. The knowledge and skill related to traditional medication was hereditary from the ancestors of the Krowe Muhang (Table 1).

Table 1: Key informant profile

Characteristics	Informant (Hattra)		
	I	II	III
Gender	Male	Female	Female
Age (years old)	61	61	48
Education level	Elementary School	Elementary School	Elementary Dropped-Out
Residential Village	Kringa	Kringa	Nebe
Average patients/week	3	3	10
Students with independent practice	0	0	1
Traditional contraception methods	Consumed concoction Rubbed with smeared oil	Consumed concoction Rubbed with smeared oil	Consumed concoction Rubbed with smeared oil
The type of ingredient	Moras/murbei DulaNelar Holak Koro/karo Tukut Organic chicken egg Natural coconut oil	Moras/murbei DulaNelar Holak Koro/karo Tukut Organic chicken egg Natural coconut oil	Tamarind barkwood Mela root Brotowali Sambiloto Lontar root Undur-undur Natural coconut oil
The method of concoction manufacturing	Boiled Dried Fried with natural coconut oil Combined with porridge Combined with soft drink (sprite)	Boiled Dried Fried with natural coconut oil Combined with porridge Combined with soft drink	Boiled Dried Mashed Combined with natural coconut oil

Conted...

The method of concoction usage	Drink Eaten with porridge Rubbed and massage to stomach	Drink Eaten with porridge Rubbed and massage to stomach	Drink Chewed and swallowed by juice, the pulp is removed Rubbed and massage to stomach
Abstinence	Certain type of fish	Certain type of fish	Contraceptive pill
Side effect	Non-exist	Non-exist	Non-exist, except if had menstruation delay >1 month

Participant's profile: The participants involved in this research were the members of the Krowe Muhangethnicity, categorised as the local society who had known the hatra for a number of years, including having received the traditional medication service. All of the participants aged above 20 were married and had bore children. Nevertheless, there are some respondents with an infertility history but had succeeded at giving birth to children through the use of traditional medication (Table 2).

Table 2: Participant's profile

Characteristic	I	II	III	IV	V	VI	VII
Age	27	24	39	26	31	43	48
Gender	F	F	F	F	F	F	M
Education	High School	Middle School	High School	Unschoolled	Middle School	Elementary School	Elementary School
Occupation	Weaver	Weaver	Health personnel	House-wife	Trader	Farmer	Censorman
Amount of children	1	1	2	2	5	8	8
Amount of visit	>3x	>3x	>3x	>3x	>3x	>3x	>3x
Residential Village	Nebe	Nebe	Nebe	Kringa	Kringa	Kringa	Kringa
Traditional contraceptive method	Concoction	Concoction	Concoction	Concoction and rubbing	Concoction	Concoction	Concoction

Gender Analysis

Control: The female participants possessed the control/power to determine the total number of children that they had, selecting and deciding on the use of traditional contraception, as well as determining who had to use it. The decision was made collectively with the husband without one party dominating the other.

"I have eight children, 6 boys and 2 girls. We both want all girls but they are all boys so we will find a way to give birth to girls. This is what we both agreed to before giving birth to a daughter. This is because the one who will

care for us is a daughter. If we fall into sick, our daughter can look after us. Our daughter will look after our house, so once they get married, she won't leave the house. That is our culture here." (YC: age 43 y.o).

"We are both the same. If we have all sons, later on we will live our life in loneliness (me and mama only). We asked for the support from mama and bapak to give us a concoction to have a daughter. Finally, we were blessed with two daughters, and then we stopped" (GG: 48 y.o)

Participation: The dimension of participation in this research unveiled the equal participation of men and

women in determining the amount of children and the usage of traditional contraception. The female participants tend to be given the freedom to choose and to use traditional contraception due to the absence of side effects and easy accessibility.

“For the roots, only my wife consumes it, but the leaves are cooked within porridge and we eat them together. This is not what we agreed upon, but we must eat them together. This is what mama and papa (*hattra*) told us. If only one of us does it, then it is unacceptable.” (GG: 48 y.o)

“I was pregnant long before we were offered the use of contraceptions but I didn’t want to. My husband did not allow me too. Probably because we feared the side effects and whether it is fit or not for us. This is because some other people got side effects (headache).” (VW: 39 y.o)

Critical awareness: There is awareness that when both husband and wife use contraceptive tools, it is due to the economic difficulties of bearing many children. Therefore, both husband and wife decide to postpone pregnancy. The husband appears to be more steady and spirited upon embarking to work. Aside from this, the female participants were also aware of the probability of economic difficulties when it comes to bearing many children. Henceforth, they become proactive when it comes to seeking a traditional contraceptive service.

“We have been husband and wife, but we said ‘wait for a moment’ to secure our economic well-being. When we find it, let’s have children.” (MVU: 24y.o)

“Sometimes, if just one person (wife) asks for the concoction and she does not menstruate or feel well, then both (husband and wife) must come together so then the menstruation may go well. If they use KB, then probably the menstruation will be delayed” (Hattra 1: 61 y.o)

Access: The husband and wife obtained the information regarding traditional contraception conveniently due to the *hattra* who own houses in the same village. This is knowledge that is hereditary over the generations. The participants can also easily visit the houses of the *hattra* due to the affordable distance. Besides this, the *hattra* can be met at any time. The *hattra* have never rejected visiting participants, regardless of the time. The other factor which drives the informants to come to the *hattra* is the absence of a fee or remuneration that must be paid,

but it must be based on sincerity from the service users or participants.

The participants are also free to come to the *hattra* once they need help. This is because the husband tends to be passive in the search for medication, hence the wife usually takes on the initiative when it comes to seeking help.

“I rely on them at times... if it gets painful, then I will just come. We have a lot of *hattra* around, but only mama and papa (*hattra*) do we attend, because even if someone is about to die, they can be cured.” (MG: 26y.o)

“I can also call in the middle of night, if they are all awake. I won’t look at the time, whenever it is, even in the middle of night as they usually go out to collect leaves. I once almost died as the hospitals in Maumere and Kupang rejected me. But I came to papa and mama (*hattra*), and I was cured.” (MAG: 31 y.o)

DISCUSSION

The majority of users are originally from the same village as the *hattra*. However, there were a number of beneficiaries who came from different villages, and even from different cities. Traditional contraceptive methods have been the main ones used in the society’s inhabited remote areas, due to the consideration of the difficult access and unaffordable distance involved when it comes to reaching the health services. Similar results were also illustrated in Yordania. Women who reside in rural areas tend to choose to apply traditional contraception, compared to modern contraception⁵.

The paranoia over the side effects of modern contraception was the most dominant reason reported when it came to avoiding the usage of it. The participants had received the information regarding modern contraception from the medical personnel in their area of residence. However, they decided to refuse to use it. This evidence is in line with the situation in Nigeria, whereby the participants are equipped with the information on modern contraception but refuse to use it⁶. The participants assumed that modern contraception may inflict disease on their reproductive system.

The participants under 30 years preferred to use traditional contraception due to the absence of fertility obstacles once they are ready to reproduce. This was

discovered in Nigeria, whereby the majority of the participants assumed that the methods of modern contraception have made the flow of menstruation somehow agitated, including bleeding, flatulency, being overweight or being underweight. The hindrance of the return of fertility eventually leads them to avoid modern contraception⁷, and the evidence in India was that the participants are avoiding childbirth but refuse the use of modern contraception⁸. Almost half of the female global population requires contraceptive tools but cannot find a suitable modern contraceptive method for themselves⁹ at national and subnational levels to inform the improvement and expansion of programmatic efforts to narrow the gaps in mDFPS coverage. METHODS Analyses were based on Demographic and Health Survey and Multiple Indicator Cluster Survey data. The most recent surveys carried out since 2000 in 77 countries were included in the analysis. We estimated mDFPS among women aged 15-49 years. Subgroups with low coverage (mDFPS below 20%). Therefore, this requires a new contraceptive method which can answer their needs.

Commonly, the process of decision-making in a patriarchal culture leads to the wife being unconditionally obedient, including in terms of contraceptive use¹⁰. The study unveiled that the female participants have been involved in the decision-making process that determines the amount of children that they have and the use of contraception. It can be observed that there is gender equality in the discussion process and in decision-making. However, there is a difference between modern and traditional contraceptive decision-making. During the use of modern contraception, men tend to strictly reject using it. The contrary appears in the method of traditional contraception, whereby the men are willing to consume a contraceptive concoction. Positive female empowerment corresponds to the use of contraception in the recent ages as well as in the future¹¹. This corresponds to the research in Bangladesh which discovered that the decision-making process undertaken related to contraception is done by both parties¹² and that in Pakistan, the wife-husband discussion may implicate the use of contraception for both individuals¹¹.

CONCLUSION

The methods of traditional contraception used by Krowe Muhang ethnicity may be a suitable type of contraception for a society residing in rural areas who

face difficulties accessing modern contraception. This method can also be considered a new type of contraception, advertised as a safe and health-friendly method of contraception. It is suitable for the couples that are willing to limit the number of pregnancies but who are avoidant of modern contraception due to the fear of side effects. Further research is required to assess the effectiveness and substance of the traditional contraception.

Conflict of Interest: None.

Ethical Clearance: The study passed ethical clearance from Ethical Committee of Faculty of Public Health, University of Nusa Cendana, Indonesia.

Source of Funding: Self-funded.

REFERENCES

1. Kabeer N. Gender equality and women's empowerment: A critical analysis of the third millennium development goal 1. *Gend Dev* [Internet]. 2005 Mar;13(1):13–24. Available from: <https://www.tandfonline.com/doi/full/10.1080/13552070512331332273>
2. Lahiri-dutt K. Experiencing and coping with change: women-headed farming households in the Eastern Gangetic Plains. 2015;(September).
3. Warren H. Using gender-analysis frameworks: theoretical and practical reflections. *Gend Dev* [Internet]. 2007 Jul 29;15(2):187–98. Available from: <https://www.tandfonline.com/doi/full/10.1080/13552070701391847>
4. Ullin PR, Robinson ET, Tolley EE. *Qualitative Methods in Public Health*. San Fransisco: Jossey-Bass; 2005. 138-174 p.
5. Almalik M, Mosleh S, Almasarweh I. Are users of modern and traditional contraceptive methods in Jordan different? *East Mediterr Heal J* [Internet]. 2018 Apr 1 [cited 2018 Oct 9];24(4):377–84. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29972232>
6. Adebo OO, Dairo DM, Ndikom CM, Adejumo PO. Knowledge and uptake of folic acid among pregnant women attending a secondary health facility in Nigeria. *Br J Midwifery* [Internet]. 2017 Jun 2 [cited 2018 Oct 9];25(6):358–64.

- Available from: <http://www.magonlinelibrary.com/doi/10.12968/bjom.2017.25.6.358>
7. Ajayi AI, Adeniyi OV, Akpan W. Use of traditional and modern contraceptives among childbearing women: findings from a mixed methods study in two southwestern Nigerian states. *BMC Public Health* [Internet]. 2018 May 9;18(1):604. Available from: <https://bmcpublikealth.biomedcentral.com/articles/10.1186/s12889-018-5522-6>
 8. Kathalia SK. Awareness about Contraceptives, their Benefits and Side Effects among Indian Armed Forces Married Individuals. *EC Gynaecol*. 2018;4:126–34.
 9. Ewerling F, Victora CG, Raj A, Coll CVN, Hellwig F, Barros AJD. Demand for family planning satisfied with modern methods among sexually active women in low- and middle-income countries: who is lagging behind? *Reprod Health* [Internet]. 2018 Mar 6;15(1):42. Available from: <https://reproductive-health-journal.biomedcentral.com/articles/10.1186/s12978-018-0483-x>
 10. Vinoda Thulaseedharan J. Contraceptive use and preferences of young married women in Kerala, India. *Open Access J Contracept* [Internet]. 2018 Jan;Volume 9:1–10. Available from: <https://www.dovepress.com/contraceptive-use-and-preferences-of-young-married-women-in-kerala-ind-peer-reviewed-article-OAJC>
 11. Hameed W, Azmat SK, Ali M, Sheikh MI, Abbas G, Temmerman M, et al. Women's Empowerment and Contraceptive Use: The Role of Independent versus Couples' Decision-Making, from a Lower Middle Income Country Perspective. Gemzell-Danielsson K, editor. *PLoS One* [Internet]. 2014 Aug 13;9(8):e104633. Available from: <http://dx.plos.org/10.1371/journal.pone.0104633>
 12. Islam AZ. Factors affecting modern contraceptive use among fecund young women in Bangladesh: does couples' joint participation in household decision making matter? *Reprod Health* [Internet]. 2018 Jun 22 [cited 2018 Oct 9];15(1):112. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29929526>

The Relationship between Sexual Behavior and the Prevalence of HIV/AIDS among Homosexual Men in Bukittinggi City, Indonesia

Nurhayati¹, Wahyu Salendri¹

¹Midwifery Applied Undergraduate Program, Applied Bachelor Degree Program in Midwifery, STIKes Fort de Kock Bukit tinggi

ABSTRACT

Homosexual men contributed to the high prevalence of new cases of HIV/AIDS in Indonesia. Sexual behaviour is a major risk factor for HIV/AIDS transmission. This study aimed to determine the relationship between sexual behaviour and the incidence rate of HIV/ AIDS in homosexual men in Bukittinggi City, Indonesia.

We employed a quantitative research methodology with a cross-sectional design. The sample population was homosexual men who attended the Rasimah Ahmad Public Health Center in Bukittinggi City, West Sumatra, Indonesia. Of the 118 men, we recruited 50 respondents using an accidental sampling technique. The data collection was conducted from January to May 2018, using a structured questionnaire. The independent variables included knowledge, attitude, and practice while the dependent variable was the prevalence of HIV/AIDS. The data was analysed using a Chi-square test.

The results showed that 76% of respondents (n=38) had good knowledge, 74% had a good attitude (n=37), and 66% had safe sexual practices (n=33). There were 10 respondents (20%) who had been diagnosed with HIV positive with or without AIDS. Knowledge was significantly associated with the prevalence of HIV/AIDS (95% CI, OR=8.50). Attitude was significantly associated with the prevalence of HIV/AIDS (95% CI, OR=7.07). Practice was also associated with the prevalence of HIV/AIDS (95% CI, OR=7.00).

Knowledge, attitude, and practice were significant predictors of the prevalence of HIV/AIDS. Therefore, improving knowledge, attitude, and safe sexual practices should be promoted to prevent the incidence of HIV/AIDS among homosexual men and the community in general.

Keywords: Knowledge, Attitude, Action, HIV/AIDS, Homosexual.

INTRODUCTION

Homosexuality refers to sexual practices between same sex individuals. In a more specific context, homosexuality is defined as men who have sex with

men (MSM).¹For some societies, this sexual practice is considered to be a sexual deviation.²However, MSM is been a growing phenomenon in many countries throughout human history since the very beginning.

HIV stands for Human Immunodeficiency Virus, which is a type of virus that attacks the human immune system. AIDS stands for Acquired Immuno-Deficiency Syndrome, which is a collection of symptoms that result from a decrease in immunity caused by HIV.³ Several factors are associated with the risk of HIV infection, including sexual behaviour.⁴According to UNAIDS, there were 36.9 million people living with HIV in 2017.³ The MSM group has a higher risk of HIV infection that is 27 times more than that of other key population.³

Corresponding Author:

Nurhayati
Doctoral Program of Public Health,
Faculty of Public Health,
Universitas Airlangga, Mulyorejo, Surabaya, Indonesia
Applied Bachelor Degree Program in Midwifery,
STIKes Fort De Kock, Bukittinggi, Indonesia
Email: ketuastikesfdk@gmail.com

The estimated new number of cases of HIV/AIDS is increasing worldwide. In 2017, an average of 1.8 million people were estimated to have become newly infected with HIV.³ In the United States, approximately 67% of the 40,324 new HIV cases were contributed to by the gay and bisexual men in 2016.⁵ In Indonesia, approximately 23.5% of the 71,879 new cases of HIV/AIDS in 2012 was contributed to by the MSM group.⁶ Approximately 77% of HIV/and AIDS transmission occurs through sexual contact.⁶

AIDS is thought to originate from the African continent and is an infectious disease that quickly spread around the world, especially through unprotected sexual intercourse.⁷ The death rate for people with AIDS is very high. Since the beginning of the epidemic, AIDS-related diseases have taken approximately 35.4 million lives.³ A previous longitudinal study in the United States found that the 5-year survival rate of AIDS patients was only 3.4%.⁸

Previous studies have suggested that the factors of knowledge, attitude, and practice affect sexual behavior.^{9,10} The Indonesia Ministry of Health (MoH) has recognised the importance of the factors of knowledge, attitude, and safe sexual practices when it comes to preventing the incidence rate of HIV/AIDS.⁶ The MoH, in collaboration with the National AIDS Commission, has been implementing voluntary HIV counselling and testing (VCT) to prevent the HIV transmission.⁶ Knowledge and attitude of sexual behaviour influenced the sexual practice.¹¹ Risky sexual behaviour can have negative consequences, including unwanted pregnancy and exposure to HIV/AIDS.¹² Engaging in sexual contact with multiple partners and the non-use of condoms are among the risky sexual behaviours which put individuals at a higher risk of HIV infection.¹³

West Sumatera is one of largest provinces in Indonesia. In this province, by 2012, the City of Bukittinggi had the second highest incidence rate of HIV / AIDS after Padang City. The number of people living with HIV/AIDS has been continuously growing and reached 358 people by 2017. The majority of them were male (61.17%).¹⁴ To prevent HIV/AIDS transmission, Bukittinggi city has established VCT service clinics. In 2017, 29.5% of 1,288 people who had attended VCT-HUV in the city were from the MSM group.¹⁴ Therefore, the present study has aimed to determine the relationship between sexual behaviour and the incidence rate of HIV/AIDS in homosexual men.

METHOD

This present research utilised an analytical observational study design with a cross-sectional approach. The study population was MSM, or male homosexuals, attending the Rasimah Ahmad Health Centre, Bukittinggi City, West Sumatera in Indonesia. We obtained the data of 118 patients. The average number of visits per month to the facility was 50 patients. By using the accidental sampling technique, we recruited 50 study participants. The study was conducted from January to May 2018 at Rasimah Ahmad Health Centre, Bukittinggi City. For the purpose of this study, we collected primary and secondary data. The Chi-Square test was used to analyse the data. The significant association between the independent variables and the dependent variable was set up at a significance level of 95% ($\alpha = 0.05$).

RESULTS

Table 1 presents the characteristics of the study respondents. The majority of the respondents were aged between 15 and 24 years old (48%). The majority had good knowledge (76%) and a good attitude (74%) toward sexual behaviour. Most of them (66%) also applied safe sexual practices. The prevalence rate of HIV-positive among the respondents was 20%.

Table 1: Characteristics of the respondents

Variables	n (%)
Age (years)	
15-24	24 (48%)
25-34	23 (46%)
35-44	2 (4%)
45-55	1 (2%)
Knowledge	
Poor	12 (24%)
Good	38 (76%)
Attitude	
Poor	13 (26%)
Good	37 (74%)
Practice	
Unsafe sex	17 (34%)
Safe sex	33 (66%)
HIV prevalence	
HIV positive	
HIV negative	

To meet the study purpose, we conducted a correlation analysis using the Chi-square test. As shown in Table 2, the variables of knowledge, attitude, and practice were significantly associated with the incidence rate of HIV/AIDS. Poor knowledge significantly increased the risk of

HIV/AIDS infection by 8.5 times (95% CI: 1.83-39.42). Poor attitude significantly increased the risk of HIV/AIDS infection by 7.07 times (95% CI: 1.57-31.86). Unsafe sex practices also significantly increased the risk of HIV/AIDS infection by 7.00 times (95% CI: 1.52-32.33).

Table 2: Bivariate analysis of knowledge, attitude and practice of HIV/AIDS infection

Variables	Incidence of HIV/AIDS		p-value	OR (95% CI)
	Positive N (%)	Negative N (%)		
Knowledge				
Poor	6 (60.0)	6 (15.0)	0.007	8.50 (1.83-39.42)
Good	4 (40.0)	34 (85.0)		
Attitude				
Poor	6 (60.0)	7 (17.5)	0.001	7.07 (1.57-31.86)
Good	4 (40.0)	33 (82.5)		
Practice				
Unsafe sex	7 (70.0)	10 (25.0)	0.021	7.00 (1.52-32.33)
Safe sex	3 (30.0)	30 (75.0)		

DISCUSSION

In our study, almost half of the respondents were adolescents and early adults aged between 15-24 years. According to Katra (2014), sexual orientation is shaped in adolescence, which starts before the average initiation of sexual activity between 12-13 years old.¹⁵ A study in Thailand found that approximately 6% of 1,200 high school respondents reported being homosexual or bisexual, and that most of them (93%) had disclosed their sexual orientation before late adolescence.¹⁶

Most of the respondents in the present study also showed that they had good knowledge of sexual behaviour. Knowledge is the result of “knowing”, which occurs after people have sensed a particular object.¹⁷ Knowledge is influenced by internal factors and external factors. The internal factors consist of education, work and age while the external factors consist of the environment and socio-culture.¹⁷ A previous study in China also found that approximately 91.65% of male homosexuals (MSM) had a high level of knowledge about HIV/AIDS.¹⁸ Another study in Indonesia also reported that about 70% of the respondents had a high level of knowledge of HIV/AIDS.¹⁹

Our study described that most of the respondents had a good attitude toward sexual behaviour. A previous study in Indonesia also reported that more than 80% of

the homosexual respondents had a good attitude toward sexual practices.²⁰ Attitude is a predisposition to do or not to do a particular behaviour.¹⁷ It does not only reflect the psychological condition of the individual but also the consciousness process of an individual.¹⁷ Practice related to the process of action starts from knowing about the stimulus or object, making an assessment or judgement on what is known and finally doing the action (practice).¹⁷ In the present study, most of the respondents reported practicing safe sex (66%). Likewise, a previous Indonesian study also reported that about 65% of respondents had safe sex.¹⁹

Our study found that the prevalence of HIV/AIDS among the study subjects was 20%. A study in China reported that the prevalence of HIV/AIDS among high school students was 3%.²¹ The prevalence of being HIV positive among homosexual men and high school students or young adults has raised concerns about HIV positive transmission and prevention. Stigma over different sexual orientations might prevent the homosexual men from disclosing their condition, which becomes a barrier to receiving education about sexual behaviour.²²

Our study confirmed the hypothesis that knowledge is significantly associated with the incidence rate of HIV/AIDS. Knowledge is one of the factors that influences a person’s attitude and behaviour.¹⁷ Acquiring knowledge

on sexual reproductive health can lead to a positive attitude toward sexual behaviour and implementing sexual contact with the proper protection.²² In contrast, poor knowledge of sexual reproductive health increases the risk of the homosexual community (MSM) practicing unsafe sex. In addition, isolating or discriminating against the homosexual community when it comes to accessing health education may result in an increased risk of HIV/AIDS infection.²²

In this study, a negative attitude toward sexual behaviour has also significantly affected the incidence rate of HIV/AIDS. A positive attitude is manifested in an action. In this context, for example, this can be done by disclosing their sexual orientation (overt behaviour).¹⁶ Providing a health facility with VCT service is formal support for the homosexual community, allowing them to acquire a positive attitude from the counselling. However, a positive attitude also requires emotional support from family, relatives, and others.¹⁷

Unsafe sex is the strongest predictor of HIV/AIDS transmission.⁴ In this study, unsafe sex increases the probability of HIV/AIDS infection by 7 times, compared to the safe sex practices among the other homosexual respondents. Safe sex practices have been promoted worldwide under the ABC approach.²³ ABC stands for Abstinence, Being Faithful and Using Condoms. The ABC approach is promoted as a grand strategy in many countries in relation to preventing HIV/AIDS transmission, related to unsafe sexual practices.²³ A previous study in Indonesia revealed that the MSM respondents were at risk of getting HIV/AIDS due to their reluctance to use condoms during sexual intercourse.²⁴ An online survey study involving the MSM community reported that the meeting venue influenced the reasons for not using condoms.²⁵ For MSMs meeting online, their choice of not using condoms related to their individual preferences and mutual agreement. On the other hand, the relationship context was the major reason for not using condoms among men who met offline.²⁵

CONCLUSION

Our study confirmed that knowledge, attitude, and practice were significantly associated with the incidence rate of HIV/AIDS. The likelihood of HIV/AIDS infection was higher among the study subjects who had poor knowledge, a negative attitude, and unsafe sex practices. As the homosexual community is at a higher

risk of HIV/AIDS infection than other key populations, a comprehensive approach to improve their knowledge, education, and practice related to sexual reproductive health is crucial. Health promotion is an important aspect when seeking to increase awareness of HIV/AIDS prevention among the MSM group and the wider community. The VCT and other educational programs on sexual reproductive health as well as HIV/AIDS prevention should be continuously promoted.

Ethical Clearance: Ethical approval was granted by STIKes Fort De Kock, Bukittinggi, Indonesia.

Source of Funding: Self-funding.

Conflict of Interest: Nil.

REFERENCES

1. Rokhmah D, Nafikadini I, Luthviatin N, Istiaji E. The Process of Socializing Men Who Having Sex with Men (MSM) in Adolescents in Jember Regency. *IKESMA*. 2012;8(2).
2. Weeks J. Discourse, desire and sexual deviance: some problems in a history of homosexuality. *Culture, society and sexuality A reader*. 1999:119-42.
3. UNAIDS. Global HIV & AIDS statistics — 2018 fact sheet 2018 [Available from: <http://www.unaids.org/en/resources/fact-sheet>].
4. Winkelstein W, Lyman DM, Padian N, Grant R, Samuel M, Wiley JA, et al. Sexual practices and risk of infection by the human immunodeficiency virus: the San Francisco Men's Health Study. *Jama*. 1987;257(3):321-5.
5. CDC. HIV and Gay and Bisexual Men: CDC; 2017 [Available from: <https://www.cdc.gov/hiv/group/msm/index.html>].
6. MoH. HIV / AIDS Estimates and Projections in Indonesia in 2011-2016. Jakarta: Kemenkes RI; 2014.
7. Zhu T, Korber BT, Nahmias AJ, Hooper E, Sharp PM, Ho DD. An African HIV-1 sequence from 1959 and implications for the origin of the epidemic. *Nature*. 1998;391(6667):594.
8. Lemp GF, Payne SF, Neal D, Temelso T, Rutherford GW. Survival trends for patients with AIDS. *Jama*. 1990;263(3):402-6.

9. Kotchick BA, Shaffer A, Miller KS, Forehand R. Adolescent sexual risk behavior: A multi-system perspective. *Clinical psychology review*. 2001;21(4):493-519.
10. Basen-Engquist K, Parcel GS. Attitudes, norms, and self-efficacy: A model of adolescents' HIV-related sexual risk behavior. *Health education quarterly*. 1992;19(2):263-77.
11. Sekirime WK, Tamale J, Lule JC, Wabwire-Mangen F. Knowledge, attitude and practice about sexually transmitted diseases among university students in Kampala. *African health sciences*. 2001;1(1):16-22.
12. Rahardjo W, Hutagalung II. Sexual Self-Esteem, Sexual Compulsivity, and Risky Sexual Behavior in People with HIV / AIDS. *Jurnal Psikologi*. 2016;43(1):52-65.
13. Catania JA, Coates TJ, Greenblatt RM, Dolcini MM, Kegeles SM, Puckett S, et al. Predictors of condom use and multiple partnered sex among sexually-active adolescent women: Implications for AIDS-related health interventions. 1989.
14. Bukittinggi DHO. Bukittinggi District Health Office Report Year 2017. Bukittinggi: Dinkes Kota Bukittinggi; 2017.
15. Kutra G. Formation of homosexual orientation of men in adolescence. *Polish Psychological Bulletin*. 2014;45(3):326-33.
16. Sethaphanich N, Arunakul J. Sexual Orientation Disclosure in Thai Homosexual Adolescents. *Journal of Adolescent Health*. 2018;62(2):S45.
17. Notoatmodjo S. *Health Behaviour Science*. Jakarta: PT. Rineka Cipta; 2010.
18. Bai X, Xu J, Yang J, Yang B, Yu M, Gao Y, et al. HIV prevalence and high-risk sexual behaviours among MSM repeat and first-time testers in China: implications for HIV prevention. *Journal of the International AIDS Society*. 2014;17(1):18848.
19. Rahmayani V, Hanif AM, Sastri S. Relationship between Knowledge and Attitudes with Prevention of HIV-AIDS Transmission among Transgender Women in Padang City in 2013. *Jurnal Kesehatan Andalas*. 2014;3(2).
20. Setyarini AI, Titisari I, Ramadhania PA. The Relationship of Youth Knowledge About HIV / AIDS With the Attitude of Prevention of HIV / AIDS in State Senior High School 1 Gurah Kediri Regency. *Jurnal Ilmu Kesehatan*. 2017;4(2):25-33.
21. Kirby DB, Laris B, Roller LA. Sex and HIV education programs: their impact on sexual behaviors of young people throughout the world. *Journal of Adolescent Health*. 2007;40(3):206-17.
22. Ardhiyanti Y, Lusiana N, Megasari K. *AIDS teaching materials on midwifery care*. Deepublish Yogyakarta. 2015.
23. Murphy EM, Greene ME, Mihailovic A, Olupot-Olupot P. Was the "ABC" Approach (Abstinence, Being Faithful, Using Condoms) Responsible for Uganda's Decline in HIV? *PLoS Medicine*. 2006;3(9):e379.
24. Laksana A, Lestari DWD. Risk Factors for HIV-AIDS Transmission in Men with Heterosexual and Homosexual Sex Orientation in Purwokerto. *Mandala of Health*. 2010;4(2):116-7.
25. Ostergren JE, Rosser BS, Horvath KJ. Reasons for non-use of condoms among men who have sex with men: a comparison of receptive and insertive role in sex and online and offline meeting venue. *Culture, health & sexuality*. 2011;13(2):123-40.

The Nutritional Status of Children Aged 1-3 Years Old Based on Food Processing Techniques in Surabaya

Qori'ila Saidah¹, Yudi Handoko¹, Nur Chabibah¹, Sri Anik Rustini¹, Nuh Huda¹,
Dwi Priyantini¹, Dini Mei Widayanti¹

¹College of Health Sciences (Sekolah Tinggi Ilmu Kesehatan) Hang Tuah, Surabaya

ABSTRACT

Food processing can affect the nutritional components within food. This contributes toward the status of nutrition. The objective of this research was to identify the nutritional status of children based on food processing technique. The research was carried out in Kenjeran Urban Village, Bulak Sub-District, Surabaya. The design of this research used a prospective cohort. The overall population amounted to 144 respondents using simple random sampling for the final amount of 105 respondents. The instrument of this research was a questionnaire and nutritional status measurement in accordance with the provision of Ministry of Health, of the Republic of Indonesia. The results of this research showed that there is a relationship between food processing technique and the nutritional status of children. The result of the Spearman Rho correlation analysis was that it obtained a value of $r=0.001$ ($\alpha<0.05$). The value of the absolute coefficient correlation was 0.435 therefore the level of this relationship is an average level relationship. Those with a unfavourable daily food processing technique accounts for 18 individuals (17.1%) and a favourable technique accounts for 87 individuals (82.9%). Food processing can affect the nutritional status of children. However, nutritional status can be influenced by several other factors. The influential factors of nutritional status include the heredity factor and the passive measure of food supply.

Keywords: *food processing technique, nutritional status*

INTRODUCTION

Nutrition is an integral part of the growth and development of an individual. The substances within food have a strong relation with health and brain ingenuity. Once nutrition goes unfulfilled, it will weaken bodily health and ingenuity simultaneously, primarily when concerning the growth and development of children¹. The nutritional necessities for children under five is relatively bigger than when compared to adults, because at this stage, there may soar rapidly. The rapid growth and development periods, such as the prenatal period or adolescence will require a larger amount of calories and protein².

According to the WHO, 42 million children under five suffer from obesity, 156 million children under five are short-bodied, and 50 million children suffer from malnutrition³. The result of the PSG Index BB/U shows that those with favourable nutrition are 79.7%, deficient nutrition is 14.9, malnutrition is 3.8%, and excessive nutrition is 1.5%. The Index TB/U Normal shows that 71% are normal-bodied and those who are short-bodied makes up 29.9%. Using the Index BB/TB Normal index, 82.7% are thin 8.2% are fat and those who are extremely thin make up 3.7%⁴. According to *Riskesdas*, the nutritional status of children under five is deficient by 13.9%, while malnutrition is 5.7%, being short-bodied is 19.2%, extremely short-bodied is 18.0%, thin is 6.8%, extremely thin is 6.8% and fat is 11.9%⁴. In East Java, the number of cases for malnutrition was 6,772⁵. Malnutrition for children under five in Surabaya 282 was male: 127, female: 155⁶. From the research of Melati integrated public health centre (*Posyandu*) in Surabaya, the amount of children under five was 85; there were 2 children with deficient nutrition and two children with excessive nutrition.

Corresponding Author:

Qori'ila Saidah
College of Health Sciences
(Sekolah Tinggi Ilmu Kesehatan)
Hang Tuah, Surabaya
Email: qorisaidah82@stikeshangtuah-sby.ac.id

To date, the most appropriate food processing method has not yet been determined. The issue of children's nutritional status may be triggered by the ignorance when it comes to comprehending the way to organise food processing, such as organising the menu, selecting the ingredients, maintaining the food and keeping the food in a safe condition. Keeping foods from previous days or boiling vegetables above the normal duration will automatically decrease the amount of nutritious substances within the food.

Carbohydrate consumption deficiency may affect the children's growth and incline them toward being thin-bodied (KEP). If in excess, the children will grow to be fat (obesity). The lack of protein may lead to an abnormal network of growth and development, obstructing physical and mental growth, and an excess of protein will lead to obesity. A lack of fat will lead to a thin body shape while an excess of fat will lead to a fat body shape (obesity)².

Regarding the problems related to food management techniques as above, this will correspond to the growth and development process of the child. These factors influence the nutritional status of children. In this particular problem, in order to maintain the nutritional status of their child, parents should be informed in order to understand the appropriate nutritional fulfilment for children under five for the sake of their individual growth and development. These particular food substances are an integral part of individual growth and development. Through this education, the nutritional status of children can be well-maintained. Through the distribution of health education, it is expected that parents will be able to maintain food properly in order to prevent the nutritional substances within the food being lessened.

METHOD

The type of this research was an observational analytical research through the prospective cohort approach. The data collection method was using simple random sampling and this research was commenced by informing both the personnel of the *Posyandu* (integrated public health post) and the respondents. The inclusion criteria were parents who manage to cook their own food and the children who consume the parent-made food.

This questionnaire was posed to obtain the measurement of nutritional status and body weight according to a body height and distribution questionnaire related to food processing technique.

OBJECTIVE

The general objective of this research was to identify the nutritional status of children aged between 1-3 years old based on the daily food processing technique.

RESULT

1. Univariate Analysis: The respondents obtained in Bulak Urban Village, Kenjeran Sub-District, Surabaya accounted for 105 respondents; 100% were willing to join the research. The results of the univariate analysis in this research were based on the age of the respondents, their last achieved education level, occupation, monthly income, and the gender of their child. Based on the results of this research, it is identified that respondents aged between 20-35 years old amounted to 89 respondents, which is larger than the amount for those aged >35 years old. The respondents from high school level amounted to 50 respondents, larger than those in middle school level. Those with a monthly income that ranged between IDR 1,500,000 – IDR 2,000,000 amounted to 66 respondents, which is higher than those with an income above IDR 2,000,000.

Table 1: Respondent's distribution based on age, education level, occupation and income

Variable	Frequency	(%)
Age (years old)		
<20	1	1.0
20-35	89	84.7
>35	15	14.3
Education		
Elementary	21	20.0
Middle School	32	30.5
High School	50	47.6
Higher Education	2	1.9
Occupation		
Private sector	23	21.9
Entrepreneur	22	21.0
Housewife	60	57.1
Income rate		
500,000-1,000,000	7	6.7
1,000,000- 1,500,000	11	10.5
1,500,000-2,000,000	66	62.9
>2,000,000	21	20.0

2. Bivariate Analysis: This research used a Spearman Rho correlation test which aimed to identify the relationship between the dependent variable and the independent variable. The

identified variables were daily food processing technique and the nutritional status of body weight based on body height.

Table 2: The Relationship between daily food processing technique and the nutritional status of children aged 1- 3 years old

Daily Food Processing Technique	Nutritional Status of Children BB/TB								Total	
	Extremely Thin		Thin		Normal		Fat			
	N	%	N	%	N	%	N	%	N	%
Poor	6	5.7	5	4.8	7	6.7	0	0	18	17.1
Good	3	2.9	9	8.6	68	64.8	7	6.7	87	82.9
Total	9	8.6	14	13.3	75	71.4	7	6.7	105	100

The value of statistic *Spearman Rho* Correlation test ($r=0.001$)

DISCUSSION

Based on Table 2, it can be identified that the respondents with a favourable food processing technique had a nutritional status that was normal, which amounted to 64.8 %. Meanwhile, those who use a poor food processing technique combined with the nutritional status of their child being extremely thin amounted to 5.7%.

The attitude of health is someone's response toward a stimulus or object linked to illness and disease, the health service system, food, beverage and the environment ⁷. The attitude toward the false food processing techniques will influence the substances within daily food ⁸. If the attitude toward the false food processing technique is being maintained continually, then the nutritious substances within the food will be diminished or even dissolved. This factor will affect the health of the person committed to this technique.

The results of the test using the Spearman Rho correlation showed that there is a relationship between daily food processing technique and the nutritional status of children aged 1 -3 years old with a Rho valuation of 0.001 which means that the value of $\alpha < 0.05$. This means that food processing technique will influence the nutritional status of children under five. Therefore if a false food processing technique is performed, then it will affect the containment of nutrition within the particular food ⁹.

Based on the results of Table 2 above, it obtained that 3 out of 9 respondents were equipped with knowledge of favourable food processing techniques, but their children's nutrition and body weight decreased, as shown by an extremely thin body shape. This particular issue may be driven by several factors, including the food

supply factor. If the mother is not supplied properly with food, therefore the foods consumed by those particular children will be decreased. This matter is supported by the research which mentioned that parental food supply will affect the nutritional status of children under five.

CONCLUSION

For the daily food processing technique in Bulak Urban Village, Kenjeran Sub-District, Surabaya, the majority of parents frequently use a favourable food processing technique and only a minority one use a poor daily food processing technique. The nutritional status of children aged between 1–3 in Bulak Urban Village, Kenjeran Sub-District, Surabaya was that the majority of the children have a favourable nutritional status, and that there is a lesser group of children who have a deficient nutritional status. There is a relationship between the daily food processing technique and the nutritional status of children aged between 1 -3 years old in Bulak Urban Village, Kenjeran Sub-District, Surabaya.

It is expected that future research should touch upon the topic of nutritional status, focusing on the relationship between active food supply and the nutritional status of children under five, aged between 1 – 3 years old in Bulak Urban Village, Kenjeran Sub-District, Surabaya.

Conflict of Interest: None.

Ethical Clearance: The study passed ethical clearance from Ethical Committee of Sekolah Tinggi Ilmu Kesehatan Hang Tuah, Surabaya, Indonesia.

Source of Funding: Self-funded.

REFERENCES

1. Ohlhorst SD, Russell R, Bier D, Klurfeld DM, Li Z, Mein JR, et al. Nutrition research to affect food and a healthy lifespan. *Adv Nutr* [Internet]. 2013 Sep 1 [cited 2018 Oct 17];4(5):579–84. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24038264>
2. Kearney J. Food consumption trends and drivers. *Philos Trans R Soc Lond B Biol Sci* [Internet]. 2010 Sep 27 [cited 2018 Oct 17];365(1554):2793–807. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20713385>
3. World Health Organization. The double burden of malnutrition: policy brief [Internet]. Geneva; 2017 [cited 2018 Oct 17]. Available from: <http://apps.who.int/iris/bitstream/handle/10665/255413/WHO-NMH-NHD-17.3-eng.pdf;jsessionid=AD2C2A6B0BC8855A7166C77B51E44F4A?sequence=1>
4. Board of Health Research and Development. Basic Health Research 2013. Lap Nas 2013. 2013;1–384.
5. Ministry of Health Republic of Indonesia. Indonesian Health Profile 2016 [Internet]. Jakarta, Indonesia; 2017 [cited 2018 Aug 2]. Available from: <http://www.kemkes.go.id>
6. Public Health Office of Surabaya. Health Profile 2015 [Internet]. Surabaya; 2015 [cited 2018 Oct 17]. Available from: http://www.depkes.go.id/resources/download/profil/PROFIL_KAB_KOTA_2015/3578_Jatim_Kota_Surabaya_2015.pdf
7. Kelly MP, Barker M. Why is changing health-related behaviour so difficult? *Public Health* [Internet]. 2016 Jul [cited 2018 Oct 17];136:109–16. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27184821>
8. Story M, French S. Food Advertising and Marketing Directed at Children and Adolescents in the US. *Int J Behav Nutr Phys Act* [Internet]. 2004 Feb 10 [cited 2018 Oct 17];1(1):3. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/15171786>
9. Hammond RA, Dubé L. A systems science perspective and transdisciplinary models for food and nutrition security. *Proc Natl Acad Sci U S A* [Internet]. 2012 Jul 31 [cited 2018 Oct 17];109(31):12356–63. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22826247>

Mammae Gland in Supporting the Lactation Process: A Review

Thontowi Djauhari Nur Subchi¹, Merryana Andriani²

¹Student of Doctoral Programe of Public Health, Faculty of Public Health, ²Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia

ABSTRACT

This review is aimed at illustrating the importance of zinc in the formation of breast milk in the mammae gland and the importance of zinc consumption throughout the individual's lifetime. This study was conducted as a literature review concerning the importance of zinc's role. The role of zinc in the mammae gland is multifaceted in nature, due to the mammae gland being a dynamic network which experiences morphological and functional changes dramatically. It requires favourable coordination in order to provide sufficient zinc during the lactation period.

Keywords: *mammae gland, lactation process, zinc consumption*

INTRODUCTION

The supply of exclusive breast milk is defined as the practice of breast milk distribution to infants in the first six months, without other food and water preferences. Breast milk deficiency has a setback influence on infant mortality¹pneumonia, measles, malaria, HIV/AIDS, the underlying cause of undernutrition, and a small group of causes leading to neonatal deaths. We review child survival interventions feasible for delivery at high coverage in low-income settings, and classify these as level 1 (sufficient evidence of effect. The maximal practice of breastfeeding and breastfeeding initiation in the first one hour of an infant's being, as well as two years or more of breastfeeding practice, strengthens the immunity of the infant. The supply of exclusive breast milk also has a protective effect against various disease in the future².

There are numerous measures that can be undertaken in order to supply breast milk during the first six month of an infant's being as part of the norms in feeding infants. It is reported that only 38% of infants aged

between 0 to 6 months enjoyed exclusive breast milk³⁴. Recent analysis has showed there to be a less-optimal breastfeeding practice, including the distribution of non-exclusive breast-milk which has contributed to the mortality of around 11.6% of children under five years old. This is equivalent to 804,000 children mortalities in 2011³. It is reported that there has been a surge of exclusive breast milk distribution between 1985 and 1995. At the global level, the distribution of exclusive breast milk soared by 2.4 percent on average per-annum. This depicts a significant increase from 14 percent to 38 percent over 10 years. It has been reported that 25 countries increased their exclusive breast milk supply by as much as 20 percent or more after 1995, with the aforementioned number driving toward achieving the global target⁵⁶.

The data of Polman⁷ shows that, based on the research of the World Breastfeeding Trends Initiative (2013), only 27.5 percent of mothers in Indonesia succeeded in supplying exclusive breastmilk during the first six months. The Basic Health Research (2013) showed that the coverage of breastmilk in Indonesia stood at 42 percent. From that particular result, Indonesia is ranked 49 out of 51 countries concerning supporting exclusive breast milk supply.

Zinc manages the function of almost 100 different enzymes, DNA and RNA synthetics, carbohydrate metabolism, acid base homeostasis, pholate absorption, vitamin A as well as activating vitamin D and preserving

Corresponding Author:

Thontowi Djauhari Nur Subchi
Student of Doctoral Programe of Public Health,
Faculty of Public Health Universitas Airlangga,
Surabaya, Indonesia
Email: thontowi@yahoo.com

the stability of the cell membranes⁸. The largest source of zinc is shells, meat, egg, grains, ground nut, milk production, wheat, and green vegetables^{8,9}. Grains contain low-level zinc concentration. It is reported that a population that enacts a wheat protein-based diet will experience a zinc deficiency. Zinc plays a pivotal role during pregnancy and breastfeeding, related to the development of the foetus and breast milk secretion. The bioavailability of zinc in the diet is required throughout pregnancy in order to fulfil the mother's physiological needs¹⁰. Further, Zinc manages gene transcription, cell development and apoptosis, which is fundamental to organising lactosite renewal. The development of alveolar cells and their functional differentiation produces breast milk secretion cells, and is arranged by zinc. Zinc is prominent in the structural, catalytic and adjustment activities for the synthesis of and resulting breast milk secretion.¹¹

Prolactin (PRL) is the zinc binder hormone that is generally required for the initiation and preservation of lactogenesis. Zinc plays a prominent role in the synthesising process, including the safekeeping and secretion of PRL from the anterior pituitary gland, starting from gene expression management until the deceleration of the enzyme binder and secretory granules¹². The research of Lorenson et al mentioned that PRL is safekept as a stable oligomer, which contains zinc. The elimination of zinc is required for the conversion of the intermolecular disulfide bond into an intramolecular disulfide bond, as a stepping stone that is required for monomerisation and secretion⁸. The enhancement of zinc availability will decelerate the formation and secretion of PRL monomers from the anterior pituitary. A number of in vitro research studies have reported the effect of zinc concentration on PRL secretion from the anterior pituitary gland.¹³

The body of a human being contains around 2 grams of zinc in total, with 60 percent discovered in the muscles and 30 percent in the bone mass. Aside from this, it is also discovered in the bodily network and fluids. An adult woman requires 12 mg of zinc per day, and a pregnant and breastfeeding woman requires over 14 mg of zinc per-day. This level of zinc consumption is generally unfulfilled in developing countries due to a lack of calories from grains and other primary foods¹⁴. This review is aimed at illustrating the importance of zinc's role in the formation of breast milk in the mammae gland and the importance of zinc consumption throughout an individual's lifetime.

METHOD

This study was a literature review on the importance of zinc. The authors searched the available literature in major research database such as Scopus, PubMed, ScienceDirect, EBSCO and ProQuest. The literature was analysed to determine the study's relevance to the topic. Then, the researchers determined which literature items would be included in the discussion.

RESULTS AND DISCUSSION

Zinc and Mammary Gland: The role of zinc is important in managing the mammae gland, including remodelling, lactation and breast disease¹⁵ including DNA and protein synthesis, enzyme activity, and intracellular signaling. Cellular Zn homeostasis necessitates the compartmentalization of Zn into intracellular organelles, which is tightly regulated through the integration of Zn transporting mechanisms. The pancreas, prostate, and mammary gland are secretory tissues that have unusual Zn requirements and thus must tightly regulate Zn metabolism through integrating Zn import, sequestration, and export mechanisms. Recent findings indicate that these tissues utilize Zn for basic cellular processes but also require Zn for unique cellular needs. In addition, abundant Zn is transported into the secretory pathway and a large amount is subsequently secreted in a tightly regulated manner for unique biological processes. Expression of numerous members of the SLC30A (ZnT). Structurally, the mammae gland consists of an alveolar duct network which ends in the smallest unit known as an acinar. Every acinar is coated with Mammary Epithelium Cell (SEM), which in charge of transferring nutrition to the created breast milk during the lactation period. From this perspective, SEM is at the centre of breast milk production, whereby it manages the function of SEM proliferation, regulation and cell differentiation. Zinc manages cell proliferation, particularly through its role in managing gene expression¹⁶. Therefore, the ineffective arrangement from transcription may impact hyper proliferation or SEM-specific hyper proliferation. There is a limited amount of information regarding the special mechanisms whereby zinc manages mammae gland growth. However, the existing data has pointed out that zinc specifically plays a pivotal role regarding the transcription factor. The localised zinc in the cytoplasm will express itself within the mammae gland, and this expression is limited to the development step of active SEM proliferation and the evolution of the labulo-alveolar gland or acinar gland¹⁷.

A number of research studies have provided structural and functional evidence that the general genetic variant in ZnT2 can impact the main cellular function in SEM. From the research, it was determined that mothers who excessively consumed zinc will express the molecular factor in the mammary gland, which may cause oxidative stress. A molecular disorder can be identified *in vitro* as it indicates the increase of the phosphorylation and mislocalisation of zinc into endoplasmic reticulum and lysosomes, which are connected to oxidative stress, disorders of paracellular function, and the death of cells mediated by lysosomes. The genetic variant of ZnT2 has a consequence on the sub-cellular Zn pools and molecular function of SEM, whereby it may impact mammary gland dysfunction and weak lactation performance. It has been reported that genetic variation may impact on the performance of sub-optimal lactation and future studies should report on the relationship between genetic variation and the function of mammary glands^{18,19}.

Lactation: Zinc is required in the process of metabolism and lactation in the mammary gland in order to supply zinc to infants. The mammary gland imports zinc from the mother's circulation and later on, secretes it into the mammary gland at around 0.5 mg zinc per-day. This process is almost twice the amount of zinc transferred every day from the placenta to the foetus during the third trimester of pregnancy²⁰. The importance of optimal zinc supply during the neonatal period is proven to be related to neonatal mortality, concerning the amount of zinc within breast milk²¹.

Dysregulation also results in a condition called a "lack of temporary neonatal zinc". This results in zinc deficiency and has an impact on the weight of the breastfed infant. A variety of research studies have unveiled that the process of transporting and arranging the transfer of zinc relies on tight integration from the zinc transporting mechanisms, ensuring that zinc is absorbed into the mammary gland and released into the breast milk. The research aimed at identifying a number of zinc transporter roles (Zip1, Zip3, ZnT1, ZnT2, and ZnT4), which have been found to supply the initial information regarding the mechanisms which manage the degree of zinc in the breast milk. A number of research studies were carried out related to breastfeeding mice and the related mammary cell model, which showed that Zip1 is expressed in the mammary gland of the mice, crossing through the luminal membrane from the mammary gland that is integrated in the alveolar lumen¹⁸.

ZnT1 is related to the luminal membrane during the initial lactation detected within mammary cells. ZnT2 is localised in the proximal membrane within the luminal of the epithelial mammary cell²². ZnT2 plays a prominent role in mediating the zinc transfer into breast milk during the process of lactation²³. The expression of ZnT2 is prompted by the lactogenic hormone as the result of the transcription of regulation through the prolactin signalling mechanism². In the mammary gland, ZnT4 is the largest amount of containment within the cell surrounding the alveolar duct²³ and it is situated in the intracellular compartment but not integrated simultaneously with the collection of unstable zinc²⁵. The role of ZnT4 in breast milk is to secrete zinc which is related to the decrease in zinc secretion into breast milk during the lactation period²³.

The mammary gland is a responsive hormonal network that is unique in nature, that possesses specific pre-conditions regarding zinc. This results from the necessity to collect, re-distribute, and release a large amount of zinc into breast milk in order to supply optimal zinc for the newborn infant. Furthermore, the failure of the zinc transporting mechanism within the mammary gland of a non-breastfeeding woman may cause the development of breast cancer²⁴.

The concept of the zinc transportation network is relatively new, dynamic and sustainable. There are 24 acknowledged *transporter Zn* from two different families; Zip and ZnT, commonly referred to as the Zn transporter. There are 14 Zip proteins (Zip1 - Zip14) and 10 ZnT protein (ZnT1 - ZnT10)²⁵ which is transported across the maternal epithelia during lactation. The mechanisms by which zinc becomes a constituent of breast milk have not been elucidated. The function of the zinc transporter ZnT4 in the transport of zinc into milk during lactation was previously demonstrated by studies of a mouse mutant, the 'lethal milk' mouse, where a mutation in the ZnT4 gene decreased the transport of zinc into milk. In the present study, we have investigated the expression of the human orthologue of ZnT4 (hZnT4) whose method of working and expression varies in every level of biological organisation. The mammary gland utilises the majority of zinc transporters in order to maintain a number of important functions. To date, there are only two zinc transporters that have been appointed to maintain a central role in the function of the mammary gland; ZnT2 and ZnT4²⁶ as women with a mutation in the gene encoding ZnT2 (SLC30A2).

ZnT2 is expressed in a number of networks including the mammae gland, prostate, small intestine, liver, kidneys and monocytes²⁷. A number of research studies have showed that ZnT2 is involved directly in the transfer of zinc into breast milk during the lactation period. In the mammary epithelium cells, the two isoforms of ZnT2 are different, localised in the exocytosis vesicles and membrane cell²⁶ as women with a mutation in the gene encoding ZnT2 (SLC30A2, Both transport zinc. The over-expression of ZnT2 in the cells leverages the level of resistance to zinc toxicity. The single and non-identical nucleotide polymorphisms within ZnT2 prompts the secretion of degraded zinc and enhances oxidative stress in the mammary gland epithelial cells²⁸. ZnT2, in transcription, is maintained by the PRL lactogenic hormone, and an overflowing of ZnT2 will increase the amount of zinc four times larger than what is within the mammae gland during the breastfeeding phase compared to the non-lactation network²⁴.

Regarding the condition of the mammae gland, ZnT4 has been localised in the apical membrane of the milk epithelium, and the overbalance of ZnT4 is significantly higher in the mammae gland during the breastfeeding phase compared to the non-breastfeeding phase²⁹. This shows the important role of zinc transportation in breast milk during the lactation period. Aside from that, the amount of ZnT4 will decrease throughout the lactation period, and the concentration of zinc within breast milk will identify the role of ZnT4 in transferring zinc into the breast milk for the infant in the growing phase³⁰ ZnT-1, ZnT-2 and ZnT-4. Physiologically, ZnT4 will increase the production of breast milk therefore the health of infant will simultaneously be enhanced.

CONCLUSION

The mammae gland is the other secretory network that requires zinc for particular biological processes in order to impact on the formation of breast milk. The role of zinc in the mammae gland is multifaceted in nature, due to the mammae gland being a dynamic network which experiences morphological and functional changes. It requires favourable coordination in order to provide sufficient zinc during the lactation period. It can be concluded that zinc plays a role and is in charge of RNA transcription. Henceforth, it impacts on the hyper-proliferation of SEM and is affective on the growth of acinar cells in the production of breast milk.

Conflict of Interest: None

Ethical Clearance: Not required

Source of Funding: Self-funded

REFERENCES

1. Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS. How many child deaths can we prevent this year? Vol. 362, Lancet. 2003. p. 65–71.
2. Horta BL, Victora CG. Long-term health effects of breastfeeding. World Heal Organ. 2013;129(8–9):57–64.
3. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet. 2013;382(9890):427–51.
4. World Health Organization. World Health Statistics 2013. World Health Organization. 2013. 1-172 p.
5. UNICEF. Breastfeeding on the Worldwide Agenda: Findings from a landscape analysis on political commitment for programmes to protect, promote and support breastfeeding. 2013;79.
6. World Health Organisation, WHO: Maternal I, Health C. Essential Nutrition Actions- Improving maternal, newborn, infant and young child health and nutrition. Geneva WHO. 2013. 144 p.
7. Wattimena I, Dwi Y. Lactation Management and Breastfeed Mothers' Wellness. J Psikol. 2015;42(3):231–42.
8. Khayat S, Fanaei H, Ghanbarzehi A. Minerals in pregnancy and lactation: A review article. J Clin Diagnostic Res. 2017;11(9):QE01-QE05.
9. Caha G. Nutrition During Lactation (1991).pdf. 2014.
10. Brown KH, Rivera JA, Bhutta Z, Gibson RS, King JC, Lönnerdal B, et al. International Zinc Nutrition Consultative Group (IZiNCG) technical document #1. Assessment of the risk of zinc deficiency in populations and options for its control. Vol. 25, Food and nutrition bulletin. 2004.
11. Lee S, Kelleher SL. Molecular regulation of lactation: The complex and requisite roles for zinc. Arch Biochem Biophys. 2016;611:86–92.

12. Lorenson MY, Patel T, Liu JW, Walker AM. Prolactin (PRL) is a zinc-binding protein. I. Zinc interactions with monomeric PRL and divalent cation protection of intragranular PRL cysteine thiols. *Endocrinology*. 1996;137(3):809–16.
13. Brandão-Neto J, Madureira G, Mendonça BB, Bloise W, Castro AVB. Endocrine interaction between zinc and prolactin - An interpretative review. Vol. 49, *Biological Trace Element Research*. 1995. p. 139–49.
14. Hussain S, Maqsood MA, Rahmatullah. Increasing grain zinc and yield of wheat for the developing world: A Review. *Emirates J Food Agric*. 2010;22(5):326–39.
15. Kelleher SL, McCormick NH, Velasquez V, Lopez V. Zinc in Specialized Secretory Tissues: Roles in the Pancreas, Prostate, and Mammary Gland. *Adv Nutr An Int Rev J*. 2011;2(2):101–11.
16. Bohnsack BL, Hirschi KK. NUTRIENT REGULATION OF CELL CYCLE PROGRESSION. *Annu Rev Nutr*. 2004;24:433–53.
17. Singh J, Itahana Y, Parrinello S, Murata K, Desprez PY. Molecular cloning and characterization of a zinc finger protein involved in Id-1-stimulated mammary epithelial cell growth. *J Biol Chem*. 2001;276(15):11852–8.
18. Kelleher SL, Seo YA, Lopez V. Mammary gland zinc metabolism: regulation and dysregulation. *Genes Nutr*. 2009;4(2):83–94.
19. Lee S, Zhou Y, Gill DL, Kelleher SL. A genetic variant in SLC30A2 causes breast dysfunction during lactation by inducing ER stress, oxidative stress and epithelial barrier defects. *Sci Rep*. 2018;8(1).
20. King JC. Enhanced zinc utilization during lactation may reduce maternal and infant zinc depletion. *American Journal of Clinical Nutrition*. 2002;75(1):2–3.
21. Huang L, Gitschier J. A novel gene involved in zinc transport is deficient in the lethal milk mouse. *Nat Genet*. 1997;17(3):292–7.
22. Liuzzi JP, Bobo J a, Cui L, McMahon RJ, Cousins RJ. Zinc transporters 1, 2 and 4 are differentially expressed and localized in rats during pregnancy and lactation. *J Nutr*. 2003;133(2):342–51.
23. Liuzzi JP, Bobo JA, Lichten LA, Samuelson DA, Cousins RJ. Responsive transporter genes within the murine intestinal-pancreatic axis form a basis of zinc homeostasis. *Proc Natl Acad Sci U S A*. 2004;101(40):14355–60.
24. Qian L, Lopez V, Seo YA, Kelleher SL. Prolactin regulates ZNT2 expression through the JAK2/STAT5 signaling pathway in mammary cells. *Am J Physiol Cell Physiol*. 2009;297:C369–77.
25. Michalczyk AA, Allen J, Blomeley RC, Ackland ML. Constitutive expression of hZnT4 zinc transporter in human breast epithelial cells. *Biochem J*. 2002;364(Pt 1):105–13.
26. Lopez V, Kelleher SL. Zinc transporter-2 (ZnT2) variants are localized to distinct subcellular compartments and functionally transport zinc. *Biochem J*. 2009;422(1):43–52.
27. Lichten LA, Cousins RJ. Mammalian Zinc Transporters: Nutritional and Physiologic Regulation. *Annu Rev Nutr*. 2009;29(1):153–76.
28. Seo YA, Kelleher SL. Functional analysis of two single nucleotide polymorphisms in SLC30A2 (ZnT2): implications for mammary gland function and breast disease in women. *Physiol Genomics*. 2010;42A(4):219–27.
29. Kelleher SL, Velasquez V, Croxford TP, McCormick NH, Lopez V, Macdavid J. Mapping the zinc-transporting system in mammary cells: Molecular analysis reveals a phenotype-dependent zinc-transporting network during lactation. *J Cell Physiol*. 2012;227(4):1761–70.
30. Kelleher SL, Lönnerdal B. Zn transporter levels and localization change throughout lactation in rat mammary gland and are regulated by Zn in mammary cells. *J Nutr*. 2003;133(August):3378–85.

The Safety and Efficacy of Ligasure using in Radical Cystectomy

Ehab Jasim Mohammad

Department of Surgery, Ibn Sina University of Medical and Pharmaceutical Sciences, Baghdad, Iraq

ABSTRACT

Background: Despite the introduction of minimally invasive surgery, open radical cystectomy remained the gold standard treatment for bladder cancer when indicated. But it has the disadvantages of long operative time and large blood loss.

Aims: To assess the safety and efficacy of the use of ligasure in radical cystectomy.

Patients and method: From June 2015 to February 2018, 72 patients with muscle invasive bladder cancer or Recurrent high grade non muscle invasive cancer who are candidate for open radical cystectomies at Al- Yarmouk teaching hospital were enrolled in this prospective, case control study to compare between the use of traditional suture ligation technique and ligasure for tissue ligation and division. The patients were randomly divided into two equal groups; group A for suture ligation technique and group B for ligasure.

Results: The age of the patients (n=72) in this study was ranged from 50 to 79 years, and the mean age was 64.1±8.4 years in group A and 65.4±8.4 in group B. The characteristics of the two groups were similar, with no statistically significant difference (p value > 0.05), but regarding the duration of surgery, blood loss and the need for blood transfusion and number blood units transfused, the difference was statistically significant (P value <0.05). Pelvic lymphocele was the most common complications in both groups and the incidence of complications in the two groups was comparable with no statistically significant difference (p value > 0.05).

Conclusion: The addition of ligasure use in radical cystectomy was effective in reducing blood loss and in saving time by decreasing the duration of surgery, and also was safe as there was no significant difference in incidence of complications.

Keywords: radical cystectomy, ligasure, bladder cancer

INTRODUCTION

The gold standard for treating muscle invasive bladder cancer is open radical cystectomy with orthotopic neobladder^(1,2) Recently, the minimally invasive surgery was suggested for radical cystectomy in the form of laparoscopic radical cystectomy and robotic radical cystectomy to decrease the postoperative morbidity and give better cosmetic outcome but it needs further evaluation for long-term oncologic implications^(3,4)

The drawbacks of the minimally invasive surgery are steep learning curve, operating time, and cost of the procedure.⁽⁵⁾

More recently, the LigaSure device has been implemented in the performance of variable open and laparoscopic surgical procedures, including radical cystectomy.⁽⁶⁾

The Ligasure vessel sealing system is a heat-sealing device that has been introduced to surgery in 1998. It allows the use of specific amount of bipolar electrothermal energy and pressure to seal off the walls of the blood vessel and a feedback mechanism guarantees that the tissues are not charred by over-coagulation. This device was designed for sealing blood vessels from 1 to 7 mm in diameter.⁽⁷⁻⁹⁾

The morbidity and mortality of radical cystectomy are high and this reflects the fact that the majority of patients undergoing this procedure are elderly patients with multiple comorbidities.^(10, 11) Among the independent predictors of high grade complications is the amount of blood loss.^[12] Duration of surgery of more six hours is also associated with an increased risk of post-operative complication.^[13] So the efforts are necessary

to decrease the blood loss and operative time and for this reason we use the ligasure in the open radical cystectomy in the hope that its use may achieve these aims in reducing the morbidity of open radical cystectomy.

PATIENTS AND METHOD

Seventy two patients with muscle invasive bladder cancer or recurrent high grade non muscle invasive cancer of transitional cell type who are candidate for open radical cystectomies at Al- Yarmouk teaching hospital were enrolled in this prospective, case control study from June 2015 to February 2018, to compare between the use of traditional suture ligation technique and ligasure for tissue ligation and division. The selected patients were divided in random manner into two equal groups; group A for suture ligation technique and group B for ligasure use.

The patient's age, gender, preoperative clinical status and investigations and the indication of radical cystectomy were recorded. The amounts of intraoperative blood loss, units of blood transfused intraoperative and postoperatively were recorded. The operative time was also recorded.

The exclusion criteria were squamous cell carcinoma, significant medical comorbidities, previous radiotherapy and previous pelvic surgery.

The operation done by a vertical midline incision from the symphysis pubis to the umbilicus, the space of Retzius is entered, Blunt dissection is used to release the bladder from the pelvic sidewall attachments on both sides, the peritoneal cavity is entered, and the urachus is identified and divided just below the umbilicus. Bowel mobilization on the right and left side is done to achieve good exposure of the major vessels and the

ureters. Good exposure is done with the use of a self-retaining retractor; both ureters are released from their attachments beginning where they cross the iliac arteries to the level of the bladder. The superior, posterior, and lateral pedicles of the bladder were divided by scissor and ligated using suture ligation in group A. the LigaSure device was used to divide the bladder pedicles in group B; and this step is the only different step in the surgical procedure between the two groups. [14] The type of ligasure used was Covidien ligasure LF420. The follow up of all patients was for six months after surgery.

The data analysis was carried out using statistical package of SPSS-24 (Statistical Packages for Social Sciences- version 24).

The data were presented in simple measures of frequency, percentage, mean, standard deviation, and range. The significance of difference of means was tested using Students-t-test for difference between two independent means. The significance of difference of different percentages was tested using Pearson Chi-square test (χ^2 -test) with application of Yate's correction or Fisher Exact test whenever applicable. Statistical significance was considered when the P value was equal or less than 0.05.

RESULTS

The age of the patients (n = 72) in this study was ranged from 50 to 79 years, with mean age of 64.1 ± 8.4 years in group A and 65.4 ± 8.4 in group B. The characteristics of patients in the two groups were similar, where difference in the age, gender, and indication of surgery and hemoglobin level was not statistically significant and also there was no statistically significant difference in the number of smokers in the two groups (p value > 0.05).

Table 1: The characteristics of patients

		Group A		Group B		P value
		No	%	No	%	
Age (years)	50---59	12	33.3	13	36.1	0.408
	60---69	14	38.9	9	25.0	
	70---79	10	27.8	14	38.9	
	Mean \pm SD(Range)	64.1 \pm 8.4(50-79)		65.4 \pm 8.4(50-79)		
Gender	Male	28	77.8	30	83.3	0.551
	Female	8	22.2	6	16.7	

Conted...

Smoking	Yes	24	66.7	24	66.7	-
	No	12	33.3	12	33.3	
Haemoglobin (g/dL)	10.0---	9	25.0	11	30.6	0.766
	11.0---	20	55.6	20	55.6	
	12.0---	7	19.4	5	13.9	
	Mean ± SD(Range)	11.5 ± 0.7(10-12.5)		11.3 ± 0.6(10-12.5)		0.257
Indication of surgery	Muscle invasive cancer	31	86.1	29	80.6	0.527
	Recurrent high grade non muscle invasive cancer	5	13.9	7	19.4	

#Significant difference between two independent means using Students-t-test at 0.05 level.

Regarding the duration of surgery, blood loss and the need for blood transfusion and number blood units transfused, the difference was statistically significant, where the duration of surgery was less in group B than group A, blood loss and the need for blood transfusion were also less in group B than group A(P value <0.05). Table 2

Table 2: Perioperative characteristics

Variable		Group A		Group B		P value
		No	%	No	%	
Duration of surgery (minutes)	180---	-	-	25	69.4	0.0001*
	240---	6	16.7	11	30.6	
	300---	26	72.2	-	-	
	360---	4	11.1	-	-	
	Mean ± SD (Range)	313.8 ± 26.8 (288-399)		217.8 ± 27.1 (180-275)		0.0001#
Intra-operative blood loss (ml)	600---	-	-	29	80.6	0.0001*
	700---	-	-	7	19.4	
	800---	7	19.4	-	-	
	900---	12	33.3	-	-	
	1000---	10	27.8	-	-	
	=>1100	7	19.4	-	-	
	Mean ± SD (Range)	1004.0 ± 96.4 (865-1199)		662.8 ± 38.5 (600-720)		0.0001#
Need for blood transfusion	Yes	24	66.7	10	27.8	0.001*
	No	12	33.3	26	72.2	
Number of units of blood transfused	1	-	-	1	10.0	0.0001*
	2	1	4.2	7	70.0	
	3	5	20.8	2	20.0	
	4	8	33.3	-	-	
	5	8	33.3	-	-	
	6	2	8.3	-	-	-
	Mean ± SD(Range)	4.2 ± 1.0 (2-6)		2.1 ± 0.6 (1-3)		0.0001#
Type of diversion	Ileal conduit	26	72.2	25	69.4	0.795
	Orthotopic neobladder	10	27.8	11	30.6	

#Significant difference between two independent means using Students-t-test at 0.05 level.

Pelvic lymphoceles were the most common complications in both groups and there was no statistically significant difference in the incidence of complications in the two groups (p value > 0.05). Table 3

Table 3: The complications of radical cystectomy

	Group A		Group B		P value
	No	%	No	%	
Pelvic lymphoceles	4	11.1	3	8.3	0.691
Wound infection	2	5.6	1	2.7	0.555
Deep venous thrombosis	3	8.3	2	5.6	0.643
Paralytic ileus	2	5.6	1	2.7	0.555
Enterocolitis	2	5.6	1	2.7	0.555
Peritonitis	1	2.7	1	2.7	-
Small bowel obstruction	1	2.7	1	2.7	-
Pelvic hematoma	1	2.7	1	2.7	-

DISCUSSION

The treatment for muscle invasive bladder cancer is radical cystectomy with urinary diversion. Variable ways are used for urinary reconstruction after radical cystectomy, including ileal conduits, cutaneous urinary diversion, and orthotopic neobladder reconstruction.⁽¹⁵⁻¹⁷⁾ so the urologist would always attempt to refine the radical cystectomy procedure and to decrease the intraoperative and postoperative complications, many modifications and new advances have been used to achieve these goals. Hanash *et al* use stapling technique to control the vascular pedicles during radical cystectomy and demonstrated a significant decrease in the intraoperative and postoperative blood loss and decrease in the time of operation.⁽¹⁸⁾

Chang *et al* demonstrated significantly decreased blood loss and the transfusion requirement during radical cystectomy using stapling device.⁽¹⁹⁾ Mandhani *et al* adopted several technical modifications to open radical cystectomy which included Pfannenstiel incision, internal splint, single urethral catheter and extraperitonealization of the orthotopic neobladder and demonstrated that with these modifications the advantages of minimally invasive surgery may be obtained, like early recovery, less need for analgesics, better cosmesis and reduction in length of hospitalization.⁽²⁰⁾

In the present study the use of ligasure as hemostasis maneuver resulted in significant advantages compared to the use of conventional ligature technique including decreased operative time and better hemostasis as reflected

by less amount of blood loss, less need for blood transfusion and fewer number of blood units transfused. Manasia *et al* demonstrated similar results to the present study where they found the use of ligasure was safe and effective in decreasing blood loss and saving the time of surgery.⁽²¹⁾

The complications of surgery reported in the present study were comparable in both groups with no significant difference in incidence of complications, so the use of ligasure was safe.

The limitations of the present study include small sample and short duration of follow up as appearance of late complications may increase with increased period of follow up.

CONCLUSION

The use of ligasure in radical cystectomy was effective in reducing blood loss and in saving time by decreasing the duration of surgery, and also was safe as there was no significant difference in incidence of complications in the two groups.

Ethical Clearance: This study was approved by the ethical committee and the patients of the two groups read and signed an informed consent form according to ministry of health and environment in Iraq.

Source of Funding: Self-fund

Conflict of Interest: the authors declare that they have no conflict of interest.

REFERENCES

1. Hautmann RE, Volkmer BG, Schumacher MC, Gschwend JE, Studer UE. Long-term results of standard procedures in urology: the ileal neobladder. *World J Urol.* 2006;24:305–14.
2. Stein JP, Lieskovsky G, Cote R, Groshen S, Feng AC, Boyd S, et al. Radical cystectomy in the treatment of bladder cancer: long-term results in 1054 patients. *J Clin Oncol.* 2001;19:666–75.
3. Haber GP, Crouzet S, Gill IS. Laparoscopic and robotic assisted radical cystectomy for bladder cancer: A critical analysis. *Eur Urol.* 2008;54:54–64.
4. Pruthi RS, Wallen EM. Robotic-assisted laparoscopic radical cystoprostatectomy. *Eur Urol.* 2008;53:310–22.
5. Chade DC, Laudone VP, Bochner BH, Parra RO. Oncological outcomes after radical cystectomy for bladder cancer: open versus minimally invasive approach. *J Urol.* 2010;183:862–70.
6. Thompson IM, Kappa SF, Morgan TM, et al. Blood loss associated with radical cystectomy: A prospective, randomized study comparing impact LigaSure vs. stapling device. *Urologic oncology.* 2014;32(1):45.e11-45.e15.
7. Kennedy, JS; Stranahan, PL; Taylor, KD; Chandler, JG. “High-burst-strength, feedback-controlled bipolar vessel sealing”. *Surgical endoscopy.* 1998;12 (6): 876–8.
8. Macario A, Dexter F, Sypal J, Cosgriff N, Heniford BT. “Operative time and other outcomes of the electrothermal bipolar vessel sealing system (LigaSure) versus other methods for surgical hemostasis: a meta-analysis”.2008;15 (4): 284–91.
9. Obonna GC, Mishra RK . Differences between Thunderbeat, LigaSure and Harmonic Scalpel Energy System in Minimally Invasive Surgery. *World Journal of Laparoscopic Surgery.* 2014;7(1):41-44
10. Tan WS, Lamb BW, Kelly JD. Complications of Radical Cystectomy and Orthotopic Reconstruction. *Advances in Urology.* 2015;2015:323157.
11. Lmezguidi K, Janane A, Hajj F i, Jendouzi O, Alami M, et al. Oncologic Outcomes after Radical Cystectomy: Comparison between Primary and Progressive Muscle Invasive Bladder Cancer. *J Cancer Sci Ther.*2017; 9:485-489. doi:10.4172/1948-5956.1000463
12. Shabsigh A., Korets R., Vora K. C., et al. Defining early morbidity of radical cystectomy for patients with bladder cancer using a standardized reporting methodology. *European Urology.*2009;55(1):164–176.
13. Lavallée LT, Schramm D, Witiuk K, Mallick R, Fergusson D, Morash C, et al. Peri-Operative Morbidity Associated with Radical Cystectomy in a Multicenter Database of Community and Academic Hospitals. *PLoS ONE.*2014;9(10): e111281.
14. Neema Navai, MD, and Colin P. N. Dinney, MD. Transurethral and Open Surgery for Bladder Cancer. In: Wein AJ, Kavoussi LR, Partin AW, Peters CA (eds). *Campbell’s Urology*, Vol. 3, 11th edn. Philadelphia, Saunders Elsevier, 2016; 2242-2253.
15. Stenzl A, Sherif H, Kuczyk M. Radical cystectomy with orthotopic neobladder for invasive bladder cancer: A critical analysis of long term oncological, functional and quality of life results. *Int Braz J Urol.* 2010;36:537–47.
16. Gerharz EW, Månsson A, Hunt S, Skinner EC, Månsson W. Quality of life after cystectomy and urinary diversion: An evidence based analysis. *J Urol.* 2005;174:1729–36.
17. Moschini, M., Sharma, V., Dell’oglio, P., Cucchiara, V., Gandaglia, G., Cantiello, F. et al. Comparing long-term outcomes of primary and progressive carcinoma invading bladder muscle after radical cystectomy. *BJU Int.*2016;117: 604–610.
18. Hanash KA, Peracha Am, Al-Zahrani HM, Merdad TA, Kardar A, Aslam M. et al. Radical cystectomy: minimizing operative blood loss with a “stapling technique”. *Urology* 2000;56(3):488-491.
19. Chang SS1, Smith JA Jr, Cookson MS. Decreasing blood loss in patients treated with radical cystectomy: a prospective randomized trial using a new stapling device. *J Urol.* 2003 Mar;169(3):951-4.
20. Mandhani A, Dharaskar A, Kapoor R. Technical steps of open radical cystectomy and orthotopic neobladder to achieve the goals of “minimally invasive surgery” *Indian J Urol.* 2010;26:277–80.
21. Manasia P, Alcaraz A, Alcover J. Ligasure versus sutures in bladder replacement with Montie ileal neobladder after radical cystectomy. *Arch Ital Urol Androl.* 2003;75(4):199-201.

Tubal Patency and Pregnancy Rate Following Surgical and Medical Treatments of Ectopic Pregnancy

Wassan R. Alkhafajy¹, Firas F. Alyaseen²

¹College of Medicine, ²College of Pharmacy, Thi-Qar University, Iraq

ABSTRACT

Background: Ectopic pregnancy is defined as the implantation of a fertilized ovum outside the endometrial cavity, most commonly in the fallopian tubes. The high incidence of ectopic pregnancies can to some extent be related to the fact that the early diagnosis of pregnancy can be made with the use of β -hCG and ultrasound scans to identify the location of an early pregnancy.

Objectives: current study was conducted to (1) assess tubal patency by using hysterosalpingography following surgical and medical treatments of tubal pregnancy, and (2) to assess pregnancy rates following surgery and medical treatment of patients with ectopic pregnancy. **Methods:** an interventional controlled clinical study involved 300 women diagnosed with ectopic pregnancy at Bint-Alhuda Teaching Hospital in Thi-Qar Governorate, Iraq. They were divided into two groups according to the patients' preference; the first group treated with methotrexate while the second group treated surgically. Hysterosalpingography was done to all patients in both groups after three months of treatment, and both groups were followed up for one year waiting for pregnancy. **Results:** Tubal patency and spontaneous pregnancy rate is higher in the medically-treated group of patients. The contralateral tubal blockage was 11.5% in surgical-treated group, while 5.85% in medical-treated group. The spontaneous pregnancy rate was higher in medical-treated group (81.81%), while (58.66%) in the surgical-treated group. **Conclusions:** Better fertility potential and hysterosalpingography findings have been found after the medical treatment for patients with tubal ectopic pregnancy than those who are treated surgically.

Keywords: ectopic pregnancy, medical, surgical, tubal patency, hysterosalpingography.

INTRODUCTION

Ectopic pregnancy is defined as the implantation of a fertilized ovum outside the endometrial cavity, most commonly in the fallopian tubes [1]. The incidence of ectopic pregnancy in UK is 11/1000 pregnancies and the mortality rate is about 10/100000. The high incidence of ectopic pregnancies can to some extent be related to the fact that the early diagnosis of pregnancy can be made with the use of β -hCG and ultrasound scans to identify the location of an early pregnancy [2].

The known etiological factors contributing to the risk of ectopic pregnancy include tub-L disease, previous ectopic pregnancy, previous tubal surgery, use of intrauterine device, subfertility [2], assisted reproductive techniques and advanced maternal age [1].

The clinical presentations of ectopic pregnancy are variable and largely determined by the location of

pregnancy. In general, ectopic pregnancies implanted close to the uterus tend to develop further and present with more severe clinical symptoms. The most common symptoms are vaginal bleeding, pelvic pain and amenorrhea [3].

Improvements in the quality of diagnostic ultrasound techniques and β -hCG test, in the recent years, have facilitated early and better diagnosis of ectopic pregnancy and the development of conservative management protocols [3]. The ectopic pregnancy can be managed using expected medical or surgical approaches, depending on the clinical presentations and patient's choice [2].

Medical treatment using methotrexate is one of the options in the treatment of stable asymptomatic women with small unruptured ectopic pregnancy and β -hCG level is less than 5000 IU/L [4]. Methotrexate is a folate antagonist which interferes with DNA synthesis and inhibits cellular proliferation in the fast growing tissues

such as trophoblasts^[3]. Methotrexate is commonly given systematically as a single dose by intramuscular injection of 50 mg. The second dose of methotrexate is required if β -hCG level did not fall by at least 15% between days 4 and 7 of treatment^[1].

Medical treatment should be tried only if the facilities are present for regular follow-up visits^[2]. Failure of medical treatment is rare and most common when the initial hCG is high (higher than 5000 IU/L)^[4].

Surgical management can be performed by laparoscopy or laparotomy. Laparoscopic approach offers significant advantages when compared to laparotomy and is the mainstay of management. Laparotomy is mainly applied to severely compromised patients or due to lack of endoscopic facilities^[3].

Therefore, the aim of current study was to evaluate tubal patency and the rates of pregnancy following medical and surgical treatments of women with ectopic pregnancies.

PATIENTS AND METHOD

Current study was an interventional controlled clinical study conducted at Bint-Alhuda Teaching Hospital during the period from February 2009 to February 2016. Informed consents were obtained from all participating women prior to the study.

During that period 300 women were diagnosed with unruptured ectopic pregnancies were enrolled in this study. The diagnosis was based on

1. Clinical history and physical examination,
2. Measurement of β -hCG level and
3. Ultrasound scans.

The exclusion criteria were:

1. Haemodynamically unstable patients with suspected ruptured ectopic pregnancy,
2. Previous history of ectopic pregnancy,
3. Patients who had completed family and not planning for further pregnancy and
4. Unable to continue with the follow-up visits.

The indications for medical therapy were:

1. No significant pain,
2. Serum β -hCG level is less than 5000 IU/L,
3. Ultrasound shows unruptured ectopic pregnancy measuring less than 4 cm and with no visible fetal heart beats,

4. No intrauterine pregnancy (heterotopic pregnancy) and
5. Methotrexate is an acceptable option (patient acceptance).

On the other hand, contraindications to medical treatment were:

1. Chronic liver, renal, or hematological disease,
2. Active infection,
3. Immunodeficiency and
4. Breast feeding.

The clinical assessment, involved detailed history and thorough clinical examination, was performed for each patient. The patients were investigated for complete blood count, random blood glucose, liver and renal function tests, β -hCG level and pelvic ultrasonography.

In the first group of patients, who selected surgical treatment, laparotomy was done with salpingectomy of the affected tube, treated as inpatients for 48 hours and then discharged.

In the second group of patients, who selected medical treatment with methotrexate, on day zero, β -hCG level was measured, pelvic U/S was performed and methotrexate injection (Methotrexate *Ebewe*® 10mg/ml solution for injection) as a single intramuscular dose (50 mg) was given. If the patient lived nearby hospital (less than 15 minutes to reach the hospital) and has support at home, she would be discharged and asked to come back after 4 days; otherwise she was treated as an inpatient.

On day four, β -hCG level was measured, pelvic U/S was performed and another dose of methotrexate injection given if the decrease in β -hCG level was less than 15% from baseline.

On day seven, β -hCG level was measured, pelvic U/S was performed to confirm the success of treatment. If any patient developed treatment failure (demonstrated by persistent symptoms, persistent high β -hCG level, ruptured ectopic by U/S or clinically unstable), the patient referred to surgery. Accordingly, 10 patients were referred and excluded from the study.

All patients who were rhesus negative, from both groups, received anti-D injection. Also patients of both groups advised to avoid pregnancy for the next three months by using ordinary contraceptive methods and were asked to return for follow-up. After three months of treatment, hysterosalpingography was done for all patients. Then they were re-examined at 6 and 12 months intervals to look for spontaneous pregnancy. Data of this study were statistically analyzed using Chi-square test.

RESULT

During the period of study, populations of 300 women were included. Out of these patients, 260 women completed the study while 40 women were excluded because they did not attend follow-up visits.

Table (1) shows demographic characteristics of participants from both groups. The proportions of both groups seemed approximately similar regarding age, parity, surgical history and history of infertility.

Table 1: Demographic characteristics of participants

No.	Parameters	Frequency (Surgical treatment)	%	Frequency (Medical treatment)	%
1.	Age (years):				
	(20 – 30)	90	34.6	69	26.5
	> 30	60	23	41	15.7
2.	Parity:				
	Primi	38	14.6	20	7.7
	Multi	112	43	90	3.4
3.	Surgical History:				
	Yes	78	30	54	20.7
	No	72	27.7	56	21.5
4.	History of infertility:				
	Yes	58	22.3	38	14.6
	No	92	35.3	72	27.7

Numbers and proportions of patients who received medical treatment (110; 42.3%) and those treated surgically (150; 57.7%) are presented in Table 1 1.

Numbers and proportions of medically-treated patients with patent contralateral tube (15; 5.8%) and those with non-patent contralateral tube (95; 36.5%) according to hysterosalpingography examination are shown in Table 4.

Table 2: Numbers and proportions of patients who were treated medically and those treated surgically

Study Groups	Frequency	%
Medical treatment	110	42.3
Surgical treatment	150	57.7
Total	260	100.0

Numbers and proportions surgically-treated patients with patent contralateral tube (120 patien; 46.2%), and those with non-patent contralateral tube (30 patients; 11.5%) are presented in Table 3.

Table 3: Numbers and proportions of surgically-treated patients according to patency or non-patency of contralateral tube

Contralateral tube		Frequency	%
Valid	Patent tube	120	46.2
	Non-Patent tube	30	11.5
	Total	150	57.7
Missing	System	110	42.3
Total		260	100.0

Table 4: Numbers and proportions of medically-treated patients according to patency or non-patency of contralateral tube

Contralateral		Frequency	Percent	Valid Percent
Valid	Patent tube	95	36.5	86.4
	Non-Patent tube	15	5.8	13.6
	Total	110	42.3	100.0
Missing	System	150	57.7	
Total		260	100.0	

The results of patency of the affected tube by ectopic pregnancy (ipsilateral tube) in the medical-treated group (78 patients with patent tube; 70.9%) while 32 patients (29.1%) were with non-patent tube are presented in Table 5.

Table 5: Results of patency of the affected tube by ectopic pregnancy (ipsilateral tube) in the medically-treated group

Ipsilateral tube	Frequency	%	Valid Percent	Cumulative Percent
Patent tube	78	70.9	70.9	70.9
Non-Patent tube	32	29.1	29.1	100.0
Total	110	100.0	100.0	

Numbers and percentages of spontaneous pregnancies after medical (90 patients; 81.81%) and after surgical (88 patients; 58.66%) treatments are presented in Table 6.

Table 6: Numbers and percentages of spontaneous pregnancies after medical and surgical treatments

Study groups (No.)	Number of spontaneous pregnancies (%)
Surgical treatment (150)	88 (58.66)
Medical treatment (110)	90 (81.1%)

DISCUSSION

Ectopic pregnancy is one of the major health problems and an important cause of morbidity and mortality in women of reproductive age [3]. Better clinical care should help prevent the avoidable mortality and also reduce physical and psychological morbidities associated with ectopic pregnancy, improve future fertility outcomes and reduce the costs associated with repeated hospital admissions [5,6].

The increasing sensitivity of our diagnostic tests for ectopic pregnancies has resulted in many cases being diagnosed earlier in their natural course and led to clinically stable patients. Those patients are usually hesitating to accept surgery with its complications and salpingectomy with its psychological burdens and the possible adverse effects of subsequent fertility potential. So, the role of medical treatment is increasing and its popularity is growing, especially at our center after the completion of this study as it had no or very limited role before that.

In this study, there was good patients' acceptance of medical treatment as 110 patients (42.3%) out of 300 patients did accept medical treatment while 150 patients (57.7%) preferred surgical treatment (Table 2).

Good compliance with follow-up has been seen for 260 patients out of 300 patients in this study, because most women took future fertility problems more seriously. Medical treatment was commonly safe with no demonstrable harms or serious side effects.

High success rate was achieved in current study using medical treatment due to good selection of patients (failure rate was low as only 10 patients needed surgery after the failure of medical treatment and they were excluded from the study).

When we compare the tubal patency of both groups (using hysterosalpingography) and compare the patency of contralateral tube (non-affected side by ectopic), we found that tubal blockage was 11.5% in the surgical treatment group (Table 3) while 5.8% in the medical treatment group (Table 4). Therefore, surgical treatment is considered more risky for adhesion formation than medical therapy. However, it was difficult for us to assess if this blockage may proceed with our treatment or not.

In the surgical group, we did salpingectomy so the affected tube was lost (i.e. 100% blockade of ipsilateral affected tube, in another word the patient lost 50% of her fertility potential. However, in the medical treatment group, 70.9% had patent ipsilateral tube (affected tube by ectopic) so its function can be preserved although could be a site of future ectopic (Table 5). Therefore, we need more accurate and sophisticated tests to prove its functional potential.

The spontaneous pregnancy rate was higher in medically-treated group (81.81%) versus (58.66%) in the surgically-treated patients (Table 6). This might be related to the patent ipsilateral tube.

Therefore, the medical treatment is safe, highly effective in the properly selected patients with better subsequent fertility and free of surgical complications with wide acceptance in our center. Hence, it should take a greater role and should be used as a first line treatment in selected patients and this is supported by special guidelines. The guidelines states that methotrexate should be used as a first line treatment if β -hCG level is less than 1500 IU/L, however, women with β -hCG levels between 1500 –5000 IU/L may be offered either surgical or methotrexate treatment [7,8].

CONCLUSIONS AND RECOMMENDATIONS

The present study demonstrated that a better fertility potential and hysterosalpingography outcomes were achieved after methotrexate treatment for ectopic tubal patency than surgical treatment.

Further studies should be performed including larger patient populations, probably multi-centre studies, and more investigation facilities like laparoscopy for assessing fertility state and tubal condition.

Ethical Clearance: It was obtained from Ethics Committee at Bint-Alhuda Teaching Hospital.

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

REFERENCES

1. Davison A, Aross J. Management of tubal ectopic pregnancy. *Recent advance in obstetrics & Gynecology*. 2014; 25: 29 – 39.
2. Monga A and Dobbs S. *Obstetrics by ten teachers*, 9th edition; 2016. pp. 94–99.
3. Luesley DM, Kilby MD. *Obstetrics & Gynecology an evidence – based text for the MRCOG*, 3rd edition; 2016.
4. Luesley DM, Baker PN. *Obstetrics & Gynecology an evidence – based text for the MRCOG*, 4th edition; 2016.
5. CEMACH. *Saving mothers lives, reviewing maternal death to make motherhood safer 2006 – 2008. The 8th report of the confidential enquires into maternal death in UK*.BJOG. 2011.
6. Wedderburn CJ, Warner P, Graham B, Duncan We, Critchley HO, Horne AW. *Economic evaluation of diagnosis and excluding ectopic pregnancy*. *Hum Reprod*. 2010.
7. Newbatt E, Beckles Z, Ullman R, et al. *Ectopic pregnancy and miscarriage. Summary of NICE guidance*. *BMJ*. 2012; 345: e & 1b.
8. Collins S, Arulkumaran S. *Ectopic pregnancy management*. *Oxford handbook of obstetrics and gynecology*. 3rd edition; 2013. pp.536 –537.

The Possible Role of Interleukin-17A Elevation in the Development of Chronic Fatigue Syndrome

Mohammed A. Jawad Kadhum

M.Sc. in Medical Laboratory Technology/Assist. Lecturer/AL-Nisour University College/Baghdad, Iraq

ABSTRACT

Background: Chronic fatigue syndrome (CFS) is characterized by immune dysfunctions including chronic immune activation, inflammation and alteration of cytokines profiles. Therefore, the aim of current study was to test the association between existence of chronic fatigue syndrome and serum levels of Interleukin-17A.

Method: Fifty three patients with CFS were enrolled in this study and level of Interleukin-17A (IL-17A) has been estimated in their sera. The results were compared with those for 32 Rheumatoid Arthritis (RA) patients as a disease control and 35 apparently healthy control individuals.

Results: The results showed highly significant elevation in the level of IL-17A among CFS group in comparison with RA patients and healthy controls. Evaluation of this biomarker by (ROC) application revealed that it is an important parameter in discrimination between CFS patients and healthy individuals and can be used as an indicator and diagnostic marker. Also, a concentration of 4.4 ng/ml is optimum with a sensitivity of 98.1%, a specificity of 65.7% and an accuracy of 85.23%. Therefore, IL-17A is virtuous and suitable to confirm the diagnosis of CFS in suspected cases.

Keywords: *Chronic fatigue syndrome, Interleukin-17A, Rheumatoid arthritis, biomarker,*

INTRODUCTION

Chronic Fatigue Syndrome/Myalgic Encephalomyelitis (CFS/ME) is a multifactorial disorder identified by symptom-specific criteria and characterized by severe and long-lasting weakness or fatigue, post-exertion malaise, cognitive dysfunction, non-energizing or crush sleep and other symptoms [1]. The precise etiology remains vague [2]. It was denoted that CFS/ME typically affects a variety of bod systems including the immune system [1,2]. It is well known that cytokines are important for the function, activation as well as suppression of immune cells [3]. Therefore, abnormalities in their expression may affect immune cells functions. As patients having CFS/ME commonly present with symptoms that indicate immune response abnormalities, such as flu-like symptoms, cytokines expression has been an area of interest for researchers. These cytokines maybe implicated in the pathophysiology of chronic fatigue via expansion of specific cell subsets or its maintenance following immune activation by an innocuous stimulus[4].

In addition, cytokines may serve as potential biomarkers that aid diagnosis, sub-typing, monitoring and determining the prognosis of CFS [Ref]. In rheumatoid arthritis, several biomarkers, including cytokines, have been used to create a multi-biomarker disease activity score which has been shown to significantly correlate with disease activity [4]. As CFS is a clinical diagnosis, biomarkers could be used as objective markers of disease status. Hence, there have been many studies that focus on the role cytokines may play in CFS [5].

It was proposed that T helper cells start off 'naive' T cells and can turn into Th1, Th2 or Th17 cells. A naive T cell can either become inflammatory Th17 cell or anti-inflammatory Treg cell [Ref]. Interleukin-17 (IL-17) is a cytokine produced by Th17 cells under induction of IL-23 which results in destructive tissue damage in delayed-type reactions [6] where it causes increasing chemokines production in various tissues to recruit monocytes and neutrophils to the site of inflammation, similar to Interferon gamma. In addition, IL-17 acts synergistically with tumor necrosis factor and IL-1 [7,8].

Though individual biomarkers varied, results of CFS cases collectively supported involvement of IL-23/Th17/IL-17 axis in the delineation of CFS in a sex-specific way^[9]. The aim of current study was to explore the possible association between the level of Interleukin-17A and the development of Chronic Fatigue Syndrome in patients having clinical manifestations of the syndrome.

MATERIALS AND METHOD

The study was conducted during the period between June and September/ 2016. It involved Fifty three patients having clinical manifestations of chronic fatigue syndrome (CFS) and attending Medical City Teaching Hospitals and some of private clinics. These patients were diagnosed under the supervision of consultant Rheumatologists physicians according to the criteria of the Centers for Disease Control and Prevention (CDC)/ CFS criteria. In addition, 35 apparently healthy volunteers as Healthy Controls (HC) and 32 patients having Rheumatoid Arthritis (RA) as a disease control group were recruited in the study. All study participants undergone a range of blood tests that included liver function, thyroid function, renal function and lipid profile tests. Furthermore, a questionnaire was administered for participants to collect data like participant's name, gender, medical history, clinical features, length and body weight. Chi-square test was used to test possible associations between study variables. Data were expressed as Mean \pm SE and tested for significance at P<0.05.

RESULTS

1. Demographic criteria of participants: The results of current study revealed that there was no significant difference between mean of ages of studied groups of participants (45.63 ± 2.071 , 41.03 ± 1.843 and 40.96 ± 1.875) years for HC, RA and CFS groups, respectively] (P = 0.184; Table 1). In addition, the ratios of females to males among those groups were 1.92, 2.2 and 1.28 for HC, RA and CFS groups, respectively (P = 0.911; Table 1). However, the mean age of disease onset was significantly different between CFS and RA groups of patients (35.05 ± 1.859 and 40.10 ± 0.875) years, respectively] (P <0.05; Table 1). Regarding gender of participants, results of this study revealed that most patients in the CFS and RA groups were females (64.2% and 68.8%), respectively. In addition, in terms of BMI, data from current study showed that most participants were over-weighted (26.539 ± 2.025 , 28.286 ± 5.692 and 25.957 ± 4.798) Kg/ m² for HC, RA, and CFS groups, respectively, with no significant statistical differences between them. The latter probably explains the role of obesity as a risk factor in the development of many autoimmune diseases such as RA. Moreover, current study revealed that approximately 31.25% of participants with RA have positive family history of the disease, whereas 7.55% of patients in the CFS group had positive family history of the disease (Table 1).

Table 1: Demographical criteria of studied groups

Parameters	Studied groups			Total	(P value)
	Healthy Control	RA Disease Control	CFS Patients		
Gender	No. (%)	No. (%)	No. (%)	No. (%)	Chi-Square P= 0.0911 NS (P>0.05)
Male	12 (34.3)	10 (31.2)	19 (35.8)	41 (34.2)	
Female	23 (65.7)	22(68.8)	34(64.2)	79(65.8)	
Total	35 (100)	32 (100)	53 (100)	120 (100)	
Female /Male Ratio	1.92	2.2	1.79	1.28	
Age/years (Mean \pm SE)	45.63 ± 2.071	41.03 ± 1.843	40.96 ± 1.875		ANOVA & LSD P=0.184 NS
Age of disease onset/ years (Mean \pm SE)	-	35.05 ± 1.859	40.10 ± 0.875		Chi Square P=0.001 HS
Family History No. (%)	-	10 (31.25)	4 (7.55)	11 (12.94)	
BMI (Kg/ m ²) (Mean \pm SD)	26.539 ± 2.025	28.286 ± 5.692	25.957 ± 4.798		ANOVA P=0.067 NS
Total numbers	35	32	53	120	

NS = Not significant, HS = Highly significant.

2. Disease distribution according to age groups of participants: The results of current study revealed that the age group 20-40 years included 37.1% of healthy controls, 49.1% of patient with CFS and 46.9% of patients with RA (Table 2). This indicates that approximately 50% of participants with CFS were 20 to 40 years old.

Table 2: Disease distribution according to age groups of participants

Age groups/Year		Studied groups			Pearson Chi-Square (P value)
		Healthy Control	Patients (CFS)	Patients (RA)	
20-40	No.	13	26	15	P= 0.518 (P >0.05)
	%	37.1%	49.1%	46.9%	
41-60	No.	18	21	16	
	%	51.4%	39.6%	50.0%	
> 60	No.	4	6	1	
	%	11.4%	11.3%	3.1%	
Total	No.	35	53	32	
	%	100.0%	100.0%	100.0%	

3. Levels of IL17A in the sera of the studied groups: Results of current study revealed that serum levels (Mean ± SE) of IL-17A in the sera of patients with CFS (27.0532 ± 2.08216 ng/ mL) were significantly higher (P <0.05; Table 3) than those in the sera of patients with RA (3.7486 ± 0.24578 ng/ mL) or those in the sera of healthy controls (3.9622 ± 0.28219 ng/ mL). The latter two groups of participants were not significantly different (P >0.05; Table 3).

Table 3: Levels of IL17A in the sera of studied groups

Immunoassay		N	Mean	Std. Error	P value	
					ANOVA test	LSD test
IL - 17 A ng/ ml	HC group	35	3.9622	0.28219	P=0.00 Highly sign. (P<0.01)	*P=0.00
	CFS patients	53	27.0532	2.08216		**P=0.932
	RA patients	32	3.7486	0.24578		***P=0.00
	Total	120				

* Highly significant difference between CFS patients and HC group. ** Non-significant difference between HC group and RA patients. *** Highly significant difference between CFS and RA patients.

4. Evaluation of serum IL-17A level by ROC test:

Receiver Operative Curve (ROC) test had been applied for evaluation of IL-17A as a biological marker for discrimination between normal healthy individuals and patients with CFS (Table 4 and Figure 1).

Table 4 shows that the sensitivity of this biomarker is as high as 98.1% with a specificity of 65.7% and an accuracy of 85.23%. When the optimum concentration of 4.4 ng/ml was applied, there was highly significant difference between CFS patients and healthy individuals.

Table 4: Validity of IL-17A as a biological marker for detection of CFS

Validity tests for (IL-17 A)	
Sensitivity	98.1%
Specificity	65.7%
Positive predictive value (PPV)	81.2%
Positive predictive value (NPV)	95.8%
Accuracy	85.23%
Area Under Curve (AUC)	0.972
Cut-off value	4.4
P value	0.00 HS

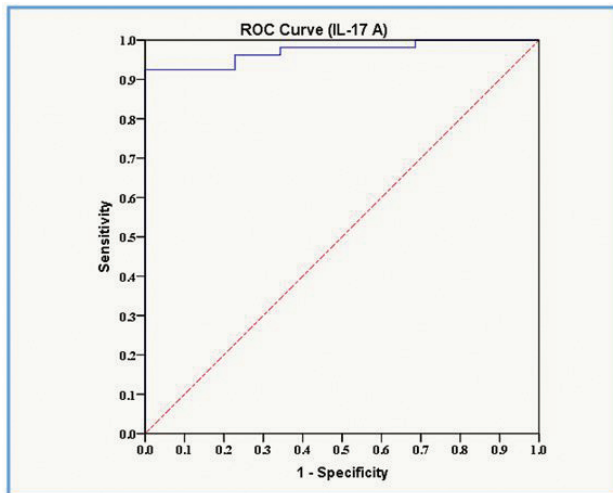


Figure 1: ROC showing the characteristic of area under curve for IL-17A

DISCUSSION

A study conducted by Hornig et al. [10] reported strong correlation between cytokine alterations and illness duration. These findings have critical implications for arriving at an early diagnosis of CFS/ME. Moreover, the same researcher [11] demonstrated the existence of a disturbed immune signature in CFS cases that was consistent with immune activation in the central nervous system and a shift toward an allergic or T helper type-2 pattern associated with autoimmunity. They denoted to an inverse relationship between IL-1R and IL-17 F.

On the contrary, another study [12] reported that the levels of many cytokines including IL-17A were declined in the sera of CFS in comparison with control group. This idea was also mentioned by [13,14]. These authors stressed that the results of their research did not show CFS markers. Unexplained aspect was that why cytokines' levels decreased within a duration of one year of the disease [14]. They suggested that it might be the result of exhaustion [12-14].

In view of the above observations, it could be concluded that duration of CFS illness may affect the level of cytokines. Another study [15] showed that cytokines, such as IL-1, production to be of relevance in CFS patients and its role in effective treatment of this disabling disease. The conflict in the results of cytokines' levels among different studies could be attributed to many factors such as sample size, duration of CFS, age of patients and type of cytokines that were estimated (whether proinflammatory cytokines or other types).

Hornig et al. [10] stated that there were distinct plasma immune signatures in CFS present in early course of illness. Their conclusions that classical proinflammatory cytokines were elevated during early course of illness agree, to some extent, with results of current study as related to IL-17A concentration increment. These facts explain the variation in the level of IL-17A among the current and different studies. Additionally, types of samples may result in different results such as estimation of cytokines in the CFS sera could result in variation from those quantified in the CSF [16].

Ethical Clearance: It was obtained from Ethics Committee in Medical City Teaching Hospitals.

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

REFERENCES

1. Blundell S, Ray KK, Buckland M, White PD. Chronic fatigue syndrome and circulating cytokines: A systematic review. *Brain, Behavior and Immunity Journal*. 2015; accepted. www.elsevier.com/locate/ybrbi.
2. Brurberg KG, Fñhus MS, Larun L, Flottorp S, Malterud K. Case definitions for chronic fatigue syndrome/myalgic encephalomyelitis (CFS/ME): A systematic review. *BMJ Open*. 2014; 4: e003973.
3. Wong N, Nguyen T, Brenu EW, Broadley S, Staines D, Marshall-Gradisnik S. A Comparison of Cytokine Profiles of Chronic Fatigue Syndrome/Myalgic Encephalomyelitis and Multiple Sclerosis Patients. *International Journal of Clinical Medicine*. 2015; 6: 769-783. <http://dx.doi.org/10.4236/ijcm.2015.610103>.
4. Centola M, Cavet G, Shen Y, Ramanujan S, Knowlton N, Swan KA, Turner M, Sutton C, Smith DR, Haney DJ, Chernoff D, Hesterberg LK, Carulli JP, Taylor PC, Shadick NA, Weinblatt ME, Curtis JR. Development of a multi-biomarker disease activity test for rheumatoid arthritis. *PLoS ONE*. 2014; 8: e60635.
5. Lorusso L, Mikhaylova SV, Capelli E, Ferrari D, Ngonga GK, Ricevuti G. Immunological aspects of chronic fatigue syndrome. *Autoimmun. Rev*. 2009; 8: 287-291.

6. Goldsby RA, Kindt TJ, Oaborne BA. "Autoimmunity" In: *Kuby Immunology*, 4th Ed. Freeman. W.H. & Company, NY; 2000: 497-516.
7. Tucker ME. Chronic Fatigue Syndrome: Immune Alterations Seen Early Medscape Medical News. March 02, 2015.
8. Hardcastle SL, Brenua EW, Staines DR, Marshall-Gradisnik S. Chronic Fatigue Syndrome/Myalgic Encephalomyelitis and the Potential Role of T Cells. *Biological Markers and Guided Therapy*. 2014; 1(1): 25 - 38 HIKARI Ltd, www.m-hikari.com <http://dx.doi.org/10.12988/bmgt.2014.3122>
9. Smylie AL, Broderick G, Fernandes H, Razdan S, Barnes Z, Collado F, Sol C, Fletcher MA, Klimas N. A comparison of sex-specific immune signatures in Gulf War illness and chronic fatigue syndrome. *BMC Immunology*. 2013; 14: 29.
10. Hornig M, Montoya JG, Klimas NG, Levine S, Felsenstein D, Bateman L, Peterson DL, Gottschalk GC, Schultz AF., Che X, Eddy ML, Komaroff AL, Lipkin WI. Distinct plasma immune signatures in ME/CFS are present early in the course of illness. *Sci Adv*. 2015; 1(1): e1400121. Published online 2015 Feb 27. DOI: 10.1126/sciadv.1400121. PMID: PMC4465185. NIHMSID: NIHMS694665.
11. Hornig M, Gottschalk G, Peterson DL, Knox KK, Schultz AF, Eddy ML, Che X. & Lipkin WI. Cytokine network analysis of cerebrospinal fluid in myalgic encephalomyelitis/chronic fatigue syndrome. *Molecular Psychiatry*. 2016; 21: 261-269. | DOI: 10.1038/mp.
12. Rudnicka J and Koziół A. Chronic Fatigue Syndrome – new facts. *Medical Journal*. 2016; ISSN: 2083-7291.
13. Nakamura T, Schwander SK, Donnelly R, Ortega F, Togo F, Broderick G, Yamamoto Y, Cherniack NS, Rapoport D, Natelson BH. Cytokines across the Night in Chronic Fatigue Syndrome with and without Fibromyalgia. *Clin. Vaccine Immunol*. 2010; 17 (4): 582-587.
14. Brenu EW, van Driel ML, Staines DR, Ashton KJ, Hardcastle SL, Keane J, Tajouri L, Peterson D, Ramos SB. & Marshall-Gradisnik SM. Longitudinal investigation of natural killer cells and cytokines in chronic fatigue syndrome/myalgic encephalomyelitis. *J Translat Med*. 2012; **10**: 88. DOI: 10.1186/1479-5876-10-88.
15. Roerink ME, Knoop H, Bredie SJH, Heijnen M, Joosten LAB, Netea MG, Dinarello CA, van der Meer JWM. Cytokine inhibition in chronic fatigue syndrome patients: study protocol for a randomized controlled trial. *Trials*. 2015; 16: 439. Published online 2015 Oct 5. DOI: 10.1186/s13063-015-0971-z. PMID: PMC4595002.
16. Peterson D, Brenu EW, Gottschalk G, Ramos S, Nguyen T, Staines D, Marshall-Gradisnik S. Cytokines in the Cerebrospinal Fluids of Patients with Chronic Fatigue Syndrome/Myalgic Encephalomyelitis. *Mediators of Inflammation*. 2015; Article ID 929720, 4 pages. <http://dx.doi.org/10.1155/2015/929720>.

Evaluation of Seminal Plasma Anti-Mullerian Hormone Levels and Their Association with Sperms' Count and Activity in Infertile Males

Thikra M. Muhammed¹, Hiba M. Saleem¹, Saleem O. Almawla²

¹AL-Maaref University College, Iraq, ²Ministry of Health, Iraq

ABSTRACT

Background: Infertility is a problem that affects approximately 10-15% of couples during their productive ages. Anti-Mullerian hormone (AMH) is produced by Sertoli cells and it regulates male sexual differentiation. Therefore, current study was conducted to evaluate seminal plasma levels of Anti-Mullerian Hormone in fertile and infertile men. **Methods:** the study was conducted in the General Teaching Hospital in Ramadi city from 1st of February 2018 to 1st of April 2018. Participants were 134 men; 70 patients (who were suffering from infertility) and 64 controls (normal healthy men). The age of participants ranged from 20 to 60 years. Conventional semen analysis was done for all cases and the AMH evaluation was done by ELISA technique. **Results:** The study showed that there were significant differences in seminal plasma Anti-Mullerian Hormone levels in fertile and non-fertile men with p-value (<0.05). The study concluded that AMH is a good biomarker for monitoring and treating male infertility and its could be an important cause of men infertility.

Keywords: Seminal plasma, AMH, Sertoli cells, normospermia, azoospermia, men infertility.

INTRODUCTION

Infertility is a problem that affects approximately 10-15% of couples during their productive ages⁽¹⁾.

Seminal fluid is a white or grey liquid (suspension) of spermatozoa in seminal plasma which is a mixture of secretions from prostate, seminal vesicles, epididymis, urethral glands, Cowper's glands and vasa deferentia^(2,3). It clots almost immediately after ejaculation forming a sticky, jelly-like liquid and liquifies again within 5-40 minutes⁽⁴⁾. The seminal fluid serves as a transport medium enabling the penetration of a spermatozoon into the ovum at fertilization. Also the seminal plasma contains several components with different origins such as Anti-Mullerian hormone (AMH). The latter provides nutritive source for spermatozoa during their journey through the female reproductive tract using fructose to produce energy (ATP) necessary for their swimming (motion). In addition, it protects them from infection and other injurious as well as toxic agents. Also, it serves as a buffer to neutralize vaginal acidic conditions. Spermatozoa constitute 2-5% of seminal fluid volume; whereas seminal plasma forms the remaining portion^(2,5,6).

Anti-Mullerian hormone (AMH), produced by Sertoli cells, is a homodimeric glycoprotein linked by disulfide bonds. It is a member of the transforming growth factor (TGF) beta superfamily with a molecular weight of 140 kDa^(7,8). In addition, its levels are down-regulated by intra-testicular testosterone and it regulates male sexual differentiation^(7,9,10).

The physiological concentration of AMH in seminal plasma is higher than in the serum. It is believed that AMH well reflects sperm production and the development of Sertoli cells^(9,11).

The present study aimed to measure the levels of AMH in seminal plasma from fertile and non-fertile men to evaluate the benefit of monitoring this hormone as a diagnostic tool for men fertility and monitoring response to treatment.

MATERIALS AND METHOD

Study Participants: The study subjects were men in their reproductive age, but suffering from infertility disorders who were attending General Teaching Hospital in Ramadi city/Al-Anbar governorate, Iraq. The study

was conducted during the period from February, 1st to April, 1st / 2018. Patients were selected randomly and their ages were 20-60 years. Controls were normal healthy subjects as well as normal semen analysis results.

Semen samples collection: Semen samples were collected from all patients by masturbation after a period of sexual abstinence for 4 to 5 days and saved in sterile containers and allowed to liquefy for at least 30 minutes at 37°C. Semen samples were centrifuged at 100 × g for 15 min and the supernatant seminal plasma was stored in polypropylene tubes at -20°C until used⁽¹⁴⁾. A routine semen analysis was then performed according to World Health Organization^(12,13). Azoospermia was tested after two semen analyses and centrifugations.

Semen analysis: Semen volume, appearance, liquefactions time, viscosity, pH were determined and duplicate assessments were performed for semen analysis⁽¹³⁾.

Microscopic examination was performed using an improved Neubauer hemocytometer and included sperms' morphology and motility, sperms count and other findings such as pus cells and red blood cells. The most appropriate liquefaction of the ejaculate was estimated and aliquots were withdrawn with a positive displacement pipette. Smears for morphology were air dried, fixed in 95% ethanol and stained with the Papanicolaou method^(12,15).

Anti-Mullerian hormone measurement: Anti-Mullerian hormone levels in seminal plasma were measured by ELISA method (DSL, Webster, TX, USA). In the assay, standards, controls, and serum samples were incubated in microtitration wells coated with anti-AMH antibody. After incubation and washing, the wells were treated with secondary anti-AMH detection antibody labeled with biotin. After a second incubation and washing step, the wells were incubated with streptavidin-horseradish peroxidase (HRP). After a third incubation and washing step, the wells were incubated with the substrate tetramethylbenzidine (TMB). An acidic stopping solution was then added and the degree of enzymatic turnover of the substrate was determined by dual wavelength absorbance measurement at 450 and 620 nm⁽¹⁴⁾.

RESULTS AND DISCUSSION

The determination of AMH levels in seminal plasma is an important tool for the accurate diagnostics and successful treatment of male fertility disorders.

Population Study: The total number of semen samples included in the study was 134 samples. Seventy samples were either azoospermic or had some abnormalities in activity while the remaining 64 samples were found to be normal in count and activity and used as controls.

Distribution of mean seminal plasma AMH levels according to age group of participants: According to semen analysis, study participants were divided into two categories (normospermic and those with abnormal sperms analysis) and according to their age, they were divided into 4 groups (Table 1). The results showed that, regardless of the age group, the mean levels of AMH in the seminal plasma of normospermic individuals were higher than those in the seminal plasma from individuals having an abnormality in sperms' count and/ or activity (Table 1). In terms of age group, individuals within the age groups 20-30 and 31-40 years were having higher mean seminal plasma levels of AMH than other age groups in both categories of individuals (Table 1). However, those from the 1st category (normospermic) had higher AMH levels than those from the 2nd category in the corresponding age groups (Table 1). These findings indicate that there is a kind of correlation between production of normal sperms and level of AMH in seminal plasma. Also, it seems that the latter decreases with advancement in age (Table 1).

Results of current study are consistent with those reported in another study⁽¹⁶⁾ that, in both genders, AMH levels decrease with age. The production of spermatozoa starts in the testes seminiferous tubules epithelium that contains Sertoli cells which produce AMH⁽¹⁷⁾. However, other studies showed a non-significant correlation between AMH production and age^(14,18).

Some physical and biochemical results: In terms of Liquefaction time, study samples were classified into 3 groups (Table 2). The results of current study showed that mean seminal plasma AMH level was higher in the 1st group (i.e. 30-45 minutes group). This indicates that the level of AMH decreases as the liquefaction time increases (Table 1).

These findings contrast those reported by⁽¹⁹⁾ who did not confirm the existence of such inverse relationship between AMH level in seminal plasma and liquefaction time of the latter. Despite that, the results reported in current study could be attributed to environmental factors.

Table 1: Mean seminal plasma AMH levels according to age groups of participants

Age Group/ Years	Total No.	AMH levels in normospermic individuals (Pmol/L) Mean \pm SD*	AMH levels in individuals with abnormal sperms analysis (Pmol/L) Mean \pm SD*	P value < 0.05
20-30	52	1.9 \pm 0.4	1.33 \pm 0.3	a
31-40	44	1.8 \pm 0.3	1.2 \pm 0.5	a
41-50	28	1.5 \pm 0.1	0.9 \pm 0.3	b
<50 Years	10	1.1 \pm 0.2	0.7 \pm 0.2	b
Total	134	64(47.8%)	70(52.2%)	
Mean \pm SD		1.575 \pm 0.3	1.03 \pm 0.2	

*: Standard Deviation.

The letters [a and b] need explanation. Also, the P values need to be mentioned: The different letters mean that there are significant differences between the averages of the totals. Similar letters mean that there is no significant difference between the averages.

Table 2: Mean seminal plasma AMH levels according to liquefaction time

Liquefaction time in minutes	No. of samples	AMH levels (Pmol/L) Mean \pm SD*	P value < 0.05
30-45 minutes	65	1.55 \pm 0.3	a
<45-65 minutes	60	1.43 \pm 0.3	b
<65 minutes	9	0.86 \pm 0.2	c
Total time in minutes	134	1.215 \pm 0.2	

*: Standard Deviation.

The letters [a and b] need explanation. Also, the P values need to be mentioned: The different letters mean that there are significant differences between the averages of the totals. Similar letters mean that there is no significant difference between the averages.

Table 3: Mean seminal plasma AMH levels according to semen analysis results

Semen analysis result	Total	AMH levels (Pmol/L) Mean \pm SD*	P value < 0.05
Azoospermia	25	0.81 \pm 0.2	a
Oligospermia	20	0.9 \pm 0.1	a
Asthenozoospermia	25	1.1 \pm 0.2	b
Normospermia	64	1.575 \pm 0.3	c
Total	134	1.215 \pm 0.2	

*: Standard Deviation.

The letters [a and b] need explanation. Also, the P values need to be mentioned: The different letters mean that there are significant differences between the averages of the totals. Similar letters mean that there is no significant difference between the averages.

Hormonal assay results: The present study showed significant differences in AMH levels in non-fertile men group (cases) as compared to healthy (normospermic) controls ($P < 0.05$; Table 3) and the mean AMH level for controls was higher than that for patients.

These findings are supported by those obtained by ⁽¹⁹⁾ who showed that mean AMH levels in normospermic men were significantly higher than those in azospermic ones. In addition, another study ⁽²⁰⁾ reported the existence of a positive correlation between AMH levels and sperm count. Moreover, ⁽¹⁸⁾ reported lower AMH levels in seminal plasma of azospermic (infertile) men as compared to normal (fertile) ones.

On the other hand, AMH may be successfully used for predictions of motile sperm recovery after semen cryopreservation ⁽¹¹⁾.

Although the relationship between AMH level in seminal plasma and spermatozoa count was concluded by ⁽¹³⁾, it had not been confirmed by ⁽²²⁾. The latter study stated that the mean AMH value was almost the same in the healthy group compared to the group with a decreased sperm count.

In present study, a significant decrease in seminal plasma AMH is associated with the absence of spermatozoa in the semen of azospermic men illuminating a handy correlation between AMH concentration and progress in spermatogenesis.

The presence of developmentally more progressive spermatogenic cells may increase AMH secretion that is related to specific stages of the seminiferous epithelium cycle ⁽²³⁾. In addition, AMH level appears to positively correlate with parameters of sperm quality such as sperm count and motility, and negatively with the percentage of damaged spermatozoa. Therefore, as a predictive value for outcomes of testicular sperm extraction, AMH had been further tested ^(18, 20, 24, 25).

Seminal AMH is also a good marker for assessments of recombinant FSH treatment in men with idiopathic infertility undergoing assisted reproduction cycles ⁽²⁶⁾. Moreover, the assay of seminal AMH may be considered as an implement for prediction of gonadotropin therapy outcome in hypogonadism, since its early increase may be a marker of good spermatogenic response ⁽⁹⁾.

CONCLUSION

Therefore, determination of AMH in seminal plasma is an important tool for accurate diagnosis, successful treatment and efficient monitoring of male fertility disorders. In addition, deficiency of AMH could be an important cause of male infertility.

Ethical Clearance: Obtained from Ethical Research Committee in the General Teaching Hospital in Ramadi city/ Al-Anbar governorate, Iraq.

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

REFERENCES

1. Sharlip ID, Jarow JP, Belker AM, Lipshultz LI, Sigman M, Thomas AJ, et al. Best practice policies for male infertility. *Fertil Steril.* 2002; 77(5): 873–82.
2. Ganong WF. *Review of Medical Physiology.* 18th edition; 1997. pp. 400-420.
3. Paris DB, Taggarat DA, Shaw G, Temple-Smith PD. *Reprod.* 2005; 130(3): 367-78.
4. Andrade-Rocha FT. Seminal Fructose Levels in Male Infertility Relationship with Sperm Characteristics. *Int Urol Nephrol.* 1999; 31: 107-11.
5. Thonneau P, Marchand S, Tallec A, Ferial ML, Ducot B, Lansac J, et al. Incidence and main causes of infertility in a resident population (1,850,000) of three French regions (1988-1989) *Hum Reprod.* 1991; 6(6): 811–6.
6. Andersson AM. Inhibin B in the assessment of seminiferous tubular function. *Baillieres Best Pract Res Clin Endocrinol Metab.* 200; 14(3): 389–97.
7. Rey R, Lukas-Croisier C, Lasala C, Bedecarras P. AMH/MIS: what we know already about the gene, the protein and its regulation. *Mol Cell Endocrinol.* 2003; 1(2): 21–31.
8. Alvaro Mercadal B, Imbert R, Demeestere I, Gervy C, DeLeener A, Englert Y, et al. AMH mutations with reduced in vitro bioactivity are related to premature ovarian insufficiency. *Hum Reprod.* 2005; 30: 1196-11202.
9. Sinisi AA, Esposito D, Maione L, Quinto MC, Visconti D, De Bellis A, Bellastella A, Conzo G. Seminal anti-Mullerian hormone level is a marker of spermatogenic response during long-term gonadotropin therapy in male hypogonadotropic hypogonadism. *Hum Reprod.* 2008; 5: 1029–1034.
10. Pankhurst MW and McLennan IS. Inhibin B and anti-Müllerian hormone/Mullerian-inhibiting

- substance may contribute to the male bias in autism. *Transl Psychiatry*. 2012; 2: e148.
11. Nery SF, Vieira MA, Dela Cruz C, Lobach VN, Del Puerto HL, Torres PB. Seminal plasma concentrations of anti-Mullerian hormone and inhibin B predict motile sperm recovery from cryopreserved semen in asthenozoospermic men: a prospective cohort study. *Andrology*. 2014; 2(6): 918–23.
 12. World Health Organization. WHO Manual for the Examination of Human Semen and Cervical mucus Interaction. Cambridge; 1999. Cambridge University Press.
 13. World Health Organization. Laboratory manual for the examination and processing of human semen. 5th edition; 2010. World Health Organization Department of Reproductive Health and Research.
 14. Taymour M, Medhat KA, Guirgis AM, Taha A, Wael SA, Dina E, Hosam HA. Seminal plasma anti-Mullerian hormone level correlates with semen parameters but does not predict success of testicular sperm extraction (TESE). *Asian J Androl*. 2007; 9(2): 265–270.
 15. Menkveld R, Kruger TF. Advantages of strict (Tygerberg) criteria for evaluation of sperm morphology. *Int J Androl*. 1995; Suppl 2: 36–42.
 16. Zec I, Tisljaric Medenjak D, Megla ZB and Kucak I. Anti-Mullerian hormone: a unique biochemical marker of gonadal development and fertility in humans. *Biochem Med*. 2011; 21: 219-230.
 17. Shaha C. Modulators of spermatogenic cell survival. *Soc Reprod Fertil*. 2007; Suppl 63: 173-186.
 18. Fujisawa M, Yamasaki T, Okada H, Kamidono S. The significance of anti Mullerian hormone concentration in seminal plasma for spermatogenesis. *Hum Reprod*. 2002; 17(4): 968–70.
 19. Soudabeh S, Ali M, Ardekani, Mahshid HT, Mohammad MA, Haleh S, Naser A, Niknam L, Mohammad RS. Comparing Seminal Plasma Biomarkers between Normospermic and Azoospermic Men. 2010; 11(1): 39–46.
 20. Duvilla E, Lejeune H, Trombert-Paviot B, Gentil-Perret A, Tostain J, Levy R. Significance of inhibin B and anti-Mullerian hormone in seminal plasma: a preliminary study. *Fertil Steril*. 2008; 89(2): 444–8.
 21. Goulis DG, Iliadou PK, Tsametiis C, Gerou S, Tarlatzis BC, Bontis I.N, et al. Serum anti-Mullerian hormone levels differentiate control from subfertile men but not men with different causes of subfertility. *Gynecol Endocrinol*. 2008; 24: 158-160.
 22. Radek KZ, Ulcova GJ, Windrichova PL and Ondrej T. Anti-Mullerian hormone in serum and seminal plasma in comparison with other male fertility parameters. *Journal Systems Biology in Reproductive Medicine*. 2016; 62(3).
 23. Baarends WM, Hoogerbrugge JW, Post M, Visser JA, De Rooij DG, Parvinen M. Anti-mullerian hormone and anti-müllerian hormone type II receptor messenger ribonucleic acid expression during postnatal testis development and in the adult testis of the rat. *Endocrinology*. 1995; 136(12): 5614–22.
 24. Mitchell V, Boitrelle F, Pigny P, Robin G, Marchetti C, Marcelli F. Seminal plasma levels of anti-Mullerian hormone and inhibin B are not predictive of testicular sperm retrieval in nonobstructive azoospermia: a study of 139 men. *Fertil Steril*. 2010; 94(6): 2147–50.
 25. Kucera R, Ulcova-Gallova Z, Windrichova J, Losan P, Topolcan O. AntiMullerian hormone in serum and seminal plasma in comparison with other male fertility parameters. *Syst Biol Reprod Med*. 2016; 62(3): 223–6.
 26. Caprio F, De Franciscis P, Trotta C, Ianniello R, Mele D, Colacurci N. Seminal anti-Mullerian hormone levels during recombinant human follicle-stimulating hormone treatment in men with idiopathic infertility undergoing assisted reproduction cycles. *Andrology*. 2015; 3(5): 843–7.

Association of miR-499 Gene Polymorphism with Some Hormones in type 2 Diabetes Mellitus Patients

Israa Harjan Mohsen¹, Haider Kamil Zaidan², Ishtar Munim Nassir³, Ali Hmood Al-Saadi¹,
Mona N. Al-Terehi¹, Methaq J. Al-Jboori⁴

¹College of Sciences/University of Babylon/Iraq, ²Embassy of the republic of Iraq cultural Attaché/ Amman/Jordan, ³Babylon Health Directorate/Iraq, ⁴College of Science- Al-Mustansiriyah University/Iraq

ABSTRACT

The genetic analysis of PCR-RFLP technique determined the genotype of miR-499 gene, which found that the homozygote (AA) pattern was significantly higher in patients than in control group. On the other hand, the statistical analysis for the role of microRNAs genes in the hormones and physiological parameters above found that the homozygote (AA) pattern of miR-499 gene show more effects in changes of parameters (cortisol, testosterone, estradiol, insulin, glucagon, Fasting Blood Glucose (FBG), insulin resistance, insulin sensitivity, microalbuminuria, systolic and diastolic pressure).

Conclusions: polymorphisms in miR-499 mediated diabetic cardiomyopathy.

Key words: T2DM, microRNA, miR-499, Polymorphism, RFLP technique, agarose-gel electrophoresis

INTRODUCTION

The changing life style in developing countries, led to rapid changes in globalization, urbanization and industrialization which had opened new ways for successful life, but from other ways it is going together with reduced physical activity and excess of metabolic disorders [1]. One of these danger disorders is Type 2 Diabetes Mellitus (T2DM). It is characterized by insulin deficiency that resulted from dysfunction of pancreatic β -cells with decline in its mass, hyperglycemia and insulin resistance. Important causes of T2DM include interaction between environmental and genetic factors [2, 3], The accumulation of polluting organic substances and chemical agents resulting in formation of amyloid fibers in pancreatic β -cells, thus, participate in T2DM pathology [4,5,6]. About 90% of all diabetic cases resulted from complex interplay between genetic, epigenetic and environmental factors. Identification of the genetic factors has been a challenge because the major environmental factors, diet and activity level, are well known [7,8]. T2DM pathophysiological process is complex where disorganization of gene expression is predicted and this will lead to discompose of variable physiological processes in tissues which contribute to glucose homeostasis [9,12].

The aim of current study was to investigate microRNA gene polymorphism and its role in T2DM and its complications.

MATERIALS AND METHOD

Participants: The study involved 80 patients (both males and females) suffering from type 2 diabetes mellitus with a duration ranged from 1-20 years, yet without any complications. They were selected from AL-Sader Teaching Hospital, Iraq. Their controls were 40 normal healthy subjects. Informed consents were obtained from all participants prior to study.

Blood samples (5 ml) were obtained from participants by venipuncture using disposable syringes in sitting position and allowed to clot in gel-containing tubes at room temperature for 10-15 minutes. Then, blood samples were centrifuged at $2000 \times g$ for approximately 10-15 minutes then the sera were obtained and stored at -20°C until analysis (hormonal assayed).

Urine samples were collected early in the morning from patients and control groups in special container for this purpose and the test was conducted as soon as possible. The COMBINA 13 Strips kit was used to determine microalbuminuria levels in urine. It is based on the "protein error" principle of the indicator which is

caused by the presence of albumin. Sulfonephthalein has a high sensitivity for albumin^[13].

Measurement of arterial blood pressure two times, 5 minutes apart, for each patient in the sitting position by using Mercury sphygmomanometer and average blood pressure was calculated for each participant.

Determination of fasting blood glucose (FBG): The RanDox kit was used to determine serum Glucose levels. It is based on the PAP enzymatic determination of glucose^[14].

Hormonal assay: Hormones such as Cortisol, Testosterone, Estradiol, Glucagon and Insulin were assayed using the Monobind ELISA Kit, which was based on standard sandwich enzyme-linked immunosorbent assay technology.

Determination of insulin resistance and insulin sensitivity: Insulin resistance is evaluated by determination of homeostasis model assessment of insulin resistance (HOMA-IR)^[15,16] and calculated by using the following equation:

$$IR_{HOMA} = (I_0 \times G_0) / 22.5$$

Where: IR_{HOMA} is insulin resistance according to homeostasis model assessment.

I₀: Fasting insulin level.

G₀: Fasting glucose level.

The **quantitative insulin sensitivity check index (QUICKI)** is derived using the inverse of the sum of the logarithms of the fasting insulin and fasting glucose^[17]

$$1/(\log(\text{fasting insulin } \mu\text{U/mL}) + \log(\text{fasting glucose mg/dL}))$$

DNA Extraction and genotyping: Genomic DNA was extracted from white blood cells (WBCs) for both diabetes and control groups using (Geneaid) DNA extraction kit. The selected miRNA gene (miR-499 (rs3746444 G-A) F:5'-CGGCTGTTAAGACTTGCAGTG-3'; R: 5'-TCCAGTCTTCCAAGCTTCA-3' was amplified by PCR with annealing temperature 55.3 and analyzed by PCR-RFLP technique using *HindIII* enzyme^[18].

Statistical analysis: All statistical analysis was performed by using SPSS 17 version. Data were expressed as (mean±SD). Comparisons among groups were performed using *t*-test, ANOVA and Pearson correlation analyses^[19]. Statistical significance of data was tested at P ≤0.05.

RESULTS

Demographic criteria of participants: Results of current study revealed that the majority of patients with diabetic were females (67.5%), 87.5% of them were not employed and 81.25% were urban residents. There are significant association between patients and controls regarding occupation and existence of CVD, nephropathy and hypertension. However, there was no significant association between patients and controls regarding gender, residence and family history of T2DM (Table 1).

Table 1: Demographic criteria of participants

Variable	Patients No. (%)	Control No. (%)	Odds ratio	95%CI	P-value
Gender					
Male	26 (32.5%)	16 (40%)	0.705	0.39–1.26	0.23
Female	54 (67.5%)	24 (60%)			
Residence					
Urban	65(81.25%)	29(72.5%)	1.65	0.85–3.21	0.135
Rural	15 (18.75%)	11 (27.5%)			
Occupation					
Employee	10 (12.5%)	23(57.5%)	0.108	0.053–0.219	< 0.0001*
Not employed	70 (87.5%)	17(42.5%)			
Family history					
Present	67 (83.75%)	30 (75%)	0.175	0.86–3.52	0.117
Absent	13(16.25%)	10(25%)			

Conted...

CVD					
Yes	19 (23.75%)	0 (0%)			0.023*
No	61 (76.25%)	40 (100%)			
Nephropathy					
Yes	16 (20%)	0 (0%)			0.036*
No	64 (80%)	40 (100%)			
Hypertension					
Yes	22 (27.5%)	0 (0%)			0.016*
No	58 (72.5%)	40 (100%)			

Genetic results: The results of present study show that the DNA has (50-200) ng and purity (1.7-2.2) as shown in Figures 1, 2, 3.

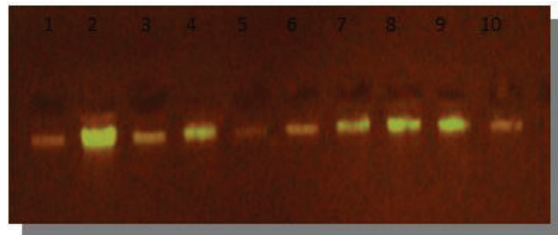


Figure 1: Agarose-gel electrophoresis pattern of DNA extracted from blood of patients (lane 1-5) with T2DM and controls (lane 6-10)

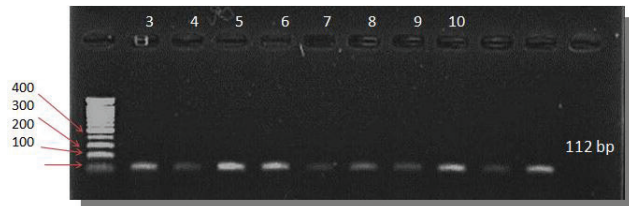


Figure 2: Agarose-gel electrophoresis pattern of PCR product for MIR-499 gene, this amplification product one band 112 bp for both patients (lane 1-5) and controls (lane 6-10)

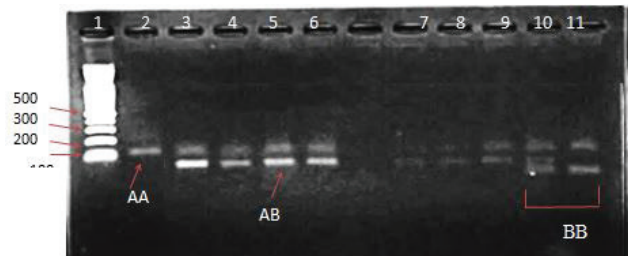


Figure 3: Agarose-gel electrophoresis pattern of RFLP-PCR for PCR product (112bp) with restriction enzyme HindIII. Lane1: DNA ladder 100bp, Lane 2 is showing homozygote type (AA) genotype, Lanes 3,4,5,6,7 and 8 are showing heterozygote type (AB) genotype, Lanes 9,10 and 11 are showing heterozygote type (BB) genotype

The genotype distribution of MIR-499 gene polymorphism in patients and control: The homozygote pattern AA was more frequent in patients with T2DM (84%) than control group with odd ratio (12.2500) as shown in Table 2.

Table 2: The genotype distribution of MIR-499 gene polymorphism in patients with T2DM and their controls

AA	84	30	12.2500	6.1772-24.2931	< 0.0001	Patients	Control
AB	16	50	6.000	0.742-48.4923	0.0928	A (0.92)	A(0.55)
BB	0	20		Reference group		B (0.08)	B(0.45)

Role of MIR-499 in some hormonal and physiological parameters levels rate in type 2 diabetic patients and control subjects: Statistical analysis of data from this study revealed the presence of significant differences ($P \leq 0.05$) between patients and control groups in all parameters. According to pattern of MIR-499 genotype, the statistical analysis showed the presence of significant differences in

cortisol, testosterone, estradiol, FBG, microalbuminuria, systolic and diastolic pressure in patients with T2DM who have pattern (AA) when compared with patients who have pattern (AB). On the other hand, according to genders there were significant differences in testosterone and microalbuminuria between males and females when compared with each other.

In the control group, the statistical analysis indicated the presence of significant differences in estradiol levels in control subjects who have pattern (AA) when compared with subjects who have pattern (BB) while there were non-significant differences with subjects who have pattern (AB).

t-test at $P \leq 0.05$. * Standard Deviation.

DISCUSSION

The genetic analysis of PCR-RFLP technique was chosen in present study because it is fast and cost-effective compared with other techniques and it gives an indicator about polymorphisms of genes so that it is documented and dependent in researches. The present study is the first study in Iraq and its one of the important studies in the world that dealt with microRNA gene polymorphism and its role in T2DM and its complications.

The statistical analysis of RFLP results for miR-499 showed that the pattern AA was more frequent in diabetic patients when compared with control group (Table 2).

Several previous studies indicated that dysregulation in the expression of microRNAs such as miR-196a2 and miR-499 were associated with several pathological disease such as cerebral ischemia as well as elevated blood pressure, BMI, insulin resistance and triglycerides [20,21,22] while study of Huang et al. [23] found that expression of miR-146a with genotype G allele increased the risk of ischemic stroke and this state was associated with effects on fasting glucose and LDL levels. These findings are in agreement with those obtained from current study which showed that FBG, insulin resistance, systolic and diastolic pressure are elevated in patients who have different polymorphisms in microRNAs genes' patterns as shown in Figures 1, 2 and 3.

On the other hand, several previous studies suggested the use of microRNAs as biomarker for diseases where it has been found that miR-499 down-regulation mediated diabetic cardiomyopathy and suggested that hyperglycemia induced miR-499 down-regulation and this was dependent on oxidative stress [24-26]. Other study [27] indicated the presence of an association between miR-499 and insulin resistance by its effect on its target gene PTEN which resulted in blocking of insulin signaling pathway by dephosphorylation of PI3K. The study of Wang and colleagues [28] found that the correlation

between miR-499 and PTEN was negative and glycogen content as well as insulin sensitivity were reduced with inhibition of miR-499. This resulted in insulin resistance and progression of T2DM.

Ethical Clearance: Obtained from Ethical Research Committee in AL-Sader Teaching Hospital.

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

REFERENCES

1. Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Res Clin Pract.* 2010; 87(1): 4-14.
2. Guja C, Gugniuc P and Ionescu-Tirgoviste C. Genetic factors involved in the pathogenesis of type 2 diabetes. *Medicine .Proc.Rom.Acad.* 2012; Series B (1): 44-61.
3. Al-Terehi M, Hasan A, Muhammed H, Mohsen I, Al-Saadi A, Zaidan H, Al-Kiam Z. Polymorphisms of Glutathione-S-Transferase M1 and T1 Genes in Breast Cancer Tissue in Iraqi patients. *JCPS.* 2016; 9(4): 2911-2914.
4. Sciacca MF, Milardi D, Messina GM, Marletta G, Brender JR, Ramamoorthy A, LaRosa C. Cations as switches of amyloid-mediated membrane disruption mechanisms: calcium and IAPP. *Biophys J.* 2013; 104: 173-184.
5. Audouze K, Brunak S, Grandjean P. A computational approach to chemical etiologies of diabetes. *Sci Rep.* 2013; 3: 12-27.
6. Mohsen IH, Zaidan HK, Al-Saadi AH. Interaction of Insulin Hormone with Microalbuminuria and Blood Pressure in Type 2 Diabetic Patients. *Journal of Babylon University/Pure and Applied Sciences.* 2016; 5(24).
7. Franks PW, Pearson E, Florez JC. Gene-environment and gene-treatment interactions in type2 diabetes: Progress, pitfalls, and prospects. *Diabetes Care.* 2013; 36: 1413-1421.
8. Mohsen IH, Zaidan HK, Al-Saadi, A.H. Estimation of sex hormones in type 2 diabetes patients. 2016; 9(06): 476-487.

9. Das SK, Sharma N K. Expression quantitative trait analyses to identify causal genetic variants for type 2 diabetes susceptibility. *World J Diabetes*. 2014; 5: 97–114.
10. Al-Terehi M, Ghaleb R, Al-Oubaidy SH, Al-Saadi A, Zaidan H. Study *TNF- α* gene polymorphism in Type 1 Diabetic Patients Using ARMS technique *Journal of Chemical and Pharmaceutical Science CPS*. 2016; 9(3): 1107-1111.
11. Sebastiani G, Vendrame F, Dotta F. MicroRNAs as new tools for exploring type-1 diabetes:relevance for immunomodulation and transplantation therapy. *Transplantation Proceedings*. 2011; 43: 330-332.
12. Fernandez-Valverde SL, Taft RJ, Mattick JS. MicroRNAs in β -Cell Biology, Insulin Resistance, Diabetes and Its Complications. *Diabetes*. 2011; 60(7): 1825-1831.
13. Thomas L. *Labor and Diagnose*, 17thed. 2008. TH-Books.
14. Barham D, Trinder P. *Analyst*. 1972; 97-142.
15. Mathews D, Hosker J, Naylor B. Insulin resistance and beta-cell functioning from fasting plasma glucose and insulin concentration in man. *Diabetologia*. 1985; 28: 412-419.
16. Stumvoll M, Gerich J. Clinical features of insulin resistance and beta cell dysfunction and the relationship to type 2 diabetes. *Clin Lab Med*. 2011; 21: 31–51.
17. Katz A, Nambi SS, Mather K, Baron AD, Follmann DA, Sullivan G, Quon MJ. Quantitative insulin sensitivity check index: a simple, accurate method for assessing insulin sensitivity in humans. *J ClinEndocrinolMetab*. 2000; 85(7): 2402-10.
18. Sambrook J, Russell DW. *Molecular cloning. A laboratory manual*. 3rd edition; 2001. Cold Spring Harbor, New York.
19. Al-Mashhadni M, Al-Mashhadni K. *Experimental design and analysis* .Baghdad university. 1989; 63.
20. Wessel J, Moratorio G, Rao F, Mahata M, Zhang L. C-reactive protein, an ‘intermediate phenotype’ for inflammation: human twin studies reveal heritability, association with blood pressure and the metabolic syndrome, and the influence of common polymorphism at catecholaminergic/ beta-adrenergic pathway loci. *J Hypertens*. 2007; 25: 329–343.
21. Luthra R, Singh RR, Luthra MG, Li YX and Hannah C. MicroRNA-196a targets annexin A1: a microRNA-mediated mechanism of annexin A1 down-regulation in cancers. *Oncogene*. 2008; 27: 6667–6678.
22. Tsai NW, Lee LH, Huang CR, Chang WN and Chen SD. The association of statin therapy and high-sensitivity C-reactive protein level for predicting clinical outcome in acute non-cardioembolic ischemic stroke. *ClinChimActa*. 2012; 413: 1861–1865.
23. Huang S, Zhou S, Zhang Y, Lv Z, Li S, Xie,C, Ke Y, Deng Y, Geng Y, Zhang Q, Chu Q, Yi, Z, Zhang Y, Wu T, ,Cheng J. Association of the Genetic Polymorphisms in Pre-MicroRNAs with Risk of Ischemic Stroke in a Chinese Population. *PLOS*. 2015; 10: 1371-1470.
24. Shantikumar S, Caporali A and Emanuelli C. Role of microRNAs in diabetes and its cardiovascular complications. *Cardiovasc. Res*. 2012; 93(10): 583–593.
25. Asrih M, Steffens S. Emerging role of epigenetics and miRNA in diabetic cardiomyopathy. *Cardiovasc. Pathol*. 2013; 22: 117–125.
26. Yildirim SS, Akman D, Catalucci D and Turan B. Relationship between downregulation of miRNAs and increase of oxidative stress in the development of diabetic cardiac dysfunction: junctin as a target protein of miR-1. *Cell Biochem. Biophys*. 2013; 67: 397–1408.
27. Peyrou M, Bourgoin L, Poher AL, Altirriba J, Maeder C, Caillon A, Fournier M, Montet X, Rohner-Jeanrenaud F, Foti M. Hepatic PTEN deficiency improves muscle insulin sensitivity and decreases adiposity in mice. *J Hepatol*. 2015; 62: 421-429.
28. Wang L, Zhang N, Pan H, Wang Z and Cao Z. MiR-499-5p Contributes to Hepatic Insulin Resistance by Suppressing PTEN. *Cell Physiol Biochem*. 2015; 36: 2357-2365.

Outcome of Celiac Disease after Two Years of Gluten-Free Diet

Abbas Mohammed Hussein Al-Shebani

Department of Pediatrics, College of Medicine/AL-Qadisiyah University, Iraq

ABSTRACT

Background: Celiac Disease (CD) is one of the most common diseases of gastrointestinal tract (GIT) and presents clinically with a wide range of GIT and non-GIT manifestations. In addition, the diagnosis of CD depends on clinical features with presence of anti-CD antibodies and the presence of specific histological changes on small bowel biopsy.

Aim of study: To evaluate the role of anti-CD antibodies in follow up of patients with CD and to study the rate of relapse in CD symptoms after re-introducing gluten after 2 years of gluten-free diet.

Method: This study done in Al-diwanayah maternity and children hospital in the period from 1st of February 2014 until the 1st of July 2017 and involved sixty three patients diagnosed as having CD depending on clinical features and the presence of positive anti-CD antibodies (anti-gliadin and anti tissue glutaminase). Then all these patients were referred to GIT center for small bowel biopsy. If the classical histological findings were present in the biopsy, then the patient involved in the study. Five patients refused to do biopsy, so 58 patients were involved in this study and full instructions about the diet of the patient were discussed with their families. Also, mobile phone No. was obtained from each caregiver for follow up every three months with full history, examination and measurements of auto-antibodies. After 2 years another small bowel biopsy done for all patients included in the study.

Results: Forty nine patients (96%) have normal biopsy and 2 (3.9%) still have abnormal changes in bowel mucosa. These 2 patient were excluded from the study and the other 49 patients reintroduced gluten in their diet gradually with close observation for relapse of symptoms and for detection of any complications. After three months of gluten-containing diet, a third biopsy was done. Forty one (83%) patient had recurrence of signs and symptoms of celiac disease and have abnormal biopsy findings so they were kept on gluten-free diet for life. Eight patients (16%) did not develop any signs and symptoms and they still have normal biopsy in spite of receiving gluten-containing diet for the last three months.

Conclusion: Anti-CD antibodies have a valuable role in follow-up of patients on gluten-free diet and sixteen percent of patient may have complete cure and complete normalization of bowel mucosa even after re-introducing gluten-containing diet.

Keywords: celiac disease, gluten-free diet, ELIZA, auto-antibodies.

INTRODUCTION

Celiac disease is an immune-mediated systemic disorder elicited by gluten and related prolamines in genetically susceptible individuals and characterized by presence of a variable combination of gluten-dependent clinical manifestations, celiac disease-specific antibodies, HLA-DQ2, DQ8 haplotypes and enteropathy [1]. Celiac disease-specific antibodies comprise auto-antibodies against TG2, including endomysial antibodies (EMA)

and antibodies against deamidated forms of gliadin peptides. Celiac disease is triggered by the ingestion of wheat gluten and related prolamines from rye and barley. In most studies oats proved to be safe, however, few celiac disease patients have oats prolamine reactive mucosal T cells that can cause mucosal inflammation. Celiac disease is a common disorder (1% prevalence of biopsy-proven disease). Environmental factors might affect development of celiac disease or the timing of its presentation [1].

There are numerous studies demonstrating that children with CD have gastrointestinal (GI) symptoms such as diarrhea with failure to thrive (FTT), abdominal pain, vomiting, constipation and abdominal distension, but there is little information currently available about the prevalence of CD in children with these GI-specific symptoms. Limited data suggest that the prevalence of CD may be increased 2–10 times in children with some of these GI symptoms or occur in up to 5% of cases [2].

Celiac disease is associated with major histocompatibility complex class II genes and the alleles encoding the human leukocyte antigen molecules (HLA)-DQ2 and HLA-DQ8. Almost all patients with celiac disease carry these HLA alleles [3].

Although other environmental factors ('second hits') in addition to gluten may be involved in triggering celiac disease, the disease goes into remission when gluten is removed from diet. This suggests that gluten is a major player in the pathogenesis of the disease. Gluten-containing cereal prolamines, such as gliadin in wheat, secalin in rye and hordein in barley, have a high number of repetitive glutamine and proline-rich sequences, making them highly resistant to proteolytic degradation by human gastric, pancreatic and intestinal brush-border enzymes, even in healthy individuals [4,5].

Such proteolytic resistance results in the persistence of relatively large peptides, which are thought to activate the small bowel mucosal immune system, thereby leading to the development of celiac disease. Under normal physiological conditions intestinal epithelium is fairly impermeable to long peptides such as wheat-derived gliadin peptides. However, in untreated celiac disease, the epithelial barrier function is compromised, and gliadin peptides gain access across the epithelial layer [6].

Studies performed with small bowel biopsy organ cultures and different *in vitro* cell cultures support the idea that gluten can activate the innate immunity mechanisms. This activation is thought to be mediated by toxic gluten-derived gliadin peptides (the α -gliadin peptide 31–43), which eventually results in intestinal epithelial cell damage [1, 7]. However, a different set of gliadin peptides, the so-called immunogenic peptides, activate the adaptive immune response. First, these peptides are post-translationally modified by a ubiquitously expressed multifunctional enzyme, transglutaminase (TG) 2, which catalyzes the deamidation of distinct glutamine amino acids to glutamic acid residues [2,8]. Such deamidation greatly enhances the ability of the peptides to bind to HLA- DQ2 which thereby potentiates celiac patient

T-cell stimulation [2,9]. As a result, pro-inflammatory cytokines are secreted during small-bowel mucosal tissue remodeling and damage, which is characterized by villous atrophy, crypt hyperplasia and inflammation.

The gold standard in diagnosing celiac disease is the presence of histological changes in small bowel mucosal biopsies. In other words, villous atrophy, crypt hyperplasia and profound inflammation characterize celiac disease. However, because of the multifaceted nature of the disease, clinicians have long used various serum-based antibody tests in case finding before proceeding to diagnostic upper gastrointestinal endoscopies with multiple small bowel mucosal biopsies. Among the first serum-based antibody tests applied in celiac disease are the anti-gliadin antibody (AGA) assays.

Currently, these tests are no longer used as diagnostic aids because their sensitivities and specificities are fairly poor [10]. In addition, individuals suffering from gastrointestinal conditions other than celiac disease and healthy individuals without celiac-type genetics have been reported to have elevated AGA levels [11].

The problems with the AGA tests were overcome by the advent of the gluten-dependent IgA-class R1-type reticulon (ARA) and endomysial auto-antibody (EMA) tests [12,13]. These tests are based on indirect immunofluorescence using rodent (ARA) or primate (EMA) tissues as antigens. In most studies, their sensitivities and specificities are both reported to be above 90%, though these tissue-based autoantibody tests are often subjective and laboratory dependent. It has been suggested that symptomatic patients, both children and adults, could be diagnosed based on a positive serum EMA finding [14,15].

In 1997, Dieterich and co-workers [19] identified TG2 as the auto-antigen for celiac disease. As various TG2-based enzyme-linked immunosorbent assays (ELISA) became available, a new era in celiac disease case finding by serology began [12,16]. Thereafter, it was shown that TG2 was also the specific protein antigen in the ARA and EMA tests [17] indicating that the above-mentioned three tests in fact do measure the same auto-antibodies. Currently, TG2 ELISA tests are widely used in diagnostic workup of celiac disease [15]. However, it is important to bear in mind that the performance of the commercial ELISA TG2- antibody assays may vary depending on the quality of the TG2 antigen and thus, may yield false-positive and false-negative results [10,18,19].

Therefore, the EMA test appears to hold its place as the gold standard celiac disease-specific antibody test. The superiority of the EMA test in celiac disease diagnosis is also supported by a high concordance between EMA positivity and the presence of the celiac-type HLA-DQ2 or -DQ8 which is not always seen with TG2 ELISA seropositivity [14,20].

Furthermore, the compromised specificity of the TG2 ELISA and the high specificity and sensitivity of the EMA tests suggest that the epitope in the EMA test is somehow specific for celiac disease auto-antibodies.

In totally asymptomatic persons belonging to high-risk groups, celiac disease should always be diagnosed using duodenal biopsies. When biopsies are indicated at least 4 fragments should be obtained from the descending part of the duodenum and at least 1 from the duodenal bulb. The diagnosis is confirmed by an antibody decline and preferably a clinical response to a gluten-free diet. Gluten challenge and repetitive biopsies will only be necessary in selected cases in which diagnostic uncertainty remains. It is important that an experienced dietician with specific expertise celiac disease counseling educates the family and the child about dietary restriction. Compliance with a gluten-free diet can be difficult, especially in adolescents. It is recommended that children with celiac disease be monitored with periodic visits for assessment of symptoms, growth, physical examination, adherence to the gluten-free diet and periodic measurements of TG2 antibody levels to document reduction. It is likely that in very rare cases a milder phenotype may allow slow weaning from parenteral nutrition allowing the patient to reach young adulthood and enjoy partial oral feeding.

Aim of study: To evaluate the role of anti-CD antibodies in follow-up of patients with CD and study the rate of relapse of CD symptoms after re-introducing gluten after 2 years of gluten free diet.

PATIENTS AND METHOD

This study done in AL-Dywaniah maternity and children hospital in the period from

1st of February, 2014 until the 1st of July, 2017 and involved sixty three patients diagnose d as having CD depending on clinical features and the presence of positive anti-CD antibodies (anti-gliadin and antitissue glutaminase) the result of enzyme were as the following:

Normal range < 12 U/ml Equivocal range 12-18 U/ml Positive result> 18 U/ml

From each patient five milliliters of venous blood were drawn and sent to the lab where Enzyme-Linked Immunosorbent assay (ELIZA) were used for detection and measurement of auto-antibodies (anti- gliadin IgA, IgG and anti-tTG IgA,IgG,) (Aesku Diagnostics Microform ring 2. 55234 Wendelsheim Germany) were used in this work.

Then all these patients referred to GIT center for small bowel biopsy, if the classical histological finding were present in the biopsy, then the patient involved in this study five patients refused to do biopsy, so 58 patients were involved in this study and full instructions about the diet of the patient were discussed with their families. Also, mobile phone No. was obtained from each caregiver for follow up every three months with full history, examination and measurements of auto-antibodies.

After 3 months, 7 patients were excluded (3 lost follow up and 4 did not keep on gluten-free diet) so only 51 patient were included, anti-CD antibodies were measured every three months (after 3, 6,9 and 12 months following introduction of gluten-free diet).

RESULT

The levels of anti-CD antibodies are presented in Table 1.

Table 1: Levels of anti-CD antibodies obtained every three month following gluten-free diet

Time of enzyme assay	No. of patients with normal enzyme levels	No. of patients with abnormal enzyme levels
Before gluten-free diet	-----	-----
After 3 month	22	29
After 6 months	14	15
After 9 months	10	5
After 12 months	2	3

[It was of great importance to include enzyme levels before introduction of gluten-free diet to evaluate its effects on disease activity].

The patients continued visiting GIT clinic every three months with full history, examination and assessment of body weight and height.

After 2 years another small bowel biopsy was done for all patients included in the study and the results are presented in Table 2.

Table 2: Biopsy results after 2 years of gluten-free diet

Time of biopsy	No. of patients	Normal Biopsy No. (%)	Abnormal Biopsy No. (%)
After 2 years (2 nd biopsy)	51	49 (96)	2 (3.9)
After 3 month (3 rd biopsy)	49	8 (16.3)	41 (83.6)

The results revealed that 49 patients (96%) have normal biopsy and 2 (3.9%) still have abnormal changes in bowel mucosa. After that, two patients were excluded from the study and the other 49 patients re-introduced gluten in their diet gradually with close observation for relapse of symptoms and for detection of any complications. Three months later, another biopsy was performed for the 49 patients and the results revealed that 41 (83%) patients had recurrence of signs and symptoms of celiac disease and had abnormal biopsy findings so kept on gluten-free diet for life. In addition, 8 patients (16%) did not develop any signs and symptoms and they still have normal biopsy in spite of receiving gluten-containing diet for the last three months.

Anti-CD antibodies also done for those eight patients every three months and they still have normal enzyme levels for additional 12 months.

DISCUSSION

Regarding CD, there is concern of the possibility of contamination of oats with gluten during harvesting, milling and shipping. Nevertheless, it seems wise to add oats to the gluten-free diet only when the latter is well established so that possible adverse reactions can be readily identified. There is a consensus that all celiac disease patients should be treated with a gluten-free diet regardless of presence of symptoms. However, whereas it is relatively easy to assess the health improvement after treatment of celiac disease in patients with clinical

symptoms of the disease, it was proved difficult in persons with asymptomatic celiac disease. The nutritional risks, particularly osteopenia, are those mainly feared for subjects who have silent celiac disease and continue on a gluten-containing diet. Little is known about the health risks in untreated patients with minor enteropathy, which may be clinically silent. There are no guidelines concerning the need for a gluten-free diet in subjects with “potential” celiac disease (patients with positive celiac disease-associated serology but without enteropathy).

The Codex Alimentarius Guidelines [Ref] define gluten-free as <20 ppm, but analytical methods for gluten detection have already reached a satisfactory degree of sensitivity, yet more information is needed on the daily gluten amount that may be tolerated by celiac disease patients. The data available so far seem to suggest that the threshold should be set to <50 mg/day although individual variability makes it difficult to set a universal threshold.

New guidelines on the diagnosis and treatment of celiac disease by the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition [Ref] state that tTG-IgA testing should be used for follow-up care. Interpreting this test results is straightforward in patients having CD on gluten-free diet for at least several months whom should have a negative test. The numerical value of the test is not important. Follow-up is very important because most patients with celiac disease get better symptomatically with therapy, they may not realize the need for follow-up. This view may be shared by some of their health care givers. Hence, not all patients with celiac disease get regular follow-up care. Follow-up is necessary not only to assess symptomatic recovery and to monitor complications but also to assist the patient in adhering to the diet. Follow-up care is the corner stone to dietary compliance [21].

Our study clarified that antibodies measurements in CD patients are useful in clinical practice. Serial measurements of antibodies can allow objective targeting of dietetic resources. Our study is unique in that it highlighted the benefits of measuring serial antibodies levels over several months in a routine clinical setting. These results agree with previous work by Burgin-Wolff et al. [22] who showed a clear rise in antibodies concentration following a gluten challenge in patients with controlled CD. Similarly, the finding of this study, that antibodies levels fall dramatically in the initial few

months after starting gluten-free diet, confirms and supports serial observations of previous studies [23,24].

The present study indicates how serial antibody measurements are able to provide unique information to target dietetic resources. This study has demonstrated that complications of CD are most commonly seen in those with persistently elevated antibodies [25].

Our study disagrees with study done in Department of Pediatrics, Medical University Vienna, by Edith Vécsei et al. [26] this study demonstrated the limited value of serologic testing in the follow-up of pediatric CD with respect to the mucosal status. Only the normalization of EMA indicates mucosal healing with acceptable accuracy. Human recombinant tTG-based ELISA is a sensitive, specific and reproducible test to support the diagnosis and follow-up of childhood celiac disease and can be used as an alternative to the EMA test [27].

Our study also supported by a study in France [28] showed that deamidated gliadin antibodies are strongly related with villous atrophy and must be considered valuable tools in CD follow-up and that multiplex serologic analysis for treated CD represents a promising tool for personalized patient management.

In this study the result of small bowel biopsy was abnormal at the time of diagnosis and after 2 years of gluten-free diet, 49 patients had normal mucosa and this support the diagnosis of CD. These patients given gluten-containing diet for three months and a 2nd biopsy was done, forty one patients had abnormal biopsy and kept on gluten-free diet for life and this result supported by many other result around the world [29].

Eight patients still have normal biopsy results and normal enzyme levels even after one year from taking gluten-containing diet so they may have complete cure and do not need further biopsies or enzyme assay, but this result not supported or agreed by any other study.

CONCLUSION

Celiac disease is one of the most common GIT diseases whose diagnosis depends mainly on clinical features, assessment of anti-CD antibodies and small bowel biopsy. In addition, Anti-CD antibodies have a valuable role in follow-up patients on gluten-free diet. On the other hand, 16% of patients may have complete cure and complete normalization of bowel mucosa even after re-introducing gluten-containing diet.

Ethical Clearance: It was obtained from Ethics Committee in AL-Diwanyiah Maternity and Children Hospital.

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

REFERENCES

1. Bonamico M, Tiberti C. Radioimmunoassay to detect antitransglutaminase autoantibodies is the most sensitive and specific screening method for celiac disease. *The American Journal of Gastroenterology*. 2001; 96: 1535-1540.
2. Bu'rk K, Bösch S, Müller CA, et al. Sporadic cerebellar ataxia associated with gluten sensitivity. *Brain*. 2001; 124: 1013–1019.
3. Zanchi C, Di Leo G, Ronfani L, et al. Bone metabolism in celiac disease. *J Pediatr*. 2008; 153: 262–265.
4. Muller AF, Donnelly MT, Sixth Neurological Complications Of Celiac Disease: A Rare but Continuing Problem. *American Journal of Gasroenterology*. 2016.
5. Hadjivassiliou M, Sanders DS, Grunewald RA, Woodroffe N, Boscolo S, Aeschlimann D. Gluten sensitivity: from gut to brain. *Lancet Neurol*. 2010; 9: 330–318.
6. Lindfors K, Koskinen O, Laurila K, Collin P, Saavalainen P, Haimila . K et al. IgA-class autoantibodies against neuronal transglutaminase, TG6 in celiac disease: no evidence for gluten dependency. *Clin Chem Acta*. 2010; 9: 740–744.
7. Abele M, Bu'rk K, Schöls L, et al. The aetiology of sporadic adult-onset ataxia. *Brain*. 2002;125: 961–968.
8. Catassi C. The world map of celiac disease. *Acta Gastroenterol*. 2005; 35: 37–55.[PubMed: 15954735]
9. Hoyos M , et al. Celiac disease and idiopathic cerebellar ataxia. *Neurology*. 2000; 54: 2346.
10. Hadjivassiliou M, Chattopadhyay AK, Davies-Jones GA, et al . Neuromuscular disorder as a presenting feature of coeliac disease. *J Neurol Neurosurg Psychiatry*.1997; 63: 770–775.

11. Serratrice J, Disdier P, de Roux C, et al. Migraine and celiac disease. *Headache*. 1998; 38: 627–628.
12. Holmes GKT. Neurological and psychiatric complications in coeliac disease. In: Gobbi G, Anderman F, Naccarato S, et al., eds. *Epilepsy and ;Other Neurological Disorders in Celiac Disease*. London:John Libbey. 1997; 246–251.
13. Visakorpi J, Kuitunen P, Pelkonen P. Intestinal malabsorption. a clinical study of 22 children over 2 years of age. *Acta Paediatr Scand*. 1979; 59: 273–280.
14. Garawicz S, Mortenson W. Intracranial calcification mimicking the Sturge-Weber syndrome: a consequence of cerebral folic acid deficiency *Pediatric Radiol*. 1976; 26: 5–9.
15. Sammaritano M, Andermann F, Malanson D, et al. The syndrome of intractable epilepsy, bilateral occipital calcifications, and folic acid deficiency. *Neurology*. 1988; 38(suppl 1): 239
16. Thain ME, Hamilton JR, Ehrlich RM Coexistence of diabetes mellitus and celiac disease. *J Pediatric*. 2000; 85: 527–529.
17. Whyte LA, Jenkins HR: The epidemiology of coeliac disease in South Wales: a 28-year perspective, *Arch Dis Child*. 2012; 98: 405–407.
18. Reunala T, Salmi J, Karvonen J Dermatitis herpetiformis and celiac disease associated with Addison's disease. *Arch Dermatol*. 2001.
19. Zelissen PMJ, Bast EJEG, Croughs RJM. Associated autoimmunity in Addison's disease. *J Autoimmun*. 1995; 8: 121–130.
20. Henegan MA, McHugh P, Stevens FM, McCarthy CF. Addison's disease and selective IgA deficiency in two coeliac patients. *Scand J Gastroenterol*. 1997; 32: 509–511.
21. O'Leary C, Walsh CH, Wieneke et al 2002 Celiac disease and autoimmune Addison's disease: a clinical pitfall. *Q J Med* . 2002; 95: 79–82.
22. Vécsei et al. Follow-up of pediatric celiac disease value of antibodies in predicting mucosal healing, a prospective cohort study. *BMC Gastroenterology*. 2014; 14: 28.
23. Bonamico M, Nenna R, Luparia RPL, et al. Radioimmunological detection of anti-transglutaminase autoantibodies in human saliva: a useful test to monitor coeliac disease follow-up. *Aliment Pharmacol Ther*. 2008; 28: 70–346.
24. Vahedi K, Mascart F, Mary J, et al. Reliability of antitransglutaminase antibodies as predictors of gluten free diet compliance in adult celiac disease. *Am J Gastroenterol*. 2003; 98: 1079–1087.
25. Leffler DA, Edwards George JB, Dennis M, et al. A prospective comparative study of five measures of gluten-free diet adherence in adults with coeliac disease. *Aliment Pharmacol Ther*. 2007; 26: 1227–1235..
26. Mehrdad M, Mansour-Ghanaei F, et al. Frequency of Celiac Disease in Patients with Hypothyroidism, Hindawi Publishing Corporation, Volume 2012, Article ID 201538, 6 pages.
27. Hansson T, Dahlbom I. Recombinant Human Tissue Transglutaminase for Diagnosis and Follow-Up of Childhood Coeliac Disease. *Pediatr Res*. 2002.
28. Hosking F, et al. Application of Deamidated Gliadin. Antibodies in the Follow-Up of Treated Celiac Disease. August 31 2015.

Immunological Assessment for Children Infected with *Human Metapneumovirus* (hMPV)

Venus H. AL-Safar¹, Mohammed A. K. Al-Saadi¹, Adnan H. Al-Jothery¹

College of Medicine, University of Babylon/Hilla, Iraq

ABSTRACT

Background: The complement system functions as an immune control system that rapidly responds to infection. It has been involved as a pathogenic effector in many diseases including contagious illnesses. This study was conducted for immunological assessment of children who have human metapneumovirus infects. **Methods:** A cross-sectional controlled study involved 80 children aged ≤ 5 years (60 patients and 20 normal healthy controls) conducted during the period from February 2017 to January 2018 in Babylon city, Iraq.

Keywords: hMPV, ELISA, immunological assessment, bronchiolitis, pneumonia, complement system.

INTRODUCTION

The complement system functions as an immune control system that rapidly responds to infection. It has been involved as a pathogenic effector in many diseases including contagious illnesses ^[1]. Activation of the complement system by particular differentiation pathways stimulates a cascade of proteases resulting in cleavage outputs that function to exclude pathogens, adjust inflammatory responses and form adaptive immune responses ^[1]. Type I and III Interferons (IFNs) are accountable for the recruitment of an antiviral event in cells promptly after infection ^[2]. However, type I IFNs are generated by abundant various cell kinds; whereas type III IFNs appear to be generally produced by plasmacytoid dendritic and epithelial cells where the epithelial cells are the major goals for action ^[3]. Due to their robust and potentially hurtful impacts, the production of these cytokines is tightly organized ^[4].

The objective of current study was to

MATERIALS AND METHOD

Participants: The study involved children aged ≤ 5 years who were suffering from lower respiratory tract infections diagnosed as bronchiolitis, according to guidelines of the American Academy of Pediatrics; AAP [Ref], and pneumonia, according to the Integrated Management of Childhood Illness; IMCI [Ref]. They were diagnosed by a paediatrician and admitted to Babylon maternity

and pediatrics teaching hospital and Al-Noor paediatrics teaching hospital in Babylon city, Iraq. The study was conducted during the period from February 2017 to January 2018. Any patient with congenital heart disease, allergic bronchitis, asthmatic bronchitis, and any child with anatomical problems were excluded from this study. On the other hand, controls (20 children) were normal healthy children who had no history of lower respiratory tract infections and who were admitted to the Al-Imam Health Center, in Babylon city, for the vaccination program. Patients were sub-divided into two groups; those who were positive for human Metapneumovirus (sero-positive; 13 patients) and those who were negative for the virus (sero-negative; 47 patients).

Ethical approval: Verbal consent was obtained from the family of each subject for participation in this study. Moreover, this study was approved by Ethical Research Committee of Faculty of Medicine, Babylon University and Babylon Health Directorate.

Immunological tests: A whole-blood sample (3 ml) was obtained from each participant (60 patients and 20 controls) by venipuncture. These samples were collected into gel tubes and left to clot. Separation of serum was performed by centrifugation at 3000 r.p.m [5] for 10 minutes, and then sera were carefully transferred to eppendorf tubes and stored at -20°C until use. Serum levels of C3, C4, IFN- α , IFN- β , IFN- γ , and IL-12 were estimated by **Enzyme Linked Immunosorbent Assay** (ELISA) according to manufacturer instructions (Elabscience-China).

Statistical analysis: Data were analysed using version 20. Categorical variables were shown as frequencies and percentages while continuous variables were presented as Mean±SD. ANOVA test was applied to compare means of three sets or more. Kruskal-Wallis test was exercised to match three independent classes when study variables do not follow normal distribution. Pearson Chi-square and Fisher's-exact tests were used to explore the association among categorical variables. A P value of ≤ 0.05 was considered significant.

RESULTS AND DISCUSSION

Estimation of C3 complement component: In current study the serum concentrations of C3 were 211.09 and 174.29 ng/ml in sero-positive and sero-negative patients, respectively, while in control group it was 142.69 ng/ml (Table 1). However, C3 concentrations were not statistically significant among the study groups ($P > 0.05$; Table 1).

Table 1: Concentrations of C3 complement component in the serum of study groups

Study marker	Study group	No.	C3 concentration (ng/ml) Mean±SD	Range	P value
C3	hMPV positive children	13	211.09 ± 103.62	37.30-303.46	0.194*
	hMPV negative children	47	174.29 ± 112.94	34.23-381.15	
	Control group	20	142.69 ± 86.12	50.76-359.61	

* = Not significant ($P > 0.05$)

It was concluded that [6] patients having chronic obstructive pulmonary disease (COPD) exhibited low activity of complement component C3 and/ or C4. On the other hand, those with pulmonary fibrosis; asthma, lung cancer and pneumonia exhibited moderate activity of complement. Nonetheless, bronchiectasis and hemoptysis had shown high efficiency of complement. Both classical and alternative routes of complement activation were reported in hemoptysis while only classical pathway of activation was indicated in bronchiactosis [Ref]. However, the results reported by [7] indicated that serum C3 was significantly higher in asthmatics when compared to controls.

Complement system has remarkable defensive functions according to data obtained from many studies[8].

Results of current study disagree with those reported in previous study [9] where serum C3 was significantly higher when compared to controls.

Estimation of C4 complement component: Current study revealed that serum concentrations of C4 were 112.14, 123.30 and 139.80 ng/ml in sero-positive, sero-negative and control children, respectively, (Table 2). In addition, there were significant differences between concentrations of C4 among study groups ($P < 0.05$; table 2).

Table 2: Concentrations of C4 complement component in the serum of study groups

Study marker	Study group	No.	C4 concentration (ng/ml) Mean ± SD	Range	P value
C4	hMPV positive children	13	112.14 ± 14.97	81.16-134.16	<0.001*
	hMPV negative children	47	123.30 ± 16.83	84.16-163.83	
	Control group	20	139.80 ± 8.09	129.33-157.66	

* P value ≤ 0.05 was significant.

A previous study involved three children with pneumonia [10] found that two of them had minimal C3 concentration while the third child had depressed levels of both C3 and C4. Moreover, another study [11] reported no differences between serum levels of IgM, C3 and C4 between two groups of patients with pneumonia and their controls ($P > 0.05$).

The complement system includes various fluid-phase and membrane-associated proteins. Under physiological states, activation of the fluid-phase synthesis of complement is ensured under strict control and complement activation exists firstly on surfaces known as "non-self" in a try to reduce harm to bystander host cells. Membrane complement composition work

to shorten complement activation on host cells or to ease uptake of antigens or microbes “tagged” with complement fractions^[12].

Estimation of IFN-α component: Results of current study showed that serum concentrations of IFN-α were

66.65 and 71.74 pg/ml in sero-positive and sero-negative patients, respectively, whereas it was 76.04 pg/ml in control children. In addition, these concentrations were not statistically different among the three study groups (P >0.05; Table 3).

Table 3: Concentrations of IFN-α component in the serum of study groups

Study marker	Study group	No.	Concentration of IFN-α (pg/ml) Mean ± SE	Range	P value
IFN-α	hMPV positive children	13	66.65 ± 5.07	41.30-88.69	0.337
	hMPV negative children	47	71.74 ± 5.16	36.52-199.13	
	Control group	20	76.04 ± 6.10	40.86-176.95	
* = No significant (P >0.05)					

The natal immune cells display weak levels of pro-inflammatory cytokines involving type I interferon (IFN), IFN-α and IFN-β as well as minimum levels of IL-12 and TNF-α. In addition, higher levels of anti-inflammatory cytokines such as IL-10 and TGF-β^[13]. On the other hand, the study by^[14] found that the levels of IFN-α remained safely low among rhinovirus patients after modulation of varied comparisons. Moreover, the study conducted by^[15] detected non-significant levels of IFN-α in severely vs. non-severely febrile children. A significant positive correlation between INF-α and viraemia was detected in severely febrile children [Ref]. Interferons alpha (IFNs-α) are pleiotropic cytokines belonging to type I IFN family, primarily qualified for their antiviral activity. These cytokines show extended lists of clinical usage in patients

with few types of cancer and viral diseases. Notably, proven autoimmune defects have been assumed to be remediated by endogenous IFN-α and are predominately observed in some IFN-cured patients. IFN-α can stimulate numerous biological effects including induction of apoptosis and suppression of cellular proliferation. In addition, these cytokines elevate the segregation and activity of host immune cells^[16].

Estimation of IFN-β component: Results of current study showed that serum concentrations of IFN-β were 195.38 and 262.03 pg/ml in sero-positive and sero-negative patients, respectively, while in control children it was 178.07 pg/ml. In addition, there were significant differences among different study groups (P <0.05; Table 4).

Table 4: Concentrations of IFN-β component in the serum of study groups

Study marker	Study group	No.	Concentration of IFN-β (pg/ml) Mean ± SE	Range	P value
IFN-β	hMPV positive children	13	195.38 ± 18.11	127.14-295.71	0.034*
	hMPV negative children	47	262.03 ± 24.25	114.28-1104.28	
	Control group	20	178.07 ± 10.86	130.0-345.71	
* P ≤0.05 was significant					

A previous study^[17] had concluded that serum levels of type I IFN-β were softly high in children whom sero-positive for human Metapneumovirus (hMPV) as compared to their healthy control children. The same study reported that serum levels of type II IFN-γ was not elevated in those patient as compared to control children. These results suggested that inflammatory response is implicated in the innate immune response to hMPV in these patients; either as a defensive mechanism or as a response to lung pathology.

Moreover, the results presented by^[18] revealed that the IFN-β pathway is stopped when there is serious excess of inflammatory cytokines, such as IL-1β, in response to LipoPolySaccharides (LPS). the authors proposed that dysregulation of IFN-β is a great determinant for preterm childbirth connected with polymicrobial infections. Furthermore, serum levels of IL-1β, the cytokine produced by TH17 cells, were safely higher in hMPV sero-positive children as compared with those having RSV infection and healthy children^[19].

Estimation of IFN- γ component: Results of current study revealed that serum concentrations of IFN- γ were 29.01 and 31.20 pg/ml in sero-positive and sero-negative patients ,respectively, while in control children it was 20.34 pg/ml. In addition, these concentrations were not statistically different among study groups ($P > 0.05$; Table 5).

Table 5: Concentrations of IFN- γ in the serum of study groups

Study marker	Study group	No.	Concentration of IFN- γ (pg/ml) Mean \pm SE	Range	P value
IFN- γ	hMPV positive children	13	29.01 \pm 13.12	13.45-39.36	0.172*
	hMPV negative children	47	31.20 \pm 14.11	14.47-42.33	
	Control group	20	20.34 \pm 9.21	9.27-48.72	

* = No significant ($P > 0.05$)

The study conducted by [20] demonstrated that children <3 years old with hMPV and RSV infections had elevated levels of rhinal airway IFN γ , CCL5 and IL-10 parallel to an elevation in Th1 (IFN γ)/Th2 (IL-4) ratios, that is predictable in antiviral responses. In contrast, early hMPV-infected children (< 32 wk gestation) did not show elevated Th1/Th2 ratio or increased nasal airway excretion of IFN γ , CCL5 and IL-10 comparative to controls.

Though the mechanism(s) by which hMPV changes IFN-mediated responses is not fully known, there is an *in vitro* evidence suggesting that hMPV modifies IFN-mediated activation of interferon-catalyzed response elements, interferon-stimulated genes and STAT 1 downstream marking [21].

The accurate cause why hMPV triggers markedly minimal IFN- γ (and IL-10, CCL5) responses than RSV is yet an area of active study, but there are many probable mechanisms of imperfect IFN-driven antiviral immune responses in hMPV infection. For instance, the structural encoding proteins of hMPV (glycoprotein G and M2) appear to play significant role in altering antiviral IFN occurring in hMPV infections [22] as shown by the control in a mutated hMPV virus not having glycoprotein G and M2 protein triggers safely great amounts of IFN and antiviral cytokines/chemokines than wild-type hMPV [23]. Moreover, hMPV also seems to overlap with the activation of the IFN signaling cascade in various points like IFNAR1 membrane expression [24]. The overall outcome of which can result in downstream repression of STAT1 and STAT2 [21,24].

CONCLUSION

The results showed that C3, IFN- α and IFN- γ

concentrations were not significantly different among study groups. However, there were considerable distinctions between concentrations of C4, IFN- β , and IL-12 among study groups ($p < 0.05$).

Ethical Clearance: this study was approved by Ethical Research Committee of Faculty of Medicine, Babylon University and Babylon Health Directorate.

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

REFERENCES

1. Stoermer KA. and Morrison TE. Complement and viral pathogenesis. Rev.Virol. 2001; 411(2): 362-373.
2. Levy DE, Marié IJ. and Durbin JE. Induction and function of type I and III interferon in response to viral infection. Curr Opin Microbiol. 2001; 1: 476-486.
3. Hermant P. and Michiels T. Interferon-[lambda] in the Context of Viral Infections: Production, Response and Therapeutic Implications. J Innate Immun. 2014; 6: 563-574.
4. Lin WJ, Zheng X, Lin CC, Tsao J, Zhu X, Cody JJ, Coleman JM, Gherzi R, Luo M, Townes TM, Parker JN, Chen CY. Posttranscriptional control of type I interferon genes by KSRP in the innate immune response against viral infection. Mol Cell Biol. 2011; 31(16): 3196-207.
5. Bishop MC, Laufer D, Fody JC, et al. Clinical chemistry principles, procedures, and correlations. The Murray Printing Company, Philadelphia, USA. 1985; 181-182.

6. Shaldoum FM, Sadek AG, Abdel-Aziz A. and Metwally GM. C3 and C4 in Patients Suffering from Lung Diseases. *Mid. Ea. J. App. Scien.* 2016; 06 (3): 559-566.
7. Abdel Fattah M, El Baz M, Sherif A. and Adel A. Complement Components (C3, C4) as Inflammatory Markers in Asthma. *Indian J Pediatr.* 2010; 77: 771-773.
8. Bernknopf A, Rowley K. and Bailey T. A review of systemic lupus erythematosus and current treatment options. *Formul.* 2011; 46:178–194.
9. Kumar B, Bhushan S. and Kumar A. A Study on Complement Components (C3, C4) as Inflammatory Markers in Asthma in a Tertiary Care Centre in Eastern Bihar. 2017; 7(6).
10. Carceller LF, delaTorre EM, Porto AR. and Écija PJJ. Acute glomerulonephritis associated with pneumonia: a review of three cases. *PediatrNephrol.* 2010; 25: 161-164.
11. Zhu XH, Chen Q, Ke JW, Liu JM, Li L, Li J, He MJ. and Hu CL. Clinical analysis of immune function changes in children with bronchial pneumonia. *Zhongguo Dang Dai ErKeZaZhi.* 2013; 15: 175-178.
12. Ram S, Lewis LA. and Rice PA. Infections of People with Complement Deficiencies and Patients Who Have Undergone Splenectomy. *ClinMicrobiol Rev.* 2010; 23(4): 740–780.
13. Corbett NP, Blimkie D, Ho KC, Cai B, Sutherland DP, Kallos, A, Crabtree J, Rein-Weston A, Lavoie PM, Turvey SE, Hawkins NR, Self SG, Wilson CB, Hajjar AM, Fortuno III ES. and Kollmann TR. Ontogeny of toll-like receptor mediated cytokine responses of human blood mononuclear cells. *PLoS One.* 2010; 5(11): e15041.
14. To, KKW, Lu L, Fong CHY, Wu AKL, Mok KY, Yip CCY, Ke YH, Sze KH, Lau SKP, Hung IFN. and Yuen KY. Rhinovirus respiratory tract infection in hospitalized adult patients is associated with T_H2 response irrespective of asthma. *J. Infct.* 2018.
15. Talarico LB, Byrne AB, Amarilla S, Lovera D, Vázquez C, Chamorro G, Acosta PL, Ferretti A, Caballero MT, Arbo A, Polack, FP. Characterization of type I interferon responses in dengue and severe dengue in children in Paraguay. *J. Clin. Virol.* 2017; 97: 10-17.
16. Rizza P, Moretti F. and Belardelli F. Recent advances on the immunomodulatory effects of IFN- α : Implications for cancer immunotherapy and autoimmunity. *J. Autoim.* 201; 43(3).
17. Malmo J, Moe N, Krokstad S, Ryan L, Loevenich S, Johnsen IB, Espevik T, Nordbø SA, Døllner H. and Anthonsen MW. Cytokine Profiles in *Human Metapneumovirus* Infected Children: Identification of Genes Involved in the Antiviral Response and Pathogenesis. *PLoS One.* 2016; 11(5): e0155484.
18. Racicot K, Kwon JY, Aldo P, Abrahams V, El-Guindy A, Romero R. and Mor G. Type I Interferon Regulates the Placental Inflammatory Response to Bacteria and is Targeted by Virus: Mechanism of Polymicrobial Infection-Induced Preterm Birth. *AJRI.* 2016; 75(4): 451-460.
19. Park JS, Kim YH, Kwon E, Callaway Z, Fujisawa T. and Kim CK. Comparison of nasal cytokine profiles of *human metapneumovirus* and *respiratory syncytial virus*. *Asia Pac Allergy.* 2017; 7(4): 206–212.
20. Pancham K, Perez GF, Huseni S, Jain A, Kurdi B, Rodriguez-Martinez CE, Preciado D, Rose MC. and Nino G. Premature infants have impaired airway antiviral IFN γ responses to human metapneumovirus compared to respiratory syncytial virus. *Pediatr Res.* 2015; 78(4): 389–394.
21. Kolli D, Bao X. and Casola A. Human metapneumovirus antagonism of innate immune responses. *Viruses.* 2012; 4: 3551–71.
22. Ren J, Liu G, Go J, Kolli D, Zhang G. and Bao X. *Human metapneumovirus* M2-2 protein inhibits innate immune response in monocyte-derived dendritic cells. *PLoS One.* 2014; 9: e91865.
23. Bao X, Kolli D, Ren J, Liu T, Garofalo RP. and Casola A. Human metapneumovirus glycoprotein G disrupts mitochondrial signaling in airway epithelial cells. *PLoS One.* 2013; 8: e62568.
24. Ren J, Kolli D, Liu T, Xu R, Garofalo RP, Casola A. and Bao X. Human metapneumovirus inhibits IFN-beta signaling by down-regulating Jak1 and Tyk2 cellular levels. *PLoS One.* 2011; 6: e24496.

Call for Papers/Article Submission

The editor invites scholarly articles that contribute to the development and understanding of all aspects of Public Health and all medical specialties. All manuscripts are double blind peer reviewed. If there is a requirement, medical statistician review statistical content. Invitation to submit paper; A general invitation is extended to authors to submit papers for publication in IJPHRD.

The following guidelines should be noted:

- The article must be submitted by e-mail only. Hard copy not needed. Send article an attachment in e-mail.
- The article should be accompanied by a declaration from all authors that it is an original work and has not been sent to any other journal for publication.
- As a policy matter, journal encourages articles regarding new concepts and new information.
- Article should have a Title
- Names of authors
- Your affiliation (designations with college address)
- Abstract
- Keywords
- Introduction or background
- Material and Method
- Findings
- Discussion
- Conclusion
- Interest of conflict
- Source of Funding
- Ethical Clearance
- References in Vancouver style.
- Please quote references in text by superscripting
- Word limit 2500-3000 words, MSWORD Format, single file.

All articles should be sent to: editor.ijphrd@gmail.com

Our Contact Info:

Institute of Medico-Legal Publications

Logix Office Tower, Unit No. 1704, Logix City Centre Mall, Sector-32, Noida-201 301 (Uttar Pradesh)

Mob.: 09971888542, E-mail: editor.ijphrd@gmail.com

Website: www.ijphrd.com



Indian Journal of Public Health Research & Development

CALL FOR SUBSCRIPTIONS

About the Journal

Print-ISSN: 0976-0245 **Electronic-ISSN:** 0976-5506, Frequency: Monthly

Indian Journal of Public Health Research & Development is a double blind peer reviewed international Journal. The frequency is Monthly. It deals with all aspects of Public Health including Community Medicine, Public Health, Epidemiology, Occupational Health, Environmental Hazards, Clinical Research, Public Health Laws and covers all medical specialties concerned with research and development for the masses. The Journal strongly encourages reports of research carried out within Indian continent and South East Asia.

The journal has been assigned international standards (ISSN) serial number and is indexed with Index Copernicus (Poland). It is also brought to notice that the journal is being covered by many international databases.

Subscription Information

Journal Title	Print Only
Indian Journal of Public Health Research & Development	₹ 9,000/=

Note for Subscribers

- Advance payment required by cheque/demand draft/bank Transfer in the name of “Institute of Medico-Legal Publications” payable at New Delhi.
- Cancellation not allowed except for duplicate payment.
- Claim must be made within six months from issue date.
- A free copy can be forwarded on request.

Bank Details

Name of Account: Institute of Medico-Legal Publications Pvt Ltd

Bank: HDFC Bank

Branch: Sector-50, Noida-201 301

Account Number: 09307630000146

Type of Account: Current Account

MICR Code: 110240113

RTGS/NEFT code: HDFC0000728

Our Contact Info:

Institute of Medico-Legal Publications

Logix Office Tower, Unit No. 1704, Logix City Centre Mall, Sector- 32, Noida-201 301 (Uttar Pradesh)

Phone: +91 120 429 4015; Mobile: +91 997 188 8542

Email: editor.ijphrd@gmail.com | Website: www.ijphrd.com



Indian Journal of Public Health Research & Development

An International Journal

SCOPUS IJPHRD CITATION SCORE

Indian Journal of Public Health Research and Development
Scopus coverage years: from 2010 to 2017 Publisher:
R.K. Sharma, Institute of Medico-Legal Publications
ISSN:0976-0245E-ISSN: 0976-5506 Subject area: Medicine:
Public Health, Environmental and Occupational Health
CiteScore 2015-0.02
SJR 2015-0.105
SNIP 2015-0.034



Website:

www.ijphrd.com

Indian Journal of Public Health Research & Development

EXECUTIVE EDITOR

Vidya Surwade

Associate Professor, Dr Baba Saheb Ambedkar, Medical College & Hospital, Rohinee, Delhi

INTERNATIONAL EDITORIAL ADVISORY BOARD

1. **Dr. Abdul Rashid Khan** B. Md Jagar Din, (*Associate Professor*)
Department of Public Health Medicine, Penang Medical College, Penang, Malaysia
2. **Dr. V Kumar** (*Consulting Physician*)
Mount View Hospital, Las Vegas, USA
3. **Basheer A. Al-Sum**,
Botany and Microbiology Deptt, College of Science, King Saud University,
Riyadh, Saudi Arabia
4. **Dr. Ch Vijay Kumar** (*Associate Professor*)
Public Health and Community Medicine, University of Buraimi, Oman
5. **Dr. VMC Ramaswamy** (*Senior Lecturer*)
Department of Pathology, International Medical University, Bukit Jalil, Kuala Lumpur
6. **Kartavya J. Vyas** (*Clinical Researcher*)
Department of Deployment Health Research,
Naval Health Research Center, San Diego, CA (USA)
7. **Prof. PK Pokharel** (*Community Medicine*)
BP Koirala Institute of Health Sciences, Nepal
8. **Sajjad Salim Issa AL-Musawi**, Supervisor for Student of the Arab
Board in Family Medicine
9. **Prof. Dr. Ayad F. Alkaim**, Professor of Surface Chemistry and
Applications of Nano-materials, Babylon University, Iraq

NATIONAL SCIENTIFIC COMMITTEE

1. **Dr. Anju Ade** (*Associate Professor*)
Navodaya Medical College, Raichur, Karnataka
2. **Dr. E. Venkata Rao** (*Associate Professor*) Community Medicine,
Institute of Medical Sciences & SUM Hospital, Bhubaneswar, Orissa.
3. **Dr. Amit K. Singh** (*Associate Professor*) Community Medicine,
VCSG Govt. Medical College, Srinagar – Garhwal, Uttarakhand
4. **Dr. R G Viveki** (*Professor & Head*) Community Medicine,
Belgaum Institute of Medical Sciences, Belgaum, Karnataka
5. **Dr. Santosh Kumar Mulage** (*Assistant Professor*)
Anatomy, Raichur Institute of Medical Sciences Raichur(RIMS), Karnataka
6. **Dr. Gouri Ku. Padhy** (*Associate Professor*) Community and Family
Medicine, All India Institute of Medical Sciences, Raipur
7. **Dr. Ritu Goyal** (*Associate Professor*)
Anaesthesia, Sarswathi Institute of Medical Sciences, Panchsheel Nagar
8. **Dr. Anand Kalaskar** (*Associate Professor*)
Microbiology, Prathima Institute of Medical Sciences, AP
9. **Dr. Md. Amirul Hassan** (*Associate Professor*)
Community Medicine, Government Medical College, Ambedkar Nagar, UP
10. **Dr. N. Girish** (*Associate Professor*) Microbiology, VIMS&RC, Bangalore
11. **Dr. BR Hungund** (*Associate Professor*) Pathology, JNMC, Belgaum.
12. **Dr. Sartaj Ahmad** (Assistant Professor),
Medical Sociology, Department of Community Medicine, Swami Vivekananda Subharti
University, Meerut, Uttar Pradesh, India
13. **Dr Sumeeta Soni** (Associate Professor)
Microbiology Department, B.J. Medical College, Ahmedabad, Gujarat, India

NATIONAL EDITORIAL ADVISORY BOARD

1. **Prof. Sushanta Kumar Mishra** (Community Medicine)
GSL Medical College – Rajahmundry, Karnataka
2. **Prof. D.K. Srivastava** (*Medical Biochemistry*)
Jamia Hamdard Medical College, New Delhi
3. **Prof. M Sriharibabu** (*General Medicine*) GSL Medical College, Rajahmundry,
Andhra Pradesh
4. **Prof. Pankaj Datta** (*Principal & Prosthodontist*)
Indraprastha Dental College, Ghaziabad

NATIONAL EDITORIAL ADVISORY BOARD

5. **Prof. Samarendra Mahapatro** (*Pediatrician*)
Hi-Tech Medical College, Bhubaneswar, Orissa
6. **Dr. Abhiruchi Galhotra** (*Additional Professor*) Community and Family
Medicine, All India Institute of Medical Sciences, Raipur
7. **Prof. Deepti Pruthvi** (*Pathologist*) SS Institute of Medical Sciences &
Research Center, Davangere, Karnataka
8. **Prof. G S Meena** (*Director Professor*)
Maulana Azad Medical College, New Delhi
9. **Prof. Pradeep Khanna** (*Community Medicine*)
Post Graduate Institute of Medical Sciences, Rohtak, Haryana
10. **Dr. Sunil Mehra** (*Paediatrician & Executive Director*)
MAMTA Health Institute of Mother & Child, New Delhi
11. **Dr. Shailendra Handu**, *Associate Professor*, Phrma, DM (Pharma, PGI
Chandigarh)
12. **Dr. A.C. Dhariwal**: *Directorate* of National Vector Borne Disease
Control Programme, Dte. DGHS, Ministry of Health Services, Govt. of
India, Delhi

Print-ISSN: 0976-0245-Electronic-ISSN: 0976-5506, Frequency: Monthly

Indian Journal of Public Health Research & Development is a double blind peer reviewed international journal. It deals with all aspects of Public Health including Community Medicine, Public Health, Epidemiology, Occupational Health, Environmental Hazards, Clinical Research, and Public Health Laws and covers all medical specialties concerned with research and development for the masses. The journal strongly encourages reports of research carried out within Indian continent and South East Asia.

The journal has been assigned International Standards Serial Number (ISSN) and is indexed with Index Copernicus (Poland). It is also brought to notice that the journal is being covered by many international databases. The journal is covered by EBSCO (USA), Embase, EMCare & Scopus database. The journal is now part of DST, CSIR, and UGC consortia.

Website : www.ijphrd.com

©All right reserved. The views and opinions expressed are of the authors and not of the Indian Journal of Public Health Research & Development. The journal does not guarantee directly or indirectly the quality or efficacy of any product or service featured in the advertisement in the journal, which are purely commercial.

Editor

Dr. R.K. Sharma
Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Printed, published and owned by

Dr. R.K. Sharma
Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Published at

Institute of Medico-legal Publications
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,
Sector- 32, Noida - 201 301 (Uttar Pradesh)



Indian Journal of Public Health Research & Development

www.ijphrd.com

CONTENTS

Volume 9, Number 11

November 2018

324. The Relationship between Personality Traits and the Perceptions on Pre-Marital Sexual Relations 1938
Affandee, S, Rehman, S, Ooi Boon Keat
325. Visual Impairment: A Comparison of Global and Indian Perspective 1944
Soumya Thankam Varghese, Maya Rathnasabapathy
326. Cohesiveness Factors of Employee Group SKK Migas Pekanbaru Riau Indonesia (Case Study) 1947
Didik Widianoro, Nur Fitriyana
327. Dimensions of Preference Towards Organic Products: An Empirical Study on Consumer's Perspective 1950
Solomon Christopher D, C.B. Senthilkumar
328. Activity based Learning for Slow Learners in Colleges through Mollycoddle Method 1957
Suresh Rasappan, John Sunil Manoah
329. Stability Analysis of a Prey-Predator System involving Holling's Response Using Back-Stepping Regimentation 1961
Suresh Rasappan, Vijaya Lakshmi Gandhavadi Mohan Rao, Pugalarasu Rajan
330. Academic Performance, Social Adjustment and Emotional Intelligence of Students Involved in Social Networking Sites 1971
Nimisha Beri
331. Effect of Affective, Normative and Continuance Commitment on Organizational Effectiveness 1977
Archana Shrivastava
332. The Trauma of Partition in Nayantara Sahgal's Storm in Chandigarh 1987
S Prabhakaran, R Lakshmi
333. Soft Computing based Cluster Head Selection for Secured Energy Aware Routing in Flying Ad Hoc Networks (FANET) 1993
Esraa Saleh Alomari
334. Survey on Faculty Members Attitude on Selection Criteria for Digital Archives at Raman Research Institute, Bengaluru 1998
E Nanda Kumari, E S Kavitha

335. The Synergistic Antibacterial Effects of Cinnamomum Verum and Cymbopogon Citrates on Urinary Tract Infections Causing Pathogens Escherichia Coli and Pseudomonas Aeruginosa 2008
Fiona Lawing, Noor Faradilla Abdullah, Che Wan Imanina Che Wan Takwa
336. Readiness in Implementing a National-wide K-12 Curriculum: A Case Study in Cotabato City School's Division 2015
Nhelbourne K. Mohammad, Yanping Li
337. Comparative Study in EHR between Iraq and Developed Countries 2023
Ali Fahem Neamah, Asmala Ahmad
338. Scientometric Study on Diabetic Retinopathy Research during the Year 2017 2030
Hemala K, Kavitha E.S
339. Aggressive Packet Combining with Consideration of the Physical Signal and Different Error Control Scheme 2039
Achyuth Sarkar, Swarnendu K Chakraborty, C.T. Bhunia
340. A Study on Engineering Properties of Black Cotton Soil Mixed with Ground Granulated Blast Furnace Slag and Embedded with Polypropylene Fibres 2045
Heera Lal M, Venkatesh N, Praveen G V
341. Discuss the Notion of 'Sustainability' and its Application to Archaeological Heritage Management 2052
Zhu Yonghan
342. Customer Shift from E-Banking to M-Banking in State Bank of India: A Study to Identify Influencing Factors Causing the Change in Behaviour 2058
343. An Intelligent Universal Remote Control for Home Appliances 2066
K Girija Rani, S Rama Kishore, Basava Dhanne
344. TMD Material A Revolution for Next Generation Transistors 2070
N Soujanya, T Satyanarayana, T Madhavi
345. A Thorough Investigation on Designs of Digital Hearing Aid 2076
T Madhavi, N.soujanya, A Chaitanya Krishna
346. 10T Sram Cell Design using Single Ended Decoupled Read Bit Line 2081
R Bhanuchandar, B Harikrishna, Suman Mishra
347. IOT Enabled Waste Management System In Smart Cities 2087
S. Keerthika, G Pravalika, Subramanyachari
348. Cervical Cancer (CC) Causes and Identification Techniques 2094
K Vani, S Ram Kishore Reddy, S Poongodi
349. Use of Break-Even Analysis in Financial Appraisal of Projects 2098
K Nagarajan, D Visagamoorthi

350. Synovial Sarcoma of the Head and Neck Region-Our Experiences at a Tertiary Care Hospital of Eastern India 2106
Santosh Kumar Swain, Smrutipragnya Samal, Mahesh Chandra Sahu, Priyanka Debta
351. Association of Neuroretinal Parameters with Diabetic Neuropathy and Nephropathy 2113
Ankita Choudhury, Lolly Pattnaik, Madan Mohan Mahapatra
352. An Unusual and Interesting Cause of Headache-A Case Report 2120
Santosh Kumar Swain, Smrutipragnya Samal, Mahesh Chandra Sahu, Priyanka Debta
353. Recurrent Aphthous Ulcer among Family Members Affected with HIV/AIDS infection- A Case Report 2123
Santosh Kumar Swain, Swayamprabha Sahoo, Mahesh Chandra Sahu, Priyanka Debta
354. Clinico-Epidemiological Study of Oral Potentially Malignant and Malignant Lesions in a Tertiary Care Centre of Odisha- A Five Year Longitudinal Study 2127
Fakir Mohan Debta, Priyanka Debta, Ekagrata Mishra, Santosh Kumar Swain, Mahesh Chandra Sahu, Smrutipragnya Samal, Anurag Dani
355. Efficacy of Photodynamic Therapy in the Treatment of Oral Lichen Planus by use of Amino Levulinic Acid 2138
Fakir Mohan Debta, Jayanta Kumar Das, Prashant Kumar Goyal, Priyanka Debta, Ekagrata Mishra, Santosh Kumar Swain, Mahesh Chandra Sahu
356. Efficacy and Outcome of 0.7mg Sustained Release Dexamethasone Implant in a Tertiary Eye Care Hospital Over a Period of One Year – A Retrospective Study 2147
Lolly Pattnaik, Santosh Kumar, Anirudha Maiti
357. Therapeutic Effectiveness of Oxcarbazepine in Intractable Trigeminal Neuralgia 2152
Fakir Mohan Debta, Priyanka Debta, Ekagrata Mishra, Santosh Kumar Swain, Mahesh Chandra Sahu, Anurag Dani, Kunal agrawal
358. GLUT-1: An Important Adjunct in Predicting Prognosis of VC & OSCC 2157
Saswati Siddhartha, Priyanka Debta, Fakir Mohan Debta, Santosh Kumar Swain, Mahesh Chandra Sahu, Anurag Dani, Somali Mahapatra
359. Efficacy of Photodynamic Therapy in the Treatment of Oral Lichen Planus by Use of Methylene Blue 2164
Fakir Mohan Debta, Jayanta Kumar Das, Prashant Kumar Goyal, Priyanka Debta, Ekagrata Mishra, Santosh Kumar Swain, Mahesh Chandra Sahu
360. Short Term PV Power Forecasting Using Empirical Mode Decomposition based Orthogonal Extreme Learning Machine Technique 2170
Niranjan Nayak, Alok Kumar Pani
361. Antibacterial Activities of 5 Plants Against MDR Bacteria Isolated from Clinical Samples at a Tertiary Care Teaching Hospital 2183
Mahesh Chandra Sahu, Swayamprabha Sahoo, Smrutipragnya Samal

362. Isolation and Identification of Dermatophytes with Biomaterials Such as Primers for Early Detection 2189
Kanishka Uthansingh, Manoj Kumar Sahu, Pradeep Mallick, Debasmita Behera, Mahesh Ch Sahu
363. Diagnosis of Genetic Analysis of Type 2 Diabetes Mellitus and Diabetic Complications at a Tertiary Care Teaching Hospital 2194
Samapika Bhuyan, Kanishka Uthansingh, Ishwar Chandra Behera, Srikant Kumar Dhar, Mahesh Chandra Sahu
364. Surveillance of Bacteria Associated with UTI and Drug Sensitivity Patterns at a Tertiary Care Teaching Hospital 2199
Srideep Rath, Swayamprabha Sahoo, Ishwar Chandra Behera, Srikant Kumar Dhar, Mahesh Chandra Sahu
365. Surveillance of Organisms Associated with CSOM and Otomycosis at a Tertiary Care Teaching Hospital 2205
Swapnarani Sahoo, Santosh Kumar Swain, Smrutipragnya Samal, Mahesh Chandra Sahu
366. Early Detection of GI Tract Cancer by Specific Primer(S) as Biomarker: Our Experience 2214
Kanishka Uthansingh, Manoj Kumar Sahu, Ayaskanta Singh, Jimmy Narayan, Manas Kumar Behera, Pradeep Mallick, Mahesh Ch Sahu
367. Efficacy of Meaning Centered Group Psychotherapy to People Living with HIV on their Quality of Life at Selected Art Centre of Odisha 2219
Sasmita Das, Anusuya Khatua, Mahesh Chandra Sahu
368. Survey on Gene Selection Methodologies based on Filter, Wrapper, Embedded and Hybrid Approaches 2224
Suchishree Panda, Kaberi Das, Debahuti Mishra
369. An Approach to Predict Hypertension based on Handwritten Manuscript 2235
Seema Kedar, D. S. Bormane
370. Analysing the Causes of Cyclonic Severity in Bay of Bengal and Its Effects in Biotic Species Using XGBoost Algorithm 2241
S. Karthick, D Malathi, Ramraj, Yashwant K

The Relationship between Personality Traits and the Perceptions on Pre-Marital Sexual Relations

Affandee, S¹, Rehman, S², Ooi Boon Keat²

¹*School of Education & Social Sciences, Management & Science University, Malaysia,*

²*Senior Lecturer, School of Education & Social Sciences, Management & Science University, Malaysia*

ABSTRACT

The study was conducted to discover the relationship between personality traits of students and their perception of pre-marital sexual relations. This paper also attempted to find out the influence of internal or external factors on their perception towards the issue. Their personal background such as relationship status was taken into account. A questionnaire was administered to 100 male students and 100 female students in a private university. The results revealed that there are differences among those who accepts and rejects the act based on their relationship statuses. People who are married have different say on the matter as opposed to those who are not married yet. However, there were no significant relation between personality traits and their perception on pre-marital sex. Based on the results collected, we were able to conclude that no matter which personality the person may have, the majority of pupils are against the idea of pre-marital sexual relations. No effect on opinion based on gender can be seen as well. Though, a look at the data on internal and external factors, another conclusion can be made. Religion is the main factor that influences the students' perceptions on pre-marital sexual relations. It being a main theme in Malaysia, strong implications are present for certain issues that have a connection with religion. Despite the person's relationship status, personality or gender, the social standard and expectations are what control their perception on the matter of pre-marital sexual relations.

Keywords -Personality Traits, Perceptions, Pre-marital Sexual Relations.

INTRODUCTION

The relationship between personality structure and sexual functions, as well as expression of sexuality in the period of adolescence has not been studied very often.¹ Eysenck (1976)² initiated the pursuit for exploring the relationship between traits that describe human personality and sexual expression. He used his Eysenck Personality Questionnaire (EPQ) to examine Extraversion, Neuroticism and Psychoticism in relevance to the traits table that describes the personalities to find out patterns of sexual activity. Based on his personality theory, Eysenck (1976)² postulated those with Extraversion or extraverts, because of their high sensation seeking needs, would be more inclined to engage in a wider range of sexual behaviour and be more active in this area than introverts. With regard to the Neuroticism (N), Eysenck (1976)² predicted that high N scorers would be more likely to be anxious and find certain aspects of sex to be disgusting. On the Psychoticism (P) dimension

Eysenck (1976)² predicted high P scorers would be more interested in impersonal sex or aggressive sex and be more inclined to participate in socially disapproved acts. In addition to predicting different patterns of sexual behaviour based on personality, Eysenck (1976)² also noted that differences in sexual arousal patterns would also occur.

The simplified objectives of this research are as follows:

To identify perception on pre-marital sexual relations among different personality types of the students.

To identify the personality type that highly rejects pre-marital sexual relations and the personality that approves of the act.

To look for other internal or external factors (individual, partners, religion, morality, society, family, friends, social media, etc.) that may shape the mindset

of acceptance or rejection towards pre-marital sexual relations.

To identify if there is a difference in opinion on pre-marital sexual relations based on different genders.

To get the opinion (very good, good, normal, bad, very bad) of the people on the current condition of pre-marital sexual relations in society.

RELATED LITERATURE

The review of related literature regarding Perception, Personality & Values, Gender Differences and Pre-Marital Sex has been able to provide relevance and work as supporting materials for this synthesis.

Anna C. Bocar (2013)⁷ stated that conservatism is signified by the act of adhering to and tending to preserve the accepted societal order, specifically on sex issues. The result of the study shows that 60% of male respondents were slightly conservative and only three percent were liberal. On the other hand, majority of the female respondents were conservative, with 52% and none of them achieved the result of liberalism towards pre-marital sex. The source of which most information was obtained about sex shows that the male respondents mostly obtain their information from mass media, whether it is from television, internet, or social networks; which is 56.67% of them. None of the male respondents obtained information about sex from books, magazine or parents. Meanwhile, most of the female respondents, at 36.67%, mainly obtained information about sex from sex education at school or from teachers, and 33% from mass media. Based on these findings, it shows that the majority of female respondents have a higher value towards chastity before marriage compared to their male counterpart.

In a study conducted by SalamehP., JomaaL., IssaC., FarhatG., ZeghondiN., &GergesN. (2012)⁸, they assessed the sexual attitudes and behaviours of university students, while identifying the possible relationships with their attitudes towards risky behaviours such as smoking cigarette, water pipe smoking, and alcohol consumption. This study also takes into consideration the respondents' gender, age group, socioeconomic status, risk involvement excitement, and motives and apprehension. Among 3384 participants, 20% were current cigarette smokers, while 23% were current waterpipe smokers and 33.5% declared consuming alcohol. Higher rates

were found for smoking and alcohol consumption in private versus public universities ($p < 0.001$). Participants also reported a very low consumption of fruits and vegetables. Moreover, 31% of boys and 8.6% of girls declared having regular sexual activity; among them, 41% of boys and 26% of girls declared using a condom regularly. Substantial proportions of university students in Lebanon adopt risky behaviours for health, particularly in private universities. (SalamehP. et al., 2012) It is clear that this study has managed to find the relationships between sexual attitudes and behaviours with demographic factors and risky attitudes and behaviours. Therefore, this may indicate the presence of a relationship between perceptions towards sexual relations, particularly pre-marital, and personality traits according to the Big Five.

According to Eze I. (2014)¹³ human sexual behaviour is strongly determined by cultural and social influences. The study was on the adolescents' attitude towards pre-marital sex in Awka North and South Local Government Areas of Anambra State. The general purpose of the study was to identify some of the attitudes of adolescents towards pre-marital sex and the major factors responsible for them. From this research it was found that, adolescents have various permissive attitudes towards pre-marital sex; majority of both gender permit the act with 20 out of 21 permissive attitudes present for males and 19 out of 21 for females. Many factors influence the adolescents' attitudes towards the act; both genders identified 10 of the listed 10 factors influencing their attitudes towards pre-marital sex. Due to these findings, it is clear that there are various factors that affect one's attitude towards pre-marital sex.

LIMITATION

This research was conducted in a concentrated geographical and background setting among respondents belonging to Management & Science University in Shah Alam. It is important to take note that Malaysia has many different areas and regimes that may contribute to the result of this kind of research. Considering that this was done in an urban area, its representation on rural area or youth as a whole can be contentious. However, the limitations of this research do not necessarily make the results insignificant but relatively call the prospect for further research and studies.

RESULTS

After data analysis, it was found out that the students' perception as a whole were affected mostly by external factors. The relationship between their perception and personality were also uncovered. The outcome presented in this study demonstrates the impending measure for a more advanced, in-depth research development and new findings.

Table 1: The perception on pre-marital sexual relations according to relationship status

Relationship Status	ACCEPT			REJECT	
	f	x ²	p	x ²	p
Married	7	130.60	0.02	83.77	0.96
Single	134				
In a relationship	57				
Undecided	7				

Note. $p < 0.05$

Table 1 shows the correlation between the relationship status of the students and their perception. Results of the chi-square test (Pearson chi-square) for the research sample shows that there is significant difference in the perception of accepting according to relationship status comparing to those who are rejecting which appear to have no significant difference. The ratio for those who accept is significantly different among relationship statuses but the ratio for those who rejects it is smaller.

Table 2: The Perception on pre-marital sexual relations based on Personality Traits

	ACCEPT		REJECT	
	M	SD	M	SD
Openness	27.55	8.33	34.85	8.97
Conscientiousness	30.43	6.35	35.71	5.31
Extraversion	22.50	10.61	41.50	3.54
Agreeableness	26.04	6.34	35.67	6.92
Neuroticism	24.14	9.60	38.14	10.29
Others	26.60	9.60	36.33	5.59

Note. $p < 0.05$

Table 2 shows the perception on pre-marital sexual relations based on different personality traits. From the total of 200 respondents, it is seen that the highest acceptance on pre-marital sexual relations come from those who has Conscientiousness as it has the highest mean. While the highest mean for those who rejected the subject comes from Extraversion. The standard deviation for those who accept the issue appear to be the highest at 10.61 for Extraversion, while rejection the highest falls on Neuroticism with 10.29. Those who are extraverted, has the smallest standard deviation while they also have the highest mean on rejection, meaning that those who rejected pre-marital sex are distributed and resulted closely to each other.

However, from the result, we can see that for each of the personality, the mean for rejection is always higher than the acceptance, proving that most of the students are against the issue of pre-marital sexual relations.

Table 3: The relationship of Personality Traits and the Perception on Pre-Marital Sexual Relations

	ACCEPT		REJECT	
	r	p	r	p
Openness	-0.02	0.82	-0.04	0.55
Conscientiousness	0.03	0.73	-0.02	0.80
Extraversion	0.01	0.93	0.01	0.90
Agreeableness	-0.09	0.23	0.00	1.00
Neuroticism	0.05	0.48	-0.02	0.80
Personality Traits	0.01	0.23	0.01	0.49

Note. $p < 0.05$

Table 3 shows the relationship of each personality traits with the perception of pre-marital sexual relations according to Spearman Rho's correlation. It can be observed that there is no significant relationship between each of the personality traits with their perception of pre-marital sex. Due to that, the regression came out insignificant as one change on the variable (personality traits) does not produce change towards another (perception). In this case, the difference of personality does not indicate or affect their perception on pre-marital sexual relations.

Table 4 Factors that affect perception towards Pre-Marital Sexual Relations

	f	%	Cum.%
Individual	35	17.5	17.5
Partners	18	9.0	26.5
Religion	66	33.0	59.5
Morality	6	3.0	62.5
Society	23	11.5	74.0
Family	6	3.0	77.0
Friends	12	6.0	83.0
Social Media	34	17.0	100.0

Table 4 shows other factors that may affect students’ perception on pre-marital sexual relations. 66 out of 200 respondents stated that their perception on pre-marital sex is the result of their religion, where it encompasses 33.0% of the data. Both family and morality had the smallest value of three percent each (frequency of six) in terms of shaping the students’ perception on the issue. As such, we can conclude that the students’ perception on the issue is highly influenced by their religion which deems the act as immoral.

Table 5: Gender differences on perception towards Pre-Marital Sexual Relations

	FEMALE		MALE		t	p
	M	SD	M	SD		
Perception					0.16	0.87
Acceptance	26.68	8.13	27.37	7.77	-0.61	0.54
Rejection	34.46	8.15	36.36	8.12	-1.57	0.12

Note. $p < 0.05$

Table 5 shows the perception of the male and female students. Both male and female has the n of 100 for each group. The rejection for both gender obtained a higher inference score than those accepting. We could see that the mean for rejection for both genders are higher at 34.46 and 36.36 as compared to their acceptance mean which are 26.68 and 27.37 for female and male respectively. Male students obtaining a slightly higher mean score on both acceptance and rejection.

The table noted that $p < 0.05$ where it is the cut-off for significance and thus, as both p values for acceptance and rejection are much higher, it can be denoted that the results were not statistically significant. The perception towards pre-marital sex between the genders held no substantial difference; being a female or a male had no bearing on the decision to either accept or reject pre-marital sex, it is a non-factor.

Table 6: The opinion on the current situation of Pre-Marital Sexual Relations by the students of Management & Science University

Opinion	f	%	Cum.%	M	SD
Very Good	2	1.0	1.0	3.83	0.87
Good	5	2.5	3.5		
Normal	69	34.5	38		
Bad	74	37	75		
Very Bad	50	25	100		

Table 6 shows that the students' opinion on the current situation of pre-marital sexual relations and it seems that it is Bad to the majority of the students with 37 percentage. The others that come close are those with the opinion of that it is Normal with 34.5% and Very Bad at 25%. Very Good and Good opinions are in the minority with one percent and 2.5% respectively. Hence, we can conclude that most of the students perceive the act of pre-marital sex as a norm in today's society as well as something to be frowned upon.

CONCLUSION

The perception of pre-marital sexual relation can't be easily determined by the "type" of person one is. Not even their personality or their gender. Belonging to the same cultural context and environment, people are expected to have the same views and morality especially regarding social issues. From this research, we can see that the most intriguing factor that affects opinion of youngsters in Malaysia is religion. Understandably the concept of religion is very strong in Malaysia; ever since the beginning, the nature and culture of this land is based entirely on religion. As such, the deeply engraved social structure may contribute to the development of attitude, behaviour and personality. Be it Islam, Buddhism or Christianity, all religion frown upon sexual intercourse before marriage. This feature is so strong that it diminishes the effects of the rest of the circumstances including friends, the influence of media and technology, personality, gender and even family.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISE Journal Reviewer Committee

REFERENCES

1. Bancroft J. *Human Sexuality And Its Problems*. 3rd Ed. Wroclaw: Elsevier; 2009, pp1-546
2. Eysenck, H. J. *Sex And Personality*. London: Open Books Ltd. 1976.
3. Gordon E. Barnes, Neil M. Malamuth Eysenck's Theory Of Personality And Sexuality *Psihologija*, Udc 159.923.01. School Of Child And Youth Care, University Of Victoria School Of Communication Studies, University Of California, 1998, 3, pp239-248.
4. Haruna, Ali And Ibrahim, Alhaji Ahmadu, Gender, Age Differentials: Implications In Premarital Sex Among Adolescents And Young Adults *Global Journal Of Arts Humanities And Social Sciences*, European Centre For Research Training And Development Uk 2014, 2(2), pp.69-76.
5. Azizah Jaafar & Chan Siew Lee, Reka Bentuk Dan Pembangunan Perisian Kursus Multi-Media Pendidikan Seksualiti Malaysia (MSE). *Jurnal Pendidikan Malaysia*, 2009, 34 (2), pp125-142.
6. Jas Laile Suzana Jaafar, (2005). *Takat Keagamaan (Religiosity) Dan Motivasi Sosisla Seks Sebelum Nikah Di Kalangan Remaja Melayu*. Roziah Omar & Sivamurugan Pandian (Edt.), Malaysia *Isu-Isu Sosial Semasa*. Unit Penerbitan ISM: Kementerian Pembangunan, Keluarga Dan Masyarakat, Kuala Lumpur.
7. Anna C. Bocar And Noeme C. Perez (2013). *Students' Perception Towards Premarital Sex*

Presented During The Asian Conference On Multidisciplinary Research In Higher Education (ACMRHE 2013), Philippines. November 26-28, 2013

8. Salameh P, Jomaa L, Issa C, Farhat G, Zeghondi H, Gergesn, Sabbagh M.T, Chaaya M, Barbour B, Waked M, Salamé J, Saadallah-Zeidan N & Baldi I (2014) Assessment Of Health Risk Behaviours Among University Students: A Cross-Sectional Study In Lebanon, *International Journal Of Adolescence And Youth*, 19:2, 203-216, DOI:10.1080/02673843.2012.733313
9. Ismatullina, V., &Voronin, I. Gender Differences In The Relationships Between Big Five Personality Traits And Intelligence. *Procedia - Social And Behavioral Sciences*,2017,237,pp638-642.
10. Ajiboye, S. K., Aina, J. S., Oyebanji, T. O., &Awoniyi, S. A, Possible Causes Of Premarital Sex Among Youths As Perceived By Lecturers Of University Of Ilorin, Nigeria. *European Journal Of Educational Sciences*, 2014,01(04).pp1-9
11. Ghani, S. A., Abdullah, S., Akil, S. M., &Nordin, N, Muslim Adolescent Moral Values And Coping Strategies Among Muslim Female Adolescents Involved InPremarital Sex. *ProcediaSocial AndBehavioral Sciences*, 2014,114,pp 637-643.
12. Noroozi M., Taleghani F., Merghati-Khoei E., Tavakoli M., &Gholami A. (2014) Premarital Sexual Relationships: Explanation Of The Actions And Functions Of Family, *Iranian Journal of Nursing and Midwifery Research*,2014,19(4),pp424-431.
13. Ifeoma R. Eze Rome-ItalyAdolescents' Attitude Towards Premarital Sex , *Mediterranean Journal Of Social Sciences* MCSER Publishing,2014.
14. Johari Talib, MaharamMamat, Maznah Ibrahim &Zulkifli Mohamad Analysis On Sex Education In Schools Across Malaysia,*Procedia - Social And Behavioral Sciences*,2012, 59,pp 340 – 348
15. Kolb, 1984. *Experiential Learning 2017*, From <https://www.learning-theories.com/experiential-learning-kolb.html>
16. Abrahama, Juneman *, Rahardjo, Wahyu, Psychopathy, Sexual Values Dimensions, And Premarital Sexual Behaviour Among Urban Unmarried Adolescents *Procedia - Social And Behavioral Sciences*,2015,165,pp 2 – 11
17. Barnes, G. E., Malamuth, N.M., And Check, J. V. P., Psychoticism And Sexual Arousal To Rape Depictions. *Personality And Individual Differences*, Elsevier,1984, Vol. 5, pp273-279.
18. Marcia Carteret ,*Cultural Values Of Asian Patients And Families*. (N.D.). 2010.
19. Kolb, A. Y., & Kolb, D. A. , *Experiential Learning Theory. Experiential Learning Theory:A Dynamic, Holistic Approach To Management Learning, Education And Development*,2008,pp42-43.
20. Laura Parks-Leduc, Gilad Feldman, AndAnatBardi (2015) *Personality Traits And Personal Values: A Meta-Analysis*, *Personality And Social Psychology, The Society For Personality And Social Psychology, Inc.* 2014,Review5, Vol. 19(1) pp3–29.

Visual Impairment: A Comparison of Global and Indian Perspective

Soumya Thankam Varghese¹, Maya Rathnasabapathy²

¹Research Scholar; ²Assistant Professor (Senior), School of Social Sciences and languages, Vellore Institute of Technology – Chennai

ABSTRACT

This paper is a comparative review on the global and Indian perspective on blindness. The estimates, initiatives and better plans are described in detail. As India is trying her best to help with own people to achieve the global status of equality as in all realms of life this attempt is really significant. Thoughts about how much we have undergone and how much left to reach are key points to address in each phase of all kinds of developmental initiatives. The paper has been divided into two parts to come up with clear thoughts for further actions.

Keywords: *Visual impairment, Global perspective, Indian perspective*

BACKGROUND

Eyes are the most sensitive organ for all living beings. Absence of eyes is in a way absence of colors too. Taking care of our eyes is of course quite important to us for this single reason alone. Seeing and helping others to see, both initiatives are needed to be addressed seriously in the present situation. The reasons are many though we could categorize it as national and international. The imbalances in the distribution of visual impairment throughout the world are totally disappointing as the least developed regions carry the largest share¹. The same reflects when it comes to the age group also. Largely spread over among the group of 50 years of age and older. Gender wise estimates telling that females are more prone to get low vision problems compared to males. Social and medical explanations were there to support on gender wise in equal distribution of visual impairment. There are 1.4 blind children below the age of 15 years pointing towards the seriousness of childhood blindness across the world. The magnitude is little when compared to older adults make us as worried as children are the future of every nation. Initiatives of the WHO were quite instrumental in recognizing uncorrected refractive errors as a major cause for blindness globally.

The initiative “VISION 2020” – The Right to Sight is clearly focused to wipe out the preventable or avoidable cases of blindness completely from the globe.

Visual impairment: A Global Perspective:

The global perspective of visual impairment shifted its focus from infectious causes of blindness to the chronic causes. The World Health Organization’s global review on visual impairment estimation for the year 2002 was that 161 million people with visual impairment and 37 million with blindness against the background of 1973 report of World Health Organization was 15 million people worldwide². These numbers are associated with the VISION 2020 global initiative. The Right to Sight is a joint plan of WHO and the International Agency for the Prevention of Blindness, which targeted to work for the elimination of the avoidable blindness by 2020³. The majority of cases are reported due to refractive error followed by cataract. The definitions of visual impairment in the International Statistical Classification of Diseases (ICD) are the actual base for the categorization on degrees of blindness. ICD consider low vision (visual impairment less severe than blindness) as best-corrected visual acuity less than 6/18 to 3/60 and best corrected best-corrected visual acuity less than 3/60 or central visual field no greater than 10 degrees in the better eye. Single issue with the nature of definition is that exclude uncorrected refractive error as a cause leads towards an underestimation of the actual number of cases

Correspondence:

HYPERLINK “mailto:soumya.thankam2017@vitstudent.ac.in”soumya.thankam2017@vitstudent.ac.in

of visual impairment. The leading causes of blindness are still reported as cataract, trachoma and glaucoma from 1990's. Most of the cases of visual impairment due to cataract are either preventable or treatable as global scenario depicts.

After the surgical interventions started for cataract there were tremendous progress in the in the therapeutic interventions for eye diseases. Unfortunately even after the interventions remains the leading cause of blindness and visual impairment in all regions of the world excluding the most developed countries. The past estimates about visual impairment worldwide (2002) revealed the median ratio as 3.7 for 37 million blind and 124 low vision affected people. Apart from the cataract surgery the activities undertaken for vitamin A campaign were also quite significant globally. Vision- 2020 worldwide targets 32 million cataract surgeries annually by the year 2020³.

The discovery of role of Vitamin A has helped people a lot to reduce the childhood morbidity and mortality. World Health Organization has announced that age related cataract has become the single most important cause of blindness in developing world. The age group 5-11 years constitutes a good amount of low or no visual impairment cases all over due to various reasons as reported by many authors. Most of the infectious and nutritional diseases too came under control like Onchocerciasis⁴. Same time non cataract age related vascular and degenerative conditions have progressively become more crucial for the development of blindness.

Visual Impairment: An Indian Perspective

Though the efforts for prevention of blindness are happening globally the number of people with blindness is still increasing in the South Eastern Asian region. The number doubled from 7 million to 15 million in this region. As there is increase in the total population as well as aging population these numbers may again gross before the first quarter of the next century. Apart from cataract the other cause glaucoma has also got public health significance in the Indian context. The reasons may start from priority allocation to poor financial strategies⁵. Vision – 2020, the global initiative launched on February 18, 1999 by the world health organization and the international agency for prevention of blindness is targeted to work towards the elimination of avoidable blindness by the year 2020 by all possible means⁶. The

global collaborative approach where governmental and non-governmental organizations valuable outputs work hands on with each other seemingly more productive. The strategic schemes of Vision 2020 are giving great priority for eye care policies and preventive measures. Recent reports from WHO and other nongovernmental organizations revealed that 80% of all visual impairment and blindness can be avoided or cured. We can make the impossible possible with helping each other. WHO, the United Nations specialized agency for health, has been created the Prevention of Blindness (PBL) programmes in 1978 and developed many prevention strategies to fight major causes of avoidable blindness and visual disability⁶. They have been helping India in all various measures like planning, establishment, monitoring and evaluation kind of work through NPCB. Apart from this they are offering training fellowships and conducting many policy awareness workshops too. After 1991 World Bank has raised their contributions on health sector for the development of India. It is of course a great help for us to reduce the level of mortality, morbidity, and disability. The three main focuses of these approaches were:

1. To reduce the burden of significant diseases.
2. To strengthen the performance of state health systems.
3. To strengthen essential functions such as food and drug administration capacities.

UNICEF has worked for the alleviation of nutrition related blindness through both the central and state government by Vitamin A supplementation and interventions programmes.

For a majority of people the eye care services are not at all affordable since they belong to the low income category. Many NGO's are working on remote areas of India and helping to spread more awareness among people. Governments should come up with policies which encourage people to go for frequent eye check up and proper treatment if required. For example plans for spreading awareness about the importance of a healthy diet as well as vitamin A deficiency as a major cause of blindness. Eye donation programmes are also having huge impact on people though it is really difficult job. The eyes should remove within 4-5 hours after death. Here addressing the emotional problems of the families of donor itself a great deal. Psychological measures and

assistance to the family members also needed to be taken care of.

Department for International Development(DID) also prioritized their work for strengthening the capacity of organizations to develop and implement more policies and promotions for education, health care and improvement of livelihoods. NGO's like sightsavers are also working their maximum to reach the aim through sponsor eye camps and subsidy arrangements for hospitals.

CONCLUSION

The government should come up with innovative programme which aim on prevention, cure and awareness of low vision and blindness. The private sector can align with government to create more facilities for eye care and prevention of eye diseases. If so, the problems with availability and accessibility of treatment options could be solved in a better way. Donating eyes also have a great impact on the treatment part. 90 percent of the eye transplant surgeries are positive and also they help the researchers to contribute more into the preventive measures. Unfortunately the majority of cases are happen(ed)ing in less advantaged countries is itself calls for the necessary strategies to prevent, screen and treat the various causes. Together we could work towards the Vision 2020 through the implementation of activities

to strengthen the work we are carrying on for the elimination of avoidable blindness.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISE Journal Reviewer Committee

REFERENCES

1. Bennett, S., *The Mystique of Markets: Public and Private Health Care in Developing Countries*, PHP Departmental Publication No.4 , London School of Hygiene and Tropical Medicine, London. 1991
2. Foster, A. *Cataract—a global perspective: output, outcome and outlay*. *Eye*.1999 , 13, pp 449-453.
3. Malla, O.K., *Vision 2020- The Right to Sight*. Kathmandu University Medical Journal,2004,2(1), pp 1-5
4. Negrel, A.D., Thylefors , B., *Global Impact of Eye Injuries*. *Ophthamol Epid* ,1998,5(3). pp 143–169.
5. Sharma, Y. R. *Community Ophthalmology*. In: *Concise text book of Ophthalmology*, New Delhi.2007.
6. World Health Organization. *Report of WHO/IAPB scientific meeting, Hyderabad, India, Childhood Blindness Prevention*. WHO/PBL/87,1999.

Cohesiveness Factors of Employee Group SKK Migas Pekanbaru Riau Indonesia (Case Study)

Didik Widianoro¹, Nur Fitriyana²,

¹Faculty of Psychology, Islamic University of Riau, ²Islamic Study Program of Psychology, Muhammadiyah University of Riau

ABSTRACT

This study aims to find out and describe the formation of cohesiveness of employee groups in SKK Migas Pekanbaru in general. The type of research used is pure descriptive research with data sources derived from primary data through interviews. The scope of the discussion in this study is based on four factors of group cohesiveness by Forsyth namely Social Strength, Unity in Groups, Attractiveness and Collaboration in Groups. The purpose of this study was to determine the process of group cohesiveness formation for employees. From the results of the study it is known that the factor of group cohesiveness formation through mutual recognition between employees, the intensity of cooperation and work communication.

Keywords--- *Group Cohesiveness, Knowing Between Employees, Cooperation Intensity, Working Communication.*

INTRODUCTION

The development of this globalization era has made special attention in improving human resources for each service provider/company. In creating a conducive environment in human resources, many strategies should be implemented to support the success of the company.

The success of the company can not be separated from the important role of the quality of human resources owned. One of the success factors of achievement is how far the group's performance is effective in a company. This paradigm arises when individual achievement is no longer the main foundation in the success of each achievement. Togetherness and cooperation creates a sense of unity called group cohesiveness. Cohesiveness is a process that is grouped together by group members to remain united in working towards the common goal. ²

SKK Migas is tasked with carrying out the management of upstream oil and gas business activities under a Cooperation Contract. The establishment of this institution is intended so that the extraction of state-owned natural oil and gas resources can provide maximum benefits and revenues for the country for the greatest prosperity of the people. The HR development

process is an important learning medium for companies to maximize the potential of their employees in working groups and individuals. For this reason, research is conducted to see the picture of cohesiveness formation in groups, so that the results of the research can make new recommendations in the development of potential employees.

METHOD

The method in this study uses qualitative research, because researchers are interested in exploring and understanding the group cohesiveness formation factors mentioned earlier. This method also gives meaning and research results obtained will be larger, more flexible, and flexible.

In this study the subject to be used by researchers is a group of employees taken randomly. The research subjects consisted of 10 employees of SKK Migas Pekanbaru. Data collection in this study will use in-depth focused interviews and FGD (focus group discussions). This interview is an important source in research using case studies. In-depth interviews focused on open questions, but researchers used a set of pre-prepared questions. The topic of the question has been directed

at several things that might lead researchers to answer the research questions. In this situation, these questions must be designed so that the subject can provide original comments. Proper excavation must still be done to get other facts that may not have been revealed in the subject's spontaneous answer. FGD (focus group discussion) becomes a comparison source of the main data obtained from in-depth interviews. FGD data is data for clarifying data in this research case study.

Data analysis in qualitative research is an effort made in organizing data, sorting data into units that can be processed, finding and determining data patterns, and finding out what is important and what is learned from the data in order to determine what should be told to public audience. Data analysis is the process of dividing, separating or describing research material into pieces, parts, elements or units. After the data is broken down, the researcher sorts and filters the data to get the type, sequence class, pattern or overall picture.¹⁶

RESULTS AND DISCUSSION

From the results of data collection through interviews of 10 research subjects taken into 3 employees, it was found that group cohesiveness formation occurred because of the social relationships that existed between employees, both from superiors to subordinates as well as fellow colleagues.

“I felt the bond in the group happened after I got to know and help each other in terms of work and personal matters at my workplace” (WIS217 December 2017)

Social strength is one of the main factors in the formation of work group cohesiveness. This makes the basis of each working group to have a sense of unity in supporting the common goals in work.⁷

“Because I have often been together, so I have to develop chemistry with each other, so I have been comfortable working with my colleagues in the office” (WIS117 December 2017)

Attachment in work is created because of the attractiveness between employees. Attractiveness arises because another greeting is interconnected and dependent. So in the work climate, cohesiveness aspects in the working group are formed automatically.²

In collecting data through FGD (Focus Group Discussion) which is a process of gathering information

about certain very specific things. Based on the results of the discussions that have been conducted by researchers there are several important notes. The important record is related to communication that is still not open between one employee and another employee. As an example of communication that has not been open to several employees, there are still employees who keep their own information related to work that is an important matter and also a matter of personal conflicts with colleagues. Many employees do not want to share their problems with colleagues or superiors on the grounds that they do not want to burden others. Some employees convey good communication to make a good working relationship in supporting tasks and work in the workplace. In the theory of cooperation, success in a work group or company is influenced by mutual communication and mutual cooperation.¹⁵

In addition, from the results of the discussion, some employees were less brave in issuing opinions about work. So that in communicating there is often a lack of conveyed information that is important to follow-up. From this it often occurs in the group work team and that of fellow colleagues in the company. In terms of employee perceptions of superiors, data was obtained that the attitudes of the participants to superiors were quite varied, some participants said that their superiors were very disciplined, even if they were going to pray, they had to ask permission first. This also puts pressure on them because they have to be ready. Employees convey in increasing unity in groups with no employees who are limited in expressing their opinions. This makes the unity in the work group created properly because all are open to each other in expressing opinions or information about tasks and jobs.

CONCLUSIONS

The results of the research on cohesiveness formation of the SKK Migas Pekanbaru employee group showed that group cohesiveness was formed from various processes. The first factor in the formation of cohesiveness is knowing each other among employees so that the formation of social forces. Furthermore, in terms of intensity of mutual cooperation in completing tasks and work, this creates attraction between employees. The last factor is communication between employees. Mutual information with each other fosters unity in groups and the formation of cooperation in working groups.

Based on the results of various research findings, the researchers put forward several suggestions:

For further research can be done by other researchers using other objects such as government, educational institutions. In addition, group cohesiveness can be investigated using other types of research and methods.

For SKK Migas Pekanbaru, from the results of this case study research can be used as a reference in developing human resources related to cohesiveness issues.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISE Journal Reviewer Committee

REFERENCES

1. Bachroni, M, Pelatihan Pembentukan Tim untuk Meningkatkan Kohesivitas Tim pada Kopertis V Yogyakarta, Jurnal Psikologi ,2011,38(1),pp40-51.
2. Carron, A.V. dkk. , Team cohesion and Team Success In Sport. Journal of Sport Science, 2000,20,pp 119-127
3. Cumming, T.G & Worley, C.G. , Organization Development and Change : Eight Edition. New York : Thomson South Westren,2005.
4. Davis, K & Newstrom, J. W. , Perilaku dalam Organisasi Jilid 1. Jakarta : Erlangga,2001.
5. Dessler, G.,Manajemen Sumber Daya Manusia. Terjemahan. Jakarta : Indeks,2004.
6. Dyaram, L., & Kamalanabhan., T.J ,Unearthed: The Slide of Group Cohesiveness. New Delhi :Journal Sosial Sciene,2005, 10 (3),pp185-190
7. Forsyth, D, R. ,Group Dynamics Fourth. Thompson Wardsworth Learning,2006.
8. Ivancevich, J, M., Konopaske, R., & Matteson, M, T. , Perilaku dan Manajemen Organisasi. Jakarta : Erlangga,2006.
9. Levi, D. , Dynamic Group for Teams. London : Sage Publications,2001.
10. Mangkuprawira, S, & Hubeis. A, V., Manajemen Mutu Sumber Daya Manusia. Bogor : Galia Indonesia,2007.
11. Martika, L, D ., Studi Deskripsi Kohesivitas Kelompok Karaywan di Yayasan Nurul Hayat Surabaya. Jurnal Ilmiah Universitas Surabaya. Surabaya : Fakultas Bisnis dan Ekonomika,2013.
12. Masyhuri, Hubungan antara motivational coaching dan budaya organisasi dengan kepuasan kerja pegawai dinas PU Kimpraswil Kabupaten Kampar, Riau. Tesis, tidak diterbitkan. Yogyakarta : Program Studi Psikologi Industri UGM.2005.
13. Munandar. A. S., Psikologi Industri dan Organisasi. Jakarta : UI-Press,2011.
14. Paris, C. R., Salas, E. & Bowers, J. A. C. (2000). Teamwork in Multi-person System : A Review and Analysis. Journal of Ergonomic, 2000,43. pp1052-107
15. Robbins, S, P. Perilaku Organisasi. New Jersey : Prentice Hal I,2008.
16. Poerwandari. ,Pendekatan kualitatif dalam penelitian psikologi. Jakarta: Lembaga Pengembangan Sarana Pengukuran dan Pendidikan Psikologi Fakultas Psikologi Universitas Indonesia ,1998.
17. Sadish, W.R., Cook, T.D, & Campbell, D.T., Experimental And Quasi Experimental Design For Generalized Causal Inference. Boston: Houghton Mifflin Company. 2009.
18. Smither, R. D., Jouston, J, M & McIntire, S, A. Organization Development Strategies for Changing Enviroments. Florida : HarperCollins College Publishers1996.
19. Sugandhi, R.,Pengaruh pelatihan pembentukan tim dalam meningkatkan kohesivitas kelompok karyawan hotel x. Tesis, tidak diterbitkan. Yogyakarta : Magister Profesi Psikologi UII,2014.
20. Trihapsari & Nashori.,Kohesivitas Kelompok dan Komitmen Organisasi pada Financial Advisor Asuransi X Yogyakarta. Jurnal Psikologi. Yogyakarta : Fakultas Psikologi dan Ilmu Sosial Budaya UII.2011.
21. Widiatoro, D., Sukarti. S., Budiharto. S7,Pelatihan Motivational coaching Untuk Meningkatkan Kohesivitas Kelompok Pada Karyawan Hotel X Yogyakarta. JIP: Jurnal Intervensi Psikologi,2014, 9 (2), pp15-28.

Dimensions of Preference Towards Organic Products: An Empirical Study on Consumer's Perspective

Solomon Christopher D¹, C.B. Senthilkumar²

¹Research Scholar (CM16D001), ²HOD Supervisor, Dr. M.G.R. Educational And Research Institute University, Declared as deemed to be university u/s. 3 of the UGC Act, 1958, Maduravoyal, Chennai

ABSTRACT

This marketing research was conducted to explore the dominant dimensions of consumer preference towards organic products in Chennai city of Tamil Nadu. The researcher has adopted survey method to gather the responses from the organic consumers through structured questionnaire. The empirical evidences proves that, Eco-Friendly, Price, Health, Environmental Conservation, Adequate Availability of Products, Safety, Chemical Free, Consumer Attitude and Environmental Non-Degradation are the dominant dimensions of consumer preference towards organic products consumption and they are highly correlated to each other.

Keywords: Organic Products, Preference, Safety, Eco-Friendly and Agriculture

INTRODUCTION

In recent years, Consumers have become more conscious of the nutrition, health, environment and quality of the food they consume^{1, 2}, and healthiness is important criterion³. The growth has prompted the many organic researchers^{4, 5} and marketing explore the development and growth of the organic product industry^{6, 7}. Over the past few decades, the organic food industry in India has been experiencing an annual growth between 20-22 % across the globe^{8, 9}, and Indian export and import has expanded largely¹⁰. India produced around 1.35 million (2015-16) of certified organic products which includes all varieties of food products^{11, 12}, and organic food export realization was around 298 million USD^{13, 14}. The organic products are offering more eco-friendly environment, helps in the maintenance of consumer health^{15, 16}, more use of products which has long lifecycle and also promoting the agriculture economy in the¹⁷.

REVIEW OF LITERATURE

Gaetano Chinnici & et.al (2002)¹⁸ have carried an empirical research to understand the Consumer's Behaviour towards Organic products for that he adopted survey method to indicate that sex, age class, family size, educational qualification, occupational status have significant influence and concluded that healthy, nutritious, tasty and eco-friendly products are the major

aspects.

Sushil Kumar and Jabir Ali (2011)¹⁹ The researcher have made an attempt to examine factors affection Consumer's awareness on Organic food. The socio-economic profiles, monthly income and location have significant association with consumer awareness.

Efthimia Tsakiridou and et.al (2008)²⁰ have carried an exploratory study to explore the consumer attitude and behaviour towards organic products of Greek consumers which results in health concern, environmental concern and animal welfare consumption are major drivers.

Brijesh Sivathanu (2009)²⁴ explored the factors affecting the consumer preference to the organic food by identifying the influence of healthy, safety, environment friendly, nutrition value, reasonable price, trust in product certification and availability of the product. The result indicates that availability of the product, price, safety, certification, eco-friendliness and nutrition value are the significant inducers of consumer preference to the organic food purchase in the order of influence.

Rambalak Yadav and Gvind Swaroop Pathak (2016)²¹ The researcher examined the applicability of theory of planned behaviour and its applicability in organic food choice behaviour and the results indications that subjective norm and behavioural control have

significant influence on the intention to purchase organic food among youngsters in India.

RESEARCH GAP

Based on the literature of review, the former authors focused only the reasons on which factors consumers purchase the organic products. This study focused on the consumer preference and perception of demand for the organic products.

OBJECTIVES OF THE STUDY

The main objective of the research is to study socio-economic profiles, dimensions of perception and relationship among factors of perception towards organic products.

SCOPE OF THE STUDY

This present study focused on the number of consumer perception towards organic products consumption in Chennai City by giving importance to health, eco-friendly concern, normative concern and safety preference towards organic products purchase intention.

RESEARCH METHODOLOGY

The present study is descriptive in nature and has adopted survey, telephone interview, and observation method for its findings. This study is based mainly on the primary data collected from 100 consumers interested in purchasing organic products. The questionnaire was well- designed and well-structured.

RESULTS AND DISCUSSION

Table 1: The Demographic Profile of the Consumers

Demographic Profile (N = 100)	Percent
Age (D1)	
15 to 25 Years	74
26 to 35 Years	16
36 to 45 Years	7
Above 45 Years	3
Gender (D2)	
Female	61
Male	39

Educational Qualification (D3)	
School Level	2
Graduate	17
Post – Graduate	67
Professional and Others	14
Occupation (D4)	
Self Employed	8
Govt. Employee	10
House Wife	5
Private Employee	77
Family Monthly Income Level (D5)	
Below Rs. 20,000	62
Rs.20,001 – Rs.40,000	24
Rs.40,001 – Rs.60,000	10
Above Rs.60,001	4
Area of the Living (D6)	
Urban	83
Semi – Urban	17
Nature of Family (D7)	
Nuclear Family	76
Joint Family	24
Marital Status (D8)	
Married	19
Un Married	81

The above table inferred the majority of the 25 years below age group respondents prefer organic products and consequently other age group respondent. 60% of female respondents and male respondents are 39%. Majority are post graduates. 77% of the occupation is private employments and 10% are PSU employment respondents. 62% of respondents whose income <Rs.20,000/- per month prefers organic products more. 83% of respondents are residing at urban area prefers organic products than semi-urban area. 76% of nuclear family respondents prefer organic products than joint family and 81% of unmarried respondents are consumes organic products more than married group.

Table 2: Factor Analysis for Consumer Perception of Organic Product – Rotated Component Matrix

Dimension	Items	MSA	Communalities	Variance	Eigen Value	Lodgings
1	PER5.2	0.765	0.709	11.255	4.721	0.783
	PER5.5	0.644	0.709			0.766
	PER5.4	0.748	0.685			0.642
	PER5.1	0.667	0.779			0.605
2	PER5.12	0.701	0.716	9.733	2.078	0.797
	PER5.7	0.744	0.682			0.688
	PER5.3	0.786	0.776			0.643
3	PER5.14	0.674	0.706	9.292	1.843	0.737
	PER5.22	0.666	0.791			0.733
	PER5.9	0.773	0.601			0.677
4	PER5.20	0.45	0.764	7.384	1.586	0.839
	PER5.17	0.632	0.716			0.483
5	PER5.24	0.462	0.802	7.287	1.472	0.869
	PER5.23	0.561	0.606			0.519
6	PER5.13	0.453	0.81	7.011	1.253	0.766
	PER5.8	0.731	0.586			0.614
	PER5.21	0.508	0.782			0.511
7	PER5.6	0.58	0.716	6.731	1.222	0.794
	PER5.11	0.724	0.715			0.425
	PER5.16	0.817	0.49			0.39
8	PER5.15	0.62	0.744	6.401	1.157	0.778
	PER5.19	0.6	0.653			0.653
9	PER5.18	0.518	0.812	5.994	1.019	0.873
KMO and Bartlett's Test Kaiser-Meyer-Olkin Measure of Sampling Adequacy Value = 0.662 (Bartlett's Test of Sphericity Approx. Chi-Square 675.075; df = 253; Sig.0.000)				Total Variance Explained Rotation Sums of Squared Loadings 71.089% of nine dominant groups		
Reliability Statistics Cronbach's Alpha Value = 0.660 of the 23 items						

The Factor analysis has been applied to 23 consumer organic product preference variables to understand the dominant latent dimensions in them.

The above table, that 2 items exhibit the total variance is 71.089% by nine factors are extracted with Eigen values of more than one, which is statistically significant to go ahead for the meaningful data reduction process. KMO and Bartlett's Test Kaiser-Meyer-Olkin Measure of Sampling Adequacy Value = 0.662 (Bartlett's

Test of Sphericity Approx. Chi-Square 675.075; df = 253; Sig.0.000) indicates sample size adequate for the meaningful factor reduction process. A variable with communality lower than 0.4 should be omitted as it has insufficient explanation²³ suggests that variables candidates are those factors with factor loading or communality lower than 0.4 respectively, and with cross loading of values exceeding 0.4 on more than one factor . Therefore, item purchase of organic food for family has

been eliminated (0.36) due to low value of communality of less than 0.4. After the deletion of the item, all the items of the current study are acceptable communality values, ranging from 0.490 to 0.812. (49 percent to 81 percent), which is statistically significant and it has been proceed for data reduction process.

Factor – 1: The most dominant factor 1 consists of five items representing health aspects to the consumers. The items are “Organic products have more nutritional value, chemical free, fresher, healthier than industrialized and conventional grown products”. It has been labeled as “**Health Consciousness**” with the explained variance of 11.255%.

Factor – 2: The second dominant factor consists of three items and the items are “Consumer purchase organic food products because of its quality, protect the environment and is good for health”. It has been labeled as “**Eco-Friendly**” and 9.733% of variance explained.

Factor – 3: The third dominant factor consists of three items of consumer organic product preference and items are “I would rather buy organic food products even though it is expensive, quality and safety are more important than price”. It explained variance is 9.292% and it has been labeled as “**Price**”.

Factor – 4: The fourth dominant factor consists of two items which related to the organic product preference and the items are “Consumer practice and prefer environment conservation task, recycled organic products”. It has been labeled as “**Environmental Conservation**” and it explained variance is 7.38%.

Factor – 5: The fifth dominant factor consists of two items among the consumers organic product preference and the items are “Consumers feel organic products is available more in online and in stores”. It has been labeled as “**Availability of Organic Products**” and it explained variance is 7.28%.

Factor – 6: The sixth dominant factor consists of three items which relates to consumers organic product consumption safety preference and the items are “Consumers would buy products with logo, dispose my

garbage in different containers environmental concern and consumer is beauty / health conscious”. It has been labeled as “**Safety**” and it explained variance is 7.011%.

Factor – 7: The seventh dominant factor consists of four items inferred the organic products are chemical free compares to the other industrial conventional products are “Organic food product consumption will help to protect the environment, readily available, no side effects and for the goodness of environment they prefer organic products”. It has been labeled as “**Chemical Free**” and it explained variance is 6.731%.

Factor – 8: The eighth dominant factor consists of two items are “The current development path is destroying the environment (development destruction) - industrialized conventional agriculture” and “Unless we do something, environmental damage will be irreversible (environmental damage)”. It has been labeled as “**Consumer Attitude**” and it explained variance is 6.401%.

Factor – 9: The last dominant factor consist of only one item which relate to environmental sustainability for organic product prefer consumers and the item is “Consumers dispose of my garbage in different containers environmental concern”. It has been labeled as “**Environmental Non-Degradation**” and it explained variance is 5.994%.

Thus, nine independent factors have been extracted out of 23 consumer organic products.

Correlation between Dimensions of Consumers Organic Product Preference and Attitude

To examined the significant relationship between dimensions of organic product preference and attitude such as Eco-Friendly, Price, Health, Environmental Conservation, Adequate Availability of Products, Safety, Chemical Free, Consumer Attitude and Environmental Non-Degradation, Bi-variate Correlation was applied to find out significant relationship the inter dimension.

Table 3: Correlation

Dimensions of Organic Product Preference	Mean (SD)	1	2	3	4	5	6	7	8	9
Health Consciousness	15.39 (2.944)	1								
Eco-Friendly	11.93 (2.396)	.323** (.001)	1							
Price	10.46 (2.480)	.305** (.002)	.419** (.000)	1						
Environmental Conservation	7.12 (1.552)	.133 (.186)	.203* (.043)	.138 (.172)	1					
Availability of Products	6.45 (1.956)	.162 (.107)	.078 (.441)	.188 (.061)	.049 (.631)	1				
Safety	9.98 (2.256)	.187 (.063)	.063 (.532)	.372** (.000)	.338** (.001)	.304** (.002)	1			
Chemical Free	11.45 (1.940)	.370** (.000)	.430** (.000)	.328** (.001)	.280** (.005)	-.041 (.688)	.194 (.054)	1		
Consumer Attitude	7.63 (1.509)	.160 (.111)	.306** (.002)	.289** (.004)	.136 (.179)	.170 (.091)	.099 (.329)	.330** (.001)	1	
Environmental Non-Degradation	3.48 (1.068)	.145 (.149)	.128 (.205)	.221* (.027)	.385** (.000)	.016 (.871)	.180 (.073)	.124 (.220)	.030 (.768)	1

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

The correlation coefficient between consumer's organic product preference dimensions such as Health Consciousness and Eco-Friendly is 32.3%, Health Consciousness and Price indicates 30.5%, Health Consciousness and Chemical Free is 37%, Eco-Friendly and Price indicates 41.9%, Environmental Conservation and Chemical Free indicates 43.0%, Environmental Conservation and Consumer Attitude is 30.6%, Price and Safety indicates 37.2%, Price and Chemical Free 32.8%, Price and Consumer Attitude indicates 28.9%, Environmental Conservation and Safety indicates 33.8%, Environmental Conservation and Chemical Free indicates 28.0%, Environmental Conservation and Environmental Non-Degradation is 38.5%, Availability of Products and Safety indicates 30.4%, Chemical Free and Consumer Attitude indicates 33.0% are positive relationship at 1% level of significance. The correlation coefficient between Eco-Friendly and Environmental Conservation is 20.3% and Price and Environmental

Non-Degradation is 22.1% are positive relationship is significant at 5% level. . Hence the above table reveals there is a relationship between dimensions of consumer's organic product preference and their attitude. Furthermore, the price concern, health concern, environmental and eco-friendly concern are imperative relationship between each other for consumer's organic products prefers ²².

SUGGESTIONS AND IMPLICATIONS

The awareness about organic through awareness campaigns by Government, Implementation of Government Organic shops and Consumers initiative to buy organic products directly from farmers to avoid price hike, New Entrepreneurs can invest in organic to earn profit because of increase in health consciousness present days.

CONCLUSION

This marketing research was conducted to explore the dimensions of organic products preference among the consumers and the result indicates that Eco-Friendly, Price, Health, Environmental Conservation, Adequate Availability of Products, Safety, Chemical Free, Consumer Attitude and Environmental Non-Degradation are the dominant dimensions of consumer preference towards organic products consumption. This study reveals that the preference on organic products is less among people but the youngsters prefer organic products more as they take care health, beauty etc. but, ultimately, the consumers should take initiative to contribute the growth of the organic agriculture development in the country.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISSE Journal Reviewer Committee

REFERENCES

- Hughner, R. S., McDonagh, P., Prothero, A., Shultz, C. J., & Stanton, J. , Who are organic food consumers? A compilation and review of why people purchase organic food. *Journal of Consumer Behaviour: An International Research Review*, 2007,6(2-3), pp 94-110.
- Furst, T., Connors, M., Bisogni, C. A., Sobal, J., & Falk, L. W. , Food choice: a conceptual model of the process. *Appetite*,1996, 26(3), pp247-266.
- Magnusson, M. K., Arvola, A., Hursti, U. K. K., Åberg, L., & Sjöden, P. O. Choice of organic foods is related to perceived consequences for human health and to environmentally friendly behaviour. *Appetite*,2003, 40(2), pp109-117.
- Altieri, M. A., Funes-Monzote, F. R., & Petersen, P., Agroecologically efficient agricultural systems for smallholder farmers: contributions to food sovereignty. *Agronomy for Sustainable Development*,2012, 32(1),pp 1-13.
- Francis, C., Lieblein, G., Gliessman, S., Breland, T. A., Creamer, N., Harwood, R., ... & Wiedenhoef, M. Agroecology: the ecology of food systems. *Journal of sustainable agriculture*, 2003, 22(3), pp 99-118.
- Padel, S., & Midmore, P., The development of the European market for organic products: insights from a Delphi study. *British Food Journal*, 2005,107(8), pp626-646.
- Fotopoulos, C., & Krystallis, A. , Purchasing motives and profile of the Greek organic consumer: a countrywide survey. *British Food Journal*,2002, 104(9),pp 730-765.
- Willer, H., Lernoud, J., Huber, B., & Sahota, A., *The world of organic agriculture*.2018.
- Sahota, A. *The global market for organic food & drink. The world of organic agriculture. Statistics and emerging trends*, 2009, pp 59-64.
- Barrett, H. R., Browne, A. W., Harris, P. J. C., & Cadoret, K., Organic certification and the UK market: organic imports from developing countries. *Food policy*, 2002,27(4), pp301-318
- Kushwaha, B., Consumer buying behavior towards organic food products in Udham Singh Nagar & Nainital district of Uttarakhand (Doctoral dissertation, GB Pant University of Agriculture and Technology, Pantnagar-263145 (Uttarakhand)).2017.
- Singh, K., Kumar, S., Pradhan, S., & Patidar, O. P., Organic Farming for Sustainable and Nutritional Fruit Production in India: A Review. *Int. J. Curr. Microbiol. App. Sci*, 2018,7(5),pp 3033-3039.
- Mitnala, J. *Nutritional Quality of Organically Grown Food Crops*.2018.
- Kumar, S., Shrivastava, G. K., Navaz, M. O., Navrang, S., Pali, G. P., & Pandey, N. , Impact of various organic sources of nitrogen on growth, yield attributes and yield of scented rice (*Oryza sativa* L.) under irrigated conditions of Chhattisgarh plains. *Journal of Pharmacognosy and Phytochemistry*, 2017,6(6), pp1388-1391.
- Kim, S., & Seock, Y. K. , Impacts of health and environmental consciousness on young female consumers' attitude towards and purchase of natural beauty products. *International Journal of Consumer Studies*,2009, 33(6), pp 627-638.
- Haws, K. L., Winterich, K. P., & Naylor, R. W., Seeing the world through GREEN-tinted glasses: Green consumption values and responses to environmentally friendly products. *Journal of Consumer Psychology*, 2014, 24(3),pp 336-354.
- Badgley, C., Moghtader, J., Quintero, E., Zakem,

- E., Chappell, M. J., Aviles-Vazquez, K., ... & Perfecto, I. Organic agriculture and the global food supply. *Renewable Agriculture and Food Systems*, 2007,22(2),pp 86-108.
18. Chinnici, G., D'Amico, M., & Pecorino, B. ,A multivariate statistical analysis on the consumers of organic products. *British Food Journal*, 2002,104(3/4/5), pp187-199.
19. Kumar, S., & Ali, J. ,Analyzing the factors affecting consumer awareness on organic foods in India. In 21st Annual IFAMA World Forum and Symposium ,2012, 2050, pp 20-23).
20. Tsakiridou, E., Boutsouki, C., Zotos, Y., & Mattas, K. Attitudes and behaviour towards organic products: an exploratory study. *International Journal of Retail & Distribution Management*, 2008,36(2),pp 158-175.
21. Yadav, R., & Pathak, G. S. Young consumers' intention towards buying green products in a developing nation: Extending the theory of planned behavior. *Journal of Cleaner Production*,2016, 135, pp732-739.
22. Aman, A. L., Harun, A., & Hussein, Z. The influence of environmental knowledge and concern on green purchase intention the role of attitude as a mediating variable. *British Journal of Arts and Social Sciences*,2012, 7(2), pp145-167.
23. Hair, J.F., Black, W.C., Babin, B.J., & Anderson, R.E., *Multivariate Data Analysis. Seventh Edition.* Prentice Hall, Upper Saddle River, New Jersey.2010
24. Brijesh Sivathanu, "Factors Affecting Consumer Preference towards the Organic Food Purchases", *Indian Journal of Science and Technology*, 2015, 8(33).

Activity based Learning for Slow Learners in Colleges through Mollycoddle Method

Suresh Rasappan¹ and John Sunil Manohar²

¹Department of Mathematics, Veltech University, 400 feet outer Ring Road, Avadi, Chennai, Tamilnadu, India,

²Vethathiri Maharishi School, Tiruttani, Tamilnadu, India

ABSTRACT

Teaching and Training the slow learners are the biggest challenge that the Institutions are facing nowadays, since in a classroom all category of students like toppers, averages and slow learners will be seated together it's a tough task for the faculty to show focus on the slow learners in specific. Most of the schools nowadays categorize the classrooms based on the students' performance and skills set, which cannot be done in colleges as the environment of the colleges mustn't allow the students above 17+ to think that they are being discriminated because of their performance and knowledge, adding to this reason even many Institutions cannot afford more manpower in coaching the slow learners in separate. This manuscript talks about a methodology to train the slow learners of colleges to show some extent of progress without splitting them or either categorizing them.

Keywords: *Slow Learners, Knowledge, Skills, Mollycoddle.*

Abbreviations: Activity Based Learning (ABL).

INTRODUCTION

Both physical body and mental ability of a person has got limitations, for e.g if 100 people are participating in an endless marathon competition, some may walk up to 50 miles and quit, some might walk up to 100 miles and few may walk even up to 1000 miles or more, the point is, at some point of miles everyone even those who are unyielding will also quit, since the physical body has got limitations. So in the same way the capability of learning differs from person to person, some can understand the concept very quickly, some might understand in the second attempt of learning¹, but for few it requires a lot of practice whom at Institutions are called as slow learners. Many factors were studied by many subject experts on what made the students as slow learners², here in this manuscript we are not going to address about the issue of why being a slow learner?

Therein we discuss about the remedial measures and methodologies for college faculties to handle the slow learners for emulation in their learning skills³⁻⁵. If we ask a group of same subject teachers to teach a same topic to a same class, everyone will be unique and different, in the same manner the learning of the students will also differ from student to student, since manuscript focuses mainly about college students a little knowledge is required about the differences from a school student to college student.

Differences between a College Student and a School Student

Several factors are there to differentiate between a college student and a school student, since it is not our main focus lets us discuss some of the prime factors, apart from the general difference like age and growth there are some factors which play a major role.

S No	School Student	College Student
1	School is place where the students will be taught a lot about discipline, obedience, manners, respect and many more	Whereas in Colleges the lectures never take serious steps in teaching the said qualities, only the expectation will remain from the students to exhibit it.
2	At schools the job of a teacher is hectic as much, since they have to ensure to students understanding a lot and mostly in cases the teachers have to do spoon feeding.	In Colleges, the Lectures will prefer mostly on given a lecture on a topic, rather than the teaching, to which the students have to take effort for better understanding.
3	The activities of students are limited	The activities of students are liberal.
4	The atmosphere in the school doesn't allow the students to perform or either act outside of the campus	In case of college the students are considered for enough exemptions and flexibilities by the faculties.

The writing can be extended further about the differences, as we get enough for our understanding we conclude about the differences and move on to our prime topic. Since our topic covers about the slow learners of colleges, we are bounded to know about the slow learners which should cover about their capability⁶⁻⁹, strength, barriers and some common factors.

About Slow Learners in Colleges

Several parameters are there for a student being a slow learner in a college; let's discuss some of the common factors.

Students those who joins a chosen college because of their parents compulsion and selects a course or branch of study, will never pay 100 %focuses towards the subjects and 90% of chances are there for them to become as a slow learner.

At schools when students really don't understand a teacher teaching, the students will never feel shy or sullen in asking the teacher to repeat or explain again, whereas in colleges the sullenness of the students will stay on higher grounds, since the age factor plays a role, that's too if the Institutions is co-education both the men and women students will never prefer asking doubts about the topic that wasn't clearly understood, which could also be one of the reason for the students to be a slow learner.

When a practical concept is explained through a lecture, the toppers and even the average students can have good understanding as they may have the capability of converting the audio mode into a visual mode,

which the slow learners might find difficult, hence the possibilities are there for the slow learners to perform in debacle.

Many students believe that college life is a place of dreams in such a case most of the students will be in day dream for many hours during the class hours which will make to let pass the focus towards lecture and chances for them to become a slow learners.

Another common factor is the basic instinct of the students, which compiles the family background, living atmosphere, and capability of understanding, behavioral conditions and many more.

Activity Based Learning (ABL)

The ultimate goal of the College Institutions is to make the students learn, the objective of teaching is being provided from the faculties end whereas the learning has to be acquired by the students, thou the students play a vital role in learning it is job of the faculties to insist and make the learning effective and coherent. There are various methodologies are being observed and applied by many experts in the history of teaching, out of the many some were found to be more successful and still prevail, among all the methodologies Activity based learning holds high frequency note because of its cultivating quality over the students^{10,11}. The activity based learning can be split into various kinds which totally depend upon the mood and mindset of the teacher, since the in ABL the teacher must act as a facilitator who is in-charge to run the show. Here in this article we have discussed one specific kind of methodology from ABL which focuses

on the development of slow learners in colleges.

Mollycoddle Methodology

Mollycoddle methodology is been constituted specifically for the slow learners who won't give much attention to the teaching. This mollycoddle method will do wonders in the classroom more than the traditional black board learning and lecture method, since it covers all the said above within one roof. This method is being applied and tested by many subject experts and proven to be more effective. The objectives of the mollycoddle methodology follow below.

The teacher must give a lecture on a topic by using any teaching aid which should not long for more than 30 minutes, the usage of teaching aid will ensure the attention of the students in the beginning and the teacher must ensure that the attention stays till the completion of the lecture. Preparation will alone help the teachers to have the students' attention till the end.

The 30 minutes of lecture must be precisely manipulated by covering the aspects of pedagogy, interesting facts, historical facts, current affairs, discoveries and inventions related only to the topic.

Once the lecture is completed the teacher must split the students into team covers maximum of 6 in a team with an inclusion of at least 3 toppers and 3 slow learners in the same team.

All teams must be given at least 10 minutes of time for discussion on the topic in which the lecture was given, whereas the teacher must ensure that all the slow learners contribute something in the discussion.

After the completion of discussion the slow learners must be separated from the toppers and need to split them again into teams.

And now the slow learners alone will have a discussion on the same topic, by now the discussion from the slow learners would quite enhanced than the previous one, as they would have heard and understood from the discussion of toppers, since now it's their own jungle and the possibilities are there for the slow learners to prevail and present some ideas fearlessly.

After the completion of discussion the slow learners must be asked to frame the questionnaires at least two from each, the topic has to be kept in mind and the

teacher has to initiate the questionnaire by framing a sample question, which will give an idea to the students on framing questionnaires on the topic.

After the completion of questionnaire session the teacher has to initiate for quick recapitulation and revision in which the teacher can ensure about the students understanding.

The mollycoddle method covers all the four process of lecture, discussion, framing questionnaires and recapitulation.

The best pro of this method is it allows the slow learners to involve themselves activity with any stress or constrain, since it gives them a wide opening when are together with the toppers and allows them to apply when they enter their domain.

CONCLUSION

Mollycoddle method is almost like method of feeding food to the children; since the toddlers won't be having enough understanding to feed themselves, the mollycoddle method is like a robotic device which ensures that the students are being fed.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISE Journal Reviewer Committee

REFERENCES

1. Jalal Nouri, The flipped classroom: for active, effective and increased learning – especially for lowachievers, Springer Open, International Journal of Educational Technology in Higher Education 2016.
2. Carmen Yot-Domínguez and Carlos Marcelo, University students self-regulated learning using digital technologies, Springer Open, International Journal of Educational Technology in Higher Education, 2017.
3. Zimmerman, B. J. , Theories of self-regulated learning and academic achievement: An overview and analysis. In B. J. Zimmerman, & D. H. Schunk (Eds.), Self-regulated learning and academic achievement, Theoretical Perspectives, New York: Routledge,2009,pp. 1–38.

4. Zimmerman, B. J., & Martinez Pons, M. , Development of a structured interview for assessing student use of self-regulated learning strategies. *American Educational Research Journal*, 1986, 23(4), PP 614–628.
5. Zimmerman, B. J., & Moylan, A. R. ,Self-regulation: Where metacognition and motivation intersect. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Handbook of Metacognition in education*, New York: Routledge.2009,pp. 299–315.
6. Gilboy, M. B., Heinerichs, S., & Pazzaglia, G. (2015). Enhancing student engagement using the flipped classroom. *Journal of nutrition education and behavior*,2015, 47(1), PP 109–114.
7. B. J. Zimmerman, & D. H. Schunk(Eds.), *Handbook of self-regulation of learning and performance*, New York: Routledge,2011,pp. 1–12
8. Beekes, W. , The “millionaire” method for encouraging participation. *Active Learning in Higher Education*, 2006,7(1), pp25–36.
9. Manoah, J. John. “Formulas for being expertise in classroom and students handling.” *IRA International Journal of Education and Multidisciplinary Studies* .2016.
10. Manoah, John Sunil. “The scheme of implementing Active Learning Methodologies for the students of rural areas.” *IJAR Indian Journal of Applied Research* 2016.
11. Manoah, J. J. S., & John, J., *Formulas for Effective Teaching and Classroom Management*. *Language in India*, 2015, 15(2).

Stability Analysis of a Prey-Predator System involving Holling's Response Using Back-Stepping Regimentation

Suresh Rasappan¹, Vijaya Lakshmi Gandhavadi Mohan Rao¹, Pugalarasu Rajan²

¹Department of Mathematics, Veltech University, 400 Feet Outer Ring Road, Avadi, Chennai, Tamilnadu, India,

²Department of IT, Ibri College of Technology, Sultanate of Oman, Ibri

ABSTRACT

In this paper, a mathematical model with back-stepping controller is proposed and analyzed to study the prey-predator interaction in which the prey population is infected. Investigation is made of the dynamical complexities of a prey-predator model with susceptible and infected (SI) prey including the non-selective prey harvesting with back-stepping controller. In this work, it has been assumed that in the interaction of susceptible and infected prey populations, predator predate on infected prey only. By constructing a suitable Lyapunov function, global asymptotic stability is established. Comparative analysis has been presented between the system without control and the system with control. Numerical examples are furnished and diagrams are presented which support our results.

Keywords: Prey-predator system, SI model, Lyapunov function, Back-stepping Control, Stability.

INTRODUCTION

The study of ecology and epidemiological models has been gaining popularity day-by-day. Epidemiological models have received much attention of the scientists. For the analysis of the spread and control of infectious disease, a mathematical model has become an appropriate tool. The infectious disease transmission models come under the broad classification of classical susceptible, infectious, and recovery (SIR) model.

A species does not have independent existence in the world. A susceptible species, while coming into contact with an infectious one turns into infectious. Several biological studies focus attention on the dynamical behaviours of epidemiological models wherein the effect of interacting species with infected one is considered.

This paper falls under the purview of Eco-epidemiology involving prey harvesting. Kar et. al,¹ have considered two fish species competing with each other for the use of a common resource and pointed out then both of them may be subjected to continuous harvesting. There is a predator (for example a *whale*) feeding on both of them. It is assumed that the predator population is not harvested (for example *whale harvesting has been prohibited*). Thus the interaction

between the harvesting agency and the predator is through the third party, namely, the prey. Since we are not making a case study in respect of a specific prey-predator community, we have opted for the investigation of logistic growth function for the prey species (that is, the population density of prey is resource limited) and for simplicity, the feeding rate of the predator species is assumed to increase linearly with prey density.

The stability analysis of prey-predator with control phenomena is a challenging problem in many ecological systems for which there are quite a few references. Al-Ruziaza², Amit Bhaya³, Frederic Gronard⁴, Vijaya Lakshmi⁵ and Awad El-Gohary⁶ have dealt with the nonlinear feedback control, positive control, controlling chaos and adaptive control on prey-predator system. Krishnapada Das et.al.⁷ and Prasenjit Das et.al.⁸ have studied the prey predator system with disease in the predator population and examined the chaos in this system.

The dynamics of stage structure prey-predator model with parasitic infectious disease has been discussed in Raid Kamel Naji et. al.⁹ and Pal et. al.¹⁰ wherein they analysed the eco-epidemiological model with a prey refuge. The aspects of persistence and stability of a two prey and one predator system have been studied by Kar

et. al.¹¹. Several authors have taken up a study on the prey-predator system with diseased prey¹²⁻¹⁷. Various types of harvesting such as the one with susceptible and infected prey, known as combined harvesting, optimal harvesting etc.. on prey-predator system have been formulated by many authors¹⁸⁻²².

Kar and Pahar et. al.²³ have studied the dynamical behaviour and the harvesting problems of a prey-predator fishery with a protective patch for the prey species. Shib sankar et. al.²⁴ have gone into the optimal joint harvest of prawns and poultry in a bio-economic system. Purohit et. al.²⁵ have dealt with the combined bio-economic harvesting of two competing fish species, each of which obeying the Gompertz⁷ law of growth.

The ecosystem perturbed by independent white noise and other related models have been investigated by Mukherjee²⁶ and Srinivasan et. al.²⁷.

Based on the above literature, we have investigated the epidemiological model, namely susceptible-infected prey (SI) and predator model, to find out how the process of predation influences the epidemics. In the present paper, we consider the case of the predator eating the infected prey only because the infected individuals are less active and are more easily caught. For instance,²⁸Peterson and Page have found that the wolf attacks on moose are more often successful if the moose is heavily infected by “*Echinococcus granulosus*”. We have taken up the problem of harvesting two competing species in the presence of a predator species which feeds on only infected species. That is, a combined harvesting effort is devoted to the exploitation of two prey species while the predator species is not harvested.

Most often, harvesting policy is one of the major problems in ecology, eco-epidemiology, economics, etc. The harvest of population species is mostly practiced in agriculture, fishery, forestry and population management. To control the oscillations arising in eco-epidemiological systems, the role of harvesting in an eco-epidemiological system wherein the susceptible prey and infected prey are subjected to combined harvesting is studied. Harvesting harms some of the species living on the other species. As a consequence, the predator species becomes extinct with an indiscrete increase in the harvesting of prey species. Therefore, to maintain the ecological balance, introducing controllers in the system is a challenging problem. Most of the mathematical

models deal with the harvesting of three species, first two species, third species etc. There has been no work so far in the introduction of back-stepping control in the study of harvesting model of two competing species in the presence of a predator, the third species (predator) being not harvested.

In this paper, we present a new approach by going in to the stability of SI prey-predator model by using back-stepping nonlinear control. This paper is organized as follows: In section 2 we introduce the model with assumptions. In section 3 we have presented the plots for the system without control. In section 4 we have furnished the problem statement for the system with back-stepping control. In section 5 we introduce the back-stepping nonlinear controls and derive the global stability conditions by constructing suitable Lyapunov function. In section 6 we have presented the numerical simulations for the system with back-stepping control which supports our result. Findings on the comparative analysis in the variations of the disease transmission rate and harvesting rate are presented. The last section 7 is devoted to the concluding remarks.

2. The Mathematical Model of the System

In this section, we study the dynamics of the continuous time three species prey-predator populations with combined harvesting in which we will use the mathematical tools and biological assumptions for modelling prey-predator system which consists of two preys and one predator.

2.1 The Basic Model and Modified Model with Assumptions

In this section, we consider the three species prey-predator system which consists of two preys, namely susceptible prey, infected prey (SI) and one predator. Here we assume that the predator predate on only infected prey with Michaelis-Menten-Holling type II functional response. Such system can be obtained from the following set of non-linear differential equations:

$$\begin{aligned} \dot{X}_1 &= rX_1 \left(1 - \frac{X_1}{K} \right) - PX_1X_2 \\ \dot{X}_2 &= PX_1X_2 - f(X_2, X_3)X_3 \\ \dot{X}_3 &= ef(X_2, X_3)X_3 \end{aligned} \quad (1)$$

$X_3(t)$:the number of the predator population at time t,

r : the growth rate of susceptible prey population,

K : the environmental carrying capacity,

P : the rate of transmission from susceptible to infected prey population,

e : the coefficient of conversion of prey into predator is e , where $0 < e < 1$.

Now to formulate the modified mathematical model of a prey-predator system with disease in prey population involving combined harvesting in prey species, we make the following assumptions:

1. In the absence of infection and predation the susceptible prey population grows logistically with intrinsic growth rate ($r > 0$), carrying capacity ($K > 0$) and then we have

$$\frac{dX_1}{dt} = rX_1 \left(1 - \frac{X_1}{K} \right) \tag{2}$$

2. In the presence of infection, the prey population is divided into two groups namely susceptible prey denoted by $X_1(t)$ and infected prey denoted by $X_2(t)$ at all time t , the total population is

$$N(t) = X_1(t) + X_2(t).$$

3. The disease is spread among the prey population only and the disease is not genetically inherited. The infected prey populations do not recover or become immune. We assume that the disease transmission follows the simple law of mass action $PX_1(t)X_2(t)$ with P as the transmission rate.
4. The susceptible prey $X_1(t)$ and infected prey $X_2(t)$ is removed by combined harvesting rate Eq_1 and Eq_2 where $q_1 (> 0)$, $q_2 (> 0)$ and $E (> 0)$ (non- selective harvesting).
5. We assume that the predator population consumes only on infected prey with Michaelis Menten-Holling functional response:

$$f(X_2, X_3) = \frac{\gamma X_2}{X_3 + \gamma\beta X_2}, \quad (\gamma, \beta > 0) \tag{3}$$

that is, the Michaelis-Menten-Holling type is a functional response for infected prey and it is a numerical response for predator. In this γ is the total attack rate for predator or predation coefficient and β is the handling time of predator to prey.

Therefore the modified of the model (1) becomes:

$$\begin{aligned}
\dot{X}_1 &= rX_1 \left(1 - \frac{X_1}{K} \right) - PX_1X_2 - Eq_1X_1 \\
\dot{X}_2 &= PX_1X_2 - \frac{\gamma X_2X_3}{X_3 + \gamma\beta X_2} - Eq_2X_2 \\
\dot{X}_3 &= \frac{e\gamma X_2X_3}{X_3 + \gamma\beta X_2} - dX_3
\end{aligned} \tag{4}$$

with initial data $X_1(0) \geq 0$, $X_2(0) \geq 0$, $X_3(0) \geq 0$ and the coefficients r , K , P , γ , β , e , d , E , q_1 and q_2 in model (4) are all positive constants. In the above model, q_1 and q_2 be the catchability coefficients of the susceptible and infected prey, respectively and E be the combined external effort devoted to non-selective harvesting of both the susceptible and infected preys by the external harvester (not by predator). Thus Eq_1X_1 and Eq_2X_2 represent the catch of the susceptible and infected prey species. Also q_1 , the catchability coefficient of the susceptible prey may be less than q_2 the catchability coefficient of the infected prey because the infected prey is less active than their healthy counterpart. Therefore, for the same effort E , the number of infected prey caught per unit time may be much higher than that of non-infected prey.

2.2. Non-dimensional model

In the above model, we have specified 10 parameters which make the analysis difficult. Now to reduce the number of the system parameters we will transform the system (4) to the non-dimensional form by using the following transformation of the variables:

$$x_1 = \frac{X_1}{K}, \quad x_2 = \frac{X_2}{K}, \quad x_3 = \frac{X_3}{\gamma\beta K}, \quad t = r\tau \tag{5}$$

The modified Michaelis-Menten-Holling prey-predator with vulnerable infected prey dynamics that is, using the transformation (5) the system (4) takes the non-dimensional form:

$$\begin{aligned}
\dot{x}_1 &= x_1(1 - x_1) - kx_1x_2 - \alpha_1x_1 \\
\dot{x}_2 &= kx_1x_2 - b \frac{x_2x_3}{x_3 + x_2} - \alpha_2x_2 \\
\dot{x}_3 &= c \frac{x_2x_3}{x_3 + x_2} - ax_3
\end{aligned} \tag{6}$$

where the relations between the non-dimensional and dimensional parameters given by:

$$k = \frac{PK}{r}, \quad b = \frac{\gamma}{r}, \quad c = \frac{e}{r\beta}, \quad a = \frac{d}{r}, \quad \alpha_1 = \frac{Eq_1}{r}, \quad \alpha_2 = \frac{Eq_2}{r} \tag{7}$$

The system (6) is more simplicity than (4) for the mathematical study, since the number of system parameters has been reduced from 10 to 6.

Now we will analyze the system (6) with the following initial conditions:

$$x_1(0) > 0, x_2(0) > 0, x_3(0) > 0 \tag{8}$$

The conditions (8) represent the conditions of positivity or biologically feasibility of the densities of susceptible prey, infected prey and predator populations respectively.

3. Numerical Simulation for the system without control

In this section, we have presented the diagrams for the prey-predator system (6) without control with prey harvesting by keeping the parameters fixed and varying transmission rate and harvesting rate.

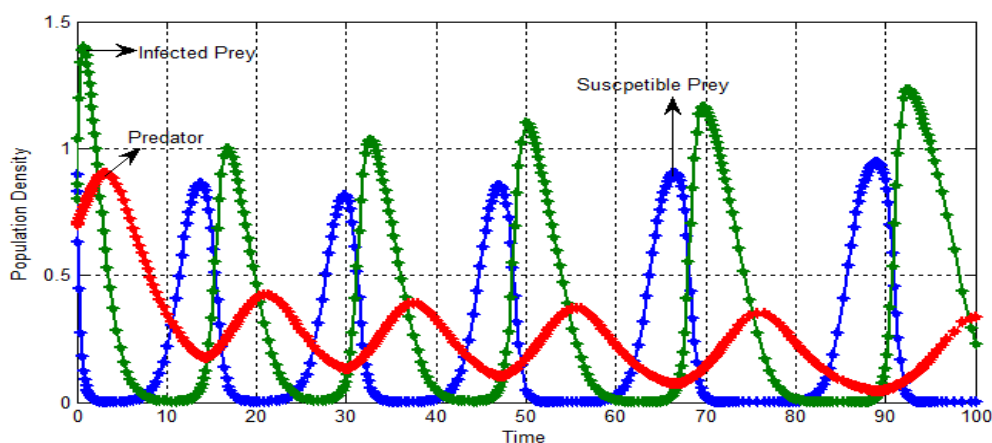


Figure 1 (a): The variation of population against time with $k = 2.5$; $\alpha_1 = 0.0002$; $\alpha_2 = 0.0002$ of the system (6).

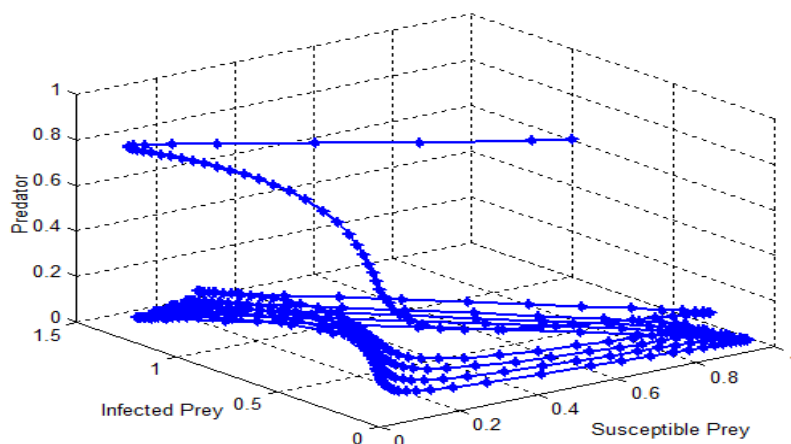


Figure 1 (b): Phase-space trajectories with $k = 2.5$; $\alpha_1 = 0.0002$; $\alpha_2 = 0.0002$ of the system (6).

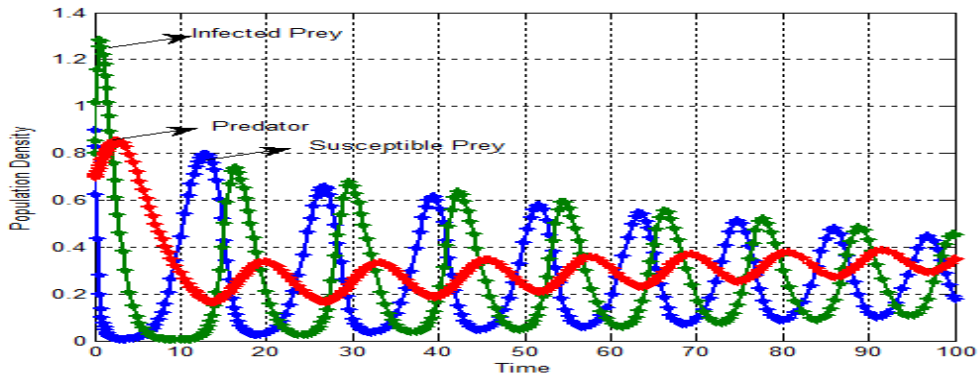


Figure 2 (a): The variation of population against time with $k = 2.5$; $\alpha_1 = 0.1$; $\alpha_2 = 0.1$ of the system (6).

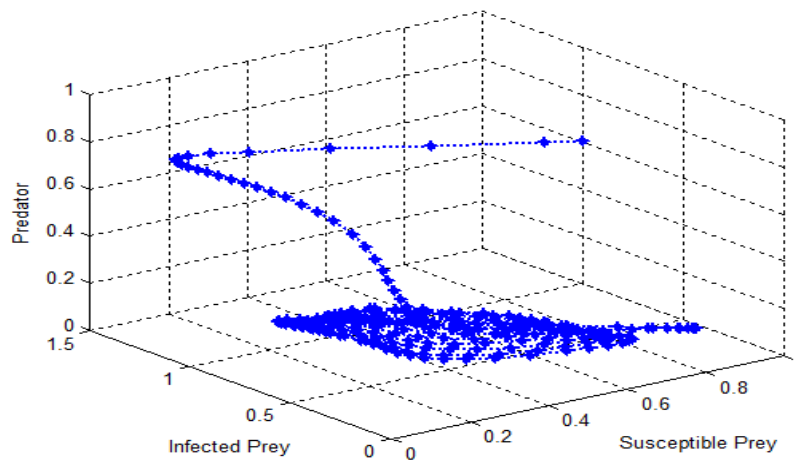


Figure 2 (b): Phase-space trajectories with $k = 2.5$; $\alpha_1 = 0.1$; $\alpha_2 = 0.1$ of the system (6).

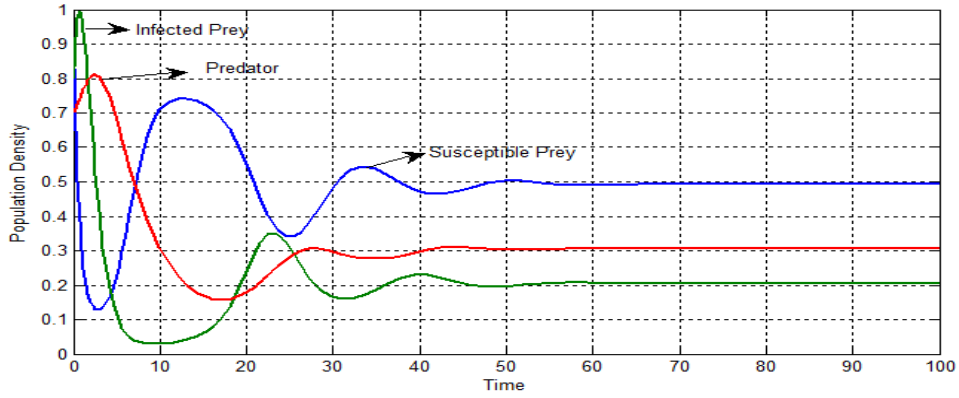


Figure 3 (a): The variation of population against time with $k = 1.5$; $\alpha_1 = 0.2$; $\alpha_2 = 0.2$ of the system (6) approaches the equilibrium point.

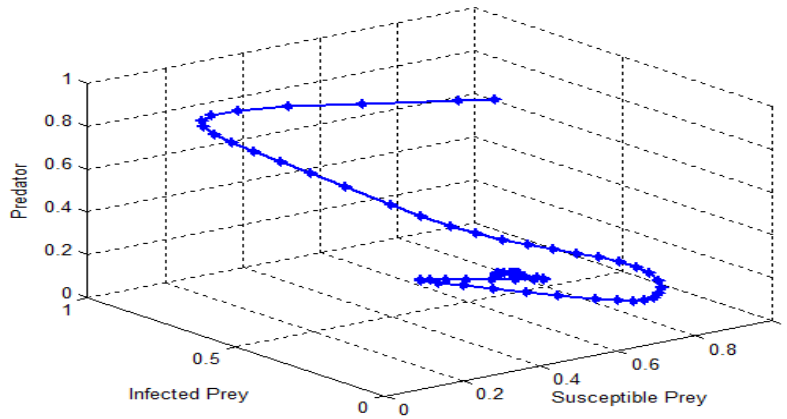


Figure 3 (b): Phase-space trajectories with $k = 1.5$; $\alpha_1 = 0.2$; $\alpha_2 = 0.2$ of the system (6).

$$\dot{V}_3 = -\alpha_1 x_1^2 - \alpha_2 w_2^2 - a w_3^2 \tag{49}$$

which is a negative definite function.

Thus by Lyapunov stability theory (Hahn, 1967)²⁹ the dynamics of the prey-predator system (6) is globally asymptotically stable by using back-stepping controllers.

6. Numerical Simulation for the system (23) with back-stepping control

In this section we present some results of numerical simulations and discuss their implications to explore the possibility of the variations and the effect of the back-stepping controllers. From the below figures, we keep the parameters $a = 0.2$; $b = 0.9$; $c = 0.5$ fixed with the initial densities $x_1 = 0.9$; $x_2 = 0.8$; $x_3 = 0.7$ and varying the disease transmission rate and harvesting rate parameters.

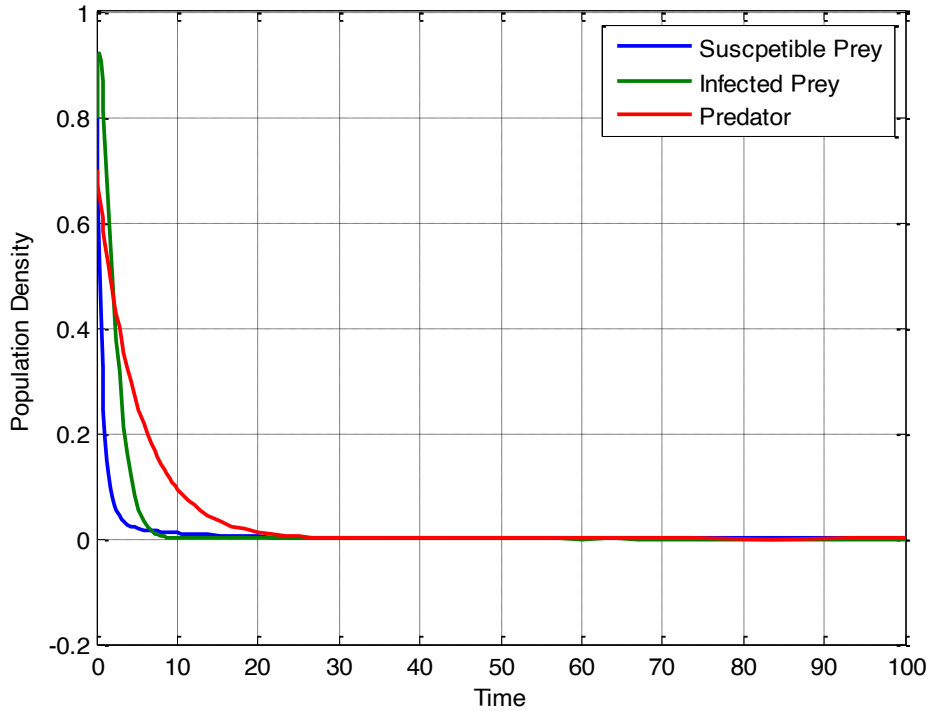


Figure 4(a)

Figure 4 (a): The variation of population against time with the parameters

1. $4 < k < 3.5$; $0.0001 < \alpha_1 < 0.3$, $0.0001 < \alpha_2 < 0.3$ and approaches the stability of the system (23).

Figure 4 (a) shows the population densities approaches the point (0,0,0) for the controlled system (23) which proves our theorem when the disease transmission rate and the harvesting rates, and figure 4 (b) shows the corresponding phase portrait. That is, for the back-stepping controllers as long as this feedback stabilizes, the states in the system (23) converges to zero as .

At last, we conclude that the three species prey-predator model, that is, two preys and one predator model, including prey harvesting with back-stepping controllers approaches the stability quickly when compared to the system without control.

CONCLUSION

In this paper, a mathematical model consisting of susceptible, infected (SI) prey and the predator interactions involving Michaleis – Menten – Holling functional response has been studied analytically as well as numerically. We show that the three species prey-predator populations is globally asymptotically

stable using back-stepping control inputs, that is, the system (23) is examined via the techniques of global asymptotic stability analysis by constructing Lyapunov function. Also comparative analysis has been given for the disease rate and harvesting rate. That is, if the disease transmission rate is decreased from to , then the density of infected prey and predator population also decreased and the susceptible prey increased which is observed in figure 3 (a). Also when we increase the harvesting rate, the infected prey density will decrease which is shown in figure 2 (a), this shows that the harvesting controls the disease in the prey species. Numerical simulations were done to observe the effect of the control on the three species and diagrams were presented which are support our results.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISSE Journal Reviewer Committee

REFERENCES

1. Kar. T.K and Chaudhuri. K.S, “ Harvesting in a two-prey one-predator fishery: A bioeconomic model”, ANZIAMI, 2004, 45,pp 443-456.
2. Al-Ruzaiza. A.S, “The chaos and control of prey-predator model with some unknown parameter”, Applied Mathematical Sciences, 2009, Vol.3, No.28, 1361-1374.
3. Amit Bhaya and Magno Enrique Mendoza Meza, “Control of nonlinear dynamic models of predator-prey type”, Oecologiu Australis, 2012, 16(1), pp81-98.
4. Frederic Grogard, Jonathan Rault and Jean-Luc Gouze, “Positive control for global stabilization of predator-prey systems”, 9th IFAC symposium on nonlinear control systems, Toulouse, France, 2013, pp4-6.
5. Vijaya Lakshmi Gandhavadi Mohan Rao, Suresh Rasappan, Regan Murugesan and Vijaya Srinivasa, “A prey predator model with vulnerable infected prey consisting of non-linear feedback”, Applied Mathematical Sciences, 2015, 9(42), pp 2091-2102.
6. Awad El-Gohary and Al-Ruzeiza. A.S, “Chaos and adaptive control in two prey, one predator system with nonlinear feedback”, Chaos, Solitons and Fractals, 2004, 34, pp 443-453.
7. Krishnapada Das, Sudip Samanta, Barasha Biswas, Joydev Chottapadhyay, “Occurrence of chaos and its possible control in a predator-prey model with disease in the predator population”, The Journal of Ecology, 2014, 108, pp 306-319.
8. Prasenjet Das, Dehasis Mukherjee, Kalyan Das, “Chaos in a prey-predator model with infection in predator- A parameter domain analysis”, Computational and mathematical biology, 2014,4(3),pp 1-12.
9. Raid Kamel Naji and Dina Sultan Al-Jaf, “The dynamics of stage structured prey-predator model involving parasitic infectious disease”, Applications and Applied Mathematics:An International Journal, 2011 , Vol. 6, Issue 2, pp. 529 – 551.
10. Pal. A.K and Samanta. G.P, “Stability analysis of an eco-epidemiological model incorporating a prey refuge”, Nonlinear Analysis: Modelling and Control, 2010, 15(4),pp 473–491.
11. Kar. T.K, and Ashim Batabyal,” Persistence and stability of a two prey one predator system” International Journal of Engineering, Science and Technology, 2010, 2(2),pp 174-190.
12. Atul Johri, Neetu Trivedi, Anjal Sisodiya, “Study of a prey-predator model with diseased prey”, Int.J. Contemp. Math. Sciences, 2012,7(10),pp 489-498.
13. Wuhaid. S.A and Abu Hasan. Y, “A prey predator model with vulnerable infected prey” Applied Mathematical Sciences, 2012,6(107),pp 5333-5348.
14. Herbert W. Hethcote, Wendi Wang, Litao Han, Zhien Ma, “A predator-prey model with infected prey”, Theoretical Population Biology, 2004, 66, pp 259-269.
15. Yanni Xiao, Lansun Chen, “A ratio-dependent predator-prey model with disease in the prey”, Applied Mathematics and Computation, 2002, 131,pp 397-414.
16. Yanni Xiao, Lansun Chen, “Modeling and analysis of a predator-prey model with disease in prey”, Mathematical Biosciences, 2001, 171, pp 59-82.
17. Md. Sabiar Rahman1, Santabrata Chakravarty, “A predator-prey model with disease in prey”, Nonlinear Analysis: Modelling and Control, 2013, 18(2), pp 191–209.
18. Wuhaib. S.A and Abu Husan .Y, “A predator infected prey model with harvesting of infected prey”, Research Article: ScienceAsia 2013, 395,pp37-41.
19. Kar. T.K, Swarnakamal Misra and Mukhopadhyay. B, “A bioeconomic model of a ratio-dependent predator-prey system and optimal harvesting”, J. Appl. Math & Computing, 2006, 22(1-2),pp 387-401.
20. Bairagi. N, Chaudhuri. S and Chattopadhyay.J, “Harvesting as a disease control measure in an eco-epidemiological system – A theoretical study”, Mathematical Biosciences, 2009, 217, pp134–144.
21. Yunfei Lv , Rong Yuan, Yongzhen Pei, “A prey-predator model with harvesting for fishery resource with reserve area”, Applied Mathematical Modelling, 2013, 37, ppn3048–3062.

22. Kar. T.K, Matsuda.H. “Global dynamics and controllability of a harvested prey-predator system with Holling type III functional response”. *Nonlinear analysis: Hybrid systems* 1, 2007, 1 , pp59-67.
23. Kar. T.K and Pahar. U.K. “A model for prey-predator fishery with marine reserve”, *Journal of Fisheries and Aquatic Science*, 2007,2 (3),pp 195-2007.
24. Shib sankar sana, Debabrata Purohit, Krishpasindhu Chaudhuri. “Joint project of fishery and poultry-A bioeconomic model”, *Applied Mathematical Modelling*, 2012, 36,pp 72-86.
25. Purohit. D and Chaudhuri. K.S. “A bioeconomic model of nonselective harvesting of two competing fish species”, *ANZIAM J*, 2004, 46,pp 299-308.
26. Mukherjee. D, “Stability analysis of a stochastic model for prey-predator system with disease in the prey”, *Nonlinear Analysis: Modelling and control*, 2003, 8(2),pp 83-92.
27. Srinivas. M.N, Reddy. K.S, Das. K, Sabarmathi. A and Das. P, “Stochastic effects on an ecosystem with predation, commensalism, mutualism and neutralism”, *Journal of advanced research in dynamical and control systems*, 2014, 6(3),pp 62-78.
28. Peterson. R.O, Page. R.E., “Wolf density as a predator of predation rate”, *Swedish wild life research, Suppl. 1*, 1987.
29. W. Hahn, *The Stability of Motion*, Berlin, Germany: Springer-Verlag, 1967.

Academic Performance, Social Adjustment and Emotional Intelligence of Students Involved in Social Networking Sites

Nimisha Beri

Associate Professor, School of Education, Lovely Professional University, Phagwara

ABSTRACT

Social networking sites have greatly influenced the life of students their academic as well as their social and personal life. These networking sites have good as well as adverse impact on the lives of students. It is a good platform for building social relationships. It is used as a communication media to share pictures, videos and personal experiences etc. Over- usage of social networking sites makes the adolescents more aggressive. Adolescents are getting affected in their mental and knowledge concentration. It affects the individual's social as well as emotional intelligences and therefore their way of behaving. This study was conducted to explore the relationship of student involvement in social networking sites to their academic performance, social adjustment and emotional intelligence among undergraduate students from both professional and non-professional courses. The findings of the study revealed that there exists a positive relationship between level of involvement in social networking sites and Academic performance, Social adjustment and Emotional intelligence.

Keywords: *Student Involvement, Social Networking Sites, Academic Performance, Social adjustment, Emotional Intelligence*

INTRODUCTION

Social network sites viz. Facebook, Twitter, Instagram, WhatsApp, LinkedIn etc. are the prevalent tools of teenage communication. Social Networking Sites are available on gadgets with active internet connection as independent applications. Although the Facebook is a growing social networking sites having 500 plus millions of members registered over it. From Schneider (2010) view's, approximately 85% of undergraduate students have Facebook account¹. Whereas, Len hart and Madden (2007), pointed out that if we are talking about year 2005, only 8% adult internet users had used online profiles but in 2007 year the strength has been increased quadrupled to 35%. It means that the social sites have greater influences on the adolescent's life style. As per Pew Research Centre report (2015), 92% of adolescents of 12–17 age group are going online daily. Teenagers and young adults have exceeded all the age group in terms of internet usage. 71% youth are involved in more than one social networking sites and these social networks plays a significant role in the life of these teens². A report submitted by Common sense Media revealed that about 45% youths are using social networking sites in

their daily routines. Moreover, the report of daily social media indicates that traditional media usage is still more than social media³.

According to CMS (Common Sense Media) report, 68 percentage users have used Facebook profile out of which 75 percentage teenagers still have their profile on social networking sites. Another common and popular SNS is Facebook, with an estimated 1.44 billion members across the globe (as per 31st March, 2015), and 125 Million Indian users while the third most used web site in India, in every week there is addition of millions of the new users. Thus, there is no doubt on the increasing membership of Indian youth in these websites, thereby bringing our attention to the potential possible benefits and drawbacks of these sites.

According to ASSOCHAM survey, about 73% of children of 8 to 13 years are making use of social networking sites like Facebook. Shockingly 75 of the parents of these children are aware of this fact. The survey was conducted in tier-I and tier-II cities such as Ahmadabad, Delhi-NCR, Bangalore, Mumbai, Kolkata, Chennai, Lucknow, Dehradun and Pune. The survey also states, "Nearly 25 percent of 13-year-olds, 22% percent

of 11-year-olds and 15 percent of 10-year-old are on Facebook, while 5-10 percent of 8 and 9-year-olds are also active on the site.”

Valkenberg, et.al (2006) investigated 881 adolescents (10-19-year olds) and found that the social self-esteem and well-being of adolescents is being affected by the frequency with which teenagers use these sites⁴. Tian (2011) reveals that the uses of social networks determine the students’ influence to social learning whereas academic learning may be achieved through a gradual process⁵.

Ahmed (2011) found that male students are more involved in the use of these sites than female students. Further the study explored that there was a time spent on SNS usage have a significant effect on academic performance of the students.⁶

Wilson (2009) found that the results of university students are adversely pretentious by Facebook practice⁷. Khan (2009) explored that student involved in use of Facebook performed poorly in exams. Students also feel that excess use of internet may cause some socialization problems⁸. Helou and Rahim (2014) found that usage of social networking sites positively impacts the academic performance of university students in Malaysia^{9, 10}.

PERSONOLOGICAL VARIABLE

Per sonological variable is defined as any measure of individual characteristics. In this study following two variables has been taken up for study:

Social Adjustment

Social adjustment means those types of relationships which involve the accommodation of the individual to circumstances in his environment for the satisfaction of his needs and motives. Social adjustment is very important for success in life. It is an adjustment which is responsible for the organization of behavior to life situations at home, at school and at work.

Emotional intelligence

Emotional intelligence is defined as a bunch of interconnected skill regarding the tendency of people to perceive exactly, assess and articulate emotions; the tendency to access and exhibit feelings when they ease thought; the capability to know emotion and emotional information and the capability to control emotions to

encourage emotional and scholarly growth.

Significance of the study

This study aims to explain the impact of the social networking sites on the students’ academic achievement, social adjustment and emotional intelligence. The need of this study emerges from the fact that science and technology has revolutionized our all walks of life on the one hand it raised man from his confined limits/power but on the other hand it takes all the sources of mental peace from him. The practice of social networking sites has a prodigious bearing on overall development of the personality. It affects the individuals social as well as emotional intelligences and therefore their way of behaving.

OBJECTIVES OF STUDY

To explore the relationship among the student involvement in social networking sites, their academic performance, emotional intelligence and social Intelligence.

To find the difference in Academic performance, social adjustment and Emotional intelligence of the students at different levels of involvement in social networking sites.

Method and Procedure

In the present research the researcher followed Descriptive Survey method. Purposive sampling technique has been used to collect the data from the undergraduate students. Investigator had taken the sample of 480 male and female undergraduate students. The sample has drawn from the Government universities/ colleges and private universities/colleges from four districts of Punjab i.e. Jalandhar, Kapurthala, Ludhiana and Amritsar Districts. The sample is designed to include 50 percent males and 50 percent female undergraduate respondents.

Tools for data collection

The following tools are required and used in study:

A self-constructed questionnaire on student’s involvement in Social Networking Sites: For this questionnaire was prepared in which there 10 items which are related to involvement in social networking sites and 30 items are related to Attitude toward social networking sites.

Emotional Intelligence Scale by Dr.S.K.Mangal and Mrs. Shubra Mangal (2004) : This tool has four dimensions namely: “Intra-personal Awareness, Inter-personal Awareness, Intra-personal Management and Inter-personal Management”.

Bell’s Adjustment Inventory (B A I) by Dr.R.K.Ojha, (2006) : This inventory includes four parts: Home, Health, social and Emotional.

RESULTS AND DISCUSSIONS

Table No. 1 Correlation between overall involvement in social networking sites (SNS) and Academic performance (AP)

Variables	Number	Mean score	Coefficient of correlation	Interpretation
SNS Score	480	98.09	0.09	Low Correlation
AP score		72.37		

The table no. 1 depicts that the co-efficient of correlation between Level of involvement in social networking sites and Academic performance is positive but negligible. It is concluded that level of involvement in social networking sites have no effect on Academic performance of students.

Table No. 2 Correlation between overall involvement in social networking sites and social adjustment

Variables	Number	Mean score	Coefficient of Correlation	Interpretation
SNS Score	480	98.09	0.43	Positive Correlation
Social adjustment		2.34		

The table no.2 depicts that the co-efficient of correlation between Level of involvement in social networking sites and Social Adjustment is positive. It is concluded that there exists a positive relationship between level of involvement in SNS and Social adjustment.

Table No. 3 Correlation between overall involvement in social networking sites and emotional intelligence

Variables	Number	Mean Score	Coefficient of Correlation	Interpretation
SNS Score	480	98.09	0.29	Positive Correlation
Emotional intelligence		63.33		

The table no. 3 depicts that the co-efficient of correlation between Level of involvement in social networking sites and Emotional intelligence is positive. It is concluded that there exists a positive relationship between level of involvement and Emotional intelligence.

Table no. 4 Results of ANOVA on difference between different levels involvement in social networking sites and academic performance.

Source of Variation	Df	SS	MS	F- Value	Significance
Among means	2	694.502	347.251	6.27	Significant at 0.01 level
Within means	477	26401.498	55.349		
Total	479				

It is evident from table no. 4 that the calculated F-ratio of academic performance is 6.27 that is significant at 0.01 level. Therefore, it can be interpreted that there exists a significant difference between the levels of SNS and academic performance. Therefore the hypothesis which reads that there is no significant difference among levels of involvement and academic performance is rejected. However, a significant F-ratio does not tell us which of the group means differ significantly; it merely tells us that at least one mean is relatively different from some other. Consequently, there arises a need for further testing to determine which of differences between means is significant. In order to find out where these differences exist, t-test as a post hoc comparison has been used in which all possible comparisons have been considered. The results of post hoc have been shown in table no. 4.1

Table 4.1 Comparisons Between three Pairs of Groups on levels of involvement

S. No	Group	N	Mean	SD	df	t-vale	significance
1	Medium & Low 110	250	71.40	7.35	358	1.19	NS
		72.44	7.84				
2	High & Medium 250	120	74.32	7.22	368	3.65	Significant at 0.01 level
		71.40	7.35				
3	High & Low 110	120	74.32	7.22	228	1.88	NS
		72.44	7.84				

Table no. 4.1 reveals that the calculated t-value of two groups i.e. first pair on level of involvement is 1.9 which is not significant at both the levels. This indicates that the two groups do not differ significantly with each other on level of involvement.

It can also be inferred from the table no. 4.1 that the calculated t- ratio of high and medium is 3.65 which is significant at both the levels. Therefore, it can be interpreted that there exists a significant difference between the high and medium level of SNS in academic performance. In third group, the t-ratio is 1.88 which is less than the table value at both the levels. Therefore, it can be interpreted that the two groups do not differ significantly in their academic performance.

Table no. 5 Results of ANOVA on difference between different levels involvement in social networking sites and social adjustment.

Source of Variation	df	SS	MS	F- Value	Significance
Among means	2	54.826	27.413	9.032	Significant at 0.01 level
Within means	477	1447.749	3.035		
Total	479				

It is evident from table no.5 that the calculated F-ratio of social adjustment is 9.032 that is significant at 0.05 and 0.01 level. Therefore it can be interpreted that there exists a significant difference between levels of SNS and social adjustment. Therefore the hypothesis which reads that there is no significant difference among levels of involvement and social adjustment is rejected.

Table No. 6: Results of ANOVA on difference between different levels involvement in social networking sites and Emotional Intelligence.

Source of Variation	df	SS	MS	F- Value	Significance
Among means	2	3450.11	1725.05		Significant at 0.01 level
Within means	477	42302.88	88.68	19.45	
Total	479				

It is evident from table no.6 that the calculated F-ratio of social adjustment is 19.45 that is significant at 0.05 and 0.01 level. Therefore it can be interpreted that there exists a significant difference between levels of SNS and emotional intelligence.

Therefore the hypothesis which reads that there is no significant difference among levels of involvement and emotional intelligence is rejected.

In order to find out where these differences exist, t-test as a post hoc comparison has been used in which all possible comparisons have been considered. The results of post hoc have been shown in table no. 6.1

Table 6.1 Comparisons Between three Pairs of Groups on levels of involvement in Emotional intelligence

S. No	Group	N	Mean	SD	Df	t-vale	Significance
1	Medium & Low	250	62.89	9.80	358	2.95	Significant at 0.01 level
		110	59.82	8.92			
2	High & Medium	120	67.46	8.90	368	3.90	Significant at 0.01 level
		250	62.89	9.80			
3	High & Low	120	67.46	8.90	228	6.52	Significant at 0.01 level
		110	59.82	8.92			

Table no. 6.1 reveals that the calculated t-value of medium and low involvement group i.e. first pair on level of involvement is 2.95 which is significant at 0.01 level. This indicates that the two groups differ significantly with each other on level of involvement.

It can also be inferred from the table no. 6.1 that the calculated t- ratio of high and medium is 3.90 which is significant at 0.01 level. Therefore it can be interpreted that there exists a significant difference between the high and medium level of SNS in emotional intelligence.

In third group, the t-ratio is 6.52 which is higher than the table value at 0.01 level. Therefore, it can be interpreted that the two groups differ significantly in

their social adjustment.

CONCLUSION

The findings of the present study revealed that there exists a positive relationship between involvement in social networking sites and Academic performance, social adjustment and emotional intelligence. Further the three groups (students with low, medium and high level of involvement of in social networking sites) differ significantly in their academic achievement, social adjustment and emotional intelligence. Govt. should restrict websites which blow violence and parents should not allow their children to use social networks, so as to make their future secure.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISSE Journal Reviewer Committee

REFERENCES

1. Schneider, Norm., "Facebook, Other Social Network Sites Could Lead to Lower Grades for Students." 2010.
2. http://www.associatedcontent.com/article.1650000/facebook_other_social_network_sites.html?cat=4.
3. Lenhart, Amanda and Madden, Mary(2007) Friendship, Strangers and Safety in Online Social Networks, Teens, Privacy and Online Social Networks, 2007.
4. <http://www.pewinternet.org/2007/04/18/friendship-strangers-and-safety-in-online-social-networks/>
5. Rideout, V.J. ;Foehr, U.G. ; Roberts, D.F., Generation M2: Media in the Lives of 8–18 Year-Olds, Kaiser Family Foundation, Menlo Park, CA ,2010.
6. Valkenburg, P.M.,Peter, J.,& Schouten,A.P., Friend Networking Sites and Their Relationship to Adolescents' Well-being and Social Self-Esteem. *Cyber Psychology & Behavior*, 2006,9(5),pp 584-590.
7. Tian,Stella Wen.,*International Journal Of Networking & Virtual Organization*, 2011,8(3, pp 264-280
8. Ahmad , Ishfaq andTehmina faiz Qazi,.A look out for academic costs of SNSs, A Student based perspective. *African journal of business management*,2011, 51(12), pp 5022-503.
9. Wilson L ,Facebook fixation harms student grades. *The Australian*,2009.
10. Khan U ., Facebook students underachieve in exams. *Daily Telegraph*,2009.
11. Adam Mahamat Helou ., The influence of social networking sites on students academic performance in Malaysia. *International Conference on Internet Studies*,2010.
12. Helou, A. M., & Rahim, N. Z. A., The influence of social networking sites on students'academic performance in Malaysia. *International Journal of Electronic Commerce*,2014, 5(2).pp247-254.

Effect of Affective, Normative and Continuance Commitment on Organizational Effectiveness

Archana Shrivastava

Professor, Balaji Institute of Modern Management, Pune, India

ABSTRACT

The aim of the present exploratory and empirical research paper was to analyze the role of organizational employee commitment in promoting organizational effectiveness. In this research paper the approach taken is the well-established Meyer and Allen's Three-Component Employee Commitment Model approach¹. The effect of the three components of commitment namely- Affective, Normative and Continuance Commitment is studied on Organizational effectiveness. Literature on the topic offers enough evidence supporting the benefits that organizations have of maintaining a strongly committed workforce. The study was conducted on the employees of the telecommunication sector using a sample size of 266 employees. Primary data for the study was collected through questionnaires, using structured questions to elicit information on the predictor variables of Affective, Normative and Continuance Commitment and response variable of Organizational effectiveness. The three different conceptual components of commitment have different antecedents and different implications for work related behavior^{2,3}. The predictive model arrived at in this research explains that an increase in any of the three commitments will lead to increase in organizational effectiveness. The final predictive model explained 54.5% of the variability of the response variable of Organizational effectiveness.

Keywords: *Affective commitment, Normative component, Continuance commitment, Organizational effectiveness, TCM Employee Commitment (TCM) Survey*

INTRODUCTION

The business environment today is witnessing VUCA (Volatility, Uncertainty, Complexity, Ambiguity) like never before. Organizations are increasingly depending on their human resources to help them tide over the challenges created by the business ecosystem. In such a scenario committed employees can be a valuable assets for organizations to achieve their goals. Committed employees stay with the organizations during difficult times and propel the organization forward during conducive times. As such organizations should consciously try to build commitment amongst their employees to improve the organizational outcomes. Organizational commitment is a complex construct. An employee can be committed for divergent reasons. It is important for organizations to understand what constitutes organizational commitment and how it can be inculcated. Organizational effectiveness can be explained as how effective an organizations is in achieving its goals. According to Richard et al. (2009) organizational effectiveness is explained by internal performance

outcomes resulting because of efficient operations and other broad measures encompassing not only financial performance but value created for the wide array of stakeholders like shareholders, employees, customers, suppliers etc. Committed employees are required by organizations to create and maintain competitive edge and achieve superior organization effectiveness.

LITERATURE REVIEW

A committed employee is one who stays with an organization, contributes to work regularly, puts in a full day and more, safeguards corporate assets and identifies with the organizational goals⁹. Ongori (2007) explained employee commitment as an affective response to the whole organization and the degree of attachment or loyalty employees feel towards the organization.

Mowday, Steers, and Porter (1979) gave behavioral and attitudinal definitions of commitment. Behavioral commitment, also referred to as attributional commitment in the literature, involves "behaviors that exceed formal and/or normative expectations". Salancik (1977)

proposed that behaviors that are explicit, irrevocable, volitional, and public bind individuals to the behaviors, thus causing greater commitment. In this approach, employees are deemed as becoming committed to a particular course of action, rather than to a particular entity; commitment is developed retrospectively⁹.

Many researchers have defined commitment on the basis of Affective commitment, also referred to as psychological or attitudinal commitment in the literature. Porter et al. (1974) opined that affective commitment can be characterized by three aspects: (1) identification with and acceptance of the organization's goals and values, (2) an inclination to focus effort on helping the organization achieve its goals, and (3) a desire to preserve organizational membership. It "represents a state in which an individual identifies with a particular organization and its goals and wishes to maintain membership in order to facilitate these goals". Normative commitment as suggested by Wiener (1982)¹ results from pressures exerted either prior to, or after entering into an organization. Continuance commitment is referred to as calculative and exchange-based commitment in the literature. This type of commitment is a function of the rewards and costs associated with organizational membership. According to Meyer and Allen (1997)⁹, employees preserve relationship with the organization because of an emotional attachment which is represented by affective commitment. Sometimes employee feel an obligation to continue their relationship with the organization which is termed as Normative commitment. Further, Meyer and Allen (1997), contended, employees who possess continuance commitment retain membership because they need to do so⁹. Morrow (1993) also came up with a model of work commitment that included affective organizational commitment, continuance organizational commitment, career commitment, job involvement, and work ethic endorsement.

In this research paper the approach taken is what is proposed in the well-established Three-Component Model proposed by Meyer and Allen²⁻⁵. For the purpose of this study commitment is viewed as a force that binds an employee to their organization. This binding force with the organization includes an affective attachment with the organization, a felt obligation towards the organization, and an awareness of the costs associated with discontinuing involvement with the organization.

In their pure forms, these psychological outlooks are referred to as affective commitment (AC), normative commitment (NC), and continuance commitment (CC), respectively.

In the literature, the goal model explains organizational effectiveness in terms of the extent to which an organization accomplishes its intentions. The legitimacy model views organizational effectiveness in terms of a background assessment "of component preferences for performance and natural limitations on performance from an external environmental perspective". The constituency model believes organizational effectiveness "as a set of several statements, each reflecting the evaluative criteria applied by the various constituencies" involved with the organization being assessed with a stress on means criteria. The systems resource model defines organizational effectiveness "in terms of its (the organization's) bargaining position, as reflected in the ability of the organization, in either absolute or relative terms, to utilize its environment in getting hold of scarce and valued resources" and how they make use of these resources. Organizational effectiveness is the extent to which an organization, by the use of certain resources, fulfils its objectives without depleting its resources and without incapacitating its means, placing undue strain on its members and/or society.

In general, the organizational commitment is considered as a useful measure of organizational effectiveness. Employee commitment has been widely investigated to predict employee retention. The review of literature revealed that employee commitment towards the organization was a persuasive predictor for organizational outcomes such as absenteeism, job performance and organizational citizenship behavior. According to Morrow, organizational commitment is a multidimensional construct that has the potential to predict the organizational outcomes such as performance, turnover, absenteeism, tenure and organizational goals. Meyer and Allen (1991) used affective, continuance and normative commitment to capture the multidimensional nature of organizational commitment^{6, 7, and 8}. Meyer and Allen (1997) opined that the affective commitment was important as the employees with strong affective commitment would be motivated for exhibiting higher levels of performance and make more meaningful contributions as compared to the employees who expressed continuance or normative commitment⁹. In a study of 238 nurses, Cohen (1993) investigated

the relationship between affective, continuance and normative commitment. Findings revealed that the affective commitment is highly correlated with all the other types of commitment. In other words, employees remain with the organization because they want to exhibit higher levels of commitment to their work, job, and career.

There is enough evidence supporting the benefits that organizations have of having a strongly committed workforce. Meta-analytic reviews of this research reveal that employees who are committed to an organization are less likely to leave⁴ and less likely to exhibit absenteeism at work¹⁰, perform job roles efficiently^{29,30}, and exhibit organizational citizenship behavior³⁰. Employee Commitments to other work-relevant vertices, such as occupations¹¹, supervisors³¹, work teams²⁷, and customers²⁸, have also been related to retention and other performance dimensions important to employers. It has been reported in literature that some forms of commitment are more advantageous than others. Commitments reflecting an affective attachment and involvement with the organization have been shown to have greater benefit for that organization than those grounded in concerns over social or economic costs.

II. Research Objective

The objective of the research is to propose a multivariate regression model where the three components of organizational commitment namely Affective Commitment, Normative Commitment and Continuance Commitment act as predictors of Organizational Effectiveness.

III. Research Methodology

Primary data was collected through questionnaire using Simple random Sampling. A sample size of 266 respondents belonging to the Telecom sector was considered for analysis. Affective, Normative and Continuance Commitment were the predictor variables and Organizational Effectiveness was the outcome variable. The Sample size was 266 with 153 respondents being male and 113 being female. 75 respondents were in the age group of 20 -30 years, while 97, 69, 25 were in the age groups of 30-40 years, 40-50 years and 50-60 years respectively. 93 employees surveyed, had worked with the current organization for at least 2 years, 72 for 2-4 years, 48 for 4-6 years, 29 for 6-8 years and 24 for more than 8 years.

Research Instruments Used

The TCM Employee Commitment (TCM) Survey

TCM survey was used to collect data on employee commitment. TCM is based on the Three-Component Model (TCM) of commitment^{8, 9}. TCM Employee Commitment Survey measures three forms of employee commitment towards an organization: desire-based (affective commitment), obligation-based (normative commitment) and cost-based (continuance commitment). The survey includes three well-validated scales, the Affective Commitment Scale (ACS), the Normative Commitment Scale (NCS) and the Continuance Commitment Scale (CCS). Each is scored separately and can be used to identify the “commitment profile” of employees within an organization. TCM survey comprises statements pertaining to employees’ perception of their affiliation with the organization and their reasons for staying with the organization. The scale is seven point Likert scale wherein the respondent indicates the strength of their agreement by selecting a number from 1 (strongly disagree) to 7 (strongly agree). Allen and Meyer (1993) reported a high reliability score in almost all the items in the instrument. To elicit careful deliberation rather than choosing alternatives mindlessly many of the statements in the scales were reverse keyed⁴.

Organizational Effectiveness Scale (O.E.S)

It is accepted that business performance is a multi-dimensional and highly complex phenomenon^{25, 26}. While a number of studies have measured organizational performance as uni- or bi-dimensional, it was resolved to gauge organizational effectiveness on dimensions which included customer, competitor and employee perspectives. Consequently, after a range of studies a measure of organizational effectiveness was adopted which fulfilled these criteria. The Organizational Effectiveness Scale (O.E.S.) developed by Srivastava and Banerjia was used to assess organizational effectiveness. O.E.S consists of 56 items which are rated on a five point scale ranging from 1 (completely disagree) to 5 (completely agree).

The 56 items measure the eight dimensions of Organizational Effectiveness which are as following:

- Effective organizational system
- organizational climate

Congenial Organizational efficiency

Job satisfaction and commitment

Dynamism and adaptability

To ascertain the extent of consistency of the resources on the Organizational Effectiveness Scale, split half reliability index by odd even method on a sample of 300 employees, and retest reliability index on a sample of 100 employees, with a gap of 15 days, were worked out for the scale as a whole. The following Table records the obtained reliability indices:

Interpersonal harmony

Efficient leadership

High morale

Sub Scales of O. E. S.	Split half reliability index (N=300)	Retest Reliability Index (N=100)
1. Efficient organizational system	.857	.914
2. Congenial organizational climate	.882	.899
3. Organizational efficiency	.895	.952
4. Dynamism and adaptability	.850	.923
5. Interpersonal harmony	.863	.943
6. Efficient leadership	.816	.907
7. High morale	.916	.947
8. Job satisfaction and commitment	.876	.954
9. Whole Scale	.843	.935

All coefficients values are significant at 0.01 level

IV. Data Analysis and Interpretation

The concurrent validity of the O.E.S. was tested by administering it alongside the measure of organizational effectiveness developed by C. N. Daftuar(1984) on a sample of 102 employees. The coefficient of correlation between the scores on two was found to be .697 which indicates the high validity of the present measures of organizational effectiveness.

The data was analyzed using SPSS 16. In order to determine the overall fit (variance explained) of the model and the relative contribution of each of the predictors i.e. Affective Commitment, Normative Commitment and Continuance Commitment to the total variance explained multiple regression was applied. The dependent variable was Organizational Effectiveness. Descriptive statistics of the variables are as shown in Table1.

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Affective Commitment	266	14	54	36.26	9.419
Normative Commitment	266	16	54	34.09	10.091
Continuance Commitment	266	14	55	32.37	9.956
Organizational Effectiveness	266	101	264	176.35	48.260
Valid N (listwise)	266				

In order to ensure unbiased results the data was checked for meeting the assumptions required for applying multiple regression. The following Section explains the test and results obtained in checking for the assumptions before applying multiple regression. The data was tested for normality and Kurtosis and Skewness were found to lie between +1 and -1.

The dependent variable of Organizational Effectiveness was measured on a continuous scale. The independent variables namely Affective Commitment, Normative Commitment & Continuance Commitment

were all measured on continuous scale. In order to check independence of observations Durbin-Watson statistic was used. The statistic returned a value of 1.722 signifying there is no autocorrelation in the data. There needs to be a linear relationship between (a) the dependent variable and each of the independent variables, and (b) the dependent variable and the independent variables collectively. Scatter plots for Regression standardized Residual and Regression Standardized predicted value for the response variable of Organizational Effectiveness are reproduces in Fig 1.

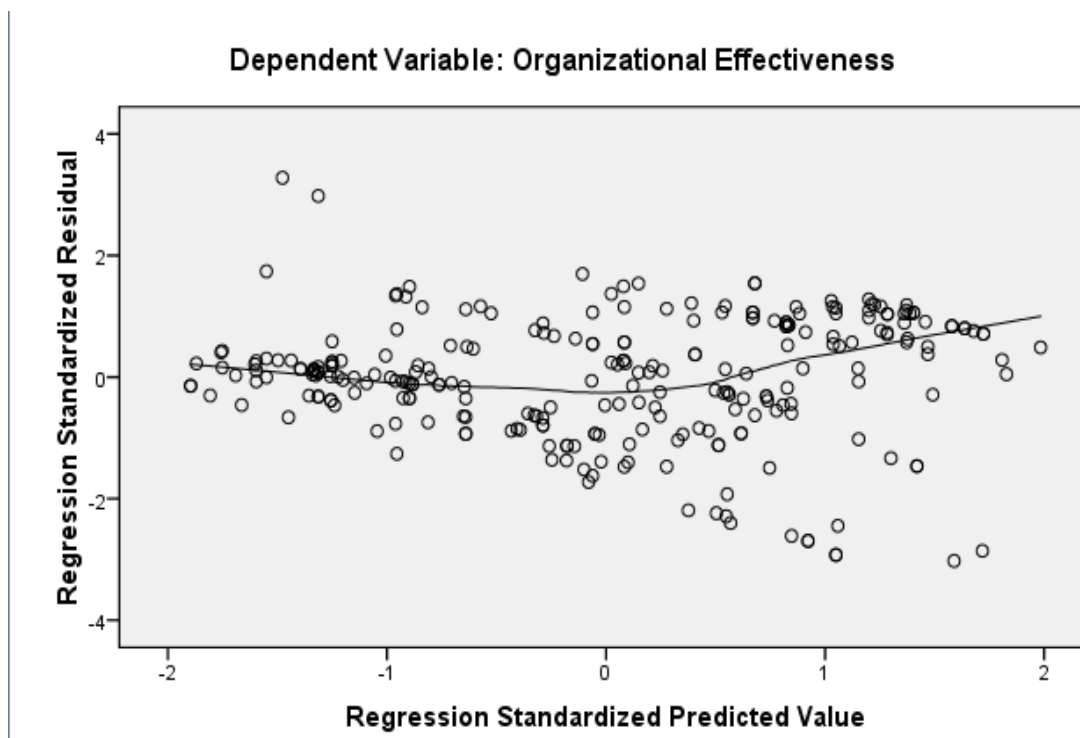


Fig 1: Scatterplot of Standardized Predicted Value and Standardized Residual

From the Loess curve, it appears that the relationship of standardized predicted to residuals is roughly linear around zero. We can conclude that the relationship between the response variable and predictors is linear since the residuals seem to be randomly scattered around zero.

Another assumption of multiple regression is that the variance of the residuals is homogeneous across levels

of the predicted values, also known as homoscedasticity. The data needs to show homoscedasticity, which is where the variances along the line of best fit remain similar as you move along the line. If the model is well-fitted, there should be no pattern to the residuals plotted against the fitted values. The scatter plot (Fig 2) between regression standardized Predicted value and Regression standardized Residual shows a random distribution showing homoscedasticity.

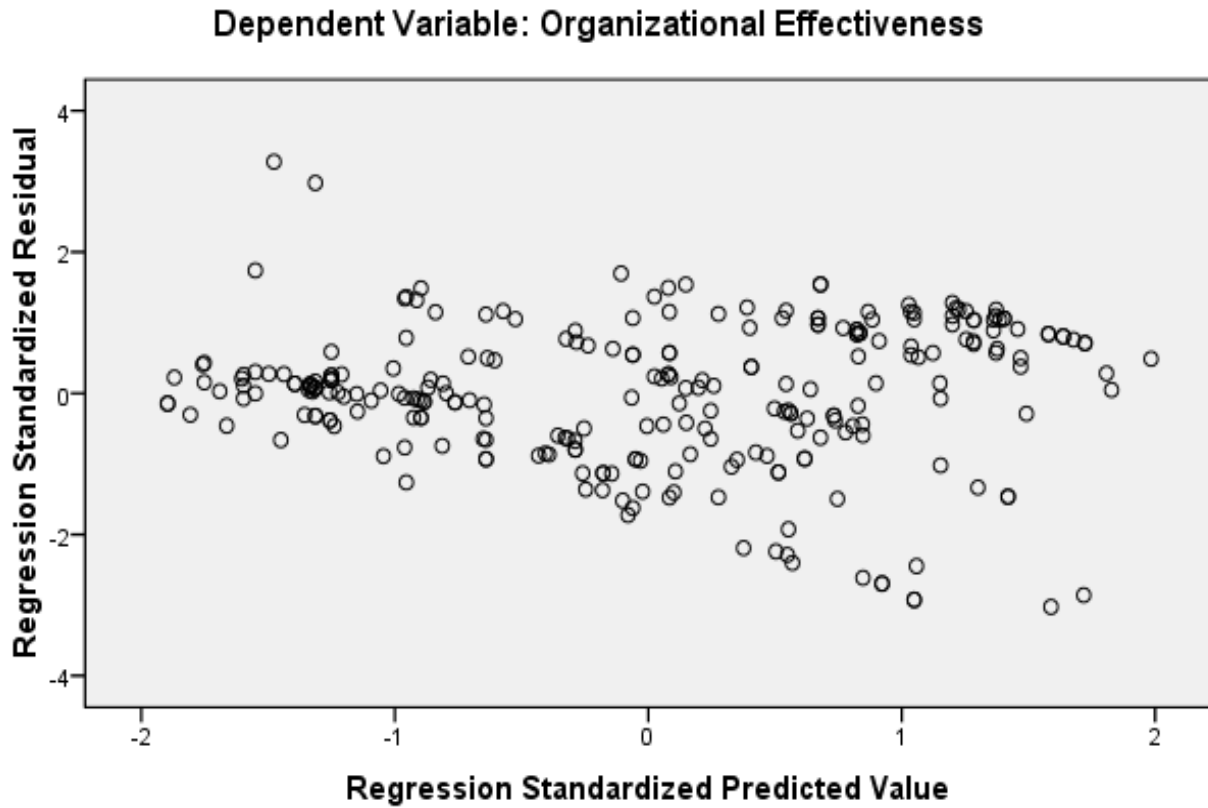


Fig 2: Scatterplot of Standardized Predicted Value and Standardized Residual to check homoscedasticity

The data must not show multicollinearity, which occurs when two or more independent variables are highly correlated with each other. This leads to problems with understanding which independent variable contributes to the variance explained in the dependent variable, as well as technical issues in calculating a multiple regression model. Collinearity statistics are reproduced in the Table 5. The variance inflation factor (VIF) which is (1/tolerance) was found to be 4.405 for Affective Commitment, 9.402 for Normative commitment and 6.914 for Continuance Commitment. Values of VIF less

than 10 are acceptable and hence it is concluded the independent variables do not exhibit multicollinearity. The residuals (errors) should be approximately normally distributed. : Standardized variables (either the predicted values or the residuals) have a mean of zero and standard deviation of one. If residuals are normally distributed, then 95% of them should fall between -2 and 2. Standardized variables (either the predicted values or the residuals) have a mean of zero and standard deviation of one. In this case Standard Predicted value Is between -1.897 and 1.984 standard residual is between -1.824 and 1.978 (Mean=0 and Std Deviation =1)(Table 2)

Table 2: Residuals Statistics^a					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	108.76	247.05	176.35	35.639	266
Residual	-98.978	107.284	.000	32.542	266
Std. Predicted Value	-1.897	1.984	.000	1.000	266
Std. Residual	-1.824	1.978	.000	1.000	266

a. Dependent Variable: Organizational Effectiveness

The PP plots were also plotted to check for normality of residuals as reproduced below in fig 3..

Normal P-P Plot of Regression Standardized Residual

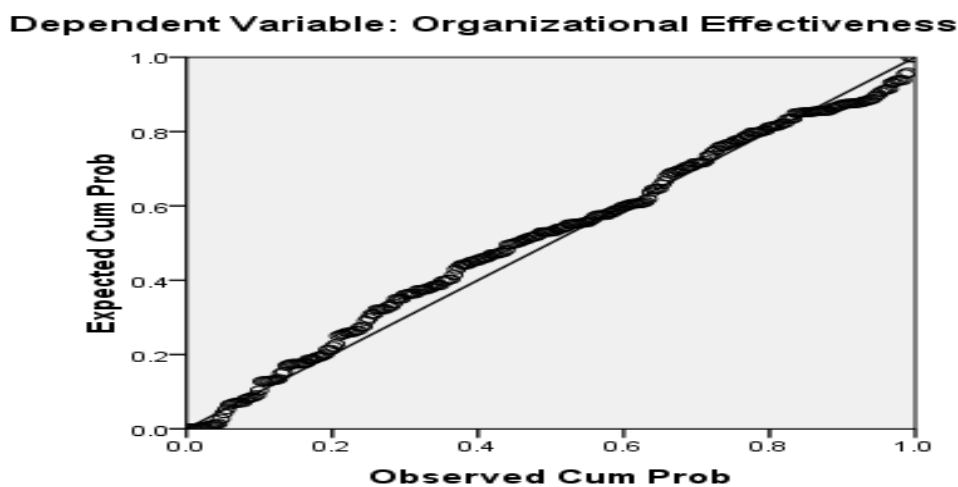


Fig 3: PP Plot of Regression Standardized Residual

The Model Fit

The model Summary (Table 3) gives the multiple correlation coefficient, R which can be considered to be one measure of the quality of the prediction of the dependent variable of Organizational effectiveness. A value of 0.738, indicates a good level of prediction. The coefficient of determination) “R Square” is the

proportion of variance in the dependent variable that can be explained by the independent variables (technically, it is the proportion of variation accounted for by the regression model above and beyond the mean model). This value is .545 signifying that our independent variables explain 54.5% of the variability of our dependent variable, Organizational effectiveness.

Table 3: Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.738 ^a	.545	.540	32.727	1.722

a. Predictors: (Constant), Continuance Commitment, Affective Commitment, Normative Commitment

b. Dependent Variable: Organizational Effectiveness

Statistical significance

The F-ratio in the ANOVA table (Table 4) tests whether the overall regression model is a good fit for the data. The table shows that the independent variables statistically significantly predict the dependent variable, $F(3,262) = 104.746, p < .05$ (i.e.the regression model is a good fit of the data).

Estimated model coefficients

The general form of the equation to predict Organizational Effectiveness from Affective Commitment, Normative Commitment & Continuance Commitment is (Table 5):

$$\text{predicted Organizational Effectiveness} = 51.945 + (0.512x \text{ Affective Commitment}) + (1.455 x \text{ Normative Commitment}) + (1.738 x \text{ Continuance Commitment})$$

Table 5: Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	51.945	8.001		6.493	.000		
	Affective Commitment	.512	.448	.100	1.142	.254	.227	4.405
	Normative Commitment	1.455	.611	.304	2.382	.018	.106	9.402
	Continuance Commitment	1.738	.531	.358	3.272	.001	.145	6.914

a. Dependent Variable: Organizational Effectiveness

Unstandardized coefficients indicate how much the dependent variable varies with an independent variable when all other independent variables are held constant. Considering the effect of Affective component we can say for a unit increase in Affective commitment there will be an estimated expected increase of .512 units in Organization Effective. Like wise a unit increase in Normative Commitment and Continuance Commitment will result in an estimated expected increase of 1.455 units and 1.738 units in Organizational Effectiveness respectively.

RESULT

A multiple regression was run to predict Organizational Effectiveness from Affective component, Normative Component and Continuance Commitment. These variables statistically significantly predicted Organizational Effectiveness, $F(3, 262) = 104.746$, $p < .05$, $R^2 = .545$. All four variables added statistically significantly to the prediction, $p < .05$.

DISCUSSION

In 2002 a meta analysis of empirical studies from Meyer, Stanley, Hercovitch and Topolnytsky showed that the Affective, Normative and Continuance components of Commitment are distinguishable from each other. The three different conceptual components of commitment have different antecedents and different implications for work related behavior^{2,3}. The predictive model arrived at in this research also explains an increase in any of the three commitments will lead to increase in organizational effectiveness. The adjusted R Square vales are quite close to R square vales (Adjusted $R^2 = .540$, $R^2 = .545$). Affective commitment can be inculcated when employees identify with the vision of the organization. Affective component depends

largely on the quality of experiences the employees have over time. Organizations must foster a culture where the employees develop a feeling of ownership resulting in improved organizational effectiveness. The literature describes employees with strong normative commitment as generally behaving in ways supportive of the organization. Normative commitment, however, is based on feelings of obligation, and thus organizations must create opportunities of growth and development for the employees to boost the normative component. The flip side is that employees with strong normative commitment may also resent the organization if they feel a sense of obligation⁹. According to the model Continuance commitment also has the potential to impact organizational effectiveness significantly. However employees with high continuance commitment may remain with the organizations because they feel they have no choice but to do so. Such employees need to be engaged and nudged to improve their skill set to positively impact organizational outcomes.

Limitations

This study has some limitations as the sample size was 266 respondents hence the findings cannot be generalized. The sector chosen for study was the telecom sector and as such the conclusions arrived at may not be applicable to all types of organization. The study is a cross sectional study and does not afford a trend analysis. Employee commitment may have many foci like leaders, work, team etc. In this paper we consider the employee commitment towards the organizations,

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISSE Journal Reviewer

Committee

REFERENCES

1. Miller, V. D., & Jablin, F. M. Information Wiener, Y., Commitment in organizations: A normative view. *Academy of Management Review*, 1982, 7, pp 418-428
2. Allen, N. J., & Meyer, J. P. The measurement and antecedents of affective, continuance, and normative commitment to the organization. *Journal of Occupational Psychology*, 1990, 63, pp 1-18.
3. Allen, N. J., & Meyer, J. P., Organizational socialization tactics: A longitudinal analysis of links to newcomers' commitment and role orientation. *Academy of Management Journal*, 1990, 33, pp 847-858.
4. Allen, N. J., & Meyer, J. P., Organizational commitment: Evidence of career stage effects? *Journal of Business Research*, 1993, 26, pp 49-61.
5. Allen, N. J., & Meyer, J. P., Affective, continuance, and normative commitment to the organization: An examination of construct validity. *Journal of Vocational Behavior*, 1996, 49, pp 252-276.
6. Hackett, R., Bycio, P., & Hausdorf, P., Further assessments of Meyer and Allen's three-component model of organizational commitment. *Journal of Applied Psychology*, 1994, 79, pp 15-23.
7. Meyer, J. P., & Allen, N. J., Testing the "side-bet theory" of organizational commitment: Some methodological considerations. *Journal of Applied Psychology*, 1984, 69, pp 372-378.
8. Meyer, J. P., & Allen, N. J., A three-component conceptualization of organizational commitment. *Human Resource Management Review*, 1991, 1, pp 61-89.
9. Meyer, J. P., & Allen, N. J., Commitment in the workplace. Thousand Oaks, CA: Sage Publications, 1997.
10. Meyer, J. P., & Herscovitch, L., Commitment in the workplace: Toward a general model. *Human Resource Management Review*, 2001, 11(3), pp 299-326.
11. Meyer, J. P., Allen, N. J., & Smith, C. A., Commitment to organizations and occupations: Extension and test of a three-component conceptualization. *Journal of Applied Psychology*, 1993, 78, pp 538-551.
12. Abramson, M. A. Memos to the president: Management advice from the nation's top public administrators. Arlington, VA: PricewaterhouseCoopers, 2001.
13. Allerton, H., Outsourcing outlook. *Training & Development*, 1997, 51, pp 11-19.
14. American Management Association, Survey: Staffing and structure summary of key findings. Retrieved from the Web 2/28/00. 1999.
15. Angle, H. L., & Perry, J. L., An empirical assessment of organizational commitment and organizational effectiveness. *Administrative Science Quarterly*, 1981, 26, pp 1-14.
16. Angle, H. L., & Perry, J. L., Organizational commitment: Individual and organizational influences. *Work and Occupations*, 1983, 10, pp 123-146.
17. Aranya, N., Pollock, J., & Amernic, J., An examination of professional commitment in public accounting. *Accounting, Organizations, and Society*, 1981, 6, pp 271-280.
18. Ascher, K. (1987). *The politics of privatisation*. New York: St. Martin's Press, 1987.
19. Ashforth, B. E., & Saks, A. M., Socialization tactics: Longitudinal effects on newcomer adjustment. *Academy of Management Journal*, 1996, 39, pp 149-178.
20. Baron, J. N., Organizational perspectives on stratification. *Annual Review of Sociology*, 1984, 10, pp 37-69.
21. Barr, S., Retirement wave creates vacuum. *The Washington Post*, pp. A1. 2000.
22. Cascio, W. F. Wither industrial and organizational psychology in a changing world of work. *American Psychologist*, 1995, 50, pp 928-939.
23. Gupta, U. G., & Gupta, A., Outsourcing the is function. *Information Systems Management*, 9. 1992.
24. Meyer, J. P., Paunonen, S., Gellatly, I., Goffin, R., & Jackson, D., Organizational commitment and job performance: It's the nature of the commitment that counts. *Journal of Applied Psychology*, 1989, 74, pp 152-156.
25. Lenz, R., "Determinants of organizational performance: an interdisciplinary review" *Strategic Management Journal*, 1981, 2, pp. 131-154

26. Venkatraman, N. and Ramanujam, Vasudevan, "Measurement of business economic performance: an examination of method convergence", *Journal of Management*, 1987, 13(1), pp.109-1
27. Becker, T. E., & Kernan, M. C., Matching commitment to supervisors and organizations to in-role and extra-role performance. *Human Performance*, 2003, 16, pp 327–348
28. Siders, M. A., George, G., & Dharwadkar, R. The relationship of internal and external commitment foci to objective performance measures. *Academy of Management Journal*, 2001, 44, pp 570–579
29. Cooper-Hakim, A., & Viswesvaran, C., The construct of work commitment: Testing an integrative framework. *Psychological Bulletin*, 2005, 131, pp 241–259
30. Riketta, M., Attitudinal organizational commitment and job performance: A meta-analysis. *Journal of Organizational Behavior*, 2002, 23, pp 257–266.
31. Stinglhamber, F., & Vandenberghe, C., Organizations and supervisors as sources of support and targets of commitment: A longitudinal study. *Journal of Organizational Behavior*, 2003, 24, pp 251–270

The Trauma of Partition in Nayantara Sahgal's Storm in Chandigarh

S Prabhakaran¹, R Lakshmi²

¹Research Scholar, ²Research Guide, Vel Tech Rngarajan & Dr. Sagunthala
R&D Institute of Science and Technology, Avadi, Chennai

ABSTRACT

This paper deals with the trauma of partition of Punjab and Haryana encountered after two decades of India - Pakistan partition. Storm in Chandigarh primarily explores the clash of ideas between the power hungry politician and the national conscious politician and the calibre of new leaders and Gandhian type politician. The novel has theme of the bifurcation of Punjab into Punjab and Haryana on linguistic and religious ground as the repercussion of bifurcation of India and Pakistan. Sahgal explores political conflicts over power supply and distribution of water and difference of opinion between two Chief Ministers,

Keywords: Power hungry politician, national conscious politician and bifurcation.

INTRODUCTION

The present paper deals with the socio political issues encountered after independent India represented in Nayantara Sahgal's novel, This Time of Morning. On the one hand, the study explores the conflict of ideas between power hungry and crafty politicians and ideal and national conscious politicians. It explicates disillusionment about the functioning of democratic institutions, the calibre of the new leaders. The erosion of moral values in politics found their articulation in her fiction. On the other hand, the novel reveals the perception of marriage of both traditional woman and new woman. In a nutshell, it deals with the theme of the conflict between idealism and materialism in post independent India's political world and tradition and modernism in the lives of man woman relationship in the society¹

Nayantar Sahgal is an Indian writer in English. Her novels deal with India's elite responding to the crises imperilled by political dynamic. She was one of the first woman Indian writer in English to receive wide recognition. She is the second of three daughters of Jawaharlal Nehru's Sister, Vijalakshmi Pandit. Since she spent her childhood in Anand Bhavan in Allhabad politics is in her ever drop of her blood. Primarily political trauma is reflected in Sahgal's novels. Nayantara Sahgal's political ideologies have been taken up in a

systematic and exhaustive manner. The basic obsession of the novelist with the policy –making aspect of society and the method of the distribution of power makes her chronicle the political dynamics in the country during the last century. She explores the political perplexity and predicament of the masses and she digs up the letters of faith in Gandhism, the latest aspires to revitalize and reinvigorate faith. She discovers both an idiom of comment on and a description of political conduct.

In Storm in Chandigarh, Chandigarh is typical and symbolic of its constructive approach to the problem of violence during the partition. Chandigarh is the city which was paralysed and helpless victim of the two bifurcations that took place within a period of two decades. At the same time Chandigarh is the virtual, painful remember of a nation that can never be a whole, and the prevailing situation of political turmoil upon which the violent scene is enacted repeatedly. Chandigarh is a place which connects two borders and two reminiscences come together: it is the place that holds cultural memory of the national breach exists on the one hand; it is land of modernity par brilliance on the other. Two cultures or constructed ethnicities (Hindu/ Sikh) interested upon one another in the land of 'Green Revolution.' Chandigarh stands in very significant idol. It symbolizes a dream of progress and perfection. But the forthcoming storm signifying an erosion of those dreams proves that any attempt at imposing of order and balance

from outside is an illusion. The Chandigarh architecture becomes similar with Indian democracy for Dubey; “That was architecture transplanted not conceived here and he wounded how successful democracy was superimposed on illiterate masses exploding millions of them” (SC212)².

The novel presents a clear picture of the clash between Gayan Singh, the Chief Minister of Punjab and Harpal Singh, the Chief Minister of Haryana. Chandigarh is the joint capital of the Hindi speaking Haryana and the Punjabi speaking Punjab, is scene of action. Vihal Dubey is an intelligent administrative officer who has been assigned the task of bringing out concord between the two warring section and rehabilitate harmony and peace among the people of Chandigarh. The clash between Gayan Singh and Harpal Singh is fight of principles and ideologies. It is a clash between the cult of violence and the ideal of non-violence. Sahgal shows the evil of hypocrisy, sham and self-importance existing at the human level.

Nationalism is a dogma or political philosophy that involves a strong identification of group of individuals in a nation. The experience and exposure which an individual has with the society in which he is born or group in which he lives, experiences either of contented state or discontented state because he is a member of the group. Conventions, customs, cultures and doctrines regarding the group become part of individual’s mental process, and therefore of his experience through the progress and development of education in the larger sense. These acquaintances become codified into system with the group as the central object. The usual feelings and intuition become one with them, lightly or deeply and these experiences are profound and baffled or merely frivolous and moving. Under proper conditions, this system so well ordered may show itself in behaviour as a distressed and distressing concern with the life and honour of the group. When this distress is more or less chronic, it becomes the sentiment of nationalism.

The other day, Indian novelist in English have emerged and grown conscious of the problems, emanating out of the working of political democracy in developing countries like India. They have tried to give a representational and realistic portrayal of the conflicts and clashes among the new unseasoned and new breed of politicians who exercised power and use their political influence perfidiously of their own private

vested interest. Their Novels depict the continuing corruption, double-dealing, swindling, inefficiency, poverty and collective misery of the public under the popular government. Political contention and contest and issues over ten decades are reflected various ways, both direct and indirect literature. The bifurcation of India has been one of the most dreadful and traumatic experiences of recent history. In the history of India, the bifurcation does not only mean the partition or separation of a vast subcontinent but also termination and devastation, catastrophe and contretemps for millions of people, the result of which has not died out yet as recommended by recent events. The political partition of India disturbed and disheartened the Indian psyche, mind and soul and also it’s social fabric. It brought to sudden end a long communally shared history. It engendered one of the great human convulsions of history³.

Sahgal’s novels depict the dilemma and turmoil and situation of Indian polity and proffer solution to political conflicts, individual confrontation and social wickedness. Her objective is to tackle the problems of politics, power, culture and history honestly. A scholarly pleasure with a profoundly reflective commonsense idea through which the reader hears the echoes of Sahgal’s ideology of nationalism fictionalized as empirical reality⁴.

The theme of Storm in Chandigarh is partition of Punjab into Punjabi speaking Punjab and Hindi Speaking Haryana on linguistic and religious ground as the consequence of the bifurcation of India and Pakistan. ‘Violence’ and ‘Power’ are themes of the novel, but it is not only political, referring to the forced linguistic partition of Punjab, but a multifarious one. It is an inconspicuous and more subtle form of ‘Violence’: “The infliction of one person’s will on another”(Asnani P125) or “emotional violence that a husband can cause to his wife, or vice versa” (Rao P 42). Sahgal not only portrayed man’s hunger to gain control over other’s mind but has also dissected deeper layer of human behaviour, accentuating the fearsome jungle of man-woman relationships.

“In Europe, eating and drinking together. Wine is part of culture. It is big performance all by itself. Here it’s a performance, a measure of one’s westernization...” (SC 75) contemplates Mera, one of the characters in Storm in Chandigarh – a series of thought that had been worked well in one of Nayantara Sahgal’s Sunday newspaper

articles. In fact, the entire novel is as of current interest as today's newspaper discussing in minute association of the partition of Punjab.

Storm in Chandigarh, one of the perfect and best political novels, deals with the bifurcation of East Punjab of linguistic lines just when the state had recuperated from the trauma of India-Pakistan partition. Faisal Fatehali Deviji, in "Hindu/Muslim/Indian," altercation that India is constructed and structured quite fervently upon lack and upon the violent demarcation of the others, such that nationalist accounts become significant only in the light of partition tale. The theoretical perception makes pleasant sense when understanding meaning in the numerous narratives of the trauma of the India-Pakistan split that took place due to the politico-geographic line mapped out by the British. Besides, over the last five decades, this partition has been iterated in folk memory, movie, literature and mythology. Storm in Chandigarh deals with the issue of political turmoil, violence and tension originating from its being: Chandigarh, the common capital of the both states – Hindi speaking Haryana and Punjabi speaking Punjab. Chandigarh, being a quite new city, has nothing to exhibit of its traditions. A new type of society has originated and emerged in this town, and people who have come to live in it have brought their ideas, creeds and traditions with them. This has improved the culture of the town; this has also engendered a sort of confusion or cultural storm. For example, Indian people have involved themselves to do the high-handed role English language. It is the consequence of the British rule and is one of the most modern features of Indian society. But it is not completely deteriorated their love for native language. It is this love that brought transformation of the earlier Punjab into Punjabi –Hindi speaking states were also the result of tradition thinking of the people. And it was conventional attitude of the Indian leadership that delayed the constitution of the new state. One of the most traditional characteristics of the Indian society is that people can still be perturbed and provoked to fight contentiously one another religion and language.

The opening sentence of Nayantara Sahgal's novel Storm in Chandigar set in the tone to zeitgeist discourse. Violence pervades the nation as well as the family in the course of narrative. The novel depicts the story of a wife who struggle to maintain her distinctiveness and individuality admits domestic violence and an administrator who struggle to maintain harmony and

peace amidst civic violence in the city of Chandigarh.

The novel opens with dismal and ominous words of proclamation of the Home Minister the Government of India to Visal Dubey, an intelligent I.C.S. officer: "violence lies close to the surface of Punjab." The Punjab has been partitioned into Punjab and Haryana and the two states are now interknitted in a fight over many issues because they accord and share many resources. The Home Minister considers the violence may be imputed to the long continuous and unbroken tradition of land ownership the pride of possession, the fact that the area was under the British Raj for less than a century and agriculture did not undergo revolution or transformation. All adding to an environment where in "the strong right arm is apt to flourish" (SC 5-6)

Dubey reflects on the predominance and of violence and hostility in the country: outbreaks of brutal, deliberated and preconceived violence had become a feature of the cities. There had become an earmark of the cities. There were too many in the tumult and turmoil that had nothing to lose by violence, to many others who sat idle and uninterested, their spirit sucked dry, watching it mount and ebb like some rough tidal wave, waiting for it to engulf them. Patiently waiting as the waited for the seasonal rains, for the harvest, for the birth of unwanted children for death. violence had become common and expected.

The Home Minister says that situation and condition in Punjab and Haryana poses an issue of violence of attitude, which may and often does lead to aggressive civic violence, an attitude that "brooks no compromise and rejects all but one solution." However, the Home Minister still deems that "The restraining voice has great value at a time like this," the approach making so much disparity. Answering Dubey's query, the Home Minister says that Dubey has been selected to be sent to Chandigarh because of his intellectual power of persuasion so that he may empower the Government to take one step ahead, hold on and wait. The Home Minister feels that Dubey has the capacity to counsel patience. The Minister ensures Dubey they will be in touch. He is dumfounded to perceive that Dubey can leave the next day. Dubey explicates that his wife died six years ago and that he has no children

The topography of India, once a homogeneous and well-balanced piece of territory to administer was now confusion of separate, sensitive separate identities,

electrified and aroused after independence. Psychology seems to play as significant a part in understanding as did history, economics and geography. Much more than realities and figures were needed in coping with political malevolence and rivalries that had now ceased even to make bargains. As long as an agreement could be made, work could go on. When the power and capacity wore out, only a collision was possible. In the new states, Punjab and Haryana carry off of water and electric power persisted, strengthened by the presence of both new states Government in a common capital, Chandigarh, which each demanded exclusively as its own. And now Gayan Singh, Chief Minister of Punjab, blackmailed and threatened to demonstrate the power and strength of his demands by instigating a crippling strike that would incorporate both states. Dubey had felt awkward that it was too late to consider persuasion. The man now meditating pensively in terms of a conclusion has committed too much of his reputation to it. In these years there had been no tug of war over power, no conflicts on political issues between state Governments even though there had been disagreement and dispute. No one had the inclination or the organization to risk an open threat.

Dubey analyses the information relating to the two states Punjab and Haryana: power systems, production industry work force, common irrigation and their exports. The power system is under jurisdiction of central government, but Gayan Singh, the Chief Minister of Punjab, now demands central of it for his state. Since he is a Left Wing leader, it is an apt setting for a showdown. Dubey is acquainted that as liaison officer between the two states and centre he will not be a popular and will not gain the credence of neither perhaps. Dubey had not question the Home Minister why the centre had admitted the Punjab to be redivided twenty years after the bifurcation of 1947, creating a new mass, because “it was the kind of question civil servant did not ask politicians”(SC13-14)

Nikil and Gauri Ray, mill owning family of Delhi, symbolizes the world of gracious and privileged living, which is no longer safe in India. Dubey started coming to Nikil Ray's home during befuddled and bewildered remorseful years following his wife's death because “there was no sign of strain in it”(SC16). Nikil contemplates that Gayan Singh is an egotistic and whimsical. Dubey tells that there is principle of it in all politicians. Nikil expounds that tribulation has been coming for years, with the labour constitution making a

monster out of labour, the congress party disintegrating people like Gyan Singh, his Haryana opposite Harpal Singh confronting each other. Dubey says that the issue between the two is a conflict of personalities, to which politics has deteriorated, with no issues left, only difference of opinion. Nikil thinks that as long as the transport keeps moving the people will not disquiet.

Harpal Singh, Chief Minister of Haryana, never desired it to exist. The formation of the new states constituted a criminal devastation of his vision. The Punjab has been his accomplishment. He had worked hard for its reconstruction, put heart into the expatriates who has resided there after the bifurcation and welcomed those who had straggled back once the annihilations were over. He really loved the Punjab. He criticised the partition disposition that had led to the bloodshed and massacre of the Punjab apparently in the interest of Punjabi language. Harpal Singh deplores that there is no big dream and vision any more.

When Dubey visits Harpal in his office, the Chief Minister says him that the issue is one of keeping the peace and placid in the face of Gayan Singh's strike threat. He desiderates Dubey to indite an appeal to all industrial establishments to keep their machinery working. He tells that Haryana Government destines to keep its concern going. He is spirited to hold the usual cattle market at Rohtak on schedule since it is likely to be occasion for a celebration once the entire problem is over. Preparing to leave for a Government machine tool factory at Pinjore. Harpal is stalled because his car does not start. Grumbling about the dearth of spares parts because of a go slow strike, Harpal is aboard into Dubey's car and invites him to the function at Pinjore because the industry is doing well in exports and it will be bad thing if the workers put down their tools. Harpal tells that Dubey will have to tell him If Gayan Singh 's approach and attitude will change.

The political conclave which carved and set out the new state of Haryana was fateful and destructive for Gayan Singh. He approached the centre to altercate of a state where the Punjabi language would have superiority and pride of place. He became the focus of editorials and news reports. He was represented as the common man who emanated from the ranks to the peak of power and yet reminded representative of the common people. After that he started to project himself as a simple and honest-to-goodness man whose only purpose was “to

call his soil his own in the language of his fore fathers” (SC142) and to dwell on his poor, rural decent and street childhood. Even the revered and admired Home Minister’s objections were countermand. Harpal Singh’s altercation against partition was ignored. Gyan Singh stuck to the language and won. He also suggested at a reserve card... the religion card.

With Gayan Singh and Punjab becoming more audacious and growing strong-willed day by day, Harpal has no ardour for the position of the Chief Minister of Haryana. When Vishal Dubey meets in his headquarters, Harpal Singh tells that he is going to quit his position. Vishal Dubey’s dissensions deprecate him. A group of university students persuade him that he is needed and has a job to do.

The schemed and calculated strike is to start in four days. For some unusual reason, perhaps as an admonishing, the State Electricity Board goes on a day strike, advocated and supported by government employee. However, Chandigarh’s electricity and light supply, unlike those of smaller neighbouring towns and cities, remain normal because the officer of the Electric Board patrolled and protected the lines for breakdowns. The Haryana cabinet meets for one whole morning and finds no concrete solution or at least a temporary suggestion.

After the conclave, in the Chief Minister head Quarters, Vishal Dubey counsels Harpal of confronts of strike, keep the works going by appealing to his stanch and faithful workers and bureaucrats and support and make a stand. Harpal Sinng is bothered and distressed about planning, strategy and tactics and afraid of failing in such a situation. Vishal Dubey suggests that the risk should be taken because a single man cannot be suffered and tolerated to run down the machinery of two states. Harpal Singh tells that prevailing belief is in support of Gayan. Dubey tells that Harpal Sing can win public belief and public opinion over to his side if he make a stand. Harpal Singh contemplates for sometimes, determine to make a stand. Harpal cogitates for some time, determines to make a stand, and requests to workout strategy.

Going to his office, Vishal Dubey works out the tactics, making a grand design of game plan on a notepad, covering all important points and contriving for all contingencies. He telephoned to the Home Minister in Delhi, who admonishes that a decision should be

made and offers to come over personally. Perturbed by the prospect of having to defend and safeguard in such a tense situation. Vishal Dubey advocates him against a visit at this moment. The Home Minister accedes his advice.⁵

Vishal Dubey’s contact at the Bahakra power plant is anxious because the protesters blocked all the road junctions so that only four hundred bureaucrats and charge-men could be put inside the plant. He announced that there are more than two thousand protesters and that the police dare not audacity the protesters because they feel that there not enough of them to contend. He dreads that the men inside may lose their spirit. Vishal Dubey discerns that it is the speaker who is afraid. So, he is says that to approach that another deputation of police will arrive in the afternoon. He instructs that meanwhile, no one is giving up anything. The approach is frightened the protesters may turn to violent, bloodthirsty and destructive. But Vishal Dubey promises him that loyal workers will not have to hold out for more than fifty eight hours. The approach is relieved to hear this. In the evening light is on agenda. Harpal Singh comes to Vishal’s office looking young and almost gay. He tells he has no thought of retirement now. He is going home and counsels Vishal to do like.

As Vishal is to leave to his office, a news flash announces the death of the Home Minister and the last rites the next morning and Vishal muses. It would mark the end of an era known as Gandhian. Crowd sweeps into the roads of Chandigarh that evening. Harpal’s car is seized in the crowd at the secretariat. A few hundred hands thrash and beat against his car. The tyres of the car are punctured. Cow dung is thrown on the car. A shot breaks the windshield of the car. A second shot thwack on his shoulder and he slumps in his seat. When he recovers consciousness in the hospital, he knows that Gayan Singh has called of the strike as a taken of respect for the death of a patriot.

CONCLUSION

Thus Nayantara Sahgal pictures the issues of nationalism, heroes in its own way. Sahgal portrays the violence in the contemporary Punjab-Haryana which mirrors the trauma of the India-Pakistan partition. Vishal Dubey reflects the actions of and principles of Gandhiji and Nehruji. Sahgal clearly shows in matching the occurrences and utterances of everyday political reality

and its consequences with larger concerns of the nation in a deliberate and reflective manner.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISE Journal Reviewer Committee

REFERENCES

1. Sahgal, Nayantara. *Storm in Chandigarh*. New York :W.W. Norton &Co. Inc.,1969.
2. "The Novels of Nayantara Sahgal." *Indian Literature* 16. 1 and 2 ,1973,pp 36-69.
3. "Interview with Nayantara Sahgal." *Punjab Journal of English Studies* 5,1990,pp 31- 35.
4. Howe, Irving. *Politics and the Novel*. New York: Horizon Press, 1957.
5. Bhatnagar, Manmohan. *The Fiction of Nayantara Sahgal*. New Delhi: Creative Books,1996.
6. Jain, Jasbir. *Nayantara Sahgal*. Jaipur: Printwell, 1978.

Soft Computing based Cluster Head Selection for Secured Energy Aware Routing in Flying Ad Hoc Networks (FANET)

Esraa Saleh Alomari

Wasit university, computer science department, Iraq

ABSTRACT

Flying Adhoc Networks (FANET) refers to the Unmanned Air Vehicle (UAV) that is used for defense applications so that the multiple flying objects or military air vehicles can communicate with each other. Network Communications generally encounter assorted assaults from different sources and channels which creates huge vulnerabilities and susceptibilities in the overall environment. By this integration of assaults, the overall communication gets under halt and the cumulative trust factor is affected. In this paper, the different perspectives of wireless communication on flying objects are underlined with the different types of energy based attacks. FANET is a type of ad hoc network in which the temporary communication channel is created on demand so that the communication and transmission of signals can be done for specific applications with the higher degree of accuracy and performance. In this manuscript, the implementation of Simulated Fermentation Optimization (SFO) is implemented so that the higher degree of performance and optimization can be done.

Keywords: FANET, Flying Adhoc Network, Wireless Network, Simulated Fermentation Optimization (SFO)

INTRODUCTION

Wireless communication involves the transmission and sharing of information in multiple nodes without using the electrical conductor. The wireless communication depends on the radio technology and related assorted aspects for effective and secured data transmission. There are assorted perspectives of wireless

communication including wireless sensor networks, mobile ad hoc networks, wi-max and many others. Now days, the inclusion of flying objects are prominent in military applications so that the flying aircrafts can communicate with each other during war time or other similar instances. The wireless communication when takes place in the flying objects or flying aircrafts are commonly known as Flying Adhoc Network (FANET)^{1,2}.

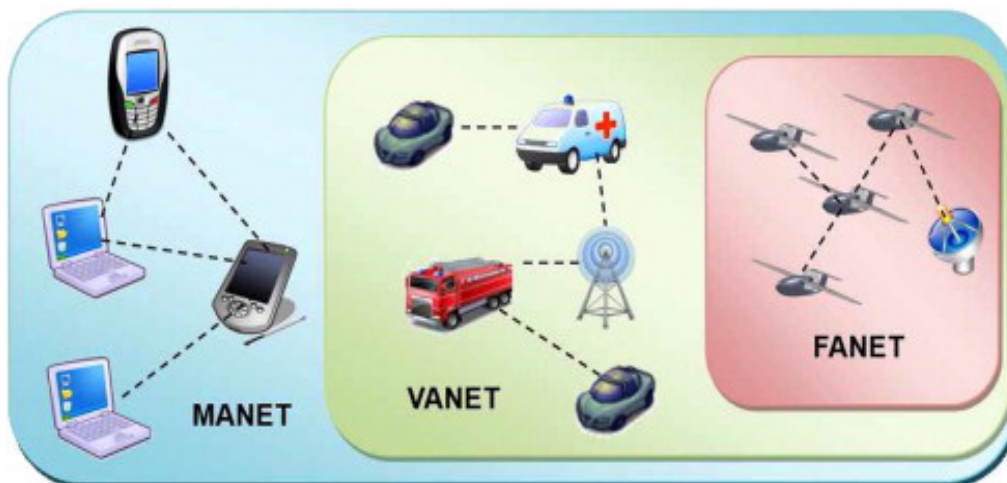


Figure 1.1. Depiction of MANET, VANET and FANET

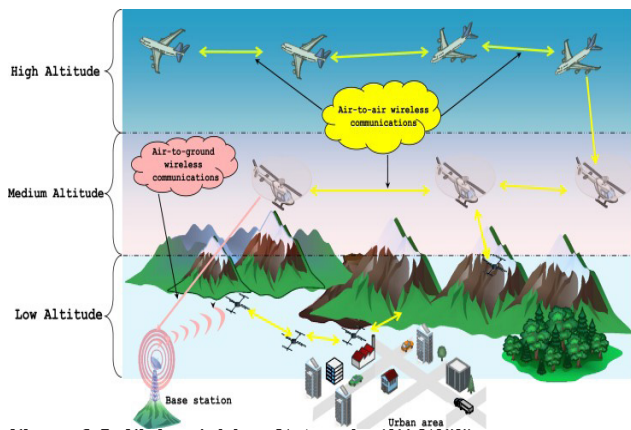


Figure 1.2. Flying Ad-hoc Networks (FANET)

Energy and Power in Wireless Sensor Networks

The energy and power in the wireless nodes are very limited which makes the network scientists aware with the development of new protocols so that the high performance algorithm for energy optimization can be devised. There are number of algorithms and approaches for energy optimization and harvesting in wireless sensor networks which are having key focus on the cluster head formation so that the minimum energy loss can be implemented in overall network scenario.

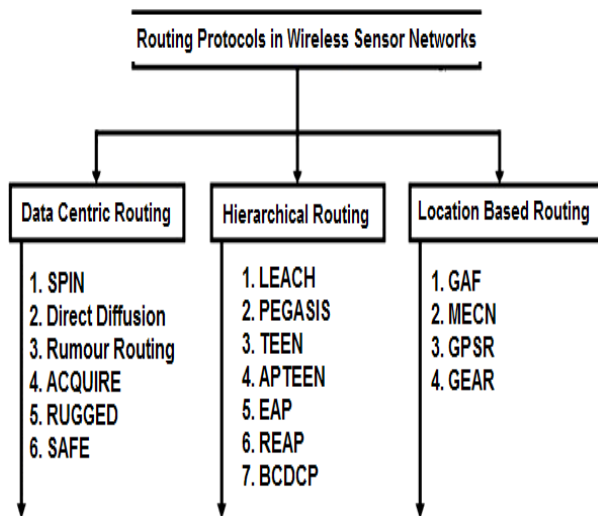


Figure 1.3. Taxonomy of Routing Protocols in Wireless Networks

Following are the excerpts from the key routing protocols in wireless sensor networks. Low-energy adaptive clustering hierarchy or LEACH is one of the prominent protocols for energy optimization in the wireless sensor networks. LEACH encapsulates the properties including threshold value, TDMA based communication, cluster based aggregation, direct communication by the cluster head to the node or sink.

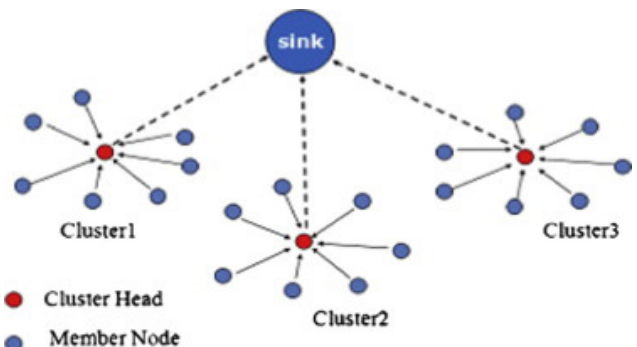


Figure 1.4. Low-energy adaptive clustering hierarchy (LEACH) Protocol

SPIN - Sensor Protocols for Information via Negotiation (SPIN) is a Data-Centric routing approach that is based on the negotiation family with the elimination of redundant data. This family avoids the limitations of Implosion, Overlap and Resource Blindness as key obstacles in the traditional flooding.

Direct Diffusion - The implementation of data aggregation is done at each node. The advertising of data is done after confirmation from base station (BS).

Rumour Routing - The routing of queries is done to the events with the acknowledgement from the event to which the query is transmitted.

ACQUIRE - ActiveQuery forwarding InsensoRnEtworks or ACQUIRE follows the approach of active query routing that is transmitted to the network to fetch the solution. The query is transmitted to each node and multiple hops to resolve the query.

RUGGED - It is RoUting on finGerprint Gradient in sEnsor networks. It is gradient based routing that relies on the utilization of fingerprint associated with the event for logging and tracking.

PEGASIS - It refers to Power Efficient Gathering in Sensor Information System with the key focus on energy efficient approach in the wireless environment. The approach grants the local communication and coordination in the nodes so that minimum bandwidth and energy can be consumed.

TEEN - Threshold sensitive energy efficient protocol or TEEN focuses on the grouping of sensor nodes so that the cluster formation can be done with the generation of cluster head to lead the cluster communication. APTEEN is the escalated or improved version of TEEN that refers to Adaptive Threshold sensitive energy efficient protocol.

EAP - Energy Aware Routing Protocol (EAP) is another class of hierarchical protocols in wireless sensor networks for the lifetime improvement and optimization of the energy in wireless environment. EAP presume that the locations are not known to the sensors and these sensors communicate using different paradigms of information including Global Positioning System (GPS), Positional Algorithm and Antenna^{3,4}.

REVIEW OF LITERATURE

A number of researchers and practitioners have worked on the analysis of similar domain with the suggestive remarks but there is huge scope for the improvement in cases where the deep evaluation of the tools, technologies and paradigms are required to be done. Enormous multi-sources based manuscripts, research papers and articles are analyzed from the time span up to year 2017 so that the latest trends in wireless communication can be evaluated. Enormous multi-sources based manuscripts, research papers and articles are analyzed from the time span up to year 2017 so that the latest trends in energy optimization and lifetime of flying adhocnetworks can be evaluated.

Bekmezci et al. (2013)⁵ worked on the assorted aspects of energy and security in Unmanned Air Vehicles (UAV) commonly referred to as Flying Objects communicating in the wireless environment. The work presents the key differences in FANET, MANET, VANET and related technologies of wireless communication with the advantages of using FANET.

Sahingoz et al. (2014)⁶ underlines the network models and paradigms of flying ad-hoc networks with the challenges and key concepts. The identifies the architectures and security models associated to enable the integrity aware FANET.

Singh K et al. (2015)⁷ presents the experimental evaluation of flying ad-hoc networks on different protocols including AODV, DSDV, OLSR with the effectual comparative analysis. The work presents the use of FANET for military applications and performance aware environment in minimum delay.

Temel S et al. (2013)⁸ depicts the promising technologies of High Altitude Platforms (HAP) with the integration of Flying Adhoc Networks (FANET) for different domains including military as well as civilians. The work projects the unique and effective protocol

titled Location Oriented Directional MAC (LODMAC) based on MAC for the network discovery and effectual data transmission.

Rosati S et al. (2016)⁹ evaluates the dynamic routing in the unmanned air vehicles or flying adhoc networks with the experimental evaluation and results on small flying robots for testing. The work presents the comparison of two routing approaches in ad hoc networks including OLSR and Predictive OLSR (P-OLSR). The approach of P-OLSR is developed for FANET and tested as the effectual algorithm.

Koucheryavy A et al. (2015)¹⁰ presents the research challenges and assorted aspects of public flying ad hoc networks in multiple applications. The work evaluates the assorted aspects of Public Flying Ubiquitous Sensor Networks (FUSN-P) with the presentation of a network model and the effectual solution for different application in military.

Research Objectives and Methodology

The multilayered approach for energy harvesting and energy optimization shall be done in the proposed approach at the multiple layers of sea with the deployment of FANET. The work includes the research goals including subterranean evaluation of energy and optimization approaches in Flying Ad-hoc Network (FANET). The work presents the pragmatic Exploration of the Energy Harvesting and Associated Packets Loss in the Flying Ad-hoc Network (FANET). The work proposes and devises an effectual and novel algorithm for energy optimization in Flying Ad-hoc Network (FANET) using Simulated Fermentation Optimization (SFO). The implementation of proposed approach using open source research based simulation tool is done with the evaluation of the Projected Proposed Results with the Traditional Approach. The work includes sensors deployed to form the dynamic clusteredhead and reconfiguration of the network. The fuzzy formula based dynamic selection of the cluster head shall be implemented with the shuffling of cluster heads. The proposed work is providing the feature and dynamic nature to the cluster head. The work is fault and failure tolerant due to shuffling of the cluster head.

In this novel and effectual research work, we hereby present and depict the Soft Computing Approach titled "Simulated Fermentation Optimization (SFO)". This approach can be used for optimization of Engineering as

well as Social Problems.

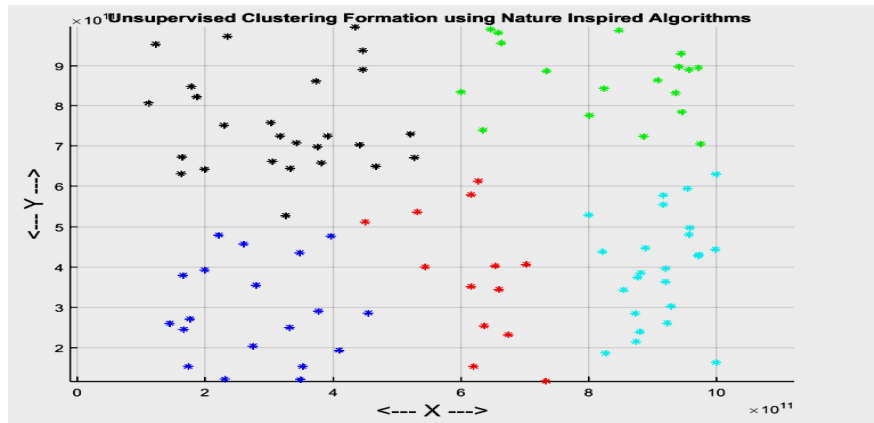


Figure 1.3. Simulated Fermentation Optimization (SFO)

In Figure 1.3, the proposed Nature Inspired Algorithm (SFO) is depicted. The components and process of classical fermentation is related to the proposed approach. Using SFO, we can fetch the integrity and performance based results. The wireless nodes with degree of energy and lifetime shall be given occasion to be cluster head so that overall performance and lifetime of the clustered environment can be escalated.

There are many procedures to select the cluster head based on the criteria including fermentation quantity and timelines, Battery power, Communication range, Position of the node, Total number of nodes in range and Mobility of the node

Projected Results and Outcome

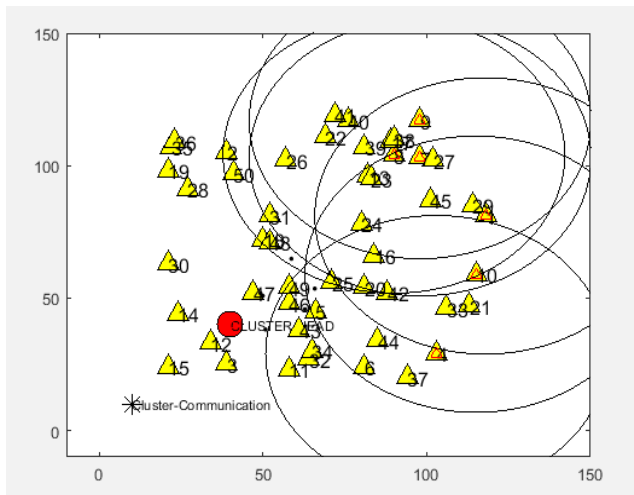


Figure 1.4. Implementation of Clustering in Wireless Environment

Figure 1.4 depicts the implementation scenario of clustering in the flying adhoc networks in the aerial region. The different points in plot presents the flying

objects or aircrafts in communication with each other to share and signals and the data transmission.

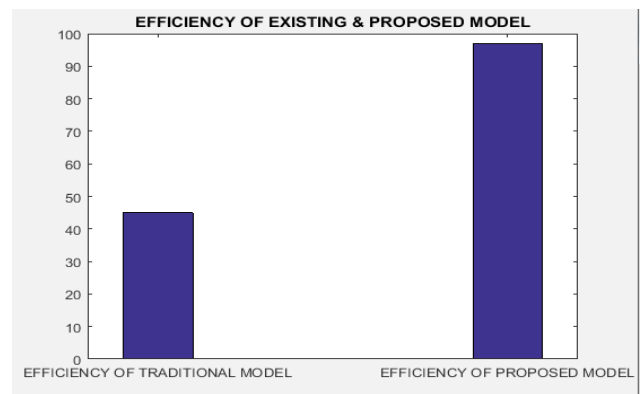


Figure 1.5. Communication in Wireless Flying Objects

Figure 1.5 presents the communication scenario between the flying aircrafts and communication with the base station and controller along with the inter-aircraft transmission of signals.

Figure 1.6. Comparison of Efficiency in Existing and Proposed Approach

From the results, it is evident that the projected approach of SFO is presenting the superior results in terms of efficiency or performance as compared to the traditional approach of energy optimization in FANET. The implementation is done in the performance aware simulation tool to have the overall outcome. By this, it is palpable that the soft computing approaches are quite effectual and integrity aware for multiple scenarios and applications.

CONCLUSION

Soft computing approaches are widely used for the optimization of engineering problems including wireless energy optimization, security, malware detection, log file analysis, image processing, video forensic and many others. In this research work, the proposal of a new approach Simulated Fermentation Optimization (SFO) is presented with the pragmatic evaluation on performance and found the approach better to improve the lifetime and energy optimization in the flying ad hoc networks.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISE Journal Reviewer Committee

REFERENCES

1. Tareque MH, Hossain MS, Atiquzzaman M. On the routing in flying ad hoc networks. In *Computer Science and Information Systems*, 2015, pp. 1-9.
2. Camp T, Boleng J, Davies V. A survey of mobility models for ad hoc network research. *Wireless communications and mobile computing*. 2002,1;2(5),pp 483-502.
3. Singh K, Verma AK. Applying OLSR routing in FANETs. In *Advanced Communication Control and Computing Technologies (ICACCCT)*, 2014 ,pp. 1212-1215.
4. Sharma V, Kumar R. An opportunistic cross layer design for efficient service dissemination over flying ad hoc networks (FANETs). In *Electronics and Communication Systems*, 2015, pp. 1551-1557.
5. Bekmezci I, Sahingoz OK, Temel Ş. Flying ad-hoc networks (FANETs): A survey. *Ad Hoc Networks*. 2013 ,1;11(3),pp 1254-70.
6. Sahingoz OK. Networking models in flying ad-hoc networks (FANETs): Concepts and challenges. *Journal of Intelligent & Robotic Systems*. 2014 ,;74(1-2),pp 513-527.
7. Singh K, Verma AK. Experimental analysis of AODV, DSDV and OLSR routing protocol for flying adhoc networks (FANETs). In *Electrical, Computer and Communication Technologies* , 2015 ,pp. 1-4.
8. Temel S, Bekmezci İ. On the performance of flying ad hoc networks (FANETs) utilizing near space high altitude platforms (HAPs). In *Recent Advances in Space Technologies (RAST)*, 2013 pp. 461-465.
9. Rosati S, Kruzelecki K, Heitz G, Floreano D, Rimoldi B. Dynamic routing for flying ad hoc networks. *IEEE Transactions on Vehicular Technology*. 2016 ,65(3),pp1690-700.
10. Koucheryavy A, Vladyko A, Kirichek R. State of the art and research challenges for public flying ubiquitous sensor networks. In *Conference on Smart Spaces 2015*, pp. 299-308,.

Survey on Faculty Members Attitude on Selection Criteria for Digital Archives at Raman Research Institute, Bengaluru

E Nanda Kumari ¹, E S Kavitha²

¹ Ph. D Research Scholar, Department of Library and Information Science, Periyar University, Salem and Sr. Library cum Information Asst. Gr. I, JNCASR, Bengaluru, ²Assistant Professor, Department of Library and Information Science, Periyar University, Salem

ABSTRACT

A repository is which stores one or more collection of digital information objects with the intention of providing long-term access to the information known as digital archives. This study is attempted on the selection criteria for the digital archives at RRI Library. To know the level of awareness on various copyright or legal issues associated with the digital collection and to get opinion from various categories of respondents about criteria guide on selection of materials for digitization. The present study analysis is to know various problems while using digital archives and ways to Publicize to use the IR/ digital archives and discuss about the special skills required for library staff to implement various methods to access the digital collection and precautionary measures relating to issues on digitizing the documents in the digital archives

Keywords: Digital Archives, IR, RRI

INTRODUCTION

A digital archive is a repository that stores one or more collection of digital information objects with the intention of providing long-term access to the information. Digital archives can be a sophisticated, multi-tiered storage system or simply from a local drive on someone's home computer. 'Long-term' refers to a period of time which is long enough to be concerned about the impact of changing technologies, including support for new media and data formats, and with a changing user community, on the information being held in a repository. This period extends into the indefinite future. Digital technology is constantly shifting, and the challenges of preserving materials in digital formats require constant innovation. This means that the curation of archives 'born-digitally' is heavily reliant on research, development and problem-solving. Ensuring long-term access to digital information is a complex challenge that includes issues such as: storage media instability and deterioration technology obsolescence and incompatibility (at the level of: hardware, system software, application software, data and file formats, storage media readers and drivers) lack of metadata which results in the failure to locate information, the inability to render and read the information, or the

inability to attribute meaning or value to the information due to the lack of contextual information lack of clearly assigned responsibilities and resources for long-term preservation

Advantages of digital archiving

Archives of artifacts is helpful for historical reasons. Physical artifacts may get worn out in few years.

Searching of the contents in digital versions can be made powerful and this can help literally to all stakeholders.

Visibility of such archives is achieved which helps users to understand the importance of archives.

Better access to information and Data retention and backup

Less space requirements for physical document storage

Cost savings due to reduced overheads for storage, searching and handling of paper documents

Raman Research Library

The present library has been developed around

the library started by Prof. C. V. Raman. After the institute's activities enlarged from 1972 onwards, library's collection developed in the new areas of research activities. Its collection is strong in the areas of astronomy and astrophysics, theoretical physics, optics and liquid crystals. Apart from these subjects there are books on Computer Science, Electronics, scientific biographies, general science, nature and fine arts. It has also a collection of non-book materials like scientific slides, CD-ROMs, DVDs and audio and video tapes. The library participates in inter library networking activities and has a good rapport with the libraries in the city as well as outside. It is used by not only by the scientists of this institute but also by others belonging to Indian Institute of Science, Indian Institute of Astrophysics, Jawaharlal Nehru Centre for Advanced Scientific Research, National Aerospace Laboratories, National Centre for Biological Sciences, TIFR Centre for Applicable Mathematics and others. The library has full text access to several online journals. The Digital repository is built to showcase all the research publications of Prof. C.V. Raman. It includes research publications of the faculty and students of RRI in addition to the historical/ archival records such as Annual Reports, Newspaper clippings, Photographs and multimedia objects. A collage of profiles and publications of RRI members (whose imprints) have been culled and collated for posterity.

REVIEW OF LITERATURE

Kim, Julia Y (2018) conducted the study about the archives and library communities had benefited from major innovations in emulation and software preservation¹. Presently the digital archives were accessible to all users and supported all major operating and desktop systems, and much of the work in determining platform requirements can be made almost invisible to end-users. The study investigating solutions for emulation, but also legal issues, metadata, and other impediments to the preservation of software necessary for rendering digital files. **Ravenwood, Clare (2015)** examined the social context of selection in institutions, in which the responsibilities of stakeholders and relationships between them can affect the material chosen for preservation by practitioners². A range of stakeholders is identified and addressed the relationships between practitioners, information technology staff, and sources of material are found to be crucial. The influence of senior managers is important in providing a

mandate and encouraging shared working and networks of expertise. **Chen, Tin-Kai (2014)** aimed to digitize video collections hosted by the Museum of Shadow Play of the Kaohsiung City Cultural Affairs Bureau in Taiwan³. The study cooperated with the museum and digitizes films kept there, whilst also constructing a Web 2.0 interactive online platform to promote the culture of shadow puppet theatre. The study designed and validated three prototypes of social interfaces representing the cultural context by taking advantage of interactive technology. **Muir, Adrienne (2014)** discussed that there are various possible approaches to dealing with the issues, including extending legal deposit law, amending copyright and related law, development and use of preservation clauses in licenses or collective licensing and the provision of preservation rights metadata⁴. There is a need for clarification of the legal situation and a raising of awareness. Roles and responsibilities in digital preservation and the impact of new trends in electronic publishing also need to be investigated.

Calanag, Maria Luisa (2001) stated about the Selection and metadata issues which surround the preservation of digital information are discussed, in particular, the assignment of "collection levels" to Web materials to ensure preservation. PMES have been identified as informed by the OAIS as Reference Model⁵. They expressed preservation decision and responsibility for the resource at the time of selection. **Bähr, Thomas (2011)** described the necessary knowing about how identified, ranging from digital curation skills needed to evaluate digital data carriers to specialist digital preservation knowledge of file formats needed to describe information with the goal of sustaining accessibility over long-term⁶. It shows how central tasks of digital preservation like process description and preservation planning require expert knowledge of traditional librarian and information technology skills as well as new knowledge which is described as digital preservation skills. **Maxwell, Alexander (2010)** discussed the mission and implementation of digital libraries from an historian's perspective⁷. This paper summarizes the abstract qualities that historians look for in their sources, and then compares various digital archives both qualitatively and quantitatively, highlighting design features that enhance or detract from the ease of use. It gives library scientists candid opinions from an intensive end user of digital information, contains several practical suggestions,

and explains the reasoning behind those suggestions. **Hodge, Gail (2004)** discussed about OAIS Reference Model which provided the framework for discussing the key areas that impact on digital preservation, the creation of the electronic information, the acquisition of and policies surrounding the archiving of resources, preservation formats, preservation planning. They are encouraged to monitor developments and projects in the field, to raise awareness of the need for preservation within their institutions, to consider preservation and long-term access issues when negotiating licenses for electronic resources⁸.

OBJECTIVES

To study the awareness levels on various copyright or legal issues associated with the digital collection

To get opinion from the respondents about criteria guide on selection of materials for digitization

To analyse various problems while using digital archives and ways to Publicize the use of IR/ digital archives

To discuss about the special skills required for library staff to implement and manage the digital collection and precautionary measures to be taken to digitize the documents.

METHODOLOGY

The researcher used a design of empirical survey using questionnaire method. This study involves both primary, secondary data and wide interaction with a sample group. Simple random sampling method is adopted to collect data from the faculty members of RRI.

Analysis

Table no: 1: Distribution of the respondents by gender

Sl. No	Gender	No of respondents	Percentage
1	Male	91	75.8
2	Female	29	24.2
	Total	120	100

The table no 1 shows the distribution of the respondents by their gender. It is noticed from the table that 76% of the respondents were male and 24% of the respondents were female.

Table No: 2: Distribution of the respondents by age

Sl. No	Age	No of respondents	Percentage
1	Below 35	29	24.2
2	36 – 40	67	55.8
3	41 – 45	10	8.3
4	46 – 50	7	5.8
5	Above 51	7	5.8
	Total	120	100

The table no 2 shows the distribution of the respondents by age. It is clear from the table that 56% of the respondents belong to the age group of 36-40. Around 24% of the respondents were below 35 aged and 8% of the respondents belong to the age group of 41-45 age. 6% of the respondents were aged 46-50 and another 6% of the respondents were aged above 51.

Table No: 3: Frequency level of accessing the digital archives

Sl. No	Frequency level	No of respondents	Percentage
1	Daily	66	55
2	Twice a Week	23	19.2
3	Occasionally	31	25.8
	Total	120	100

The table no 3 shows the frequency level of accessing the various digital archives materials is clear that 55% of the respondents were accessing the digital archives daily and 26% of the respondents were accessing the digital archives occasionally. 19% of the respondents were accessing the digital archives twice a week.

Table No 4: Awareness on copyright or legal issues associated with your digital collection which would result in restrictions on its use

Sl. No	Type		Highly Aware	Aware	Moderately Aware	Somewhat Aware	Never	Total	Mean	Std. Div	Rank
1	Publishers Policy	N	42	14	8	7	49	120	3.06	1.798	9
		%	35	11.7	6.7	5.8	40.8	100			
2	Sherpa Romeo	N	42	13	23	26	16	120	2.68	1.473	7
		%	35	10.8	19.2	21.7	13.3	100			
3	Creative Common Licensing	N	34	21	16	22	27	120	2.89	1.549	8
		%	28.3	17.5	13.3	18.3	22.5	100			
4	Fair Dealing / Fair use Rights	N	34	7	15	7	57	120	3.38	1.74	10
		%	28.3	5.8	12.5	5.8	47.5	100			
5	Site Licensing	N	49	7	31	15	18	120	2.55	1.494	6
		%	40.8	5.8	25.8	12.5	15	100			
6	Indian Copyrights Act	N	32	37	30	8	13	120	2.44	1.256	3
		%	26.7	30.8	25	6.7	10.8	100			
7	International Copyrights	N	50	37	8	15	10	120	2.15	1.313	1
		%	41.7	30.8	6.7	12.5	8.3	100			
8	Confidentiality	N	27	41	27	13	12	120	2.52	1.237	5
		%	22.5	34.2	22.5	10.8	10	100			
9	Multiple Format	N	45	29	10	18	18	120	2.46	1.489	4
		%	37.5	24.2	8.3	15	15	100			
10	Inter Library Loan	N	44	25	36	8	7	120	2.24	1.188	2
		%	36.7	20.8	30	6.7	5.8	100			

The table no 4 shows the respondents’ opinion about Awareness on copyright or legal issues associated with digital collection which would result in restrictions on its use. It is noticed that 47% of the respondents were aware about the publishers policy related copyrights. Around 46% of the respondents were aware about Sherpa Romeo type of copy rights and another 46% of the respondents were aware about the Creative Common Licensing. 34% of the respondents were aware about Fair Dealing /Fair use Rights and 46% of the respondents were aware about Site Licensing. It is noticed that 57% of the respondents were aware about the Indian Copyrights Act, Confidentiality based rights and 73% of the respondents were aware about the International

Copyrights. It is noticed that 62% of the respondents were aware about multiple format of rights and 58% of the respondents were aware about the inter library loan rights.

Among the various factors of the awareness on copyright or legal issues associated with the digital archives, high level on awareness is noticed on International Copyrights, Inter Library Loan Indian Copyrights Act and Multiple Format. Moderate level of awareness was found in Confidentiality, Site Licensing and Sherpa Romeo. Low level of awareness noticed on Creative Common Licensing, Publishers Policy and fair Dealing /fair use Rights

Table No 5: Criteria guide selection of materials for digitization

Sl. No	Criteria		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total	Mean	Std. Div	Rank
1	Preservation	N	27	32	36	11	14	120	2.61	1.259	10
		%	22.5	26.7	30	9.2	11.7	100			
2	Enhanced Access	N	55	22	22	11	10	120	2.16	1.322	5
		%	45.8	18.3	18.3	9.2	8.3	100			
3	Archival value	N	30	51	19	6	14	120	2.36	1.242	7
		%	25	42.5	15.8	5	11.7	100			
4	Academic Importance	N	21	31	18	29	21	120	2.98	1.384	14
		%	17.5	25.8	15	24.2	17.5	100			
5	To Save Space	N	27	21	45	11	16	120	2.73	1.282	11
		%	22.5	17.5	37.5	9.2	13.3	100			
6	Organizational Commitment	N	87	12	6	7	8	120	1.64	1.222	1
		%	72.5	10	5	5.8	6.7	100			
7	Quantity to meet user need	N	53	38	8	12	9	120	2.05	1.263	2
		%	44.2	31.7	6.7	10	7.5	100			
8	Subject relevance	N	40	22	38	7	13	120	2.42	1.301	8
		%	33.3	18.3	31.7	5.8	10.8	100			
9	Cost effectiveness	N	45	23	14	27	11	120	2.47	1.420	9
		%	37.5	19.2	11.7	22.5	9.2	100			
10	Authenticity of information	N	60	26	10	10	14	120	2.10	1.405	3
		%	50	21.7	8.3	8.3	11.7	100			
11	Distributed access	N	59	11	16	19	15	120	2.33	1.514	6
		%	49.2	9.2	13.3	15.8	12.5	100			
12	Added Value	N	38	21	15	23	23	120	2.77	1.538	12
		%	31.7	17.5	12.5	19.2	19.2	100			
13	Ease of accessibility	N	27	20	28	38	7	120	2.82	1.263	13
		%	22.5	16.7	23.3	31.7	5.8	100			
14	Legal issues	N	64	15	14	14	13	120	2.14	1.455	4
		%	53.3	12.5	11.7	11.7	10.8	100			

The table no 5 shows the respondents' opinion about various criteria guide selection of materials for digitization in the digital archives. It is clear that 50% of the respondents were considering for type of preservation and digitization of digital archives. 64% of the respondents thought about enhanced access for digital archives. 68% of the respondents considered for archival values. 43% of the respondents were thinking

of academic importance before digitization of the documents and 40% of the respondents have agreed to save the space. It is noticed that 83% of the respondents have thought of organizational commitment factor for digitization of materials and 76% of the respondents have agreed for criteria of quality of information to meet the user need. It is clear that 52% of the respondents have thought about selection of materials based on subject

relevance and 57% of the respondents about the cost effectiveness. It is noticed that 72% of the respondents have discussed about authenticity of information for digital archives and 58% of the respondents have agreed for distributed access of digital archives. . It is clear that 49% of the respondents have agreed to the point of added values of the digital collection and 65% of the respondents agreed about the ease of accessibility to be considered for digitization.

Among the various criteria guide for selection of materials for digitizing the digital archives, high level of acceptance was found as criteria for Organizational Commitment, Quantity to meet user need, Authenticity of information, Legal issues and Enhanced Access. Moderate level of acceptance was found on distributed access, archival value, subject relevance, cost effectiveness and preservation. Low level of acceptance noticed on saving the space, added Value, ease of accessibility and academic Importance.

Table No 6: Major Problems while using digital archives

Sl. No	Problems		Always	Often	Sometimes	Rarely	Never	Total	Mean	Std. Div	Rank
1	Inadequate Funding	N	25	22	37	23	13	120	2.81	1.272	11
		%	20.8	18.3	30.8	19.2	10.8	100			
2	Human resource	N	31	22	32	23	12	120	2.69	1.314	7
		%	25.8	18.3	26.7	19.2	10	100			
3	IT support	N	20	22	23	27	28	120	3.18	1.412	13
		%	16.7	18.3	19.2	22.5	23.3	100			
4	Data storage	N	27	41	21	17	14	120	2.58	1.30	6
		%	22.5	34.2	17.5	14.2	11.7	100			
5	Copyright issues	N	28	25	30	22	15	120	2.76	1.335	10
		%	23.3	20.8	25	18.3	12.5	100			
6	Expertise and experience	N	35	24	34	19	8	120	2.51	1.25	4
		%	29.2	20	28.3	15.8	6.7	100			
7	Support from Administration	N	37	33	26	16	8	120	2.38	1.237	1
		%	30.8	27.5	21.7	13.3	6.7	100			
8	Rapid Growth	N	18	35	41	17	9	120	2.7	1.12	8
		%	15	29.2	34.2	14.2	7.5	100			
9	Sustainability	N	18	57	21	16	8	120	2.49	1.108	3
		%	15	47.5	17.5	13.3	6.7	100			
10	Management of resources	N	14	26	47	25	8	120	2.89	1.075	12
		%	11.7	21.7	39.2	20.8	6.7	100			
11	Partnership / Collaboration	N	24	38	34	16	8	120	2.55	1.151	5
		%	20	31.7	28.3	13.3	6.7	100			
12	Lack of Flexibility	N	25	45	29	14	7	120	2.44	1.121	2
		%	20.8	37.5	24.2	11.7	5.8	100			
13	Lack of Expertise	N	18	29	45	21	7	120	2.75	1.094	9
		%	15	24.2	37.5	17.5	5.8	100			

The table no 6 shows the respondents' opinion about major problems faced by them while accessing and developing the digital archives. It is noticed that 39% of the respondents mentioned about inadequate funding, 44% of the respondents stated about the lack of human resources, 35% of the respondents said about the lack of IT support and 57% of the respondents faced the lack of sufficient space for data storage for developing the digital archives. It is clear that 44% of the respondents were worried about copyright issues and 58% of the respondents were faced the lack of expertise and experience in accessing the digital archives. It is clear that 44% of the respondents faced the lack of support from the administration, 63% of the respondents faced the rapid growth of literature and another 63% of the respondents were worried about the sustainability problems. for developing the digital archives. It is noticed that 34% of the respondents thought about the

management of resources in the digital archives and 52% of the respondents considered about the partnership and collaboration areas of digital archives. Around 58% of the respondents faced the lack of flexibility in maintaining the digital archives and 40% of the respondents were worried about lack of expertise in developing and accessing the digital archives.

Among the various problems faced by the respondents while accessing and developing the digital archives, majority of the respondents faced lack of support from Administration, lack of Flexibility, Sustainability, Expertise and experience ranked fourth, Moderate respondents were lack of Partnership / Collaboration, data storage, lack of Human resource support and rapid Growth on literature. Least preference of barrier to be mentioned by the respondents like lack of Expertise, Copyright issues, inadequate funding, Management of resources and IT support.

Table No 7: Ways to Publicize to use the IR/ digital archives

Sl. No	Factors		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total	Mean	Std. Div	Rank
1	User orientation	N	26	24	42	17	11	120	2.69	1.222	3
		%	21.7	20	35	14.2	9.2	100			
2	Intimation through email	N	27	24	41	24	4	120	2.62	1.139	2
		%	22.5	20	34.2	20	3.3	100			
3	Notice board	N	29	22	33	23	13	120	2.74	1.312	4
		%	24.2	18.3	27.5	19.2	10.8	100			
4	Pamphlets	N	25	22	29	27	17	120	2.91	1.347	5
		%	20.8	18.3	24.2	22.5	14.2	100			
5	Seminar	N	32	40	20	16	12	120	2.47	1.289	1
		%	26.7	33.3	16.7	13.3	10	100			

The table no 7 shows the respondents opinion about ways to publicize the use of digital archives. It is noticed that 42% of the respondents agreed about user orientation to help to publicize the effective use of digital archives. Around 43% of the respondents agreed about intimation through emails which promote the effective use of digital

archives and another 43% of the respondents agreed about display on notice boards will promote the digital archives. 39% of the respondents agreed about using the pamphlets to promote the digital archives and 60% of the respondents agreed about promoting the digital archives by conducting seminars.

Among the various ways to publicize the use of digital archives, majority of respondents suggested to publicize the digital archives through Seminars, intimation through email and through user orientation. Some of the respondents suggested to promote through notice board and pamphlets to publicize the digital archives.

Table No 8: Opinion about special skills required for library staff possess in the field of digital preservation

Sl. No	Factors		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total	Mean	Std. Div	Rank
1	Technical skills	N	33	23	29	20	15	120	2.68	1.367	4
		%	27.5	19.2	24.2	16.7	12.5	100			
2	Assistance in digitization	N	31	22	36	22	9	120	2.63	1.256	3
		%	25.8	18.3	30	18.3	7.5	100			
3	Copyright advice	N	32	30	31	18	9	120	2.52	1.243	1
		%	26.7	25	25.8	15	7.5	100			
4	Ensuring material availability for long term	N	16	32	43	19	10	120	2.79	1.122	5
		%	13.3	26.7	35.8	15.8	8.3	100			
5	Allowing other institutions to view the material	N	16	51	26	18	9	120	2.61	1.125	2
		%	13.3	42.5	21.7	15	7.5	100			

The table no 8 shows the respondents’ opinion about special skills required for library staff to possess in the field of digital preservation. It is noticed that 47% of the respondents agreed that the library staff must have adequate technical skill to manage the digital archives. Around 44% of the respondents agreed about the library staff need for assistance in digitization. 52% of the respondents agreed about the library staff to know about the copyright advices. 40% of the respondents accepted to ensure the material availability for long term through

the library staff. 56% of the respondents agreed about allowing other institutions to view the material.

Among the various special skills required for library staff to possess in the field of digital preservation, more number of respondents agreed for required skills on Copyright advice, allowing other institutions to view the material and assistance towards digitization. Some of the respondents had mentioned about the technical skills and ensuring material availability for long term.

Table No 9: Opinion about the precautionary measures relating to while digitizing the documents in the digital archives

Sl. No	Factors		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total	Mean	Std. Div	Rank
1	Future changes in hardware technology	N	13	24	47	27	9	120	2.96	10.8	5
		%	10.8	20	39.2	22.5	7.5	100			

Cont... Table No 9: Opinion about the precautionary measures relating to while digitizing the documents in the digital archives

2	Future changes in software technology	N	20	36	37	18	9	120	2.67	1.147	3
		%	16.7	30	30.8	15	7.5	100			
3	Security issues	N	24	48	33	10	5	120	2.37	1.028	1
		%	20	40	27.5	8.3	4.2	100			
4	Copyright issues	N	14	31	50	20	5	120	2.76	1.004	4
		%	11.7	25.8	41.7	16.7	4.2	100			
5	Copying and updating incase of obsolescence of storage device	N	18	22	65	10	5	120	2.68	0.97	2
		%	15	18.3	54.2	8.3	4.2	100			

The table no 9 shows the respondents' opinion about the precautionary measures relating to digitizing the documents in the digital archives. It is noticed from the table that 31% of the respondents agreed to adopt the future changes in hardware technology while digitizing the documents in the digital archives. Around 46.7% of the respondents agreed about adopting the future changes in software technology while digitizing the documents in the digital archives. 60% of the respondents agreed about security issues related to digital archives. 38% of the respondents agreed about maintaining the copyright issues related to digital archives and 33% of the respondents agreed upon copying and updating incase of obsolescence of storage device for digital archives.

Among the precautionary measures relating to digitizing the documents in the digital archives, more number of respondents showed concern about the Security issues, future changes in software technology, copying and updating incase of obsolescence of storage device. Moderate levels of concern were identified on copyright issues and future changes in hardware technology.

FINDINGS AND DISCUSSIONS

It is noticed that high level on awareness noticed on International Copyrights, Inter Library Loan Indian Copyrights Act and multiple Format of copy right/Legal issues associated with the digital Archives.

There is need to give more awareness on Creative Common Licensing, Publishers Policy and fair Dealing /fair use Rights related to digital archival policies

Majority of the respondents agreed to follow Organizational Commitment, Quantity to meet user need, Authenticity of information, Legal issues and Enhanced Access as criteria for digitization of materials in the archives.

It is identified that majority of the respondents faced the lack of support from Administration, lack of Flexibility, Sustainability, Expertise and experience. Moderate respondents faced lack of Partnership / Collaboration, data storage, lack of Human resource support and rapid Growth on literature while accessing and developing the digital archives.

The study indicated that more number of respondents suggested to publicize the digital archives through Seminars, intimation through email and through user orientation. Some of the respondents suggested to promote through notice board and pamphlets to publicize the digital archives.

It is suggested that more number of respondents agreed to the requirement of staff skills on Copyright advice, allowing other institutions to view the material and assistance towards digitization.

It is clear that more number of respondents have shown concern about the Security issues, future changes in software technology, copying and updating incase of obsolescence of storage device.

CONCLUSION

A successful digital archives could be brought together by all the efforts taken by the library professionals. Confidently, digital archives would develop over time

and pull the library services into digital information service and the optimistic concentration taken for the efforts to reach this goal. The study attempted to draw the attention of the users towards digital archives on their copyright awareness and their own criteria for the digital collection. The digital archives policies and the strategy is simple, and to know about the digital collection which could identify possible partners and projects. Digital archives identified the importance of the users and associated with understanding of the specific user needs.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISE Journal Reviewer Committee

REFERENCES

1. Kim, Julia Y, Researcher Access to Born-Digital Collections: an Exploratory Study, *Journal of Contemporary Archival Studies*, 2018,5(7),pp1-11
2. Ravenwood, C., Muir, A., & Matthews, G., Stakeholders in the selection of digital material for preservation: Relationships, responsibilities, and influence. *Collection Management*,2015, 40(2), pp 83-110.
3. Chen, Tin-Kai,A Case Study of a Digital Archives Programme: The Development of Digital Shadow Plays in Taiwan, *International Journal of Humanities and Arts Computing*, 2014, 8, pp. 38-48
4. Muir, Adrienne(2014) Digital Preservation: awareness, Responsibility and Rights Issues
5. *Journal of Information Science* ,2014,30(1),pp 73 – 92,
6. Calanag, Maria Luisa, A Metadata Approach to Digital Preservation, *Proc. Int’l. Conf. on Dublin Core and Metadata Applications 2001*, pp 143-150
7. Bähr, Thomas,Puzzling over digital preservation – Identifying traditional
8. and new skills needed for digital preservation, 217 — Education for digital curation — Education and Training Section with Preservation and Conservation, *Information Technology*; co-sponsored by ICA Section for Archival Education and Training, 2011, pp 1-14,
9. Maxwell, Alexander, Digital archives and history research: feedback from an end user, *Library Review*, 2010,59(1), pp24-39.
10. Hodge, Gail, Preservation of and Permanent Access to Electronic Information Resources, RTO IMC Lecture Series on “Electronic Information Management”, held in Sofia, Bulgaria, 8-10 September 2004, and published in RTO-EN-IMC-002.2004.

The Synergistic Antibacterial Effects of *Cinnamomum Verum* and *Cymbopogon Citrates* on Urinary Tract Infections Causing Pathogens *Escherichia Coli* and *Pseudomonas Aeruginosa*

Fiona Lawing¹, Noor Faradilla Abdullah¹, Che Wan Imanina Che Wan Takwa¹

¹Faculty of Health Sciences, aSIA Metropolitan University, Selangor, Malaysia.

ABSTRACT

Escherichia coli (*E.coli*) and *Pseudomonas aeruginosa* (*P. aeruginosa*) have been one of the few main pathogens that lead to urinary tract infection. The study was conducted because there have been an increase in antibiotic resistance pattern in the world. Ethanol and aqueous extract of medicinal plant, cinnamon, *Cinnamomum verum* and lemongrass, *Cymbopogon citrates* were prepared to test its synergistic antibacterial effect against *Escherichia coli* and *Pseudomonas aeruginosa*, using the disk diffusion method. The test was then preceded with the Minimum Inhibitory Concentration (MIC) using the 96 well microtitre plate. The Minimum Bacterial Concentration (MBC) were then attained after the the MIC result were observed. The MIC of *E.coli* was at 6.25 µg/mL for the synergy ethanolic extract between *Cinnamomum verum* and *Cymbopogon citratus*. The aqueous extract did not visualize any growth inhibition on the bacteria *E.coli*. Both ethanolic and aqueous extract also had no inhibitory effect on the *P. aeruginosa*. The synergistic extract of *Cinnamomum verum* and *Cymbopogon citratus* was effective against *E. coli*. Therefore, it was concluded that the effect of the extract was effective on *E. coli* and it was almost as effective as the antibiotics that were usually prescribed for the treatment of urinary tract infections.

Keywords: Synergy, *Cinnamomum verum*, *Cymbopogon citratus*, *Escherichia coli*, *Pseudomonas aeruginosa*.

INTRODUCTION

Urinary tract infection (UTI) is a common bacterial infection that can occur in both males and females of any age group, though it affects females more than the males. This is due to the anatomical structure of the female urinary tract. Previous studies have reported that the total of 50-60% of woman will experience urinary tract infection in the lifetime ¹. UTI also shows high prevalence in pregnant woman as it the second common complications after anemia ². In the world, the total number of 150 million cases has been reported per year ³. In urinary tract infections, antibiotics are used as the primary measure to treat the infection.

Although antibiotic treatment has been widely used for the treatment of urinary tract infection, this has also contributed to the rise of antibiotic resistance in the population. From 2000 to 2010, the antimicrobial resistance of urinary tract pathogen, *Escherichia coli*

towards the antibiotic ciprofloxacin and trimethoprim and sulfamethoxazole have increased rapidly ⁴. As for the antibiotic resistance case of the pathogen *Pseudomonas aeruginosa*, more than 6,000 (13%) of the 51,000 health care-associated infections occur in the United States annually ⁵. Since the increase of antibiotic resistance have rise all over the world, this have made plant and other natural resources to be the best option for treatment of urinary tract infection. Plus, it is also known to the researchers and also the public that the use of plant will have minimal side effects and it is easier to obtain, thus minimizing the risk of antibiotic resistance pattern in the population.

Cinnamon is one of the most well known common spices that can be found all over the world. It has also been used both as cooking material and medicine over thousands of years. Cinnamon comes from the family of *Lauracea*. The cinnamon is derived from the inner bark of trees from the genus *Cinnamomum* ⁶.

The species that is used in this study is *Cinnamomum verum* (*C. verum*). Cinnamon possesses a characteristic odour and a pungent taste. The taste and scent of the cinnamon is caused by cinnamaldehyde, which ages in the presence of oxygen and it is also believed to be the compound that carry the antibacterial effect of the plant⁷. Cinnamon also contains other compounds such as cinnamic acid, hydroxyl cinnamaldehyde, cinnamyl alcohol, coumarin, cinnamyl acetate, borneol and more. Various studies have reported several antibacterial activity of the cinnamon. The extract of the *C. verum* were also tested to have effect against dental caries causing bacteria, *Gingivalis*. This is believed to be due to the presence of cinnamaldehyde in the cinnamon bark⁸. There was also a study that was conducted to view the antibacterial activity of *Cinnamomum verum* and *Eclipta alba* (*L*) *Hassk*. The test extract were tested against the bacteria of *E. coli* and *P. aeruginosa*. The experiment have concluded that *Cinnamomum verum* possessed more antibacterial activity compared to *Eclipta alba* (*L*) *Hassk*. Compared to commercially used antibiotics, the *C. verum* also had more effect towards the inhibition of the growth of the bacteria⁹. There had also been a few synergistic study that was done using the said plant. One of the researches was on the effect of combination of the cinnamon bark extract and honey. The study was known as “Antibacterial Activity of Ethanolic Extract of Cinnamon Bark, Honey, and Their Combination Effects against Acne-Causing Bacteria”. The two plant extract inhibited the growth of *P. acnes* and *S. epidermidis*¹⁰.

The other plant that was used in this synergistic antibacterial study was lemongrass. The plant is scientifically known as *Cymbopogon citratus* (*C. citratus*). It is known as lemongrass due to the typical lemon-like odour of the essential oil present in the shoot. When squeezed, the leaves usually produce yellow or amber colored, aromatic, essential oil. Its aqueous extract is commonly used as an aromatic drink while the whole plant is well incorporated into traditional food for its lemon flavour¹¹. The plant also used widely in Ayurvedic medicine. One of the recent studies have stated that the ethanolic extracts of the leaves of lemongrass showed potential antibacterial property against *Staphylococcus aureus*. It is believed that this is resulted due to the presence of flavonoids and tannins that is present in the extract¹². Another research on in vitro study of antibacterial activity of *Cymbopogon citratus* have shown that the extracts inhibited the growth of

the bacterial strains that were tested. Alcohol and water extracts of *C. citratus* was investigated for anti bacterial properties and phytochemical constituents. The extract was screened against four gram-negative of bacteria *Escherichia coli*, *Klebsiellapneumoniae*, *Pseudomonas aeruginosa*, *Proteus vulgaris* and two gram positive bacteria *Bacillus subtilis* and *Staphylococcus aureus* at four different concentrations of 1:1, 1:5, 1:10 and 1:20 using disc diffusion method. The presence of alkaloid and phenols were inferred as being responsible for the antibacterial properties of the extracts¹³. A research made on the year of 2018 entitled “In vitro antibacterial activity of lemongrass (*Cymbopogon citratus*) leaves extract by agar well method” demonstrated that the extract have its antimicrobial activity against various bacteria such *Escherichia coli*, *Pseudomonas aeruginosa*. The result demonstrated that the lemongrass leaves extract have a great antimicrobial activity against the antibiotic resistant microorganisms¹⁴. Nyamathet. al also conducted another study on the antifungal activity of the lemongrass. The result that was recorded had shown that the extract was effective against *Aspergillusniger*. Its high citral content, flavanoids and tannins may be the some of the few factors on why it has a great antimicrobial ability. Due to the great results that were obtained from the previous study and researches, it was expected that this study would follow lead and produce such result too. Therefore, the main aim of this study was to investigate the synergistic antibacterial effect of cinnamon, *Cinnamomumverum* and lemongrass, *Cymbopogon citrates* against *Escherichia coli* and *Pseudomonas aeruginosa*, using the disk diffusion method. It is anticipated that data gathered from this study will open new approaches for the development of pharmacological bio-products from local resources that can be used to treat infectious diseases.

MATERIALS AND METHOD

2.1 PLANT MATERIALS

The cinnamon bark and lemongrass were purchased at the local market in Cheras. The cinnamon and lemongrass species were send to Universiti Putra Malaysia (UPM) and was botanically identified for the confirmation of its species.

2.1.1 Plant Extraction

The plants were cut into small pieces and then were soaked briefly with distilled water before blotting the

excess water with tissue paper. The plants were then placed in a clean steel tray and were set in the hot air oven at 40°C. The plants were left to dry in the oven until a constant reading of the weight of the plant were achieved. Once the constant reading of the plant materials were achieved, the plants were deemed to be dry enough. In order to obtain the powdered form of the plant material, the plants had to be finely grinded using a dry blender. Then, about 200g of fine powder of both plants were weighed and were soaked in 600ml of 95% of ethanol and water. The plant materials were soaked for 3 days. After 3 days of soaking, the filtrates were filtered using Whatman filter paper. The aqueous extract were placed in the hot air oven at 40°C while the ethanolic extracts were be concentrated using the rotary evaporator also at 40°C¹⁵. From this process, the ethanolic and aqueous extracts were obtained, and the extracts were chilled in the refrigerator until used at 4°C.

2.2 BACTERIAL STRAINS

Bacterial strains of *E. coli* (ATCC 11775) and *P. aeruginosa* (ATCC 27853) were used in this study. The two bacterial strains were obtained from the Asia Metropolitan University Research Laboratory.

2.2.1 INOCULUM PREPARATION

The pure culture was cultured on sterile nutrient agar and was incubated for 24 hours at 37° C. The cultures were then being stored at 4° C to maintain its growth. The inoculums were prepared by growing the sub culturing the bacteria that had been made in Mueller Hinton broth at the temperature of 37° C, overnight¹⁶.

2.3 ANTIBIOTIC SUSCEPTIBILITY TEST

The antibiotic susceptibility test was performed using the disk diffusion method. It is also more commonly known as Kirby Baur test. First, the bacteria inoculum was prepared. It was prepared by inoculating a single colony of the bacteria *E. coli* and *P. aeruginosa* into the Mueller Hinton broth. The inoculums were then incubated at 37°C overnight in the incubator.

The next day, suspension of the bacteria would be swabbed all over the surface of the Mueller Hinton agar plate. Then, the paper disk which contained single concentration of each antimicrobial agent will be set on the surface of the agar that has been inoculated with the bacteria. Next, blank disc that had been soaked in the

extract of the *C. verum* and *C. citratus* were also placed on the agar for testing. Three different concentration of tested plant extract were prepared, which started off from 20 mg/mL, 50 mg/mL and 100 mg/mL. For *E. coli*, the positive control that was used for the experiment was ciprofloxacin. As for *P. aeruginosa*, the positive control was gentamicin. The negative control used for both organism was distilled water for aqueous extract, 10% DMSO for ethanolic extract. The extract of the cinnamon and lemongrass antibacterial effect would be compared with the commonly used antibiotic¹⁷. Then, the agar plate was leaved to be incubated overnight at 37°C and measurement of inhibition zone was taken the following day.

RESULTS AND DISCUSSIONS

The emergence of antibiotic resistance has been alarming in the past few years. Due to the increasing cases of the antibiotic resistance among the world's population, various experiments and researches have been done to counter this problem by using plant and fruit resources which are deemed to be safer with fewer side effects. Furthermore, plant and fruit are easier to obtain and they are easily available. It is also believed that these products will have lesser side effect compared to antibiotics. The World Health Organization (WHO) had also released a statement that stated there around 21,000 plant species all over the world that can be used as medicinal plants with a high potential¹⁸.

In the study that was conducted, two different plants which have their own medicinal property were used. The first plant that had been used was the cinnamon bark, which is known scientifically as *cinnamomumverum*. During ancient period, the cinnamon was used often due to its antibacterial nature. The plant bacteriostatic and bactericidal effects on food spoiling, human and plant pathogenic bacteria were widely observed using cinnamon products, extracts, oil and oleoresins¹⁹. The second plant that was used in this study is the lemongrass, which is also scientifically known as *cymbopogoncitratus*. As for the extraction, 2 different type of solvent has been prepared which were ethanol and aqueous solution. The synergistic study was made by combining the two plant extract based on 1:1 ratio.

The pathogens that were used in this study were *E. coli* (ATCC 11775) and *Pseudomonas aeruginosa* (ATCC 27853). Using the two plant extract that had

been made, 3 different concentration of the plant were prepared, starting from the concentration of 20 mg/mL, 50mg/mL and lastly 100mg/mL.

At the concentration of 20mg/mL, the synergy ethanolic concentration have shown the zone of inhibition of 11 mm on the bacteria *E.coli*. The single ethanolic plant extract cinnamon showed the inhibition of bacteria growth at 16 mm on *E. coli*, while the single ethanolic extract of lemongrass show the zone of inhibition of 33 mm on *E.coli*. Compared to the other concentration, the zone of inhibition of lemongrass ethanolic extract was the highest at 20mg/mL. The extracts did not show any inhibitory activity on *Pseudomonas aeruginosa*. The aqueous extracts did not show any inhibitory activity too.

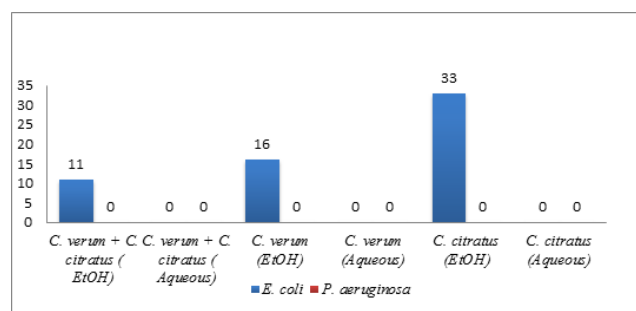


Figure 1 Comparison between the zone of inhibition (in mm) produced by the extracts at the concentration of 20 mg/mL on *E.coli* and *P. aeruginosa*.

For the concentration of 50 mg/mL, the the synergy ethnolic concentration have shown the zone of inhibition of 31 mm on the bacteria *E. coli*. The single ethanolic plant extract cinnamon showed the inhibition of bacteria growth at 14 mm on *E. coli*, while the single ethanolic extract of lemongrass show the zone of inhibition of 17 mm on *E. coli*. Again, no inhibitory activity on *Pseudomonas aeruginosa* can be seen, along with no inhibitory activity for the aqueous extract towards both bacteria were seen.

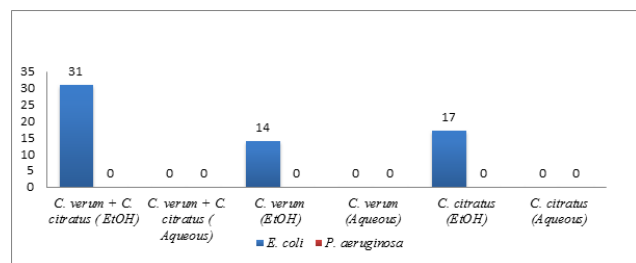


Figure 2 Comparison between the zone of inhibition (in mm) produced by the extracts at the concentration of 50 mg/mL on *E.coli* and *P. aeruginosa*.

The final concentration was 100 mg/ml. The the synergy ethanolic concentration have shown the zone of

inhibition of 33 mm on the bacteria *E. coli*. The zone of inhibition for the synergistic ethanolic extract was at the highest at this concentration. The single ethanolic plant extract cinnamon showed the inhibition of bacteria growth at 27 mm on *E. coli*, while the single ethanolic extract of lemongrass show the zone of inhibition of 24 mm on *E. coli*. From this, what can be concluded that the synergistic extract showed the highest efficacy at the concentration of 100 mg/mL. The one way ANOVA test that were carried out also have shown the significance of the result. By using the SPSS, the value of P had been expressed to be less than 0.05 Even though the extracts produced significant result for *E. coli*, it did not show any inhibitory activity on *Pseudomonas aeruginosa*. The inhibitory activity by the aqueous extract on both of the tested bacteria was not present too.

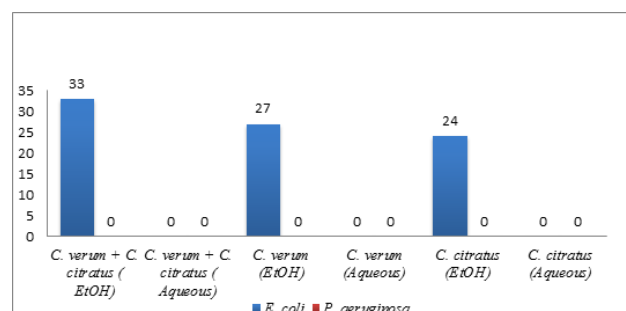


Figure 3 Comparison between the zone of inhibition (in mm) produced by the extracts at the concentration of 100 mg/mL on *E.coli* and *P. aeruginosa*.

Since the presence of antibacterial activity is detected from the antibiotic susceptibility test, the experiment was preceded for the determination of Minimum Inhibitory Concentrations (MIC). The method that was used for the minimum inhibitory concentration determination was the broth microdilution method. It was done on the 96 well microtitreplate. As for the result of the minimum inhibitory concentration (MIC), the extracts that were tested against *Pseudomonas aeruginosa* were all negative. The negative result was observed by the cloudiness or the formation of palette which indicated the growth of bacteria at the bottom of the well. As for the positive or no growth of bacteria, it was indicated by no clumping or formation of palette at the bottom of the well. The result that were obtain showed the following. The MIC of *E.coli* was at 6.25 µg/mL for the synergy ethanolic extract between *cinnamomumverum* and *cymbopogoncitratus*. The same MIC result of 6.25 µg/mL was also recorded for the *cinnamomumverum* ethanolic extract for *E.coli*. As for the *cymbopogoncitratus* ethanolic extract, the MIC were

recorded to be 12.5 µg/mL. The aqueous did not show any inhibitory activity on both organisms.

Table 4: The Minimum Inhibitory Concentration of *C. verum* + *C. citratus* ethanol extract (100 mg/mL) against *E. coli* and *P. aeruginosa*. Growth is indicated with (+) and no growth of bacteria is indicated with (-).

Bacteria	<i>C. verum</i> + <i>C. citratus</i> ethanol extract (µg/mL)									
	50	25	12.5	6.25	3.12	1.56	0.78	0.39	0.19	0.095
<i>E. coli</i>	-	-	-	-	+	+	+	+	+	+
<i>P. aeruginosa</i>	+	+	+	+	+	+	+	+	+	+

The minimum bactericidal concentration was the last test that was run after the MIC. It is referred to as the lowest concentration of the antimicrobial agent that is needed in order to produce a sterile culture. The result of the minimum bactericidal concentration that have been obtain from the MIC show that a few colony of bacteria can still be visualized after it is being subcultured on the Mueller Hinton agar.

Even though the study that was conducted using the *C.verum* ethanolic extract did not show any inhibitory activity towards *Pseudomonas aeruginosa*, another study that was conducted by in 2012 stated otherwise. The study concluded that ethanol extract of cinnamon were found sensitive to *Pseudomonas aeruginosa*, and *E. coli*. Another study that was conducted by Unachukwu et al. also showed that the ethanolic lemongrass extract have its effect on *P. aeruginosa*²⁰.

There was also a study back in 2017 that revealed that the aqueous extracts of *C.verum*, alongside other plant extract which were *Terminalia bellirica*, *Ammomum subulatum* and *Glycyrrhiza glabra* were ineffective against all the test organisms of the study, in which one of it was *E. coli*. The concentration of the extract was prepared was 50 µL. On the other hand, the researcher also prepared the same concentration of ethanol extract of cinnamon for the study and the outcome of it was the extract of the cinnamon proved to have inhibitory activity at 27 mm²¹.

The inability of the both of the ethanolic and aqueous extract to inhibit the growth of the *P. aeruginosa* may be due to a few factors. First is it may be due to the nature of the bacteria itself. *P. aeruginosa* is strictly aerobic but it can also be a facultative anaerobe at times. The suitable temperature of growth for *P. aeruginosa* can also be a

factor that lead to the inability of the extract to inhibit its growth which range from 4°C to 43°C²².

As stated by Ochei et al. in the book of Medical Laboratory Science, Theory and Practice year 2000, there are a few factors that can affect this antimicrobial susceptibility test. The first is the depth of the medium²². The depth of the media that is being used may affect the result as it can interact and disturb the concentration gradient of the diffusing antibacterial or antimicrobial agent. Thicker agar medium will give out smaller zone of inhibition while thinner agar medium will produce a larger zone. In order to standardize, it is advisable to pour 25 ml of medium in agar plate which will produce an agar with the depth of 4mm. Next factor that can interfere with the test is the atmosphere of the incubator. The incubation is recommended to be carried out in incubator with ambient air. If the incubation is carried out, for an example in a carbon dioxide incubator, it may result in decrease pH of the agar, thus affecting the action of some drugs.

CONCLUSION

The synergistic ethanolic extract of *Cinnamomum verum* and *Cymbopogon citratus* was effective against one of the bacteria which were *E. coli*. The result that were obtained had also shown that effect of the extracts were almost as effective as the antibiotics that were usually prescribed for the treatment of urinary tract infections. To ensure the safety of the extract, the extract can also be tested against the normal flora of the urinary tract. Toxicity test of the extract can also be done. The extract can also be tested on extended spectrum beta lactamase (ESBL) bacteria, in order to know more about its effect on Gram negative bacteria.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRIS Journal Reviewer Committee

REFERENCES

- Al-Badr, A., & Al-Shaikh, G. Recurrent urinary tract infections management in women: A review. *Sultan Qaboos University Medical Journal*, 2013, 13(3), pp 359–367.
- Amiri, M., Lavasani, Z., Norouzirad, R., Najibpour, R., Mohamadpour, M., Nikpoor, A. R., ... Zare Marzouni, H. Prevalence of Urinary Tract Infection Among Pregnant Women and its Complications in Their Newborns During the Birth in the Hospitals of Dezful City, Iran, 2012 - 2013. *Iranian Red Crescent Medical Journal*, 2015, 17(8).
- Ayoade, F., Moro, D. D., & Ebene, O. L. Prevalence and Antimicrobial Susceptibility Pattern of Asymptomatic Urinary Tract Infections of Bacterial and Parasitic Origins among University Students in Redemption Camp, Ogun State, Nigeria. *Open Journal of Medical Microbiology*, 2013, 3, pp 219–226.
- Sanchez, G. V., Master, R. N., Karlowsky, J. A., & Bordon, J. M., In vitro antimicrobial resistance of urinary *Escherichia coli* isolates among U.S. outpatients from 2000 to 2010. *Antimicrobial Agents and Chemotherapy*, 2012, 56(4), pp 2181–2183.
- Ventola, C. L. The antibiotic resistance crisis: part 1: causes and threats. *P & T : A Peer-Reviewed Journal for Formulary Management*, 2015, 40(4), pp 277–83.
- Nabavi, S. F., Di Lorenzo, A., Izadi, M., Sobarzo-Sanchez, E., Daglia, M., & Nabavi, S. M. Antibacterial effects of cinnamon: From farm to food, cosmetic and pharmaceutical industries. *Nutrients*, 2015, 7(9), pp 7729–7748.
- Maheshwari, R. K., Chauhan, a K., Gupta, A., & Sharma, S, Cinnamon: An imperative spice for Human Comfort. *International Journal of Pharmaceutical Research and Bio-Science*, 2013, 2(5), pp131–145.
- Kwak, Y.-S., Kim, S.-J., & Kim, H.-Y. , The antibacterial effect of *Cinnamomum verum* extract. *Biomedical Research*, 2017, 28(15).
- Sudha, R., Evaluation of antibacterial activity of *Cinnamomum zeylanicum* and *Eclipta alba* (L) Hassk . on UTI pathogens . *INTERNATIONAL JOURNAL OF CURRENT RESEARCH IN CHEMISTRY AND PHARMACEUTICAL SCIENCES*, 2017, 4, pp 4–10.
- Julianti, E., Rajah, K. K., & Fidrianny, I., Antibacterial Activity of Ethanolic Extract of Cinnamon Bark , Honey , and Their Combination Effects against Acne-Causing Bacteria. 2017, 85(19), pp1-8
- Olorunnisola, S. K., Asiyanbi, H. T., Hamed, A. M., & Simsek, S. Biological properties of lemongrass: An overview. *International Food Research Journal*. 2014, 21(2), pp 455-462
- Manvitha, K., & Bidya, B. Review on pharmacological activity of *Cymbopogon citratus*. *International Journal of Herbal Medicine*, 2014, 1(6), pp5–7.
- Sanchez, G. V., Master, R. N., Karlowsky, J. A., & Bordon, J. M., In vitro antimicrobial resistance of urinary *Escherichia coli* isolates among U.S. outpatients from 2000 to 2010. *Antimicrobial Agents and Chemotherapy*, 2012, 56(4), pp2181–2183.
- Nyamath, S., & Karthikeyan, B., In vitro antibacterial activity of lemongrass (*Cymbopogon citratus*) leaves extract by agar well method, 2018, 7(3), pp 1185–1188.
- Noor, S. (2016). Synergistic Effect of the Methanolic Extract of Lemongrass and Some Antibiotics to Treat Urinary Tract Bacteria. *Journal of Biosciences and Medicines*, 2016, 04(11), pp48–58.
- Sana Mukhtar and Ifra Ghorri. Antibacterial Activity Of Aqueous and Ethanolic Extract Of Garlic , Cinnamon And Tumeric Against *Escherichia coli* ATCC 25922 And *Bacillus Subtilis* DSM 3256 . *International Journal of Applied Biology and Pharmaceutical Technology*, 2012, 3(2), pp 131–136.
- Mahon, C. R., Lehman, D. C., & Manuselis, G., *TEXTBOOK OF DIAGNOSTIC MICROBIOLOGY (3RD EDITIO)*. 2007.
- Bhaukajee, S., Shakya, A., Shrestha, R., & Shrestha, R. , *Journal of Microbiology Research Society (JMRS)* Effect of ethanol extract and water extract of medicinal plants on respiratory pathogens and gastrointestinal normal flora, 2017, 1(1), pp4–10.
- Baruah, A., & C. Nath, S. , *Aromatic and Spice Plant*

Utilisation and Conservation.2018.

20. Usha, M., Ragini, S., & Naqvi, S. M. A., Antibacterial activity of acetone and ethanol extracts of Cinnamon (*Cinnamomum zeylanicum*) and Ajowan (*Trachyspermum ammi*) on four food spoilage bacteria. *International Research Journal of Biological Sciences*,2012, 1(4), pp7–11.
21. Unachukwu, N., Kennedy, I. O., & Irene, O., ANTIMICROBIAL ACTIVITY OF LEMON GRASS (CYMBOPOGON CITRATUS) ON CLINICAL ISOLATES OF PSEUDOMONAS AERUGINOSA, SALMONELLA TYPHI, STREPTOCOCCUS PYOGENES AND CANDIDA ALBICANS. *International Journal of Recent Scientific Research*.2017,8(6), pp. 17450-17452.
22. Ochei, J., & Kolhatkar, A., *Medical Laboratory Science (12TH REPRI)*. TATA McGraw Hill Education.2000.

Readiness in Implementing a National-wide K-12 Curriculum: A Case Study in Cotabato City School's Division

NhelbourneK. Mohammad ¹ Yanping Li²

¹ Ph.D. Program, ² Assistant Professor, School of Education, Shaanxi Normal University, China

ABSTRACT

The K-12 Education program is the basic and essential program of the Philippine government, it is a new curriculum comparing to the K-10 program to be harmonizing with international trend in the 21st century. This enactment of the reform thrusts Basic Education Sector Reform Agenda. It is a process or policy reform that sought to systematically enhance a critical regulatory, structure, institutional, financial, physical, and cultural and information conditions influencing of primary education provision link and delivery on the ground. This study is descriptive, investigating the possible impact of the DepEd program implementation on teachers' and pupils' behaviors. The aim of the study focused on the aspects of readiness program of elementary schools in Cotabato City Division in implementing the K-12 Curriculum; it was concerned instructional materials, classroom management, assessment of learning, techniques, human resource, and school facilities. The study used a self-made questionnaire in collecting the data.

Keywords: *k to 12 program, readiness, basic education, educational implementation, contemporary education, curriculum development*

INTRODUCTION

Before the arrival of Magellan, the education system in the Philippines was informal, unstructured and devoid of methods more vocational, pieces of training and fewer academics by their parents and in the house of tribal tutors, and experienced several process and development from pre-Spanish until the present. The tribal tutors took place by the Spanish missionaries; hence, education was for elite and became religious-oriented by the Spanish settlement¹. Access to education by the Filipino was later liberalizing through the enactment of the Educational Decree series 1863 which offered for the establishment of the at least one primary school. The primary school in every town for boys and girls under the management of the district government. Primary school was free, and teaching of Spanish was a prerequisite, and definitely, the school was under controlled by the Spanish and American¹.

The Philippine education had closed about three centuries and reopened during Aguinaldo's Republic on 29th August 1898, namely the Burgos Institute, Military Academic and the University of the Philippines under Act No. 74 series 1901 on public school system of the Philippines commission². Later, the American

sent 600 teachers to teach English as a medium of instruction and established a high school, unique educational institution, such as the college of arts and Trades, college of agricultural, Institute of Commerce and the marine institute were established in 1902 by the Philippine Commission on Higher Education. In 1908, on Act No. 1870, the Philippine Legislature approved the establishment of the University of the Philippines. In 1945, the Japanese Educational Policies established under Military Order no. 42 series 1945².

K – 12 Education System in the Philippines

The K – 12 Program is a public education curriculum that currently most familiar for the people. The so-called K – 12 Curriculum is a flagship program of the Department of Education (DepEd) that aims to improve the standard quality of primary education in the Philippines and offer more opportunities for graduating students or for graduates to be employed merely. Everyone knows that implementing of the K – 12 education system is the key to developing to our country because we are left behind concerning the curriculum adjustments. The K – 12 Basic Education Curriculum is a new curriculum development of the Department of Education program which converted from 10-Year Basic

Education Curriculum (BEC) to 12-Year Education Cycle. A logical reason for the implementation of this program is the Philippines the only country in Southeast Asia is still using ten years education system and among three remains countries in the world⁷.

The former President Aquino – III was instituting of the K – 12 Program last October 05, 2010, this is one of the political agendas that he wants to expand the basic education curriculum to a globally competitive from 10 years into 12 years education cycle⁸. On May 13, 2013, Aquino signed into law on the implementation of the K – 12 Basic Education Program under the Republic Act No. 10533 series 2012. This law was enacted and promulgated that aims to enhance and upgradethe old curriculum. K – 12 Curriculum was fully implemented in 2012 nationwide regulated and managed by the Department of Education. DepEd seeks to design a primary education agency that capable of obtaining all the objectives and the Millennium Development Goals of the country in the future and Aquino 10 points agenda of primary education in 2016. This curriculum development is expected to introduce critical changes necessary to yonder accelerate, broaden, and deepen and to furnish the effort of the Department of Education in enhancing or improving the quality education system in the country⁹.

Importance of Education in the Society

Education is an essential aspect of the country that plays vital roles in the modern world. Every human being needs the school to be able to survive. Nowadays, people realize how important education is for future generations. At the same time, the government all over the world is spending money on a good education system, and students are actively encouraged to win a scholarship and pursue their studies¹⁴. To have a better life, people need high-level training for their future growth, while the parent's responsibility to send their kids to the school that hopes they succeed from poverty. Everyone knows that people who have a degree holder as well as who have completed their master and postgraduate degrees are very likely to get professional work in the future. Therefore, today the education carries greater importance than ever in our nation¹⁵.

Typically, the people who live in rural areas have a different understanding towards education, they understand education is just to learn how to read and write but in fact education is also it offers them the opportunity

to have a good life, communicate better, develop new technologies and support the economy but they do not know. Thus, education must be genuinely directed to produce quality human being who can compete and have noble character and good morals¹⁶.The critical value of education is an investment in human resources which in itself will provide monetary and non-monetary benefits. That is why the educational investment needed for the people of the Philippines is actually must first lead to primary education and not a highly sophisticated culture. Guided by what was proclaimed by UNESCO, the process of learning in basic training must at least fight on the four pillars, namely 1) learning to know; 2) learning to do; 3) learning to be, and 4) learning to live¹⁶.

According to Plato, a model designed is to produce proficient adults to meet the needs of the nation. The teacher educators could work to provide people who are both self-actualized and functional to the state¹⁷. Too many controversies and praises that hassle this new policy on education, nevertheless, the schools in the country should buckle up to cope with the request as they have already contended globally even the law was a passage. To meet the global demands of the schools, have to face the defiance of the implementation of the K to 12 Education Program by the Philippine government. Also, Plato believes that we should educate our children according to their capabilitiesand needs because they should not have the same educations as Plato's plan produced for the specialized training of guardians, workers, soldiers, and artisans¹⁸.

METHOD

The researcher presents the research design, locale of the study, respondents of the survey, sampling techniques, research instrument, data gathering procedures, and statistical analysis.

The study focused on assessing the three years of implementation of the K – 12 Program in Cotabato City School's Division. Specifically, the study seeks to find the answer to the following research problem. The questions of the study were as follows:

What is the level of readiness of the elementary school in Cotabato City Division in implementing K-12 curriculum concerning instructional materials?

What is the level of readiness of the elementary school in Cotabato City Division in implementing K-12 curriculum concerning classroom management?

What is the level of readiness of the elementary school in Cotabato City Division in implementing K-12 curriculum concerning the assessment of learning?

What is the level of readiness of the secondary school in Cotabato City Division in implementing K-12 curriculum concerning the teaching strategies?

What is the level of readiness of the secondary school in Cotabato City Division in implementing K-12 curriculum concerning the human resources? and

What is the level of readiness of the secondary school in Cotabato City Division in implementing K-12 curriculum concerning the physical and facilities resources?

Research Design

This study is descriptive, investigating the possible impact of DepEd program implementation on teachers' pupils' behavior/attitudes. Also, this study focused on the aspects of program readiness of the elementary school in Cotabato City Division in implementing K-12 curriculum concerning instructional materials, classroom management, assessment of learning and teaching strategies. It also described the level of readiness of the secondary school in Cotabato City Division in implementing K-12 curriculum concerning human resources, financial resources, and physical resources.

Respondents of the Study

The respondents included in this study are teachers of the different elementary school in Cotabato City Division.

Sampling Techniques

Stratified sampling techniques using proportion allocation used in determining the sample included in this study. The Cotabato City Division composed of four districts the district will serve as strata, and from there a sample elementary school will be chosen.

Research Instrument

The researcher here is the main instrument of this research (Lincoln & Guba, 1985; Miles & Huberman, 1992). The researcher as an instrument in this study does not mean eliminating the essence of human of the researcher himself, but the spiritual capacity in

observing, questioning, tracking and abstracting is a valuable tool. Therefore, the position of the researcher being an instrument is the ability of the researcher himself.

A gathering the data needed in this study is a self-made questionnaire. The research instrument is composed of two parts. Part I are a statement that briefly described the readiness of the secondary school in Cotabato City Division in implementing K-12 curriculum concerning instructional materials, classroom management, assessment of learning and teaching strategies. Part II described the level of readiness of the secondary school in Cotabato City Division in implementing K-12 curriculum concerning human resources, financial resources, and physical resources. The self-made instrument subjected to validity and reliability. For the validity of the tool this will be submitted to the screening committee for content validity and to determine the security of the instrument, this will be done using the test and re-test methods.

Data Gathering Procedures

Data in this study collected in the following stages. The first stage of the data collection will be the preparation of the all the needed instrument, includes the revision of the self-made instrument base on the recommendation of the screening committee. After revising the tool, a pre-conversation with the division superintendent, district supervisor and principal of the targeted included school will be adhering to explain to them the nature and concept of the study. After pre-conversation, a letter of approval will seek to the division superintendent through the recommendation of the respective school principal. As soon the approved message from the division superintendent will be received the self-made instrument distributed to the teacher's respondents and the pupils. The second stage of the data collection will be the conduct of the ocular visits to the school and personal interview with respondents to validate the information given to the self-made instrument. The third stage will be the encoding of the data in excel software to facilitate secure data analysis using SPSS statistical software.

RESULT

The researcher came to the necessary field of the study to collect the data, and how this data has been analyzed, interpreted and presented in the easiest possible way.

Instructional Materials

The level of readiness of the elementary school in Cotabato City Division in implementing K-12 Curriculum concerning Instructional Materials.

The respondents rated ready the level of readiness of the elementary school in Cotabato City Division in Implementing K-12 curriculum regarding the instructional materials with the grand mean of 2.51. The researcher validated this information through personal interviewed with the respondents. The respondents explained that the Department of Education prepared and distributed instructional materials to all elementary school in Cotabato City division to prepared teachers in the implementation of the K-12 curriculum.

Further, the respondents show some of the instructional materials provided by the DepEd in preparation for the implementation of the K-12 curriculum like teachers guide manual, textbook, and handbook for the pupils. Specifically, the respondents rated elementary school in Cotabato City Division ready like general reference (2.56.). The researcher observed that there was plenty copy of general reference available in the classroom and in the library for the teachers and pupils to use in case their assignment given by the teachers. However, textbooks rated less ready, and handouts also assessed less inclined. The teacher’s respondents explained that books and gifts were not enough to cater to the needs of the pupils. The textbooks ratios for ten pupils is only one textbook, means that in everyone textbooks it will cater to ten pupils.

Moreover, modules and teachers guide was rated ready with an average means of 2.56 and 2.68 respectively implied that the elementary school in Cotabato City division has enough modules and teachers guide to make teaching and learning process more productive. Likewise, the workbook rated as very much ready with an average means of 3.52. As showed by the respondents during the ocular visits of the researcher to the teacher’s classroom there were significant numbers of workbook displayed in the bookshelves of the school. There were visual aids also rated as ready with an average 2.54. However, audio-visual aids evaluated less prepared with an average mean of 1.76.

Table 1. Instructional Materials (n=75)

Instructional Materials	Mean	Description
General reference	2.56	Ready
Text Books	2.21	Less Ready
Handout	2.23	Less Ready
Modules	2.56	Ready
Teachers guide	2.68	Ready
Workbook	3.52	Very Much Ready
Visual Aids	2.54	Ready
Audio-Visual Aids	1.76	Less ready
GRAND MEAN	2.51	Ready

Range of Means

- 1.74 Least Ready
- 1.75 - 2.49 Less Ready
- 2.50 - 3.24 Ready
- 4.00 Very Much Ready

Classroom Management

The level of readiness of the elementary school in Cotabato City Division in implementing K-12 Curriculum concerning Classroom Management.

The respondents rated their readiness in implementing the K-12 curriculum regarding the classroom management such as the use of every corner of the room to goodness rated as ready with an average mean of 2.45. The accessibility of the instructional materials to the pupils (2.53), regular arrangement of the desk height of the blackboard, charts, and visual aids on the walls (3.31), structuring of the classroom to stimulate the pupil’s curiosity and interest in what they are about to learn (2.42). The arrangement of the rooms that look bright and Airy with children moving freely in performing their Classroom activities (3.11). The provision of pupil’s health and comfort in the classroom (3.11), the provision pupils health and prosperity in the

school (3.42). Structuring of the rooms to provide pupils Sense of nationalism (2.89), the structure of the classroom to develop Pupils love for beauty and orderliness (3.52), use of colorful, attractive printing words for the pupils (3.24), and the changing of pinboard according to the units taught (3.11).

Table 2. Classroom Management (n=75)

Classroom Management	Mean	Description
The use of every corner of the room to goodness	2.45	Ready
The accessibility of the instructional materials to the pupils	2.53	Ready
The regular arrangement of the desk height of the Blackboard, charts, and visual aids on the walls	3.31	Very Much Ready
The structuring of the classroom to stimulate the pupil's curiosity and interest in what they are about to learn	3.42	Very Much Ready
The arrangement of the rooms that look bright and Airy with children moving freely in performing their Classroom activities	3.11	Ready
The provision pupil's health and comfort in the classroom	3.42	Very Much Ready
The structure of the rooms to provide pupils Sense of nationalism	2.89	Ready
The structuring of the school to develop Pupils love for beauty and orderliness	3.52	Very Much Ready
The use of colorful, attractive printing words for the pupils	3.24	Ready
The changing of pinboard according to the units taught	3.11	Ready
GRAND MEAN	3.10	Ready

Range of Means

- 1.0 – 1.74 Least Ready
- 1.75 – 2.49 Less Ready
- 2.50 – 3.24 Ready
- 3.29 – 4.00 Very Much Ready

Assessment of Learning

The level of readiness of the elementary school in Cotabato City Division in implementing K-12 Curriculum concerning Assessment of Learning. The respondents rated the level readiness such as, classroom evaluation instrument 3.52; grade level evaluation instrument 3.11; subject level evaluation instrument 2.35; program evaluation instrument 2.31; and school evaluation instrument 2.31.

Table 3. Assessment of Learning (n=75)

Assessment of Learning	Mean	Description
Classroom evaluation instrument	3.52	Very Much Ready
Grade level evaluation instrument	3.11	Ready
The Subject level evaluation instrument	3.43	Very Much Ready
Program evaluation instrument	2.35	Ready
School evaluation instrument	2.31	Ready
GRAND MEAN	2.94	Ready

Range of Means

- 1.0 – 1.74 Least Ready
- 1.75 – 2.49 Less Ready
- 2.50 – 3.24 Ready
- 3.29 – 4.00 Very Much Ready

Teaching Strategies

Level of Readiness of the Secondary School in Cotabato City Division in Implementing K-12 Curriculum regarding the teaching strategies.

Table 4. Teaching Strategies (n=75)

Teaching Strategies	Mean	Description
Reporting	3.19	Ready
Modular	3.13	Ready
Lecture type	3.40	Very Much Ready
Discovery approach	3.17	Ready
Group Reporting	3.19	Ready
GRAND MEAN	3.21	Ready

Range of Means

- 1.74 Least Ready
- 1.75 – 2.49 Less Ready
- 2.50 – 3.24 Ready
- 4.00 Very Much Ready

The respondents rated their readiness in implementing the K-12 curriculum regarding the teaching techniques average mean of 3.21, reporting or presentation by the pupils mostly active (3.19), modules and syllabus from the teachers were made accurate and standard (3.13), very strategic style of teaching by doing more on activities in an outside and inside the classroom. The teachers were always doing their best motivation stimulating and make the pupils enthusiastic in the class (3.40). The School’s Division often visited the schools to discover a new and development on teaching approach by the teachers (3.17), and the pupils very interested by doing any activities by doing with the other pupils, such as group reporting (3.19). The elementary schools, as well as the secondary schools in Cotabato City, were conducive for learning with atmosphere environment and good communities.

Human Resources

Level of readiness of the Secondary School in Cotabato City Division in implementing K-12 Curriculum

Table 5. Human Resources (n=75)

Human Resources	Mean	Description
Supervisor	3.26	Very Much Ready
Principal	3.30	Very Much Ready
Department Chairman	3.25	Very Much Ready
Librarian	3.20	Ready
Laboratory Custodian	2.45	Less Ready
Guidance Counselor	3.20	Very Much Ready
Registrar	3.05	Ready
Teachers	3.20	Ready
Security Guard	3.27	Very Much Ready
10. Janitor	3.10	Ready
GRAND MEAN	3.12	Ready

Range of Means

- 1.0 – 1.74 Least Ready
- 1.75 – 2.49 Less Ready
- 3.24 Ready
- 3.29 – 4.00 Very Much Ready

The respondents rated their readiness in implementing the K-12 curriculum regarding the human resources in an average mean of 3.12, there many teachers who are qualified and undergone their master’s degree to prepared as a position of the supervisor (3.26) and the school principals (3.30) and even as a department chairman as well (3.25). The Philippines produced graduates every year, therefore, hiring for a qualified person for the position of a librarian is very friendly (3.20). For now, not all elementary schools and secondary schools have a laboratory custodian (2.45), but they have complete guidance counselors (3.20) and

even registrar (3.05). As mentioned above there are many qualified novice teachers in the city, but the hiring of novice teachers is minimal and very competitive. The division office open for new teachers' application as long as there is a slot from the national government or the Department of Education, therefore teachers here is good enough for all schools in the city (3.20). Not compulsory for security guard have a license (3.27) and janitor (3.10) like teachers one the qualifications should pass the national examination held by the Philippine Regulation Commission (PRC) so-called Licensure Examination for Teacher (LET).

Physical and Facility Resources

Level of Readiness of the Secondary School in Cotabato City Division in implementing K-12 Curriculum

Table 6. Physical and Facility Resources (n=75)

Physical/Facilities Resources	Mean	Description
Classroom building	2.65	Ready
Faculty room	3.02	Ready
Principal's office	3.26	Very Much Ready
School Library	3.11	Ready
Science Laboratory	2.60	Less Ready
Computer Laboratory	2.45	Less Ready
Comfort room	3.00	Ready
Sport complex	1.80	Less Ready
Audio-Visual Room	3.28	Very Much ready
Grand Mean	2.80	Ready

Range of Means

- 1.0 – 1.74 Least Ready
- 1.75 – 2.49 Less Ready
- 2.50 – 3.24 Ready
- 3.29 – 4.00 Very Much Ready

The respondents rated their readiness in implementing the K-12 curriculum regarding the Physical and Facility Resources with an average mean of 2.80. The classroom building such as the use of every room of the school building is goodenough (2.65), the

faculty room as well (302) especially the office of the head (3.26). Each school has a library (311) although the science laboratory some of the schools are still in the process their buildings (2.60) and computer laboratory (2.45), while the restroom (3.00) are almost complete in every school. The school has not yet fully prepared the sports complex (1.80), but every school has sports playground as their alternative sports complex and sometimes they used the sports complex of the Cotabato City State Polytechnic College (CCSPC) for the city meets and since this college is own by the government. Hence, every citizen has the right to use the government facilities.

Accordingly, the Department of Education has no enough budget for adding two years in secondary level because of the Philippine government failure to solve the old K – 10-year Basic Education Curriculum (BEC) and even the 547 public universities and college all over the country (Calderon & Ph, 2014). See table 7 below:

Table 7. Level of Ratio According to the World Bank Database Online

Level	Ratio
Philippine Kindergarten	1:25-35
Philippine Elementary (level 1-2)	1:<30
Philippine Elementary (level 3-8)	1:45-55
Philippine Secondary School	1:45-55
Brunei Darussalam Primary School	1:11
Laos Primary School	1:27
Thailand Elementary School	1:16
Vietnam Elementary School	1:19
Malaysia Primary School	1:12
Myanmar Elementary School	1:28
Timor Leste Elementary School	1:31
Indonesia Elementary School	1:19
USA Primary School	1:14
Cuba Elementary School	1:9
Sweden Elementary School	1:9
China Primary School	1:27

CONCLUSION

In this study, we examined the level of readiness in implementing the K – 12 Education Program particularly in Cotabato City, Southern Philippines. The K – 12 Curriculum is a concurrent education program in the Philippines to improve a global standard education system in the country. In Asia, developing countries,

like Singapore, Hongkong, Korea, and Malaysia today is educational systems is one of the primary reasons for their progress. Hence, the Philippine government should make them a tool guides in implementing education curriculum.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISSE Journal Reviewer Committee

REFERENCES

- Musa, S., & Ziatdinov, R., The Features and Historical Aspects of the Education System in the Philippines. *European Journal of Contemporary Education*, 2012, 19(2), pp 155–176.
- Durban, J. M., & Catalan, R. D.. Issues and Concerns of the Philippine Education Through the Years. *Asian Journal of Social Sciences and Humanities*. 2012.
- Shahani, L. R., No Title the Challenges of Basic Education: Dealing with the K-12 | Opinion, News, The Philippine Star | philstar.com. Philstar 6TH Floor, RFM Corporate Center Pioneer St., Mandaluyong City Philippines Tel. No. 2015, 632, pp 637-5400.
- UNESCO Asia and Pacific Regional Bureau for Education.,. Higher Education in South-East Asia. Online Submission. 2006.
- Calderon, M. T. F., & Ph, D., A Critique of K-12 Philippine Education System. *International Journal of Education and Research*, 2014, 2(10), pp 541–550.
- Young Chaterin., First Language First: Literacy Education for the Future in a Multilingual Philippine Society. 2002.
- Oigara, J. N. , Integrating Technology into the Teacher Education Program. *K-12 Education: Concepts, Methodologies, Tools, and Applications*. 2013.
- Maria, M. M., Katerina, M., George, S., Stephanos, M., & George, C., The Teaching Mathematics with Tablet PCs: A Professional Development Program of Targeting Primary School Teachers. In *Tablets in K-12 Education: Integrated Experiences and Implications*. 2015.
- Michael, D., & Juan, M. S., What is wrong with the K to 12 in the Philippines ?. 2014.
- Grover, S., & Pea, R., The Computational Thinking in K-12: A Review of the State of the Field. *Educational Researcher*, 2013.
- Okabe, M. , Where Does the Philippine Education Goes? The K to 12 Program and Reform of the Philippine Basic Education Curriculum. *Institute of Developing Economies*, 2013, (425), pp 1–30.
- Kafai, Y. B., From the Computational Thinking to Computational Participation in K-12 Education. 2016.
- Siew, N. M., Amir, N., & Chong, C. L., The pre-Service and In-service Teachers' Perceptions regarding a project-based STEM approach to teaching Science. SpringerPlus. 2015.
- Knight, J. , The Internationalisation of Higher Education has an Identity Crisis. *The Forefront Education Higher of International*. 2014.
- Ingleby, E., *Research Methods in Education. Professional Development in Education*. 2012.
- Schulz, B., Beyond Academic Knowledge: Importance of Soft Skills. *Nawa: Journal of Language & Communication*. 2008.
- McPherran, M. L., Socrates, Plato, Erôs and Liberal Education. *Oxford Review of Education*. 2010, pp 1–22.
- Adams, H., The Plato Critical Theory. *The Journal of Aesthetics and Art Criticism*. 1971.
- Johnston, P., Woodside-Jiron, H., & Day, J., Teaching and Learning Literate Epistemologies. *Journal of Educational Psychology*. 2001.

Comparative Study in EHR between Iraq and Developed Countries

Ali Fahem Neamah¹, Asmala Ahmad²

¹Mohd. Khanapi Abd Ghani, ²Biomedical Computing and Engineering Technologies (BIOCORE), Faculty of Information and Communications Technology, University Technical Malaysia, Melaka, Malaysia

ABSTRACT

Electronic health records (EHRs) have led to a major transformation in the health care sector. EHRs have progressed the person of supply within the varied health care groups. While recognizing the modifications in health care zone, this research studied the implementation and additionally using EHRs in four advanced countries, the United States (USA), United Kingdom (UK) and Australia and one growing Iraq. By way of comparison amongst these international locations still as lessons for growing international locations have been known.

Keywords- HER, E-health, NCVHS, NHS, Npfit, ICT, NSFS

INTRODUCTION

Records unit of measurement unbroken to behave type of indicates that of communication, offer of reference or perhaps for the intention of untrustworthiness. This takes place altogether sectors of life. In care, information are used for same features. Previously, there wasn't abounding would love for definition of health data aside from as notes on history, illnesses, lawsuits and hypersensitive reactions that to deal with any health hassle¹. However, because of the rising role of individuals assortment and assembling facts referring to their health, and moreover the emergence of recent technology similar to the internet, altogether totally distinctive definitions are advanced, despite the fact that, the core which suggests stays equal.

EHR TECHNOLOGY

EHRs are managed via health information systems that present the technological technique normally this can be often used internal with-it health report management structures. The adoption and implementation of generation within the type of health facts systems is inspired through method of the performance and effectiveness at some stage in that health information are controlled thru this method². The maximum large role of document management in the course of a very care cluster beside a health facility is to facilitate assortment,

storage, retrieval and use of the health information. Health information embody of data and information at the care cluster of employees and sufferers³. Health statistics are without a doubt sensitive and therefore the protection of the health report management appliance is one in every of the crucial problems through health report managers and directors⁴.

EHRs include demographics of recent and past patients. The virtual data inner this tool moreover includes the approaches in which sufferers need to undergo or have already suffered throughout the techniques of treatment or treatment. The EHR jointly consists of electronic discharge outline (EDS) this is used for the motive of shifting patient medical information between the primary care medical health practitioner and hospitalist⁵. The extremely good of the EDS content cloth is taken into thought to be absolutely immoderate visible that it is short.

THE IMPLEMENTATION OF EHRs IN THE USA

The us care comfort is that the most dearly-gained health machine at durations the global; but, relative to all absolutely different global locations, it continuously underachieves in most elements of overall performance. Maximum evolved worldwide locations have national medical insurance programmes operated through victimization the government and supported via preferred

taxes. Maximum citizens in such worldwide places are lined through shows that of coverage hence are entitled to urge care offerings. The USA is in difference to absolutely one-of-a-kind worldwide locations due to the real truth now not all individuals are coated via medical insurance. The following provides an excessive level read of the United States care system, comprehensive of the shape, improvement, EHR implementation and form of the problems facing its development¹⁰.

a. The Healthcare System in the US

Much like all thoroughly completely unique countries, there unit every private and public insurers at durations America aid machine, but, not like completely exceptional countries, the united states resource facilities unit loosely owned and operated with the aid of implies that of the private sector. The general public health tool covers the aged and occasional-profits households while all absolutely exclusive folks especially line of coverage through organization- backed private insurance¹¹.

The health care application covers bad families and moreover the disabled. States unit responsible to cover low-earnings pregnant girls, kids, the elderly and additionally the disabled. Similarly, states also can increase their coverage. People over age sixty five unit included thru the health care programme.

Youngsters whose families do not appear to be eligible for the health care programme but who cannot word the money for to induce personal coverage unit served at a decrease place the country children's health insurance programme¹².

b. Implementing EHRs

The implementation of EHR in north nation is additionally categorized thru awing durations. The duration before 2004 represents the first length of implementation, marked by using pattern very low degree of presidency pursuit to assist EHR diffusion. In 2004, president bush required a "well-known EHR adoption" most of the following 10 years, making the number one wave of pursuit and swollen popularity of the capability benefits that EHR has in enhancing care exceptional. A look at aimed to assess the EHR adoption some of the USA. Before and as soon as 2004 (2001-2004 and 2001-2007 correspondingly) determined that the physicians' disposition to undertake EHR of their exercise has swollen at some stage in the second one

period. In addition, it anticipated that with the aid of technique of 2014 (47.Three %) of physicians could have applied the EHR¹⁰.

c. US's EHRModel

The development of EHR model a few of the USA. Is evolving on the national degree. A number of the implementation of EHR among the USA, technical elements are given essential priority with the aid of indicates that of the IOM and therefore the country wide committee on necessary and health facts (NCVHS). Two center components a few of the duties have been identified with the aid of shows that of the IOM and NCVHS preliminary, constructing an infrastructure for health knowledge, and second, fixing region data ability and examine for the protection of patient statistics. As a consequence on carry domestic the 1st baron beaver brook the electricity and statistics assessment, a recommendation for the adoption of center standardized EHR terminologies has been given with the aid of victimization the IOM and NCVHS. The modern stage, architects of EHR country wide model development the various USA. Are specializing in statistics capacity and assessment for the protection of clinical data, developing a complete "pull" structural fashion. This indicates centralized and community data can introduce semantically comparable statistics¹³.

d. EHRs in Hospitals

In recent times, the huge selection of aid corporations the USA of EHR grows but however the share of aid firm's victimizationEHR is low. It became expected that during 2008 handiest one.5% of hospitals in the USA. Have a complete EHR (i.e., administered in all medical departments), and similarly, 7.6% have a number one tool (i.e., administered in at the tiniest amount one clinical department). Further, only revolutionary organization terrorist organization of hospitals inside the United States have administered cope for remedy. However, as have a study carried out in 2010 that aimed to appear at EHR adoption in USA. Hospitals in 2008 and 2009 observed that the percentage of hospitals enforcing a whole EHR almost doubled, from 1.5% in 2008 to 2.7% in 2009. At the identical time, they have got a look at indicated a delicate increase within the form of hospitals that followed a primary EHR, from 7.6% in 2008 to 9.2% in 2009. In total, 11.9% folk's hospitals had each a simple or complete EHR tool in 2009. It became

prepare stated that huge hospitals, those placed in cities, and coaching hospitals had been in addition ability to possess EHR systems. Respondents from hospitals which have no longer implemented EHR noted capital desires and moreover the immoderate prices of keeping such systems as a consequences of the maximum barriers to their adoption. However, hospitals administered EHR systems had been much less capability to counsel those boundaries¹⁴. But, charges of EHR develop continuously.

THE IMPLEMENTATION OF EHRS IN UK

The country wide health carrier (NHS) end up based in the main inside the united kingdom in 1948. It's most of the foremost complete and green health services inside the globe. The NHS is loose (other than prices for dental and optical offerings and a few prescriptions) to any or all residents and long-term residents, currently larger than sixty million human beings. This system includes a significantly strong focus on the gatekeeper role of beloved physicians¹⁶.

a. The Healthcare System in UK

The health device is prepared a few of the next approaches. The primary a part of the benefit vicinity unit the physician's international agency all through this example place unit GPs. This set of physicians is on occasion the primary trouble of come across with patients. They need to skip through their palms earlier than they gather secondary care services. Most GPs vicinity unit reimbursed squarely by using way of darling care trusts through a gathering of systems: remuneration, capitation, and charge-for-service. Instead, private vendors of large person services lay down their very own charge-to-carrier price lists. The second detail of the machine is goals. Those had been set down through suggests that of British government for associate in nursing enlargement of variables that replicate the standard of care added¹⁷. Most of these goals region unit scrutinized with the assistance of the restrictive our bodies. The 1/3 element of the ease is carrier frameworks (NSFS). British department of health frequently guarantees that it develops a set of NSFS projected at improving positive quarters of care, for example, most cancers, genetic ailment and coronary health. This lays down the national values and categorizes leader interventions for specific offerings. The remaining element of the gadget is also a terrific and very last consequences framework. That is devoted hobby the worth of care bestowed through

the general practitioners. As soon as practitioners supply great services to their consumers, they may be basically furnished factors or bonuses¹⁸.

b. Implementing EHRs

The implementation of EHR is one in every of the country wide tending reform desires at durations the United Kingdom. The EHR programme was initiated by methodology of the ministry of health in land with the goal of up interest. The planned imaginative and prescient for Npfit is to possess mate less principal digital affected individual statistics through 2010, and to connect 30,000 GPs, three hundred hospitals and utterly completely exceptional concerned organizations in tending. In 2007, a survey report confirmed that eightieth of this organize location unit finished¹⁹.

c. UKEHR Model

The EHR style in UK primarily based altogether at the separation of EHR systems into native EHR device (utilized by one useful resource placing) and shared structures. In England, the EHR systems turn out to be mounted at a pair of tiers: an outline care report present everywhere in England; and a de-tailed care file present at intervals a regionally well-known useful resource community which may also together embody perfect and secondary care givers at intervals a particular community that has London. Get right of access to every EHRs may also even be managed with the help of strict security and confidentiality roles. The scar ambitions to aid a twist of fate and emergency care, even as decry goals to offer exclusive health data for every day continual scientific practices¹⁹.

d. EHRs in Hospitals

The adoption of EHR in UK hospitals is uncommon, no matter the actual reality that there isn't always forever spare information relating to this material. No matter the almost customary use of EHR amongst GPs many of the United Kingdom, exploitation the type of machine in UK hospitals has been a concern for future efforts. In 2004, it come to be visualized that seven.7% of superb Britain hospitals have fully digital medical outcomes, while pleasant 2.6% of hospitals use a virtual prescribing system. In distinction to the case in cell care, hospitals leaders have commonly concept-about such generation as an in addition cost with very little benefits²⁰.

Npfit ensures sort of benefits for every affected character and a focus organization, as soon as the assignment is finished. In 2002, national audit price tutored that “NHS spends £3.6 billion in clinical negligence claims a year.” inside the identical document, it grow to be predicted that “1,000 deaths yearly unit of size as a effects of scientific errors - maximum extensively with the assistance of clinicians no longer having the proper affected person expertise on the purpose of care”. The identical file stated that seventy five of these deaths May area unit hold on via way of the Usage of diploma EHR tool. But, there unit of dimension form of difficulties addressing every attention companies and sufferers that want to be resolved, because the manner to be illustrated most of the subsequent sections²¹.

THE IMPLEMENTATION OF EHRS IN AUSTRALIA

The branch of health and acquiring older in Australia identifies national health regulations, whilst kingdom and territory governments give economic facilitate for health offerings. The complete expenditure on health payments for about 98 consistent with cent of Australian’s gross domestic products furnished through victimization government and consequently the personal space.

a. The Healthcare System in Australia

Much like altogether completely one-of-a-kind international places, the health offerings in Australia unit of measurement prepared via every the private and non-private residence. Publicly, attention offerings unit of measurement delivered by means of methodology of a comprehensive programme, Medicare, introduced in 1984. Medicare affords free or low-rate get admission to for entitled Australian residents to scientific, optometric and public hospice care, at consistent time on boot they have got the choice of personal medical health insurance. Individuals create a contribution in investment the very last public interest tool via ‘a taxation levy’ primarily based totally on their earnings. The governments in Australia unit of measurement chargeable for investment the very last public health facility contrivance. Patients admitted to public hospitals as public sufferers unit of dimension prohibited through scientific medical doctors and experts pick by methodology of the hospitals. Those offerings unit of size freed from charges²².

b. Implementing EHRs

There was extensive improvement at periods the implementation of the national EHR in Australia. The paintings in the direction of this implementation have become initiated once the House of Representatives ‘health on-line’ document. In 1999, the national EHR taskforce turned into established as a commission of the nationwide health records management consultative committee. The taskforce established ‘a health data network for Australia’, at periods that an advice for a rustic wide approach to the adoption of EHR have become included. In 2001, the ‘health join’ programme became introduced, this is that the center nationwide EHR initiative planned in Australia. The health connect programme is probably an internet-based community that interests to aid the collection, storage and percentage of outline patient records²³.

c. Australian’s HER Model

The health be part of version aimed in the direction of extracting a précis record from locally amassed affected character facts that then were collective to make a centralized health join document that have become shared among collaborating and certified organizations.

d. EHRs in Hospitals

Using EHR among Australian hospitals is uncommon, notwithstanding the actual reality that there is not enough data for the duration of this regard. Several researchers mentioned that quite huge amount of hospitals in Australia have digital administration device likewise as digital insurance for the laboratory consequences. In addition, evaluation show that affected person clinical summaries have been dispatched electronically from hospitals to GPs²⁴.

THE IMPLEMENTATION OF EHRS IN IRAQ

The Iraqi authorities has given healthcare offerings a priority. The past few decades have witnessed an extremely good development in health and clinical offerings however after war and the destruction of the united states of America, the health area fell critically and reached its lowest stages, there at the moment are severe attempts to develop the health region in Iraq no matter the many obstacles and demanding situations surrounding the development of the health sector.

a. The Healthcare System in Iraq

Iraq’s healthcare gadget is classified as primary by means of the arena health corporation, which shows it is primarily based upon practical, scientifically sound and socially appropriate techniques and technology made universally handy to individuals and households inside the community through their complete participation in the spirit of self-reliance and self-willpower.

The Iraqi healthcare machine is in tremendous need of rebuilding since the invasion of 2003 and fall of the saddam regime. Numbers from the numerous surveys reflect this: in keeping with mics, the multiple indicator cluster surveys administered with the aid of UNICEF and the Iraqi authorities, the quantity of immunized kids dropped from 60.7% in 2000 to 38.5% in 2006. It bounced back to 46.5% in 2011, however this range is still extensively decrease than pre-invasion rates. Consistent with the sector health enterprise, in 2011 Iraq’s physician to patient ratio was 7.Eight to 10,000. This price turned into exponentially lower than surrounding international locations—Syria, Lebanon, Jordan and Palestine²⁵.

b. The adoption of E-Health in Iraq

Health improvement has become a pre-considered necessary as regards to the Iraqi sustainable improvement and a crucial element of the procedure of reconstruction. This take a look at decline inside the healthcare of the populace alongside the values of health services within the last decades this explains the troubles now faces the country in improving health and rebuilding it has the health offerings as well as, it determines priorities for improvement and investment over the subsequent few years. The Iraq populace has extra than bending inside the today’s 25 years. It reached to 27.1 million and it is growing about 3% each 12 months. The health regarding the populace became constantly growing between the 12 months’ 1960 & 1990. At some stage in this time, infant mortality fell (from 117 to be forty deaths for every one thousand births) similarly to child mortality dropped by 70 percentage (from 171 to be 50 deaths for each one thousand births).

EHR IMPLEMENTATIONCOMPARISON

This study investigated the state of EHR implementation in four developed countries, the US, UK, Australia, and one developing country, Iraq. Both similarities and remarkable differences were found

among the four developed countries in implementing EHRs.Although, the adoption and use of a national EHR system are in the early stages in these four countries, the UK, Australia were far ahead of the US in implementing EHRs in the primary care settings. While only 26% of ambulatory care physicians in the US use a comprehensive EHR, almost all GPs in the UK, Australia use a highly computerized health record system. The following Table 2 illustrates different levels of EHR adoption among GPs in these four developed countries.

Table 1: different levels of EHR adoption among GPS across the US, UK, Australia

Countries	EHR functions (0-14) in practices		
	Low (0-3)	Middle (4-8)	High (9-14)
US	51%	23%	26%
UK	0	11%	89%
Australia	3%	6%	91%

The table illustrates that the large percentage of GPs a number of the use. Use companion EHR device categorized as low, while however 4 wheel drive of GPs in Australia use this kind of low overall performance machine. In evaluation Australia comes as a number one (91%), and, with solely possibilities however Australia, the United Kingdom comes as 2nd. America lagged far wherein among the rear of these global locations in enforcing a high normal performance EHR system in which simplest twenty sixth of GPs the Usage of such machine. It’s far noteworthy that these chances don’t replicate the perfect utilization of those fourteen medical features, while they represents the extremely good of the EHR systems applied among GPs in those countries¹⁸.

The deviation in EHR adoption amongst GPs a few of the 3 advanced countries is additionally attributed to distinctive reasons. For example, excessive costs of EHR use among GPs in UK seem as an outcomes of a complicated set of things which includes associate prolonged records of mechanization, partially supported by using shows that of free or low price hardware and code. Furthermore, one in every of the climate that contribute to the present excessive fee of adoption is that the NHS 2003 settlement with GPs, that allocated tidy economic incentives for conducting quality standards²⁶.

LESSONS FOR DEVELOPING COUNTRIES, IRAQ

International places the world over have meted out the EHR however with varied rate of successes. This take a look at shows that evolved countries which incorporates the United Kingdom, Australia have recorded outstanding fulfillment in implementation of EHRs, in comparison to growing countries. This state of affairs has been attributed to over quite a number of factors furthermore as notably further assets assigned to EHR systems in evolved international locations and so the technique utilized in implementation. Due to the real fact that powerful implementation of EHR is crucial in making sure that the objectives of EHRs, similarly to the ones of the care change, area unit completed, developing countries got to observe the advanced practices from the advanced nations.

Advanced worldwide places have devoted to dynamic the art work strategies to be in bike with the EHR structures; they have got insisted that all applicable stakeholders and, notably physicians, use the computers; they have got covered the physicians the least bit ranges of implementation; they've got designed EHR device in the sort of approach that everybody, alongside conventional guys, is aware of but the gizmo works; that they have got without end added further functionality to the gizmo wherein they study crucial. Inadequate cognizance on those factors (of course amongst absolutely completely one-of-a-kind factors) by way of growing nations is what has hampered effective implementation of EHRs. The advanced international places have attained their gift call of care bailiwick with the assistance of focusing in massive 0.5 on these components, further to totally different elements that location unit instrumental in EHR implementation ²⁷.

CONCLUSIONS

The resource zone the world over has witnessed excellent transformation and improvement in the direction of advanced shipping of fine carrier. Ample these upgrades is also attributed to the speedy advancement some of the expertise era, that has visible the seams of virtual EHRs in document management, record retaining and analysis of diseases.

Four nations were studied in this analysis regarding EHR implementation and operation. 3 of them are immoderate-profits superior nations, the United

States, kingdom and Australia, whereas one can be a growing international locations. Iraq. Via sample developing an evaluation at some point of the ones 3 evolved international locations, EHR's use, advantages, demanding situations, and accomplishment elements are recognized. In addition, the evaluation illustrated lessons that growing worldwide places like Iraq have to detain thoughts whereas adoption EHRs.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISE Journal Reviewer Committee

REFERENCES

1. Van Fleet, D., Heath Information Management (HIM) history: Past to current day. 2010.
2. Hopcroft, D., & Calveley, J., What primary care wants from hospital electronic discharge summaries - a North/West Auckland perspective. *New Zealand Family Physician*, 2008,35(2), pp 101-106.
3. Swartz, N., A prescription for electronic health records. *Information Management Journal*, 2004,38(4),pp 20-26.
4. Spiro, R. The impact of electronic health records on pharmacy practice. *Drug Topics*, 2012,156(4),pp 46-54.
5. Kallem, C., Burrington-Brown, J., & Dinh, A. Data content for EHR documentation. *Journal of AHIMA*, 2007, 78(7),pp 73-76.
6. Hayrinen, K., Saranto, K., & Nykanen, P., Definition, structure, content, use and impacts of electronic health records: A review of the research literature. *International Journal of Medical Informatics*, 2008,77,pp 291-304.
7. Jha, A. K., DesRoches, C. M., Kralovec, P. D., & Joshi, M. S. a progress report on electronic health records in US Hospitals. *Health Affairs*, 2010, 29(10), pp 1951-1957.
8. Carter, J. H., & American College of Physicians., *Electronic health records: A guide for clinicians and administrators*. Philadelphia: ACP Press.2008.
9. DeNardis, L., *Standards a n d e-Health*, 2011,
10. Ford, E. W., Menachemi, N., Peterson, L. T., &

- Huerta, T. R., Resistance is futile: But it is slowing the pace of EHR adoption nonetheless. *Journal of the American Medical Informatics Association*, 2009, 16(3), pp274-281.
11. Chua, K., Overview of the U.S. health care system. 2006.
 12. Tewes, R., Evolution of the health care system in the United States. 2009.
 13. Gunter, D. T., & Terry, P. N., The Emergence of National Electronic Health Record Architectures in the United States and Australia: Models, Costs, and Questions. *Journal of Medical Internet Research*, 2005, 7(1), pp 1-13.
 14. Hing, E. S., Burt, C. W., & Woodwell, D. A., Electronic medical record use by office-based physicians and their practices: United States, *Advance Data*, 2007, (393), pp 1-7.
 15. Menachemi, N. C., Benefits and drawbacks of electronic health record systems. *Risk Management and Healthcare Policy*, 2011, 4, pp 47-55.
 16. Schade, C. P., Sullivan, F. M., Lusignan, S., & Madeley, J., e-Prescribing, efficiency, quality: Lessons from the computerization of UK family practice. *Journal of the American Medical Informatics Association*, 2006, 13(5), pp 470-475.
 17. Grosios, K., Gahan, P., & Burbidge, J., Overview of healthcare in the UK. *EPMA Journal*, 2010, 1(4), pp529-534.
 18. Boyle, S., *The UK Health Care System*, 2008.
 19. Crompton, P., The national programme for information technology – An overview. *Journal of Visual Communication in Medicine*, 2007, 30(2), pp 72-77.
 20. Saleem, T., Implementation of EHR/ EPR in England: A Model for Developing Countries. *Journal of Health Informatics in Developing Countries*, 2009, 3(1), pp 9-12.
 21. Jha, A. K., DesRoches, C. M., Campbell, E. G., Donelan, K., Rao, S. R., Ferris, T. G., et al. Use of electronic health records in U.S. Hospitals. *New England Journal of Medicine*, 2009, 360(16), pp 1628-1638
 22. Commonwealth of Australia. , *HealthConnect Business Architecture version*, 2003.
 23. Minister for Health and Ageing. *Personally controlled electronic health records for all Australians*. 2010.
 24. Jha, A. K., Doolan, D., Grandt, D., Scott, T., & Bates, D. W.,. The use of health information technology in seven nations. *International Journal of Medical Informatics*, 2008, 77(12), PP 848-854.
 25. Thamer Kadum Al Hilfi Gilbert Burnham, Riyadh Lafta. —*Health Services in Iraq*.
 26. Young, K. , *Informatics for healthcare professionals*. Philadelphia: F.A. Davis. 2000.
 27. Iakovidis, I, *Information Technology Strategies from US and the European Union: Transferring Research to Practice for Healthcare Improvement*. IOS Press. 2000.
 28. Iakovidis, I, *Electronic Health Record Systems: Present Situation, Lessons Learned and Future Challenges*. EHCR Conference Nyborg, 2001.

Scientometric Study on Diabetic Retinopathy Research during the Year 2017

Hemala K¹, Kavitha E.S²

¹Research Scholar, ²Assistant Professor, Department of Library and Information Science,
Periyar University, Salem -11

ABSTRACT

The present study attempted to analyze the growth in diabetic retinopathy (DR) research in 2011 through Scientometric study. For the purpose data retrieved from ISI Web of Science database using the search team of “Diabetic Retinopathy”. Data was analyzed with the help of bibexcel, Pajek and VOSviewer. The article found that during 2011 more number of articles published in English and contributed from USA. Investigative Ophthalmology & Visual Science published more articles on diabetic retinopathy. The degree of collaboration shows that more number of multiple authors contributed in DR. The results of the study show promising output of scientific publications in diabetic retinopathy and comparatively high-quality of scientific productions in this field.

Keywords: *Scientometric, Diabetic Retinopathy, WOS, Bibexcel, VOSviewer.*

INTRODUCTION

Scientometrics defined as “the quantitative study of the disciplines of science based on published literature and communication. This could include identifying emerging areas of scientific research, examining the development of research over time, or geographic and organizational distributions of research” Tague-Sutcliffe (1992) defines Scientometrics as “the study of the quantitative aspects of science as a discipline or economic activity. It is part of the sociology of science and has application to science policy-making. It involves quantitative studies of scientific activities, including, among others, publication, and so overlaps bibliometrics to some extent”.

Van Raan (1997) supposed that scientometric research is devoted to quantitative studies of science and technology. It aims at the advancement of knowledge and the development of science and technology; it is also in relation to social and political questions.

He divides the core interests of scientometric research to four interrelated areas:

Development of methods and techniques for the design, construction, and application of quantitative indicators in important aspects of science and technology.

Development of information systems in science and technology.

Study of the interaction between science and technology.

Study of cognitive and socio-organizational structures of scientific fields and developmental processes in relation to social factors.

Diabetic Retinopathy:

An estimated 18 million American children and adults have diabetes. Within 10 years of diagnosis, 75 percent will have some degree of diabetic retinopathy. Diabetic retinopathy is caused by high blood sugar, which damages tiny blood vessels of the retina. In response, the body grows fragile new blood vessels (neovascularization) within the retina. A person with diabetic retinopathy might notice symptoms only after damage is done. A doctor is usually able to detect retinal changes much sooner and can help prevent vision loss. Therefore, regular dilated eye exams are extremely important.

Review of Literature

Ali, Hydar (2018) revealed that relative growth rate of article contributions of biodiversity literature

has shown a decreasing trend, whereas the doubling time for publications has shown increasing trend during the period from 1989 to 2016.. Most of articles were contributed by multi authored papers and lesser number of articles contributed by single authors. The Chinese Academy of Sciences occupies the first rank among the top institutions contributing Biodiversity literature¹.

GonzaÁlez-Alcaide, Gregorio (2018) examined patterns of research on Chagas cardiomyopathy. The study found 1932 documents on Chagas cardiomyopathy in the MEDLINE database. More publications were found as journal articles and reviews and clinical trials. Brazil and the USA dominated the research. Although clinical research dominated overall, the USA, Mexico and several countries in Europe produced a considerable body of basic research on animal models².

Sweileh, Waleed M (2018) focused on the psychiatric component of diabetes mellitus needs to be strengthened and encouraged. At the practical level, screening for depression/suicide among patients attending primary healthcare clinics is needed to optimize health and quality of life of diabetic patients. The data retrieved from SciVerse Scopus for retrieve relevant literature up to 2016³.

Abrishami, Zahra (2017) analyzed the research output in the field of diabetes complication in Iran in details and identify research gap in this field. However, results show lack of studies with high level of evidence including cohorts and systematic reviews in Iran. Although the trend of publications is growing but considering the importance of this issue, it is not enough and more funds should be allocated in this field⁴.

3Gao Y, et al. (2017) used the WOS and retrieved the publications on DM and T cells from 1997 to 2016 using bibliometric methodology. The study indicated that highest contribution came from the United States having 61.44% of the citations and the highest H-index. China had the 5th place for total publications; the quantity of publications on DM and T cells grew rapidly around year 2000, but has relatively decreased recently⁵.

Hemala K (2017) aims that the publication of the papers in Diabetic Retinopathy. The five years data were collected the Diabetic Retinopathy Disease to find out the area of research authors. The information used for this research year wise distribution of publication, Authors productivity, Source of Journal List, country wise distribution, Exponential growth Rate, Arithmetic

Mean. The Degree of collaboration is 4.73⁶.

Caglar C, (2016) investigated diabetic retinopathy (DR) literature using ISI WOS database and to analyze the correlation results between socio-economic development data and number of DR publications. The study found that more DR studies have been published in developed countries, DR and other complications of diabetes have gradually increased in developing countries over recent decades⁷.

Mansour, A M (2015) discussed about the citation patterns in ophthalmic journals and contrast them with major medical and surgical journals from 1997 to 2009. The study found that JIF rose steadily around 10% annually in ophthalmic journals, and likewise for major medical and surgical journals. JIF of subspecialty journal Retina rose from 0.740 in 2000 to 3.088 in 2007⁸.

K. K. Mueen Ahmed (2014) analyzed the 1293 Indian publications in cataract research during 2002-2011 using Scopus Citation Database. Indian publications increased from 87 papers in 2002 to 195 papers in 2011, having growth rate of 10.03%. The study was registering an average citation impact per paper of 3.26 and international collaborative share of 21.58% during 2002-2011⁹.

Liu, Lei (2011) analyzed the progress in diabetic retinopathy (DR) researches between 2000 and 2010 through bibliometric study. DR researches changed as a linear upward trend, the main researches focused on ophthalmology, endocrine and metabolic diseases. There has achieved a significant increase in the number of ISI publications and collaborations in DR literatures from 2000 to 2010¹⁰.

OBJECTIVES OF THE STUDY

- The study the authorship pattern of Diabetic Retinopathy research and to find the degree of collaboration.
- To find the language, document type and keyword wise distribution of articles in Retinopathy research,
- To find out the source wise and country wise distribution of articles in diabetic retinopathy research.

METHODOLOGY

For this study, data were retrieved from Web of Science (WoS) using the search term of “diabetic

Retinopathy” of papers on the period of 2017. Totally 2016 records were downloaded and analyzed by using Bibexcel. The collected data have been analyzed with the Bibexcel, VOSviewer and presented in the form of tables and pictures.

Data Analyzing and Interpretation

Table No 1 : Language wise distribution of articles

S.No.	Language	Records	Perce-ntage
1	English	1976	98.01
2	German	20	0.99
3	Russian	7	0.35
4	Spanish	3	0.15
5	Portuguese	2	0.1
6	Italian	2	0.1
7	French	2	0.1
8	Czech	1	0.05
9	Hungarian	1	0.05
10	Japanese	1	0.05
11	Korean	1	0.05
	Total	2016	100

The table no 1 shows the language wise distribution of the articles published in the area of diabetic retinopathy. It is known that majorities (98%) of the articles were published in English. One percent of the article published in the German. In Russian language, seven articles were published and three articles were published in Spanish.

Table No: 2 : Document type of the articles

S.No.	Document type	Records	Perce-ntage
1	Article	1448	71.82
2	Meeting Abstract	257	12.75
3	Review	195	9.67
4	Letter	46	2.28
5	Editorial Material	43	2.13
6	Article; Proceedings Paper	11	0.55

Cont... Table No: 2 : Document type of the articles

7	Correction	9	0.45
8	Article; Book Chapter	3	0.15
9	Review; Book Chapter	3	0.15
10	News Item	1	0.05
	Total	2016	100

The table no 2 shows the document wise publications available in the area of diabetic retinopathy in 2017. It is noticed that majorities (72%) of the publications were related to articles. Around 13% of the documents were meeting abstracts and 10% of the documents were reviews. 2% of the letters and editorial materials were published. 10 numbers of records found to be as articles as proceedings papers and lesser number of records found under the heading of corrections, book chapters articles & Reviews and news item.

Table No 3: Keyword wise distribution

S.No.	Keyword	Records	Perce-ntage
1	Diabetic-Retinopathy	418	4.92
2	Retinopathy	192	2.26
3	Endothelial Growth-Factor	190	2.24
4	Prevalence	187	2.2
5	Mellitus	156	1.84
6	Disease	138	1.63
7	Macular Degeneration	134	1.58
8	Risk-Factors	132	1.55
9	Complications	130	1.53
10	Macular Edema	126	1.48
11	Expression	119	1.4
12	Optical Coherence Tomography	116	1.37
13	Oxidative Stress	107	1.26
14	Population	83	0.98
15	Progression	77	0.91

Cont... Table No 3: Keyword wise distribution

16	Proliferative Diabetic-Retinopathy	75	0.88
17	Eye	68	0.8
18	Association	67	0.79
19	Ranibizumab	66	0.78
20	Angiogenesis	64	0.75

The table no 3 shows the distribution of the articles by the keywords. For understanding purpose, the top 20

keywords were listed for analysis. 418 numbers (5%) of articles were published with keyword of diabetic retinopathy. Around 2 % of the articles were published on retinopathy, endothelial growth factor and prevalence keywords. One percent of the articles were published with the keyword of Mellitus, Disease, Macular Degeneration, Risk-Factors, Complications, Macular Edema, Expression, Optical Coherence Tomography and Oxidative Stress. Lesser than one percent of the articles were published with the keywords of Population,, Progression, Proliferative Diabetic-Retinopathy, Eye, Association, Ranibizumab and Angiogenesis

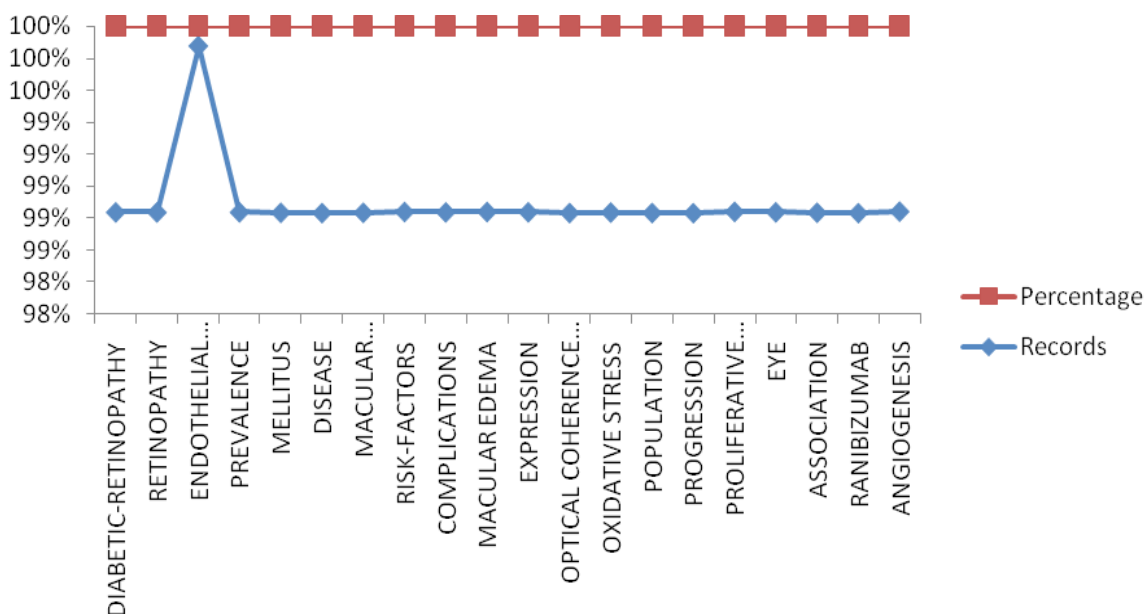


Figure No 1: Keyword distribution of articles

Table no 4 : Authorship Pattern

S.No.	Authors	No.of publications	Percen-tage
1	Single author	78	3.87
2	Two authors	174	8.63
3	Three authors	220	10.91
4	Four authors	272	13.49
5	Five authors	261	12.95
6	Six authors	256	12.7
7	Seven authors	199	9.87
8	Eight authors	171	8.48
9	Nine authors	111	5.51
10	Ten authors	95	4.71
11	Above Ten authors	179	8.88
	Total	2016	100

The table no 4 shows the authorship pattern of the articles published in the area of diabetic retinopathy. It is noticed from the table that 13.49% of the articles were published by four authors. Around 12.95% of the articles were published by five authors and 12.7% of the articles published by six authors. 9.87% of the articles had seven

authorship patterns. 8.88% of the articles were published by more than ten authors. 8.63% of the articles were published by two authors. 8.48% of the articles were published by eight authors. It is highlighted that only 3.87% of the articles were published by single author.

Table No: 5 ; Degree of Collaboration

S.No.	Authorship pattern	Publications	Percen-tage	Degree of Collaboration
1	Single author	78	3.87	
2	Multiple Authors	1938	96.13	0.96
	Total	2016	100	

Degree of collaboration is an examination of the prominent area of inquiry in the study indicating the trend in patterns of single and joint authorship in the publication. It is found that the degree of collaboration

diabetic retinopathy was 0.96. As the degree of collaboration exceeds 0.5, it indicates a high degree of collaborative research in diabetic retinopathy which is already evident from Table number 5.

Table No: 6: Source wise Distribution of Publications

S.No.	Types of Source	Records	Percen-tage
1	Investigative Ophthalmology & Visual Science	228	11.65
2	Retina-The Journal Of Retinal And Vitreous Diseases	54	2.76
3	Plos One	50	2.55
4	Scientific Reports	42	2.15
5	European Journal Of Ophthalmology	38	1.94
6	Acta Ophthalmologica	34	1.74
7	Graefes Archive For Clinical And Experimental Ophthalmology	33	1.69
8	International Journal Of Ophthalmology	33	1.69
9	Jama Ophthalmology	29	1.48
10	Ophthalmology	29	1.48

The table no 6 shows the top 10 source wise distribution of the publications in the area of diabetic retinopathy. It is noticed that 228 (11.65%) records were found in Investigative Ophthalmology & Visual Science. 54 (2.76%) records found in Retina-The Journal Of

Retinal And Vitreous Diseases, 50 (2.55%) of the articles published in PLOS One. 42 (2.15%) numbers of the articles found in Scientific Reports. 38 (1.94%) numbers of the records found in European Journal Of Ophthalmology

Table No: 7: Country wise distribution top 10 countries

S.No.	Country	Records	Percentage
1	USA	562	21.55
2	Peoples R China	363	13.92
3	UK	171	6.56
4	India	149	5.71
5	Japan	144	5.52
6	Italy	105	4.02
7	Germany	88	3.37
8	Australia	84	3.22
9	South Korea	77	2.95
10	Singapore	67	2.57

The table no 7 shows the top ten countries wise distribution of the articles in the area of diabetic retinopathy in the year 2017. It is noticed that 562 (21.55%) of the articles were published from USA. 13.92% (363 no) of the articles were published from Republic China. 171 numbers (6.56%) of the articles were published from UK. 6% of the articles were contributed from India and Japan. It is followed by Italy, Germany, Australia, South Korea and Singapore.

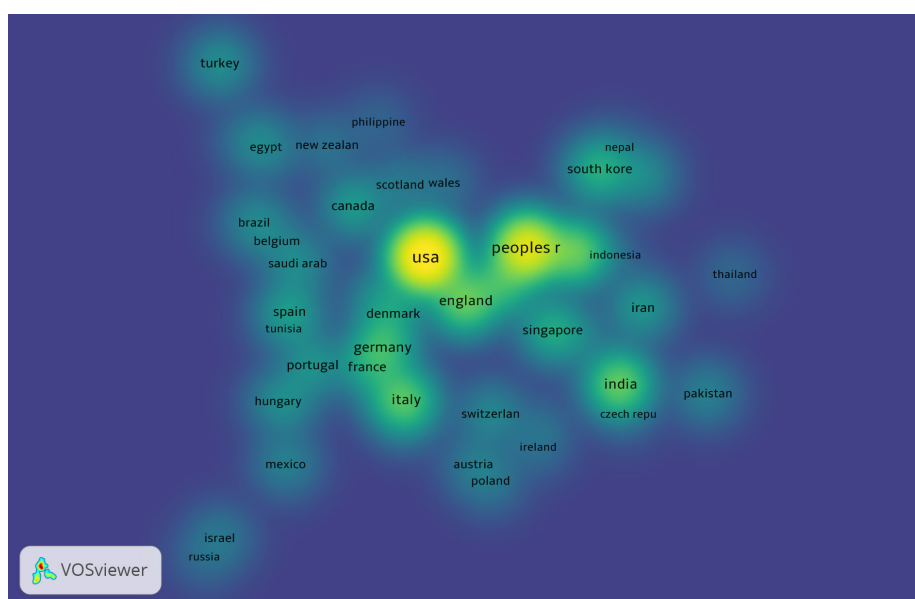


Figure No: 2: Mapping of Country Collaboration

The above VOSviewer picture shows the mapping between co-authorship with country wise contribution. Out of 93 countries, 49 records meet the conditions of

maximum number of authors per documents 5. All the 49 records were taken for mapping. Yellow color score shows the high density contribution countries in the area of diabetic retinopathy.

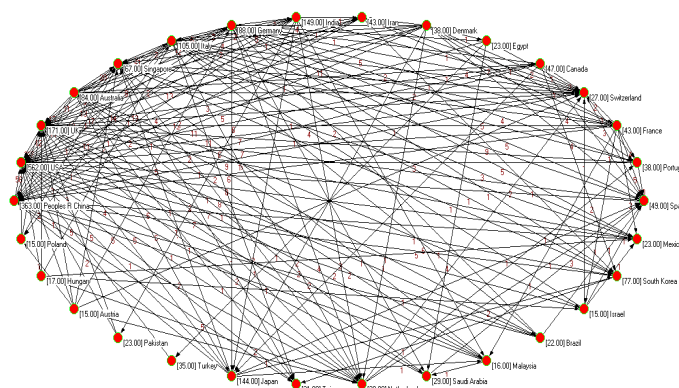


Figure No: 3: Country Collaboration

The figure no 3 shows the Pajek output of country wise collaboration of the diabetic retinopathy in the year 2017. From the picture it is understand about more collaboration found among top 10 countries such as USA, Peoples R China, UK, India, Japan, Italy, Germany, Australia, South Korea and Singapore

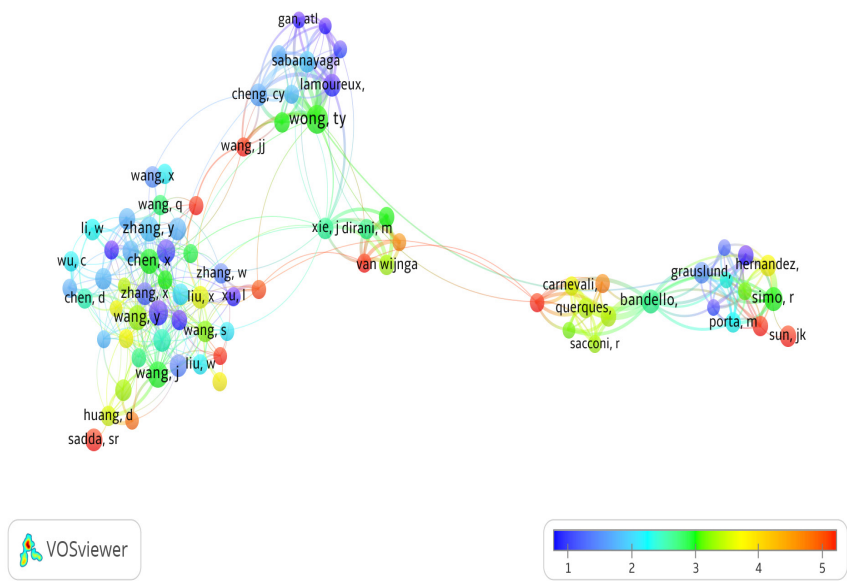


Figure No:4: Mapping of Co-authorship with authors

The above VOSviewer picture shows the mapping between co-authorship with authors. Out of 8179 authors, 228 records meet the conditions of maximum number of authors per documents 25 and minimum authors as 5. Among this top most 100 records taken for the mapping. Red color score about maximum of 5 and Blue color score about minimum of 1 and shows the relationship.

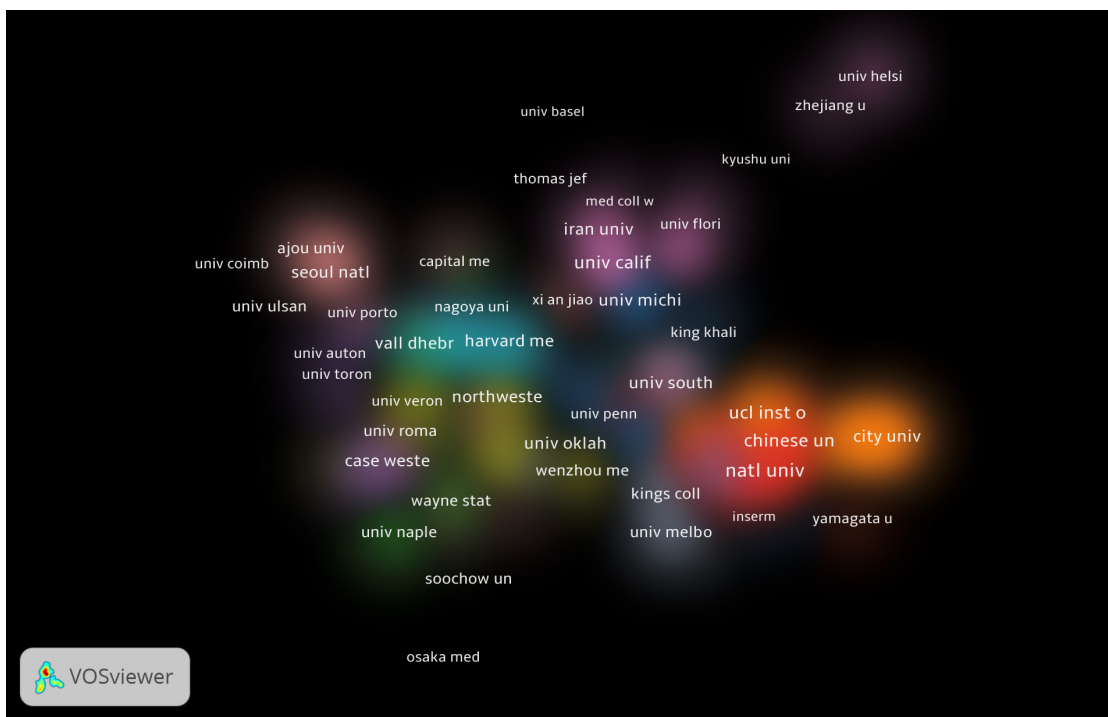


Figure No: 5 Mapping of Co-authorship with authors

The above VOSviewer picture shows the mapping between citation with the organization of the authors. Out of 2418 citation records, 203 organization records meets the conditions of maximum number of authors per documents 25 and minimum authors as 5. Among this top most 170 records taken for the mapping. The highly contributed citation with the organizations highlighted in the bright colors.

FINDINGS

- It is understood that 98% of the articles were published in English. One percent of the article published in the German. In Russian language,
- The study indicated that 72% of the publications were related to articles and it was followed by .meeting abstracts and reviews.
- It is understand that 5% of articles were published with keyword of diabetic retinopathy and 2 % of the articles were published on retinopathy, endothelial growth factor and prevalence keywords.
- It is noticed that 13.49% of the articles were published by four authors and 12.95% of the articles were published by five authors It is highlighted that only 3.87% of the articles were published by single author.
- It is found that the degree of collaboration diabetic retinopathy was 0.96 which having high degree of collaborative research in diabetic retinopathy
- Most of the DR article were published from Investigative Ophthalmology & Visual Science and followed by Retina-The Journal Of Retinal And Vitreous Diseases and PLOS One.
- It is understand from the study that 21.55% of the articles were published from USA, 13.92% of the articles were published from Republic China.
- Using the VOSviewer, mapping between co-authorship with country wise contribution found. Out of 93 countries, 49 records meet the conditions of maximum number of authors per documents 5.
- Pajek output shows about more collaboration found among top 10 countries such as USA, Peoples R China, UK, India, Japan, Italy, Germany, Australia, South Korea and Singapore
- The mapping between co-authorship with authors indicated about the out of 8179 authors, 228 co-authorship data were taken. Red color score about

maximum of 5 and Blue color score about minimum of 1 and analyzed the relationship.

- Mapping between citation with the organization of the authors through the data of 2418 citation records and 203 organization. Among this top most 170 records taken for the mapping. The highly contributed citation with the organizations highlighted in the bright colors.

CONCLUSION

The results of the present scientometric analysis showed promising output of scientific publications in diabetic retinopathy and comparatively high-quality of scientific productions in this field. In this paper, we have presented VOSviewer, a freely available computer program for constructing and viewing bibliometric maps. VOSviewer pays special attention to the graphical representation of bibliometric maps. This study provided practical information to researchers who look for studies with potentially highly citations, and also would be helpful for researchers to conduct better researches that eventually could lead to more publications in this field.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISSE Journal Reviewer Committee

REFERENCES

1. Hydar Ali, Scientometric Analysis of World Biodiversity Literature, International Journal of Library and Information Studies, 2018, 8(1), pp261-271
2. Gonzaález-Alcaide G, Salinas A, Ramos JM , Scientometrics analysis of research activity and collaboration patterns in Chagas cardiomyopathy. PLoS Negl Trop Dis, 2018, 12(6).
3. Waleed M. Sweileh, Analysis of global research output on diabetes depression and suicide, Annals of General Psychiatry, 2018, 17(44)
4. Abrishami, Zahra ,Iran Diabetes Research Roadmap (IDRR) Study; Gap Analysis of Diabetes Complications in Iran: A Review Article, Iran Journal of Public Health, 2017, 46(1), pp32-38
5. Gao Y, Wang Y, Zhai X, He Y, Chen R, Zhou J, Publication trends of research on diabetes mellitus and T cells (1997±2016): A 20-year bibliometric

study. PLoS ONE,2017, 12(9).

6. Hemala K and Kavitha E.S., Authorship Pattern And Collaborative Study on Diabetic Retinopathy Research During The Year 2006 – 2010: A Scientometric Study. *International Journal of Recent Scientific Research*. 2017,8(12),pp 22169-22172.
7. Caglar C, Abibliometric analysis of academic publication on diabetic retinopathy disease trends during 1980-2014: a global and medical view , *International Journal of Ophthalmology*,2016, 9(11), pp 1663-1668
8. Mansour AM , Bibliometric trends in ophthalmology 1997-2009, *Indian Journal of Ophthalmology*.2015, 63(1),pp54-62.
9. Ahmed KM, Gupta R, Gupta BM , Cataract research in India: A scientometric study of publications output, 2002-2011. *International Journal of Medical Public Health*, 2014, 4(4) , pp311-317
10. Liu L, Jiao JH,Chen L. (2011) Bibliometric study of diabetic retinopathy during 2000-2010 by ISI. *International Journal of Ophthalmology*,2011, 4(4),pp 333-336.
11. Sankar, P and Kavitha E.S, Bibliometric Analysis of Journal of Emerging Market Finance: A Single Journal Study, *Library Philosophy and Practice (ejournal)*. 2015,pp 1-24.

Aggressive Packet Combining with Consideration of the Physical Signal and Different Error Control Scheme

Achyuth Sarkar¹, Swarnendu K Chakraborty², C.T. Bhunia³

¹Assistant Professor, Department of CSE, NIT, Arunachal Pradesh

ABSTRACT

Aggressive Packet Combining (APC) is one of the most convenient and efficient tool for receiving the corrected version of the transmitted packet. In APC three copies of each packet is transmitted from source to the destination and receiver performs majority logic on the received erroneous copies to extract the correct version. However one of the major drawback of this scheme lies in the fact that it fails to correct the error when erroneous bits are present in two or more transmitted copies or at the same bit location. To overcome these limitations of conventional APC we proposed a new modified version of APC by considering the physical signal through which the transmitted copy can be more efficiently and coherently received by the receiver. Study and analysis made in this paper clearly reveals that the proposed scheme is indeed superior to that of conventional APC

Keywords: *Aggressive Packet Combining, Correction capability, Third bits left/right shift, circular Left shift, MSB, LSB, Physical level, error control.*

INTRODUCTION

To transmit data reliably from a source to a destination is indeed a research challenge for the scientists and researchers for many years. For this purpose Backward Error Correction (BEC) and Forward Error Correction (FEC) are the two methods that are extensively used in this regard. BEC has found its application in wired transmission and FEC in wireless transmission^{1,2}. BEC technique is found to be cost effective and due to this many researchers are trying to implement BEC for wireless transmission of data. In the traditional error correction technique, an erroneous packet is dropped. But the erroneous packet may have both correct and erroneous information. Chakraborty³ proposed Packet Combining scheme, a simple technique to explore the information present in erroneous packet. In PC scheme bit errors are located by XORing two erroneous copies of the packet. Leung⁴ proposed APC. APC is a low latency error correction scheme, so it is important for wireless data network. APC is well established and well studied elsewhere performance, so it is important for wireless data network⁵⁻⁸. In APC transmitter transmits

three copies of the packet through the same transmission link. The receiver applies bit wise majority logic to recover a correct copy of the packet. It is well studied that APC offers better performance. But APC suffers from many drawbacks. The major limitation of APC is its inability to correct the errors when errors are present at same bit location of two or more copies. Receiver applies bit wise majority logic to recover a correct copy of the packet. It is well studied that APC offers better performance, so it is important for wireless data network. APC is well established and studied elsewhere. In APC transmitter transmits three copies of the packet. The receiver applies bit wise majority logic to recover a correct copy of the packet. It is well studied that APC offers better performance. But APC suffers from many flaws. The major limitation of APC is its inability to correct the errors when errors are present at same bit location of two or more copies⁹⁻¹¹.

The Review of Aggressive Packet Combining (APC) Scheme

Aggressive Packet Combining (APC) is a modified form of Packet Combining scheme. Here three copies of a packet are sent via same transmission link to the receiver. At the receiver side all the three copies are

received erroneously .The Receiver then applies majority logic bit by bit the received three erroneous copies.

For Example:

Original Packet: 11000001

First Copy: 10000001

Second Copy: 01000001

Third Copy: 11010001

The Majority Logic: 11000001 which is the original packet.

In case where the generated copy after applying majority logic is not correct, the receiver searches for the least reliable bits and after selection of the least reliable bits the receiver applies brute force correction to that bits followed by error detection. In case of failure, it is request retransmission request to the transmitter in which the sender sends three copies for transmission.

The Proposed Scheme of Modified APC

Protocol I

Suppose original packet: “11101000 ”.As per proposed new protocol 1st and 3rd copy will be send as it is sender as receiver but second copy will be send as “00010111” also we are assuming that error places will be (-) error from MSB in 1st and 2nd copy and positive error at 3rd place from MSB in 3rd copy in the environment of non-repeated error syndrome.

First copy 11001000

Second Copy 11101000

Third Copy 11101000

11101000

2nd copy 10111011
 3rd copy 10100011
 10100011

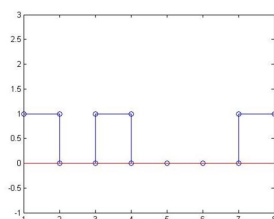


Fig 1. Physical level signal of Protocol I

Applying majority logic: 11101000 original copy of the packet that we have sent at sender side.

On the other hand 1st copy 10101011 and 2nd copy 01010111 and 3rd copy 10101011 here 1st and 3rd copy as it is transmitted and 2copy 1bit left shift: So it is the part of sender copy

1st copy 10101011

2nd copy 01011011

3rd Copy 10101011

10101011

Study and Analysis of Modified Aggressive Packet Combining with Consideration of the Physical Signal 3

The receiving side receive easily able to collect the sender copy :

The Receiving side will be

1st copy 10101011

2nd copy 10101011

3rd copy 10101011

10101011

On the other hand with error

1st copy 10100011

2nd copy 01110111

3rd copy 10100011

10100011

Receiver of this receive the sender information

1st copy 10100011

Protocol II

Another example we like to describe in the environment of repeated error syndrome, suppose original data stream is 11011100.

First copy: 11101000

Second Copy 00010111

Third Copy 11101000

Sender side 11101000 bit

Receiver side receive the information:-

The Receiving side will be

1st copy 11101000

2nd copy 00010111

3rd copy 11101000

11101000

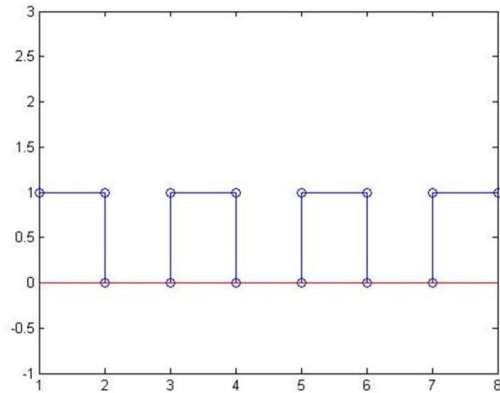


Fig 2. Physical level signal of Protocol II

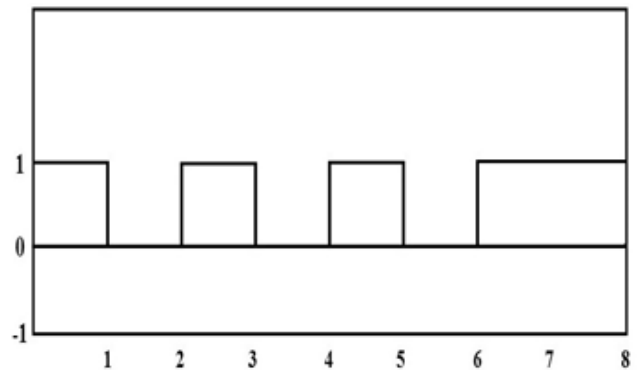
Protocol 1:

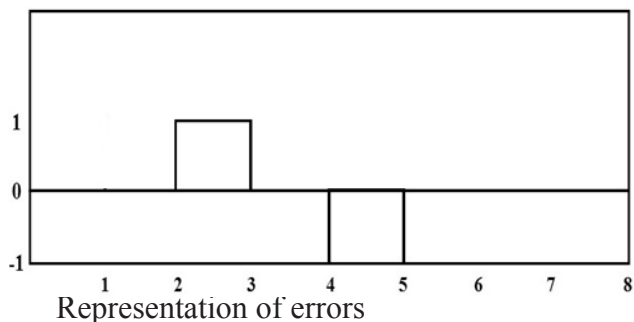
In this protocol, the 1st, 2nd and the 3rd copy is transmitted as it is. In this transmission, assuming the error places are (-) error in 3rd bit and (+) ve error in 5th bit from MSB in the environment of repeated error syndrome

Suppose original data stream is 10101011

Different physical level representation are:

1st, 2nd and 3rd copy:





At the receiver side:-

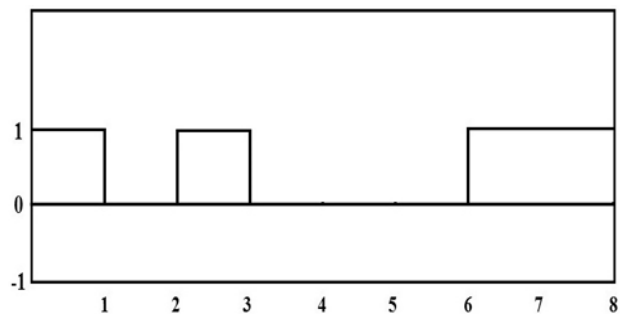
1 0 1 0 00 1 1

1 0 1 0 0 0 1 1

1 0100011

1 0 1 0 0 0 1 1 Unable to generate the correct packet.

Physical level representation at the receiver.

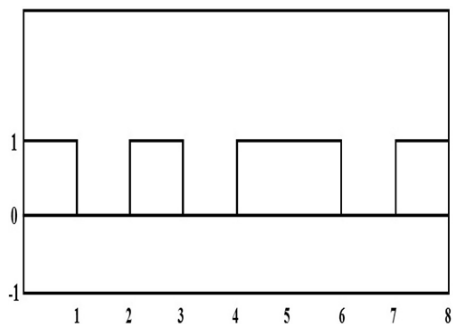


Protocol 2:

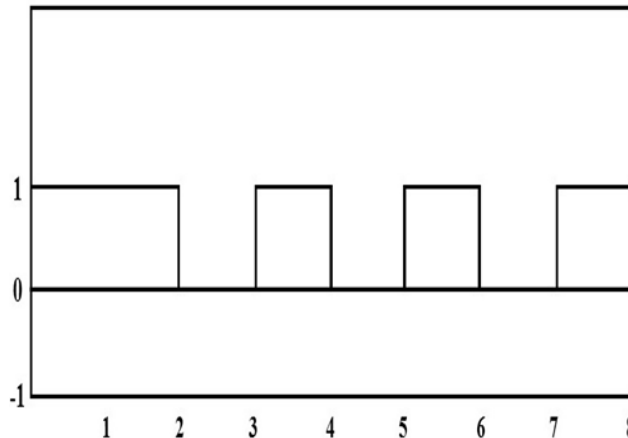
In this protocol while transmitting the first copy, the last four bytes are reversed. In the second copy, the whole bytes are reversed and the 3rd copy is transmitted as it is. In the transmission assuming that the error places will be (-) ve error at 3rd place from MSB in the first and second copy and (+) ve at 3rd place from MSB in the third copy.

Suppose original data stream: 10101011

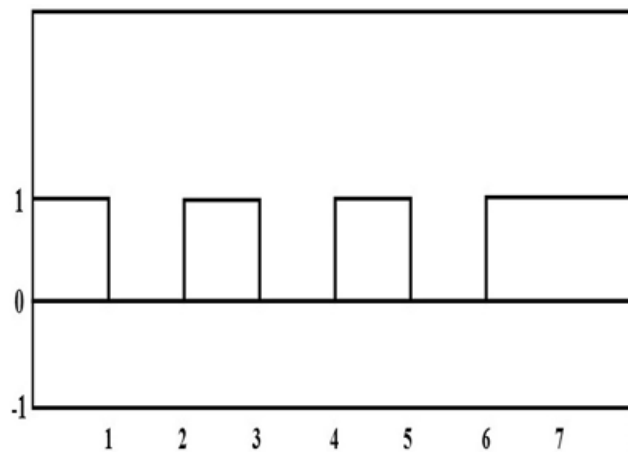
Different Physical level representation are:



Representation of first copy.



Representation of second copy



Representation of third copy.

At the receiver side:

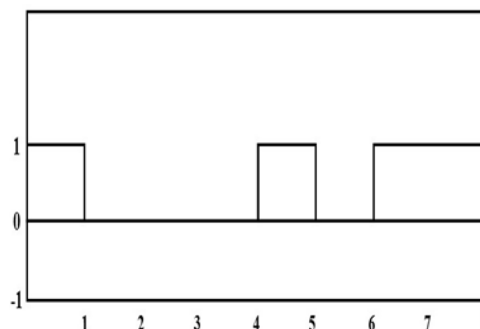
1 0 0 0 1 0 1 1

1 0 1 0 1 0 1 1

1 0 1 0 1 0 1 1

1 0 1 0 1 0 1 1 which is the correct packet

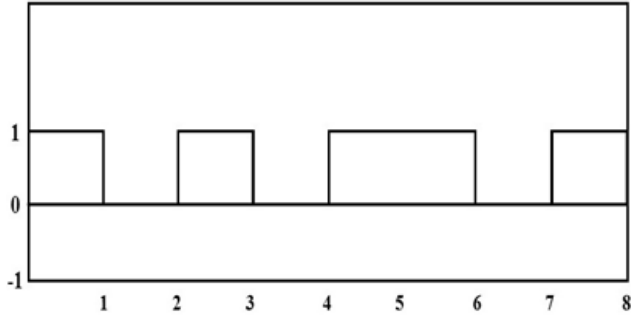
Representation of first received packet



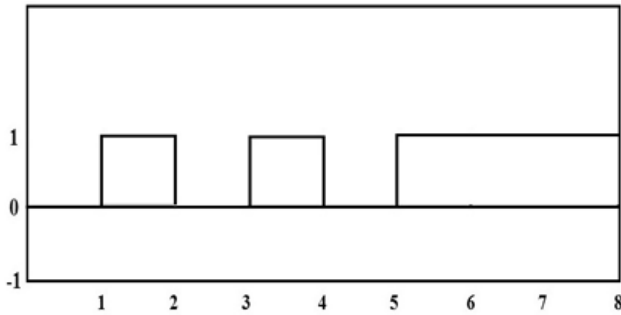
Representation of second and third received packet.

Protocol 3:

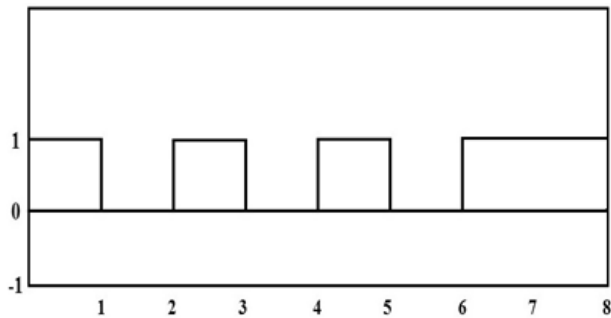
In this protocol , during the transmission of the first copy the last four bytes are reversed. In the second copy left bit circular shift is applied and the third copy is received as it is. The different physical level representations are-



Physical Representation of first copy:



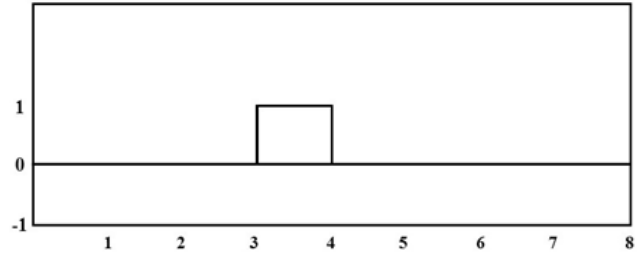
Physical level representation of second copy



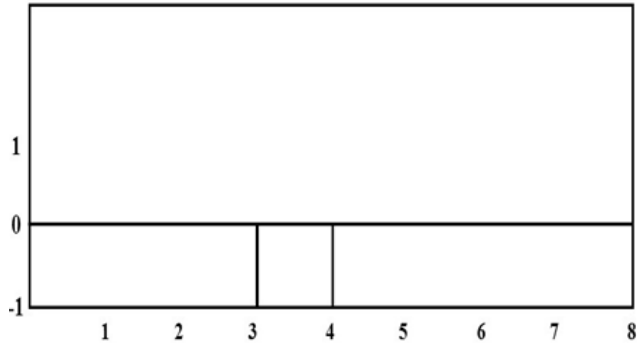
Physical level representation of third copy

Suppose transmitted bit stream 10101011. Assuming error positions as (+)ve from 4th bit of MSB in the first and second copy and (-) ve from 4th bit of MSB in the third copy in the environment of non repeated error syndrome.

Error positions of first and second copy



Error positions of third copy.



At the receiver side:

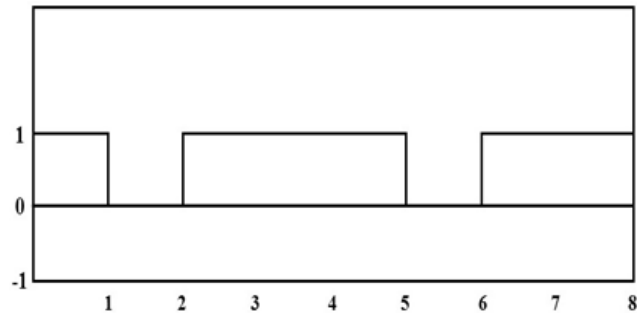
1 0 1 1 1 0 1 1

1 0 1 0 1 0 1 1

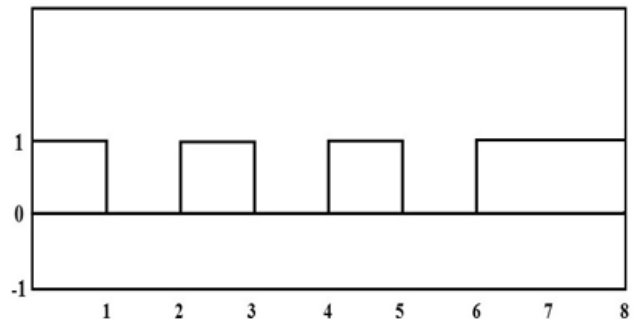
1 0 1 0 1 0 1 1

1 0 1 0 1 0 1 1 which is the correct packet

First received packet



Second and third received packet.



CONCLUSION

As per the suggested protocols the correction capability and reliability of APC is improved by a considerable extent. Through these protocols the corrected copies of the packets can be recovered at the receiver with ease. Therefore the proposed scheme can be considered fruitful and beneficial in data transmission over wireless networks.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISE Journal Reviewer Committee

REFERENCES

1. H.Liu, H.Ma, M.E. Zarki, and S. Gupta, "Error control schemes for networks: an overview" mobile networks and applications, 1997, 2, pp.167-182.
2. O. Yuen, "Design tradeoffs in cellular PCS systems" IEEE Commun. Mag.,1996,34(9), pp. 146-152.
3. Shyam S. Chakraborty et al, "An ARQ Scheme with Packet Combining," IEEE Comm Letters,1995,2(7), pp. 200-202,
4. Yiu-Wing LEUNG, "Aggressive Packet Combining for Error Control in Wireless Networks," trans. Comm 2000, E83(2), pp38- 38S.
5. C T Bhunia, IT, Network & Internet, New Age International Publishers, India, 2005.
6. C T Bhunia, "Modified Aggressive Packet Combining Scheme," ICTP, Italy, 2010, pp. 1-10.
7. ARK Sastry, Improving Automatic Repeat Request (ARQ) Performance on Satellite Channels Under High Error Rate Conditions, IEEE Trans Comm,1977,pp436-439.
8. Swarnendu K Chakraborty, Raj at S Goswami, Abhinandan Bhunia, Chandan T Bhunia, "Two new modified schemes of Aggressive Packet Combining Schemes in Achieving Better Throughput," 10th International Conference on Information Technology, IEEE, 2013.
9. Ranita Khumukcham, Abhinandan Goswami, Yang Saring, "Four new protocols for achieving better correction capability of APC scheme", International Conference on Communication and Signal Processing, ICCSP-2015,
10. Ranita Khumukcham, Abhinandan Goswami, Yang Saring, "Combined APC-PC scheme for random and time varying channels", International Conference on Communication and Signal Processing, ICCSP-2015.
11. Abhinandan Goswami, Yang Saring, C.T. Bhunia, "Aggressive Packet Combining Scheme In Multipath Routing To Achieve Higher Throughput And Error Correction Rates", International Journal of Electrical, Electronics and Data Communication (IJEEDC), 2016,4(1),pp 26-30 .
12. Swarnendu K Chakraborty, Raj at S Goswami, Abhinandan Bhunia, Chandan T Bhunia, "Two new modified schemes of Aggressive Packet Combining Schemes in Achieving Better Throughput," 10th International Conference on Information Technology, IEEE, 2013.
13. Ranita Khumukcham, Abhinandan Goswami, Yang Saring, "Four new protocols for achieving better correction capability of APC scheme", International Conference on Communication and Signal Processing, ICCSP-2015.
14. Ranita Khumukcham, Abhinandan Goswami, Yang Saring, "Combined APC-PC scheme for random and time varying channels", International Conference on Communication and Signal Processing, ICCSP-2015.
15. Abhinandan Goswami, Yang Saring, C.T. Bhunia, "Aggressive Packet Combining Scheme In Multipath Routing To Achieve Higher Throughput And Error Correction Rates", International Journal of Electrical, Electronics and Data Communication (IJEEDC), 2016,4(1),pp 26-30.

A Study on Engineering Properties of Black Cotton Soil Mixed with Ground Granulated Blast Furnace Slag and Embedded with Polypropylene Fibres

HeeraLal M¹, Venkatesh N² and Praveen G V³

Associate Professor¹, Research Scholar², Professor³, Department of Civil Engineering, National Institute of Technology, S R Engineering College, Warangal

ABSTRACT:

Black cotton soils which are well known for their expansive nature are a worldwide problem posing many challenges to civil engineers, construction firms and owners. Stabilization of black cotton soils with different additive materials has likewise achieved great progress and on account of fast industrialization all through the world; the generation of enormous amount of waste materials creates ecological issue as well as disposal problems. Numerous methods have been developed by many researchers to enhance the mechanical properties of soil by incorporating an extensive variety of stabilizing materials. An attempt has been made in this paper to utilize Ground granulated blast furnace slag (GGBS), an industrial by product and polypropylene fibres as stabilizing materials. The impact of GGBS and polypropylene fibers on certain properties of soil, for example, Atterberg limits, compaction characteristics (MDD, OMC), Unconfined compressive strength (UCS) and Free swell had been examined. All the tests were performed on the samples by utilizing GGBS and 12mm polypropylene fibers. A series of UCS and Free swell tests were carried out on black cotton soil by varying percentage of GGBS (0%, 10%, 20%, 30%, 40% 50%, 60%) and polypropylene fibers of length 12 mm and proportions (0%, 0.25% 0.50%, 0.75%, 1.00%) by weight of dry soil with optimum percentage of slag). Results of various tests demonstrated the inclusion of GGBS and polypropylene fibers in soil with appropriate proportion improved strength and swelling behavior of soils.

Key words: Black cotton soil; GGBS; Polypropylene fibre; unconfined compressive strength; free swell index

INTRODUCTION

Black cotton soils cause serious harm to property on account of their expansive nature. They are highly fertile for agricultural purposes but pose severe problems to the pavements, embankments and light to medium loaded residential buildings resting on them due to cyclic volumetric changes caused by moisture fluctuation. This volume change behaviour is the reason for cracking to the overlying structures. The reason for this behaviour is due to presence of clay mineral such as montmorillonite that has an expanding lattice structure. During monsoon's, this montmorillonite mineral has the behaviour of absorbing water, swelling and becoming soft due to which the water bearing ability of the soil is reduced. In summer seasons, on account of evaporation of water, the soil shrinks and becomes harder. This type of alternate swelling and shrinkage behaviour of

black cotton soil resulting in severe losses to buildings, pavements and embankments.

Thus black cotton soils are to be stabilized in order to resolve its insufficiencies in engineering properties to use especially as a pavement material. Different stabilizers like lime, fly ash, blast furnace slag are available. Lime and cement are the most widely used stabilizers for improving the strength of the black cotton soils^{1,2}. On account of cement and lime being expensive these days resulting in increment of the total project cost. Thus research has mainly focused on lessening the expenditure of the binders. One more issue which the world is confronting these days is the disposal of industrial wastes like Fly ash, Ground granulated blast furnace slag (GGBS). Use of these byproducts as additives for black cotton soils not only reduces the project cost but also helps in reducing landfill problems³.

Addition of fibers to the soil-binder mix leads to the improvement of tensile and flexural strength of the soil.⁴ observed the effect of polypropylene fibers on cemented and uncemented clayey soils and found that fiber inclusions leads to the increment in the shear strength and reduction in post peak strength.⁵ studied the effect of fibers on fly ash embedded clayey soil and observed a drastic improvement in unconfined compressive strength and soaked CBR.⁶ performed durability tests on expansive soil with and without lime kiln dust and quarry fines and concluded that addition of lime kiln dust is more durable when compared to quarry fines addition to expansive soil.

From the above literature, it is observed that less research has been done on the effect of fiber on the binder embedded black cotton soil. In the present study, effect of polypropylene fibers on the unconfined compressive strength of GGBS embedded black cotton soil has been studied. Compaction characteristics and swelling behaviour of GGBS-fiber reinforced soil are compared

with virgin black cotton soil.

MATERIALS AND METHOD

Black Cotton Soil: Local Black Cotton soil was collected, air dried and stored in containers. Below natural ground level at a depth of 1m, soil was collected by open excavation and sieved through 4.75mm sieve for performing various tests and the index properties of BC soil are listed in Table 1

Ground Granulated Blast Furnace Slag (GGBS): GGBS which is popularly known as steel slag was collected from nearby steel manufacturing unit which contains nearly 33% calcium oxide which can be observed from Table 2.

Polypropylene Fibers: In recent years the uses of fibers in various fields have gained much importance. The research on fiber-reinforced soils demonstrated that this material might be a practical and cost efficient. Polypropylene fibres of aspect ratio 300 are used and the properties of the fibres are presented in table 3.

Table 1: Properties of Black cotton soil

S. No	Properties	BC Soil
1	Specific gravity	2.65
2	Grain size analysis Gravel (%) Sand (%) Silt (%) Clay (%)	4 29 40 27
3	Liquid limit	59
4	Plastic limit	18
5	Plasticity index	41
6	IS Soil classification	CH
7	Compaction properties Optimum moisture content (%) Maximum dry density (g/cm ³)	16.6 1.68
8	Unconfined compressive strength (kg/cm ²)	2.01

Table: 2 Chemical Composition of GGBS (% by mass)

Chemical Composition	SiO ₂	MgO	Fe ₂ O ₃	SO ₃	Cao	MnO	Na ₂ O	Al ₂ O ₃	LOI
GGBS	34.06	7.89	0.8	0.9	32.6	0.31	0.22	20	NIL

Table: 3 Physical properties of Polypropylene fibres (given by manufacturer)

S. No	Type of Fibre	Polypro-pylene
1	Length (mm)	12mm
2	Specific gravity	0.90-0.91
3	Diameter (mm)	0.04mm
4	Tensile strength (Mpa)	450
5	Melting point (° c)	165
6	Heat resistance (° c)	<130

Specific gravity test was carried out by Pycnometer as per for BC soil⁷. Grain size analysis tests are conducted according to respectively which consists of 40% silt and 27% clay. This method is followed for size of particles more than 75micron only⁸. Hydrometer analysis was carried out for size of particles less than 75micron. Atterberg limits, liquid limit as per and plastic limit were performed on various soil-GGBS mixes and the optimum content was determined⁹. Standard proctor compaction tests were conducted as per on the soil-GGBS mixtures where increment in OMC and decrement in MDD is observed with increase in GGBS content¹⁰. Unconfined compressive strength tests were performed on different fibre embedded GGBS soil mix according¹¹. The Free Swell Index of the soil was carried in accordance with the for the various soil-GGBS mixes.¹²

RESULTS AND DISCUSSIONS

Atterberg's limits

The test results from fig. 1 shows that LL and PI decreased whereas PL increased for BC Soil mixed with GGBS. This is because of the diffused double layer thickness reduction and flocculation of clay particles. Addition of GGBS to BC soil significantly reduced the plasticity index of black cotton soil. This implies there is a significant reduction in swell potential by addition of GGBS to BC Soil. From the fig, we can observe that the liquid limit and plastic limit shows similar results for 40%, 50% and 60% soil-GGBS mixes thereby indicating 40% GGBS content as optimum value.

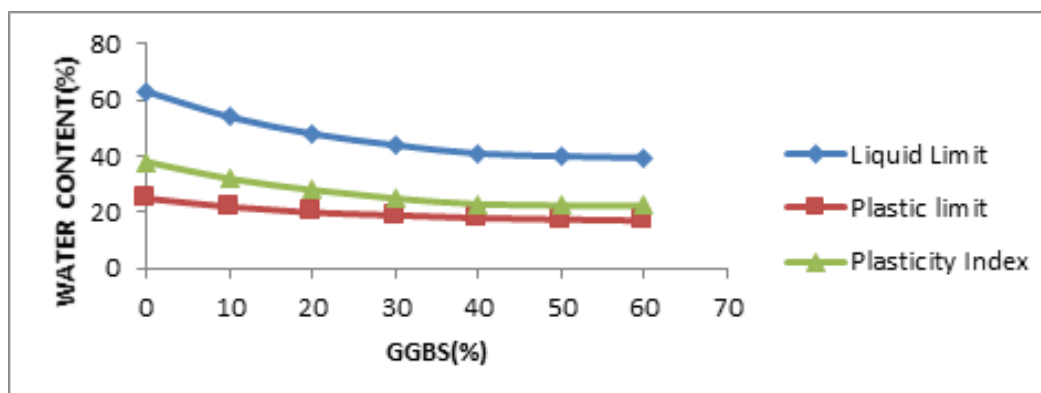


Fig 1: variations of liquid limit, plastic limit and plasticity index with addition of GGBS

Standard proctor test

The standard proctor tests were conducted by mixing different percentages of GGBS from 10% to 50% to the Black cotton soil. After selecting suitable proportion of GGBS as 40%, polypropylene fibres were mixed from 0.25% to 1% in increments of 0.25% and standard proctor tests were conducted on these mixes.

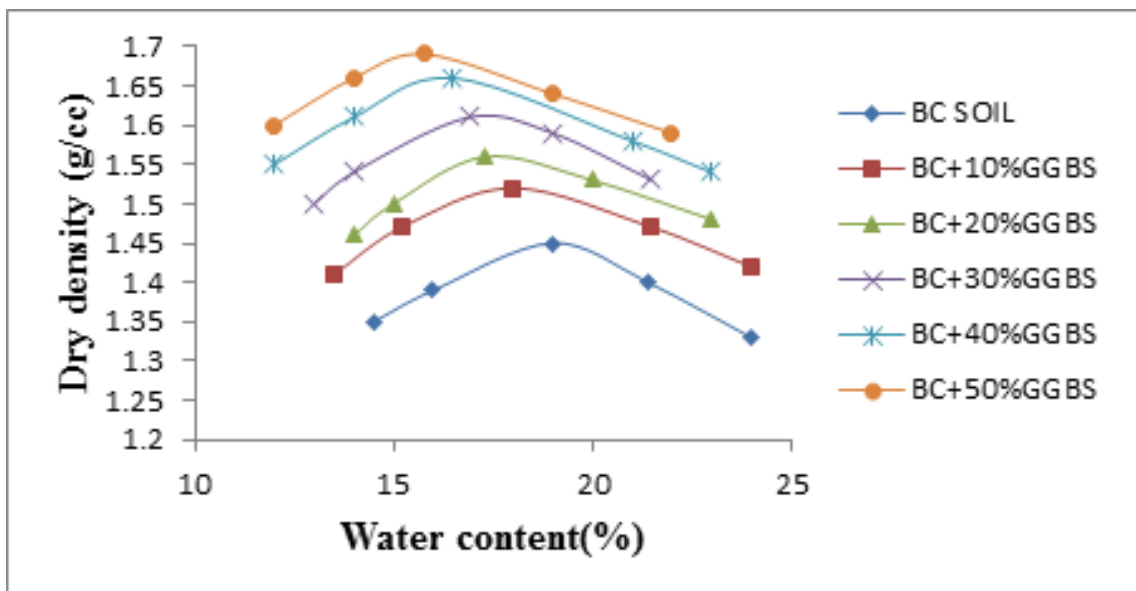


Figure 2: showing changes in OMC and MDD with addition of GGBS to BC soil.

From figure 2, it is observed that there is an increase in the OMC and decrease in MDD when GGBS is added to BC Soil. The decrease of the MDD by adding GGBS to BC Soil is mainly due to its lower specific gravity and the immediate formation of cementation products. The pozzolanic reaction between BC soil and GGBS is responsible for increase in OMC. As GGBS content increases, the water sensitivity of GGBS stabilized clay

decreases i.e., causing only a minor change in dry density with large increase in water content. The dry density increased with GGBS increment upto 40% whereas for 50% GGBS addition, the dry density decreases indicating 40% GGBS content as optimum value. From figure 3, it can be seen that the MDD value decreases with increase in fibre content whereas maintaining nearby constant OMC of 16%.

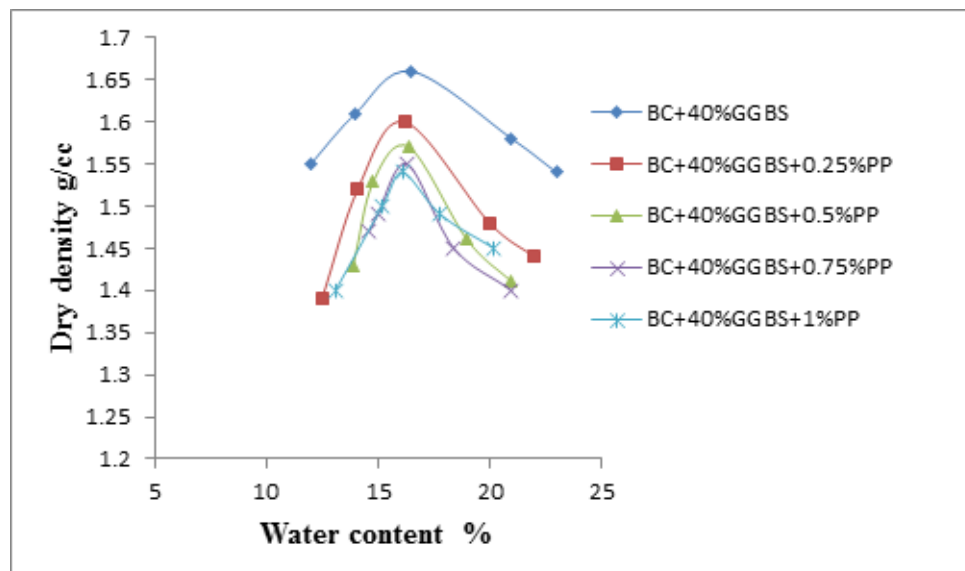


Figure: 3 Showing changes in OMC and MDD of BC soil treated with 40% GGBS with varying percentages of Polypropylene fibres

Unconfined compressive strength

The unconfined compressive strength tests were conducted on the optimum mixes which are selected from standard proctor’s compaction test. The stress-strain behaviour of different composites with 28 curing period is shown in figure 4. Up to 40% GGBS, there is a drastic increment in unconfined compressive strength and there after reduction in UCS strength is observed. The

reason for this behaviour is due to the fact that complete consumption of Ca(OH)_2 by the natural pozzolonic material in the soil happening at 40% GGBS. It can be observed that the maximum UCS is coinciding with the GGBS fixation point obtained from the Atterbergs limits. For more than 40% increment in GGBS content results in non-occurrence of pozzolonic reaction and the added GGBS particle remain as unbounded particles thereby resulting in the reduction of overall strength.

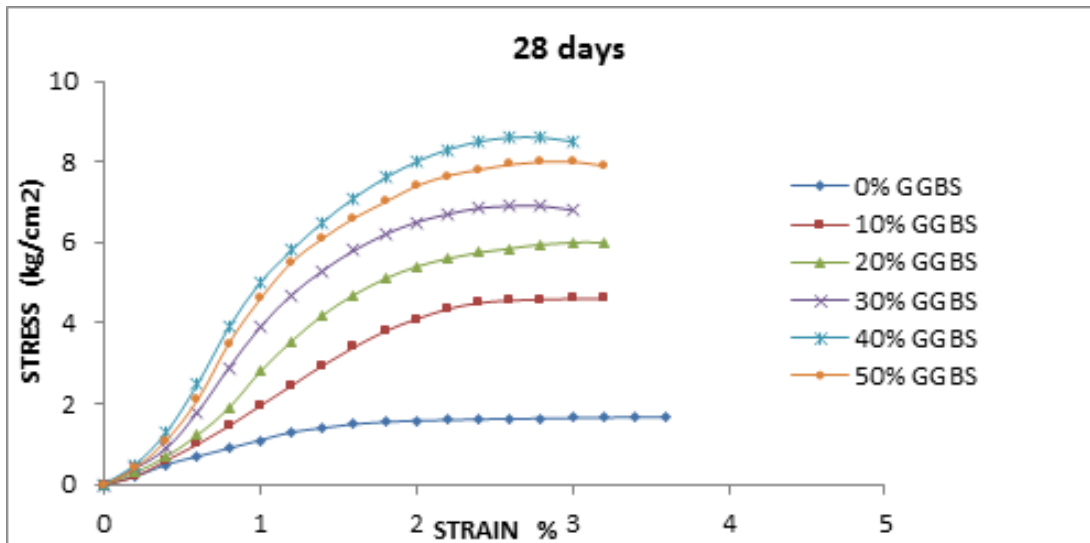


Figure 4: Stress-Strain behaviour of BC soil treated with GGBS for a curing period of 28 days

In the presence of fibers, even when the soil deforms in compression, the normal strains in certain other directions may be a tensile extension. The deformation is resisted by fibers in the direction of the tensile strains through fiber–soil frictional interactions, and the high tensile strength of the fiber itself. The overall failure surface is larger and non-planar, owing to the

presence of fibers, and the failure load and energy are increased. Thus, from the figure 5, it is observed that the peak strength increases for fibre mixed soil-GGBS samples when compared to soil-GGBS mixes. The UCS value increases till 0.75% fibre inclusions whereas on 1% addition of fibres UCS value decreased thereby indicating 0.75% fibres as optimum content.

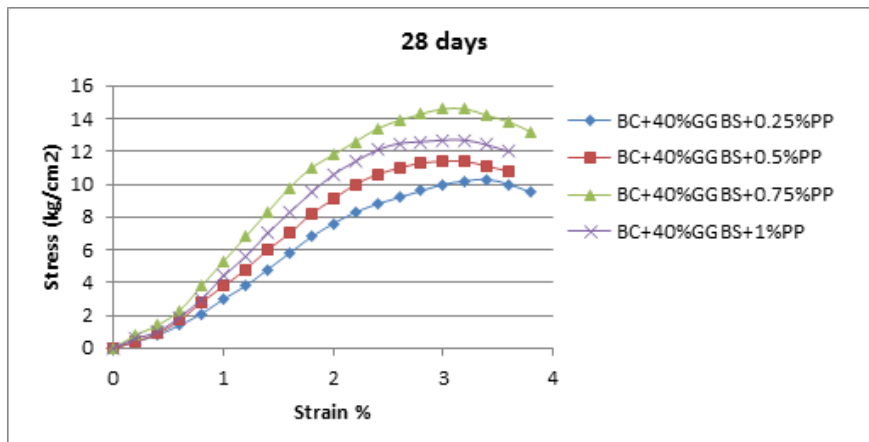


Figure 5: Stress-Strain behaviour of BC soil treated with 40% GGBS with varying percentages of Polypropylene fibres for a curing period of 28 days

Free swell

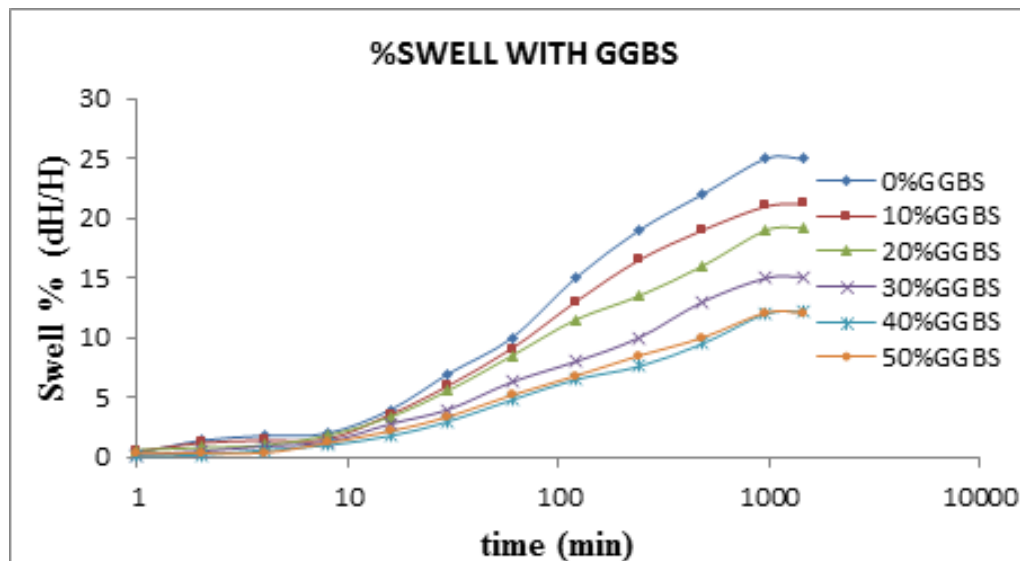


Figure 6: Swell% of BC soil treated with varying percentages of GGBS

From fig. 6, it is observed that when free swell tests were performed on BC soil with different GGBS mixes and it was observed that the swell percent reduced from 24% to 5% for 1000 mins with increase in GGBS from 0% to 40% and for 50% GGBS mix the swell percent was observed to be nearly same as 40% GGBS mix which can be observed from fig6.

In the expansive soil swell percentage is reduced due to exchange of sodium ions in expansive soils with

calcium ions presented in the in GGBS there by leading to the formation of calcium aluminates and calcium silicates which reacts with water and hydration takes place due to pozzolonic reaction The paste which is formed will form a stable cementitious bonded-structure on treatment with slag. On the other hand, as expansive soil is sensitive to the moisture and swelling occurs whereas for treated soils GGBS helps in the prevention of moisture to expel out of soil particles.

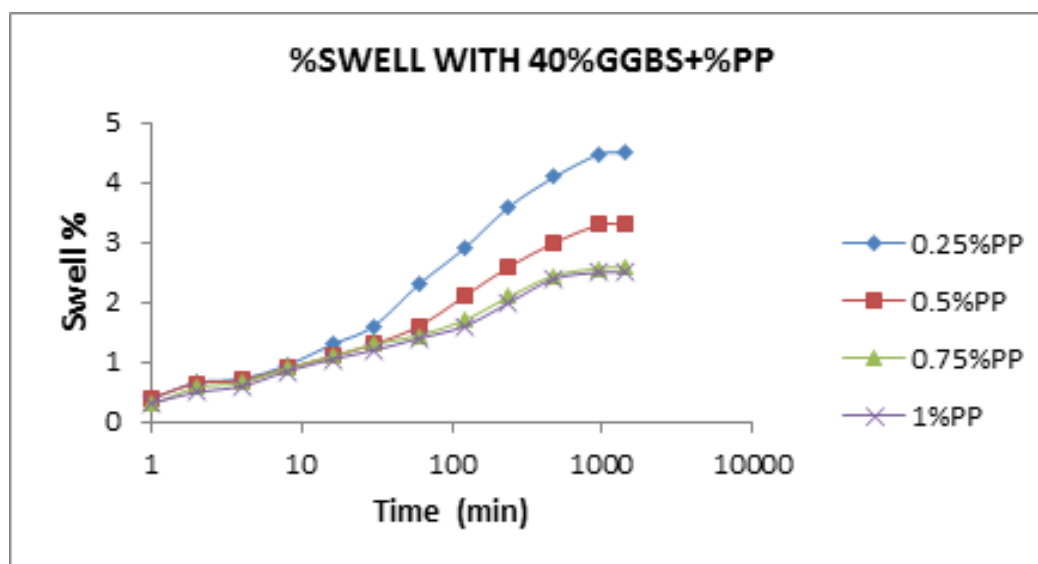


Figure 7: Swell percentage of BC soil treated with 40% GGBS with varying percentages of polypropylene fibres

Free Swell percent tests were performed on BC soil + 40% GGBS content which is considered as optimum percentage and the glass fibres were added in increments of 0.25% till 1%. From fig. 7 it is observed that the swell percent at 40% GGBS was observed to be 5% which was further decreased to 2% with increase in glass fibres from 0.25% to 0.75% where similar results were observed for soil-GGBS mix with 1% glass fibre inclusion. The reason behind this is that as the soil swells, the stretching of the fiber occurs and throughout the length of the fiber tension will be induced which helps in reduction of further swelling. The more the fibers connection with the soil particles, the better effects on swelling reduction.

CONCLUSIONS

The following conclusions can be drawn from the experimental results:

The LL, PI decreased and PL increased with increase in GGBS content on account of the reduction in the thickness of the diffuse double layer and flocculation of clay particles. On further increment in GGBS content from 40% LL, PL and PI values are nearly constant. Thus, 40% GGBS is taken as optimum content.

Addition of GGBS to the BC soil results in increment of maximum dry density and decrement in optimum moisture content because of the reduction in clay content and increment in frictional resistance.

The increment in Unconfined Compressive strength is observed on addition of GGBS up to 40% for 28 days curing period whereas decrement in strength is observed on further addition of GGBS. The UCS value of soil-GGBS- mix is observed to be higher when compared to soil-GGBS mix on account of the higher tensile strength of fibre itself.

Free swell percent is reduced considerably with increment in GGBS content because of the stable cementitious bonded-structure formed through the slag treated soil

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISE Journal Reviewer Committee

REFERENCES

1. Yong, R. N., Ouhadi, V. R., & Mohamed, A. M. O. Physicochemical evaluation of failure of stabilized marl soil. In *Proceedings of the 49th Canadian geotechnical conference frontiers in geotechnology* 1996, 2, pp. 769-776.
2. Du, Y., Li, S., & Hayashi, S., Swelling-shrinkage properties and soil improvement of compacted expansive soil, Ning-Liang Highway, China. *Engineering Geology*, 1999, 53(3-4), pp 351-358.
3. Kamon, M., & Nontananandh, S., Combining industrial wastes with lime for soil stabilization. *Journal of geotechnical engineering*, 1991, 117(1), pp 1-17.
4. Tang, C., Shi, B., Gao, W., Chen, F., & Cai, Y., Strength and mechanical behavior of short polypropylene fiber reinforced and cement stabilized clayey soil. *Geotextiles and Geomembranes*, 2007, 25(3), pp 194-202.
5. Kar, R. K., & Pradhan, P. K. Laboratory tests of reinforced fly ash mix for use as sub-base in low volume rural roads. *Indian Highways*, 2012, 40(1).
6. Amadi, A. A., Enhancing durability of quarry fines modified black cotton soil subgrade with cement kiln dust stabilization. *Transportation Geotechnics*, 2014, 1(1), pp 55-61.
7. IS 2720 Part 3: Laboratory determination of specific gravity of soil, Bureau of Indian Standards, New Delhi, India. 1980.
8. IS 2720 Part 4: Laboratory determination of Grain size distribution of soil, Bureau of Indian Standards, New Delhi, India. 1985.
9. IS 2720 Part 5: Determination of liquid & plastic limit of soil, Bureau of Indian Standards, New Delhi, India. 1985.
10. IS 2720, Part 7: Determination of water content dry density relation using light compaction, Bureau of Indian Standards, New Delhi, India. 1980.
11. IS 2720, Part 10: Determination of unconfined compressive strength of soil Bureau of Indian Standards, New Delhi, India. 1973.
12. IS 2720, Part 40: Determination of free swell index of soil Bureau of Indian Standards, New Delhi, India. 1977.

Discuss the Notion of ‘Sustainability’ and its Application to Archaeological Heritage Management

Zhu Yonghan

*Institute of Archaeology, University College London, WC1E 6BT,
London, Great Britain*

ABSTRACT

‘Sustainability’ is a kind of policy concept which emphasizes a system of harmonious development. This dynamic system is composed of economic growth, well-protected environment and stable society, it devotes to a well-being achievement from generation to generation of human society. This study discusses the application of “sustainability” to archaeological site management, several possible methods, such as educational interpretation, a participatory planning process and the ecotourism, are analyzed. Although some of applications are inevitably faced with problems because the site management is a complicate process, the notion of ‘sustainability’ helps to promote and develop a long-term plan that is beneficial to both local society and archaeological site.

Keywords: *Sustainability, Archaeological Management, Long-Term Development, Well Protection*

INTRODUCTION

As a kind of policy concept, ‘sustainability’ was promoted in the Brundtland Report of 1987, the document discussed the tension between human desire and limited resources¹. Currently, with the increasingly social and environmental problems worldwide, ‘sustainability’ is becoming a significant term because it is believed to help solve these difficulties. Sheehan (2009)² claimed that ‘sustainability’ is usually concerned with social, economic and environmental system. Thus, this term might be able to apply to many fields, such as archaeological site management. In fact, before considering the application of ‘sustainability’, it is wise to rethink the notion of this term. This probably helps lead the work more effectively. The purpose of this study is to discuss the concept of ‘sustainability’ and critically analyze some possible applications to archaeological site management. The discussion of this study will help to promote the related research in sustainable development of archaeological site.

The study achieved objective by being divided into three main parts. Firstly, there is a discussion about the concept of ‘sustainability’. In part two, three possible applications are critically analyzed by discussing their benefits and potential limitations. The last part of this study concludes discussions above and argue that in

general while some applications may be faced with potential problems, the notion of ‘sustainability’ which strongly links to sustainable development, is of great importance to archaeological site management.

Notion of ‘sustainability’

The concept of ‘sustainability’ is not a static one, according to Kuhlam and Farrington(2010)¹, it has changed over a long historical period. Thus, it is necessary to briefly introduce the evolution of this term. The notion of ‘sustainability’ was originally created in forestry to warn woodcutters against harvesting more than new growth³. Obviously, this concept began to discuss a relation between human and nature at that time. Indeed, there usually is an opposite relation between human and nature, because the development of human society inevitably causes consumption of natural resources. Currently, the consumption experiences increasing trend and further generates many problems on environment, such as global warming, water pollution and desertification. With the development of human society and the consumption of nature, how to deal with this opposite relation possibly will become a permanent topic between human and nature.

Over a long period, 'sustainability' also has been regarded as a natural topic of research by economists. For example, a theory about looming mass starvation was published by Thomas Malthus in 1798. Another example is that Harold Hotelling formulated a theory about the optimal rate of exploitation of non-renewable resources in 1936¹.

According to Kuhlman and Farrington(2010), the report of the club of Rome forecast that many important resources would be exhausted within one or two generations, this point of view captured the attention of global public policy¹. In 1987, the World Commission published another famous report which is named Brundtland Report. This report includes a famous definition of 'sustainable development' which still has significant impact on current society. As it defines, "sustainable development is a development that meets the needs of the present without compromising the ability of future generation to meet their own needs"⁴. The reason why this definition has lasting influence is that it not only emphasizes the tension between natural resources and present generation, but also considers the need of future generation. According to this definition, the term which is called 'sustainability' should be considered as a dynamic concept.

In fact, except this famous report, there were countless definitions of 'sustainability' in history. For example, Sheehan(2009)² asserted that 'sustainability' means people need to find a way to lead wealthy, healthy and stable lives without damaging present environment and welfare of future generation. In addition, 'sustainability' might also represents a new course which can help to improve the quality of lives from generation to generation though economic and eco-friendly development⁵. Kuhlman and Farrington(2010) believed that sustainable development is a undertaking to achieve high quality of lives though economic development, social development and environmental protection¹. Clearly, all of these definitions almost involve three elements: economy, environment and society. In fact, even two decades ago, Elkington(1994) pointed out the Triple Bottom Line concept which emphasized that 'sustainability' is mainly concerned with those three elements⁶.

According to Elkington(1994), this concept is a reliable way to operationalize corporate social responsibility. The triple Bottom Line can be divided into

economic bottom line, environmental bottom line and social bottom line. As the term described, 'sustainability' means people need to keep a balance between these three lines. More specifically, the development of profit should care for the environment and human society. This essay will respectively discuss these three elements and summarize a personal view of 'sustainability'⁶.

One of important purposes of 'sustainability' is to maintain economic development⁶. Thus, analyzing the objective of economic development might help to understand the notion of 'sustainability'. Currently, economy is often regarded as equation of money¹. Indeed, as a part of economy, money possibly is a symbol of economy in some areas. However, it is hard to agree that money can represent everything about economy because economy also includes other factors, such as products. Thus, it is also difficult to claim that the purpose of economic development is only to make more profits or improve income. Generally, there is a link between economy and quality of live. With the rapid growth of economy, the fact is that the quality of live has become higher than ever before. Moreover, people tend to feel more satisfied because a high quality of live may help them meet their needs more easily. Thereby, the development of economy plays an indirect but important role in helping people meet their desires. This probably can be considered as the main purpose of economic development.

According to the triple bottom line, environment is another crucial element in notion of 'sustainability'. Sheehan(2009) thought that environment is composed of diverse resources. Hence, resources can be regarded as a symbol of environment². In fact, the growth of economy usually relies on consumption of resources and some of resources are nonrenewable. Therefore, protecting environment is important for humans to achieve a kind of development that can be beneficial to both present generation and future generation. Furthermore, one of most significant processes of conservation is to define what kind of resources should be regarded as environment. Because this can help people identify the targets which they need preserve. Indeed, when people consider environment, it is common that they tend to associate this word with nature because they can easily feel consumption of natural resources. For instance, development of human society usually consumes those fundamental natural resources, such as water, wood and minerals. However, environment not only includes

natural resources. As Kuhlman and Farrington(2010) asserted, environment also involves cultural resources, all the paintings, theories, folklore and other man-made resources should be considered as a part of environment. Therefore, environmental conservation means both natural resources and cultural resources are well-protected¹.

In addition, 'sustainability' is also concerned with social element⁶. The purpose of sustainable development is to meet the needs of present generation and future generation, Kuhlman and Farrington(2010) believed that a stable social structure is helpful to achieve this object. Indeed, it is often easier for people to organize their work effectively in a stable society¹. Thus, a well-organized human society is a cornerstone of economic growth and environmental preservation. In general, social structure is a system of social elements, these elements contain population, institution, social groups, and other important factors. A stable social structure means all of these elements should be managed both reasonably and efficiently⁷. Therefore, a rational management of social structure is important to achieve sustainable development.

After a long discussion above, some main characteristics of 'sustainability' probably can be found out to help make a personal definition. According to the Triple Bottom Line concept, 'sustainability' mainly consists of economic, environmental and social elements⁶. Moreover, because the main purpose of 'sustainability' is to help both present generation and future generation achieve well-being, this term should be seen as a dynamic concept. In conclusion, 'sustainability' is a dynamic system which aims to helping people meet their needs from generation to generation. The whole of system achieves its objective by maintaining economic growth, well-protected environment and stable society from generation to generation. According to this personal understanding, in the next part, this essay will critically analyze some possible applications of 'sustainability' to archaeological site management.

Possible applications of 'sustainability' to archaeological site management

Archaeological site management, as a complicate progress, contains many specific contents. This essay only chooses three possible applications of 'sustainability' to this field and critically discuss

them. Firstly, the conception of 'sustainability' can be applied to interpretation of site management. Nigro and Taha(2006) suggested that the sustainable role of interpretation within site management area can be approached from a preservation perspective⁸. More specifically, interpretation is believed to achieve this sustainable role through two processes. In the first process, interpretation is used to help the public understand the values and uses of archaeological site, this process is related with education⁸. For instance, some education programs probably help the explanation to both visitors and residents. Furthermore, Heritage sites inevitably face different problems. Hence, Nigro and Taha(2006) claimed that the second process is to interpret these issues and explain how to deal with them. This might help the public raise the awareness of their behaviors because they can know how to cooperate with managing plan. After these two interpretative processes, Nigro and Taha(2006) believed that some of visitors and residents will change their attitudes as well as behaviors. In fact, these changes play a sustainable role in protecting heritage site because economy, environment and local society all benefit from these changes. For instance, interpreting the values and uses of heritage site may enhance awareness of the public and create a sense of ownership⁸. As a result, the public tend to reduce some activities that have negative impact on the environment of heritage site, such as looting, rubbish dumping and damage⁸. Sometimes, visitors even donate money after they know the value of heritage site and these donation may make an economic contribution. Moreover, a detailed explanation of issues and plans helps the public understand how to cooperate with managing strategies. One example is that the public tend to comply with managing arrangement and social orders. This plays a positive role in maintain a stable local society. Obviously, the most important role of interpretation is to provide a protective motivation for people. When the public improve their motivations of conservation, their behaviors will be beneficial for economy, environment and society. This helps to achieve a sustainable and long-term conservation.

In addition, there is a valuable view which need be considered. Because archaeological site management is a long process, interpretation should maintain the sustainable role as much as possible in the long process. Thus, explanation not only communicate present situation of heritage site, but also introduces a possible

future⁸. This may help the public understand the whole managing strategy more comprehensively and know how to cooperate with this strategy over a long period of time.

Meanwhile, the notion of 'sustainability' also can be applied to the planning process of site management. Nigro and Taha(2006) pointed out that a participatory planning process partly reflects this concept because this kind of planning process contributes to maintaining a stable local society⁸. Generally, participatory planning process is used to create an effective communication between site managers and stakeholders⁸. Through the communication, stakeholders can directly join in the planning process of heritage management. In the planning process, stakeholders have chances to share their opinions as suggestions. It is clear that their sense of ownership can be increased in this way. As a result, more adaptive decisions are made and stakeholders usually tend to support these decisions, because these plans include some of their suggestions and needs. Finally, it is helpful to maintain a stable society because most of people are willing to comply with managing strategies. Therefore, the sustainable role of a participatory planning process is to help keep local society stable.

Because 'sustainability' means a the social order should be maintained steady from generation to generation. Thereby, before making every important decision, stakeholders should be invited to join in a participatory planning process. This can help managing plan continuously be supported by stakeholders. Moreover, Nigro and Taha(2006) also thought that site managers need to invite stakeholders as many as possible because it is helpful to achieve a more extensive communication⁸. Then after extensive debate, a more reasonable decision might be made. Indeed, a more reasonable plan means it is supported by more people, the social order can benefit from this kind of wide support. However, one problem is that more stakeholders may easily cause a difficult negotiation because the managing plan should meet more needs. Sometimes, it is hard to achieve a compromise due to many different standpoints. Personally, before inviting stakeholders, a significant task is to find out those key stakeholders who have strong relation to the managing strategy. Their suggestions should be firstly considered because they are concerned about the managing plan more than other stakeholders. In general, a managing plan involves four groups of key stakeholders: local

communities, site managers, operators and visitors. These four groups of people are directly affected in different ways by managing policy⁹. Therefore, the opinions of these four groups are more considerable. In fact, it is difficult to make a decision that can satisfy every stakeholder, what site managers can do is to meet the needs as many as possible through a participatory planning process. Hence, when many stakeholders are involved in a managing planning process, it is wise to firstly consider the interests of key stakeholders.

Currently, with the rapid growth of tourism industry, ecotourism is believed to help achieve a sustainable development of archaeological site. According to Keitumetse(2009), ecotourism is a kind of responsible trip to natural areas that improves the well-being of local society without environment damage¹⁰. Clearly, this definition conforms with the notion of 'sustainability'. From a sustainable perspective, Wood(2002) claimed that ecotourism has four important roles¹¹. The first role is that ecotourism emphasizes responsible business which works cooperatively with local government and residents in order to improve local economy. As a kind of tourism, ecotourism emphasizes the economic value of archaeological site and one of most significant roles of ecotourism is to develop economy. For instance, area protected tourism in Canada made nearly 370 billion dollars in 1996⁹. Moreover, tourism is the second largest source of foreign currency in Egypt, because this industry makes countless profits, Egyptian authorities highly value tourism industry¹². In fact, ecotourism aims to improving local economy, government and residents usually prefer to support a managing strategy that can improve local economy. Therefore, site managers should consider the tourism as a part of managing strategy. The second sustainable role of ecotourism is to help residents and local authorities raise the awareness of heritage conservation¹¹. Generally, travelers are the main financial source in tourism industry, and they often prefer to visit a well-protected heritage site rather than a damaging one. Thereby, local government and residents tend to value the site and protect it. This is beneficial for both heritage site and local environment. If the heritage site can constantly attract visitors, it will be protected by local communities from generation to generation. Wood(2002) also pointed out that ecotourism directly provides an economic support for archaeological site conservation. With the development of tourism, more revenues can be offered to site management and environmental preservation¹¹.

For example, it is common that entrance fees account for a large proportion of protective expenditure in developed countries. In 1994, this proportion is over 40%⁹. According to Wood(2002), the last sustainable role of ecotourism is to minimize the negative influence on natural and cultural environment¹¹. As a complicate industry, tourism inevitably leads to some problems and these issues may threaten heritage sites as well as natural environment. For instance, site managers and local communities usually blame an excessive number of visitors for damaging environment. Indeed, although visitors make economic contribution, they also impose pressures on heritage site and nature. However, in contrast to conventional tourism, ecotourism not only emphasizes the economic benefits, but also concentrates on environmental preservation. Developing ecotourism means site managers and local authorities should make reliable plans to minimize visitor impacts¹¹. For example, site managers need to design a reasonable tour route that avoids some sensitive areas, and local government also can provide a certain level of environmental education for visitors⁹. Therefore, ecotourism can reduce the negative impact on environment and promote sustainable development of heritage site.

In fact, one of most important problems might be that some local authorities refuse to develop the ecotourism. Compared with traditional tourism, ecotourism needs more investment because it requires a great deal of information to make a sustainable plan. For instance, before making a strategy of sustainable tourism in Sahara, much information was collected by researchers, such as population, trade, geographic features and climate¹². Thus, some governments tend to develop a tourism that only concentrates on making profits because it is unnecessary to invest much money in environmental conservation. However, the fact is that this kind of unsustainable development only makes a short-term benefits. With the environmental deterioration, visitors gradually lose interests in the archaeological site. Thereby, a long-term consideration is of significance. Personally, it is wise to develop an ecotourism due to these sustainable roles.

CONCLUSION

‘Sustainability’ is a kind of policy concept which emphasizes a system of harmonious development. This dynamic system is composed of economic growth, well-protected environment and stable society. In this system,

these three elements work cooperatively to help people achieve well-being from generation to generation. Furthermore, as a policy conception, the notion of ‘sustainability’ can be applied to archaeological site management. In fact, several possible applications were discussed above, such as educational interpretation, a participatory planning process and the ecotourism. Although some of applications are inevitably faced with problems because the site management is a complicate process, the notion of ‘sustainability’ helps make a long-term plan that is beneficial to both local society and archaeological site. For instance, with sustainable development, the economic level of local society is improved and heritage site can be protected well by local communities. Therefore, the concept of ‘sustainability’ is worthy to be considered when site managers make a plan.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISSE Journal Reviewer Committee

REFERENCES

1. Tom Kuhlam and John Farrington, What is sustainability. *Sustainability*, 2010,10(2), pp.3436-3448.
2. Brendan Sheehan, What is sustainability. *Control Engineering*,2009, 3(21), pp.1-12.
3. Wiresum,K.F. Years of sustainability in Forestry: Lessons from History. *Environ, Manage*, 1995,19(5), pp.321-329.
4. WCED(World Commission on Environment and Development), *Our common future*. Tokyo,Japan, New York:Oxford University Press.1987.
5. Paul Johnston, Mark Everard, David Santillo and Karl-Henrik Robèrt. Reclaiming the Definition of Sustainability. *Discussion Articles*,2007, 14(1), pp.60-66.
6. Elkington,J. Towards the sustainable corporation: Win-win-win business strategies for sustainable development. *Calif,Manage,Rev*,1994, 36(3), pp.90-100.
7. S. Hill and B.S.Turner, *The Penguin Dictionary of Sociology*, 4th edition, London: Penguin.2000.
8. Lorenzo Nigro and Hamdan Taha, *Tell Es-Sultan/*

- Jericho In The Context Of The Jordan Valley:Site Management, Conservation and Sustainable Development. Ramallah: Rome “La Sapienza” University.2006.
9. Paul F. J. Eagles, Stephen F. McCool and Christopher D. Haynes. Sustainable Tourism in Protected Areas: Guidelines for Planning and Management. Cardiff: The World Conservation Union.2002.
 10. S.O.Keitumetse. The Eco-tourism of Cultural Heritage Management (ECT-CHM): Linking Heritage and ‘Environment’ in the Okavango Delta Regions of Botswana. International Journal of Heritage Studies, 2009, 15(2), pp.223-244.
 11. Megan Epler Wood. Ecotourism:Principles, Practices and Politics For sustainability. Paris: Unite Nation Environment Program,2002.
 12. Ezzedine Hosni. Strategy for Sustainable Tourism Development in Sahara. Paris:Unite Nation Educational, Scientific and Cultural Organization.2000.

Customer Shift from E-Banking to M-Banking in State Bank of India: A Study to Identify Influencing Factors Causing the Change in Behaviour

Deepa Damodaran, N Sambandam

¹Assistant Professor, ²Pro Vice Chancellor, VIT Business School, VIT University, Chennai Campus, India

ABSTRACT

The basic purpose behind writing this paper is to identify those variables that causes shift of customers from e-banking to m-banking of State Bank of India. A quantitative approach was used. The study was conducted on 450 people customers, out of which 384 respondents were finally shortlisted. Simple random sampling method was used to select them. It was identified that perceived benefits of using the banking services over mobile phones, influence of peer groups, service provider facilitating conditions and technology are the major influencing factors. It was suggested that banking institution must extend their services offering through the m-banking and more and more customers must be encouraged and convinced to use m-banking services. Emphasis must be laid on ease of use of technology in the hands of customers. Employees must be trained enough to promote m-banking services not only in-house (within the branch), but also by becoming brand ambassadors in promoting m-banking services at other places as well. Bank must make use of different medium of communication to connect with customers to increase level of awareness and to build positive perception of customers towards m-banking services.

Keywords: *Technology Acceptance Model, M-Banking, Services, State Bank of India.*

INTRODUCTION

Technology advancement over past few years had a tremendous effect on Indian banking industry leading different players to introduce its offerings over mobile for its customers, timely, safely and reliably. Banking system have a history of over 200 year's serving the customers through their branch-based systems. However, developments in technology and growth in e-commerce revolutionized the nature of banking activities towards its customers.

Stiff competition within the BFI sector has forced the players to develop strategies to overcome competition level and to survive within this environment^{[1][18][11]}. Need is to develop, adopt innovative technologies and to transform their business operations to web-based by adding element of mobility. Mobile based banking activities ushered a new era within banking sector across the globe^{[19][32][29]}, leaving with the banks as their only survival strategy^{[1][18][11]}.

Despite of the fact that m-banking extends numerous advantages to users, the adoption process is not exciting^{[27][19][28]}. The success is decided how user uses m-banking services in daily activities^{[20][17]}. Lot of studies were conducted to explore various factors that effects consumers' to accept m-banking^{[3][1][9][7][10][12][11][16][15]}. However, findings remained fragmented. No relation identified between different factors that effect IN adoption m-banking services offered by banks^{[21][10][28]}.

Mobile banking is a result of wireless communication interface that add value for customers with respect to banking transactions. Providing banking services over smart phones is a miraculous development in present scenario. Use of smart phones to perform banking operations is in infancy stage, even then momentous development is observed which promises remarkable outcomes in future^[43].

The amazing development of technology and its expansion into monetary and banking markets across the world has considerably changed current banking

methods while providing facilities in customers' affairs. With the increasing growth of electronic commerce transactions across the world and today's commerce need for bank participation in financial resources transfers, electronic banking has become an inseparable part of electronic commerce and plays a fundamental role in its implementation. It is worth noting that electronic commerce is not realized without electronic banking. With the development of internet and its accessibility to all people, the method of service providing has extensively changed in banks and these developments have laid the grounds for the emergence of phenomena such as mobile banking, internet banking and virtual banking^[40].

Currently, banks have provided online banking services for their customers via the internet in most developed countries and customers can easily perform most of their bank affairs by getting connected to banks home pages using their unique account passwords without their presence in banks. These factors have created a platform for facilitating commercial transactions resulting in competition growth among financial banks and non-bank institutes. Therefore, Electronic banking is defined as providing certain facilities for the customers who can access banking services without the need for their physical presence in bank using secure interfaces^[39].

E-banking is a mix of all those e-channels that customers use to access their bank accounts to make money transfer or to pay their bills^[44]. Mobile-based banking is considered as one of the latest achievements of technology in banking industry, which serves numerous advantages for banks and their customers. Thus, bank managers' interest in identifying which factors and elements may lead to the use of services such as mobile-based banking by customers is obviously justified. In addition, finding influential factors in accepting and using such services will provide more appropriate planning in the enhancement of the number of mobile-based banking services users and faster utilization of this modern phenomenon both for banks and users of this high-tech service.

Based on the experiences of the developed countries and the growth of electronic banking services could help predict the evolving and increasing process of needs in banking services in India to some extent. Referring to the current traditional methods in national banks and the insufficiency of these methods in providing new banking

services, it is highly crucial to establish the required infrastructures in banks, which is fortunately highlighted by the related authorities. In addition, certain expansive activities have been completed in the banking system to present electronic banking and other modern banking services^{[41][42]}.

LITERATURE REVIEW

M-banking

In present scenario, almost all of the banks are now busy in providing their product mix and services mix electronically that reduces the use of traditional practices followed from decades. Customers' likelihood towards smart phones also provided a new channel of marketing in the hand of banking industry. More and more banking activities are now technology driven creating a need to identify and understand competition within the industry. Technological developments have given a new dimension to concepts of services marketing^[6].

Using the term '*electronic banking*' means making the information related to services and product offerings available to users via electronic or wireless channels^[22]. It is necessary to quote at this point that though the technology based applications that expedite the users to perform banking services are available, but the fact is that the USE (usage rate) within India and across the globe is too low. Even the financial institutions of developed nation's offered mobile based banking services to their users, very recently. Hence, m-banking services is still in infancy stage^{[23][14]}.

Technology based m-banking blessed customers and banks with number of advantages. Banks are able to reduce down the cost and time of serving their users; whereas, provided convenience of place and time to conduct transactions resulting in quality service delivery^{[11][17][29][18][33]}. However, these benefits will get applause if m-banking are adopted by every single user using banking services^{[12][3][17][21][20][28]}.

M-banking Scenario in India

Recent telecommunication developments is considered as genesis of m-banking and given a channel in hands of shoppers to transact^[4]. M-Banking may also be considered to be as m-commerce where users carry bank with them and enjoy all the services over it phone with the help of mobile applications, economically. This

also helps in increasing customer's satisfaction and thus leading to loyalty^[11].

Indian users does not believe in taking risks especially when it is related to monetary aspects, therefore banks need to ensure security of customer's money. Quick technological developments have re-drafted all the processes of providing services, which finally become the backbone of economic growth. Banking sector also admires the effect of technology advancement over its functioning and customer's-centric activities that can be easily amended because of information technology. Technological developments not only assisted banks in extending their offerings to customers such as ATM, Internet Banking, and M-Banking etc., but drawn their attention towards customization also. Replacement of plastic money over conventional note is the result of such technological advancement^[34].

Growth of Indian Economy in recent years is the result of liberalization in 1991 that also leads to transform banking sector in a great way^[8]. The government has taken corrective measures resulting the growth in monetary sector. Indian banking discovered vital reforms in recent times with a focus around profit, minimum investment and maximizing the value and satisfaction of the client. In spite of all these happenings, one area of concern is left behind i.e. long waiting queues within banks. Therefore, mobile banking could be the answer to this issue^{[25][26]} as customers can perform different banking activities without actually moving to the banks, physically^[13].

There exists a direct relationship between the use of new technology and bank's performance. Therefore, it is said that technology plays an important role in elevating quality of banking services, however, Indians believe to have face to face contact with the personnel's of service provider which is not available in technology based services^[5]. Therefore it is required to identify those factors that effects customers' to adopt technology based services i.e. m-banking in India and how customers react to it after adopting the same^{[24][31]}.

India enjoys second largest mobile user base of the world which accounts to be 10% of total global users. Approximately, 983.21 MM customers' are mobile users, out of which 57.69% represents urban area and remaining 42.31% represents rural areas of India.

In India, ICICI bank and Union bank must be praised for introducing the concept of m-banking^[2]. Presently, banks are targeting to the segment of users who might not have access to computer but have a mobile phone. Introduction of idea 'Digital India' developed the prospects for m-banking growth in India. Security, privacy, quick changing technology and lack of information are creating problems in the way of m-banking revolution in India^[30].

Statement of Problem

Although Mobile banking service has been recognized as a newly established system within the country, it may encounter an important problem in the process of development which is due to the non-acceptance of its practical usage by the users. Thus, it is essential to follows certain research in order to identify the influential factors involved. This problem is likely to play a considerable impact on the level of application and expansion of mobile banking, since we are facing an updated technology which is not widely welcomed by numerous public customers. Despite its remarkable advantages and banks' substantial investment, mobile banking has not received satisfactory acceptance and recognition by public users yet. Hence, it is crucially important to determine the key factors involved in accepting and using this new developed technology^[35].

Recently, all organizations are seeking to attract more customers and increase their satisfaction. It is of particular importance in case of banks, which are in frequent contact with customers. On the other hand, competition between banks and interest free loan institutions and other forms of absorbing financial resources are growing rapidly. Nevertheless, creating competitiveness for banks survival is very essential. Modern bank services which are closely integrated with information and telecommunication technology serve as highly important factors in developing competitiveness for banks, inducing customers' attraction and increasing their satisfaction^[36].

Significance of the Study

Today's, banking industry is changing as fast as possible. Technology will lead in breaking legal, geographical, and industrial obstacles and in developing new service-mix for the bank's customers. It is more than 2 centuries during which banks served their customers via network of branches. However, the way the services

mix are offered to customers changed greatly as a result of the advancement in Information Technology.

It is worth noting that mobile banking technology has expanded in recent years as a method to maintain customers' faithfulness and increasing market share. Thus, the present study seeks to examine different

influential factors changing change in behaviour from online based banking to mobile based banking, and play an effective role in increasing customers' use of mobile banking.

Research Hypotheses

Table 1 indicates the various research hypotheses

Hypotheses	
H ₁	Relationship between perceived advantage of using m-banking and customers' attitude is significant.
H ₂	Relationship between complexity of using m-banking and customers' attitude is significant.
H ₃	Relationship between compatibility of using m-banking and customers' attitude is significant.
H ₄	Relationship between peer group and subjective norms is significant.
H ₅	Relationship between superior group and subjective norms is significant.
H ₆	Relationship between self-efficacy and perceived behavioural control is significant.
H ₇	Relationship between source facilitator conditions and perceived behavioural control is significant.
H ₈	Relationship between technology facilitator conditions and perceived behavioural conditions is significant.
H ₉	Relationship between bank customers' attitude and behavioural tendency toward using mobile banking is significant.
H ₁₀	Relationship between bank customers' subjective norms and behavioural tendency toward using mobile banking is significant.
H ₁₁	Relationship between perceived behavioural control and behavioural tendency toward using mobile banking is significant.
H ₁₂	Relationship between behavioural tendency toward using mobile banking and customers' actual behaviour from online banking to mobile banking is significant.

Table 1 Research Hypotheses

METHODOLOGY USED

A quantitative approach was used. The study was conducted on 450 people customers, out of which 384 respondents were finally shortlisted with use of simple random sampling method. The questionnaires consist of close-ended questions in order to have proper considerate, precise and authentic information about the research problem. The Planned Behaviour Theory Questionnaire including 39 questions, along with a sociological questionnaire including age, sex, studies, monthly income were applied for data collection. In order to insure the reliability of the questionnaire, Cronbach's α coefficient techniques was used. Table-2 indicates the reliability of the variables included in the questionnaire.

Variable	α
Variable-1: Perceived Advantage	0.81
Variable-2: Complexity	0.93
Variable-3: Compatibility	0.75
Variable-4: Peer Groups	0.82
Variable-5: Superior Groups	0.78
Variable-6: Self-Efficacy	0.72
Variable-7: Source Facilitator Conditions	0.71
Variable-8: Technology Facilitator Conditions	0.76
Variable-9: Attitude	0.88
Variable-10: Subjective Norms	0.88
Variable-11: Perceived Behavioural Control	0.85
Variable-12: Behavioural Tendency of Using	0.88
Variable-13: Actual Behaviour of Using	0.81

Table-2: Reliability Coefficient for the Variables

Sources: Primary Data Analysis

Data Collection

In order to collect data on literature and theoretical issues of this research, the author used library method such as books, and articles, dissertations, websites etc., were applied while questionnaire distribution, field-

survey study and holding analytical meetings managers and employees were used in order to collect data on research hypothesis.

Hypothesis Testing

Data were analysed as shown in Table 3.

Hypothesis	Standardized Coefficient	t-Value	P-Value	Result
H ₁	0.53	9.66	< 0.01	+
H ₂	0.37	- 6.55	< 0.01	+
H ₃	0.15	2.89	< 0.01	+
H ₄	0.45	8.12	< 0.01	+
H ₅	0.38	7.10	< 0.01	+
H ₆	0.08	1.89	< 0.01	-
H ₇	0.42	7.67	< 0.01	+
H ₈	0.40	7.66	< 0.01	+
H ₉	0.61	10.97	< 0.01	+
H ₁₀	0.43	8.22	< 0.01	+
H ₁₁	0.33	6.42	< 0.01	+
H ₁₂	0.68	12.35	< 0.01	+

Table-3: Research Hypothesis Testing

Sources: Primary Data Analysis

RESULTS AND DISCUSSION

Descriptive results for main research variables

The mean values indicate that with regard to average value (number 3), the mean value of all variables except “complexity” is higher than the mean level. The highest mean value belongs to variable 1 (M = 4.3), variable 9 (M = 3.9) and variable 11 (M = 3.8). The lowest mean belongs to variable 2 (M = 2.4).

Correlation of Variables

The results of Pearson’s correlation test indicated that a positive correlation was observed between variables 1, variable 3 and variable 9 ($p < 0.01$) while it was negatively correlated with variable 2. Further, a positive and meaningful correlation was observed between variable 10 and variable 4 ($r = 0.6$), and variable 5 ($r = 0.5$). In addition, there is positive and meaningful correlation between variable 11 and variable 6 ($r = 0.6$), with variable 7 ($r = 0.6$) and variable 8 ($r = 0.7$).

The results of the study showed that the intensity of correlation between variable 9 and variable 12, between variable 10 and variable 12, and between variable 11 and variable 12 is equal to 0.59, 0.5 and 0.52, respectively. The results also indicated that a meaningful correlation was reported between variable 12 and variable 13 ($r = 0.7$).

Correlation Analysis of the Research Components

Amongst the different influencing variables of attitude, the highest level goes to variable 1 ($r = 0.5$). Regarding subjective norms, variable 4 had the highest correlation ($r = 0.4$). Amongst the different variables on behavioural control, variable 7 and variable 8 had the highest correlation ($r = 0.4$). Finally, regarding behavioural tendency, the highest correlation was observed between variable 9 and variable 12 ($r = 0.6$).

Recommendations for Research Hypotheses

Regarding the results of research hypotheses, the following recommendations are made.

It is suggested that the banks must expand their service offerings via m-banking and must encourage customers to use it.

m-banking software must be simple to handle and easy to understand for customers.

Because of the increasingly rapid changes of environment, every six months or every year, a field study should be performed for the customers in order to achieve an accurate understanding of the customers’ basic needs and substantial beliefs.

Employees must be trained enough to promote m-banking services not only in-house (within the branch), but also by becoming brand ambassadors in promoting m-banking services at other places as well.

It is also recommended to hold regular meetings with managers of different organizations explaining the advantages of using mobile banking services, they are more encouraged and motivated toward using mobile banking services and are requested to introduce these special advantages to their employees.

Banks should enhance the individuals’ self-efficacy in using computers and internet banking systems by holding workshops and training courses.

It is suggested that bank authorities should provide available and ready-made references such as skilled individuals or groups with strong communicative capabilities and appropriate teaching skills via online or telephone for guiding and helping customers in facing problems during internet banking operations in order to improve source facilitator conditions.

Bank authorities are advised to establish internet banking systems in brochures, home pages, websites, mass media, etc., in order to take effective steps in attracting customers' confidence and motivating them to use mobile banking services.

Banking systems authorities should influence families perceptions and attitudes in creating more tendency to use internet banking services by proper advertisements via mass media and correct marketing.

It is suggested that bank managers should provide customers' satisfaction and comfort of mobile banking by having full knowledge of internal and external factors.

Bank managers must use combination of different medium of communication mix (both electronic media and print media) to increase awareness level and must take necessary measures to create positive attitude on use ability of mobile banking amongst general public.

CONCLUSIONS

The basic purpose behind writing this paper is to identify those variables that causes shift of customers from e-banking to m-banking of State Bank of India. It was identified that perceived benefits of using the banking services over mobile phones, influence of peer groups, service provider facilitating conditions and technology are the major influencing factors. It was suggested that banking institution must extend their services offering through the m-banking and more and more customers must be encouraged and convinced to use m-banking services.

Ethical Clearance: Taken from VIT University

Source of Funding: Self

Conflict of Interest: NA

REFERENCES

1. Alalwan AA, Dwivedi YK, Rana NP, Williams MD. Consumer adoption of mobile banking in Jordan: Examining the role of usefulness, ease of use, perceived risk and self-efficacy. *Journal of Enterprise Information Management*. 2016 Feb 8;29(1):118-39.
2. Ali SS, Bharadwaj RK. Factor analysis approach of decision making in Indian E-banking: A value adding consumer's perspective. *International Journal of Business Innovation and Research*. 2010 Jan 1;4(4):298-320.
3. Alwahaishi S, Snásel V. Acceptance and use of information and communications technology: a UTAUT and flow based theoretical model. *Journal of technology management & innovation*. 2013 May;8(2):61-73.
4. Barnes SJ, Corbitt B. Mobile banking: concept and potential. *International Journal of Mobile Communications*. 2003 Jan 1;1(3):273-88.
5. Barnes JG, Howlett DM. Predictors of equity in relationships between financial services providers and retail customers. *International Journal of Bank Marketing*. 1998 Feb 1;16(1):15-23.
6. Bitner MJ, Brown SW, Meuter ML. Technology infusion in service encounters. *Journal of the Academy of marketing Science*. 2000 Jan;28(1):138-49.
7. Carlsson C, Carlsson J, Hyvonen K, Puhakainen J, Walden P. Adoption of mobile devices/services—searching for answers with the UTAUT. In *System Sciences, 2006. HICSS'06. Proceedings of the 39th Annual Hawaii International Conference on 2006 Jan 4 (Vol. 6, pp. 132a-132a)*. IEEE.
8. Chakraborty I. Financial development and economic growth in India: An analysis of the post-reform period. *South Asia Economic Journal*. 2010 Sep;11(2):287-308.
9. Chitungo SK, Munongo S. Extending the technology acceptance model to mobile banking adoption in rural Zimbabwe. *Journal of Business Administration and Education*. 2013 Mar 7;3(1).
10. Cruz P, Barretto Filgueiras Neto L, Munoz-Gallego P, Laukkanen T. Mobile banking rollout in emerging markets: evidence from Brazil. *International Journal of bank marketing*. 2010 Jul 27;28(5):342-71.
11. Cudjoe AG, Anim PA, Nyanyofio JG. Determinants of mobile banking adoption in the Ghanaian banking industry: a case of access bank Ghana limited. *Journal of Computer and Communications*. 2015 Feb 11;3(02):1.
12. Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*. 1989 Sep 1:319-40.
13. De P, Hu Y, Rahman MS. Technology usage and

- online sales: An empirical study. *Management Science*. 2010 Nov;56(11):1930-45.
14. Durlacher Report. UTMS Report. An Investment Perspective. page available at www.durlacher.com/downloads/umtsreport.pdf. Version current as of 9th December 2002.
 15. Gu JC, Lee SC, Suh YH. Determinants of behavioral intention to mobile banking. *Expert Systems with Applications*. 2009 Nov 1;36(9):11605-16.
 16. Hanafizadeh P, Behboudi M, Koshksaray AA, Tabar MJ. Mobile-banking adoption by Iranian bank clients. *Telematics and Informatics*. 2014 Feb 1;31(1):62-78.
 17. Koenig-Lewis N, Palmer A, Moll A. Predicting young consumers' take up of mobile banking services. *International journal of bank marketing*. 2010 Jul 27;28(5):410-32.
 18. Koksall MH. The intentions of Lebanese consumers to adopt mobile banking. *International Journal of Bank Marketing*. 2016 May 16;34(3):327-46.
 19. Laukkanen T. Internet vs mobile banking: comparing customer value perceptions. *Business process management journal*. 2007 Nov 13;13(6):788-97.
 20. Laukkanen T, Kiviniemi V. The role of information in mobile banking resistance. *International Journal of Bank Marketing*. 2010 Jul 27;28(5):372-88.
 21. Mathieson K. Predicting user intentions: comparing the technology acceptance model with the theory of planned behavior. *Information systems research*. 1991 Sep;2(3):173-91.
 22. Mattila M. Factors affecting the adoption of mobile banking services. *The Journal of Internet Banking and Commerce*. 1970 Jan 1;8(1).
 23. Mattila M, Pento T. Development of Electronic Distribution Channels in Finland—M-banking Usage and Customer Profiles. *BIT*. 2002 Feb;2(2002):41-9.
 24. Ngai EW, Gunasekaran A. A review for mobile commerce research and applications. *Decision support systems*. 2007 Feb 1;43(1):3-15.
 25. Olatokun WM, Igbinedion LJ. The adoption of automatic teller machines in Nigeria: An application of the theory of diffusion of innovation. *Issues in Informing Science & Information Technology*. 2009 Jan 1;6.
 26. Pavlou PA. Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model. *International journal of electronic commerce*. 2003 Apr 1;7(3):101-34.
 27. Riquelme HE, Rios RE. The moderating effect of gender in the adoption of mobile banking. *International Journal of bank marketing*. 2010 Jul 27;28(5):328-41.
 28. Shaikh AA, Karjaluo H. Mobile banking adoption: A literature review. *Telematics and Informatics*. 2015 Feb 1;32(1):129-42.
 29. Shambare R. Factors influencing the adoption of cell phone banking by South African students. *African Journal of Business Management*. 2013 Jan 7;7(1):30-8.
 30. Sharma P, Singh P. Users' perception about mobile banking-with special reference to Indore & around. *Review of Business & Technology Research*. 2009;2(1):1-4.
 31. Varshney U, Vetter R. Mobile commerce: framework, applications and networking support. *Mobile networks and Applications*. 2002 Jun 1;7(3):185-98.
 32. Yang AS. Exploring adoption difficulties in mobile banking services. *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration*. 2009 Jun;26(2):136-49.
 33. Zhou T. An empirical examination of initial trust in mobile banking. *Internet Research*. 2011 Aug 12;21(5):527-40.
 34. Fasan R. Banks, customer relation and use of ATM cards. *Business Day Newspapers*. Retrieved February 28, 2008.
 35. Amadeh H, Jafarpour M. Specification of Obstacles and Solutions of Electronic Banking Development within the Framework of "Iran at 1404" Prospective. *Danesh va Tosee Journal*. 2009; 26(2):2-43
 36. Amiri Y, Evaluation of the performance of electronic services provided in selected public banks of Fars province based on fuzzy BSC approach. MSc thesis, Yazd University. 2009.
 37. Elahi S, Ghanbari MH, Shayan A. Determining the effective factors in implementing mobile banking technology by the customer. *Quarterly Journal of Commercial Law Research*, 2012;16(63):27-50.
 38. Mattila M, Karjaluo H, Pento T. Internet banking adoption among mature customers: early majority

- or laggards?. *Journal of services marketing*. 2003 Sep 1;17(5):514-28.
39. Motamedi M. Investigating the factors affecting the acceptance of the bank by the customers by using the models of technology acceptance and affiliated marketing. MSc Thesis, Shiraz University. 2010.
40. Taghavifard MT, Torabi M. Factors affecting the use of mobile banking services by customers and rank them Case study: Tejarat Bank branches in Tehran. *Journal of Business Management Researches*. 2010;2(3).
41. Taylor S, Todd PA. Understanding information technology usage: A test of competing models. *Information systems research*. 1995 Jun;6(2):144-76.
42. Vafaei N. Identifying and explaining the factors influencing the adoption of banking with customers' perspectives: a case study in National Bank branches in Tehran. MA Thesis in Economics, Faculty of Management and Economics, Tarbiat Modarres University, 2009.
43. Wati Y, Koo C, Jung J, Li D. An empirical analysis of end-user satisfaction toward e-banking in Indonesia (A comparison model of ATMs, internet banking, and mobile banking). In 15th Americas Conference on Information Systems 2009, AMCIS 2009. 2009 Dec 1; Paper 30:514-526.
44. Yu CS. Consumer switching behavior from online banking to mobile banking. *International Journal of Cyber Society and Education*. 2014 Jun 30;7(1):1-28.

An Intelligent Universal Remote Control for Home Appliances

K Girija Rani¹, S Rama Kishore², Basava Dhanne³

¹M.tech Student, ²Associate Professor, ³Assistant Professor, Dept of ECE,
CMR Engineering College, Hyderabad, Telangana

ABSTRACT

In this Paper Wi-Fi module is introduced to make easy usage of home appliances with mobile application called as IoT-device-control. It is implemented using Arduino software to control home appliances. Through Wi-Fi, control the switching access of multiple appliances in the house from one place. It can be also useful to physically handicapped people to operate home appliances without facing any difficulties. What's more, traditional strategies for correspondence between remote controllers and associated are IoT applications. In earlier days Point-n-Press tends to the directionality include, which empowers simple and instinctive control by indicating the objective gadget to show the objective's control interface on the screen of the remote controller. To address these issues, a wise general remote control system for home appliances is proposed. That application can be used to control all the home appliances operating from anywhere trough internet. By this reduce the space for remote controllers for each and every device. It creates new IP address every time which can protective from hacking.

Keywords: *Arduino controller, Wi-Fi module, LCD module, mobile application, IP address, IoT,*

INTRODUCTION

Internet of Things (IoT)^[1] is a technology that connects all things and the Internet in smart spaces. By implementations of intelligence with sensing devices, IoT has been widely applied to different fields, such as smart homes^{[2], [3]}. The application fields in smart homes^[4] incorporate smartness into home areas for comfort, safety, security, healthcare, and energy conservation^{[5], [6]}. The need for comfort and a convenient life are especially important in smart homes. Thus, home automation is one of the most essential and critical components for the IoT-based smart home technology.

Home automation systems are used to control home devices or appliances in smart homes and provide automatic remote control inside or outside homes^[7]. Nevertheless, although remote control provides convenience and ease of use, some major problems require consideration and improvement, such as how to provide an intuitive and user-friendly remote control scheme in IoT-based smart homes^[8]. The goal of this paper is to develop an intelligent universal remote control system for home appliances. Two real prototypes are implemented in smart homes to demonstrate the feasibility of the proposed scheme. In this control

prototype is implemented in a mobile phone; a fan can be directly controlled by mobile application. Note that two state dependencies are included in the control process of the fan. First, the fan can only be started by pressing the "Power" button when it is powered off, whereas pressing other buttons is useless. Second, the "wind speed" button has no effect on the fan when the fan is in sleep or natural mode, because the wind speed is automatically adjusted. Thus, by considering the state dependencies, only functional buttons that are relevant to the current context are displayed on the screen of the controller.

Related work

The home computerization controls the home gear. "Spare ELECTRICITY" is the primary motivation behind home robotization. The adequate utilization of power is essential in day by day routine life. The home hardware or office gear naturally controlled by everybody. Different kinds of advancements are studied in this paper. Presentation of a few remote correspondences, for example, GSM, ZIGBEE, WIFI and Bluetooth are talking about here. Home computerization framework (HAS) spares time, cash even power, man workforce. The detail of home computerization framework is

Reliable, Secured, adaptable, easy to understand and moderate. The remote innovation is more celebrated in mechanization process. Any sort of home machines can be controlled and observed through the home robotization by means of web. In some task Bluetooth and GSM innovation is utilized. GSM innovation home machine is controlled by message administrations and in Bluetooth innovation home apparatus is controlled utilizing android applications application. The data of the home mechanization segments, for example, sensors, techniques, remote innovation.

Bluetooth based Home Automation framework utilizing mobile phone.

In this paper creator planned Bluetooth based robotization. An independent Arduino BT board and the apparatuses of home are associated with the information and yield ports of this board by means of transfers.

The Arduino BT board can be modified remotely finished the association of Bluetooth utilizing the microcontroller’s abnormal state intelligent C dialect. The approved clients are just permitted to getting to the home machine so assurance is finished by giving a secret key. The remote correspondence is built up between the mobile phone and the Arduino BT board. Python content is utilized where it is versatile and can keep running on any of the Symbian Operating System stage. To demonstrate the status of the gadget in the wake of accepting a charge from mobile phone the criticism circuit is outlined and actualized. The calculation which collaborate with the cell phone Bluetooth stack and show the rundown of known gadgets. Figure 1 has shown the block diagram of proposed system. In block diagram use the wi-fi module is connected to the arduino controller and the loads can be connected as output side. And the loads can be controlled by using mobile application.

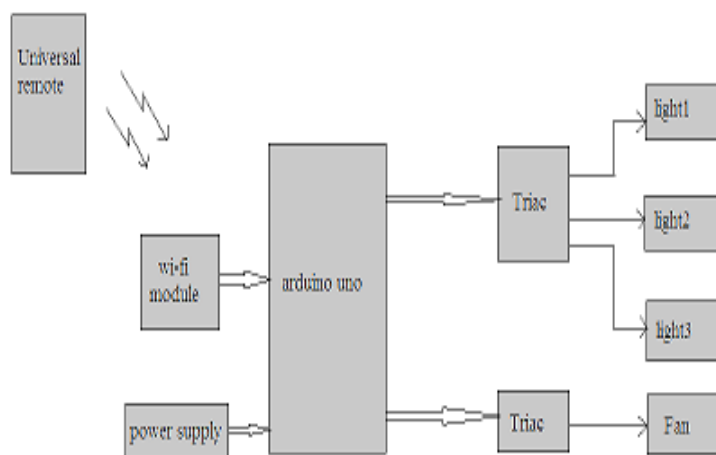


Figure 1: Block Diagram of home automation

Hardware Description

Arduino Controller

The Arduino UNO is a broadly utilized open-source microcontroller board in view of the Microchip ATmega328P microcontroller and created by Arduino. cc. The board is furnished with sets of computerized and simple information/yield (I/O) sticks that might be interfaced to different extension sheets (shields) and other circuits. The board highlights 14 Digital pins and 6 Analog pins. It is programmable with the Arduino IDE

(Integrated Development Environment) through a sort B USB cable.

It can be fuelled by a USB link or by an outside 9 volt battery; however it acknowledges voltages somewhere in the range of 7 and 20 volts. In Figure 2 as shown the flowchart of this project. In this flow chart explain how control the loads in home by using the arduino controller.

Liquid-Crystal Display

LCD is a flat panel display, electronic visual display

that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

Board hardware resources features Wi-Fi Module

ESP8266 is a 3V Wi-Fi module extremely mainstream for its Internet of Things applications. The ESP8266's greatest voltage is 3.6V, so the thing has a locally available 3.3V controller to convey a sheltered, steady voltage to the IC. That implies the ESP8266's I/O sticks additionally keep running at 3.3V, you'll have to Logic Level Controller any 5V signals running into the IC.

Opto Coupler

Transformers separate the essential info voltage from the optional yield voltage utilizing electromagnetic coupling and this is accomplished utilizing the attractive transition circling inside their covered iron core. But we can likewise give electrical disconnection between an information source and a yield stack utilizing simply light by utilizing an exceptionally normal and significant electronic segment called an Opto coupler. The fundamental plan of an opto coupler, otherwise called an Opto-isolator, comprises of a LED that produces infra-red light and a semiconductor photograph touchy gadget that is utilized to recognize the discharged infra-red bar. Both the LED and photograph touchy gadget are encased in a light-tight body or bundle with metal legs for the electrical associations.

Arduino Software

Arduino is a model stage (open-source) in light of a simple to-utilize equipment and programming. It comprises of a circuit board, which can be programmed (alluded to as a microcontroller) and an instant programming called Arduino IDE (Integrated Development Environment), which is utilized to compose and transfer the PC code to the physical board. Arduino gives a standard shape factor that breaks the elements of the miniaturized scale controller into a more available bundle.

Flow Chart

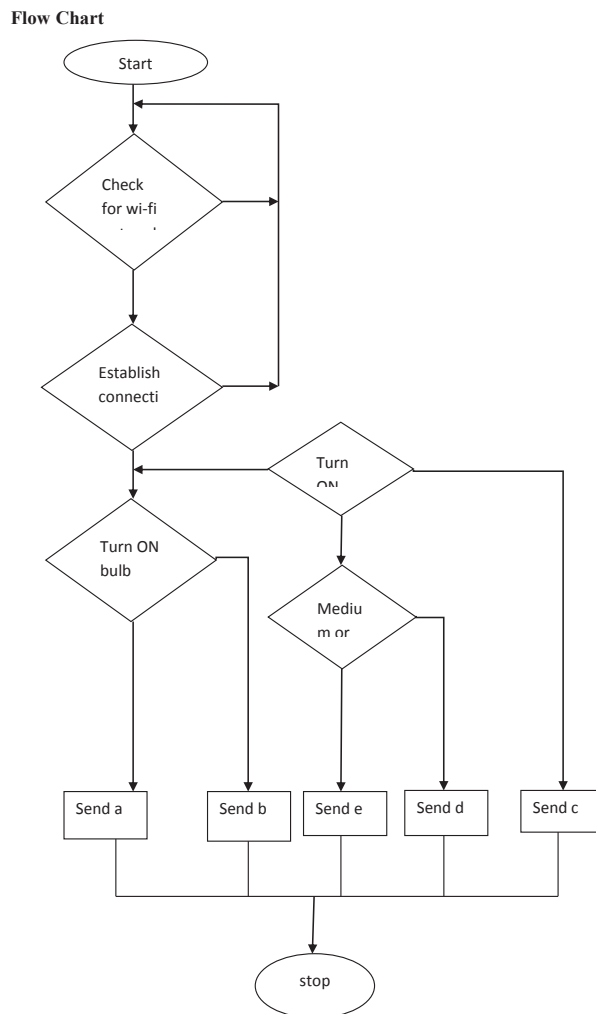


Figure 2: flow char of home automation

RESULTS AND DISCUSSION

An intelligent universal remote control for home appliances circuit connected with respected to block diagram is shown in the Figure 3. At first open the mobile app and set the IP address. IP address is from the Wi-Fi module which unique after that by using app the home appliances can control. If Press the fan ON button in mobile app then FAN will be ON as shown in Figure 4 & this also can be shown in LCD module. If press the fan OFF button then FAN is OFF. If press the load1 ON button in mobile app then the first bulb1 will be ON as shown in Figure 5 & this can be shown in LCD module. If press the load1 OFF button then bulb1 is OFF. If press the load2 ON button in mobile app then the first bulb2 will be ON as shown in Figure 6 & this can be shown in LCD module. If press the load2 OFF button then bulb2 is OFF. Likewise all the loads can be controlled.

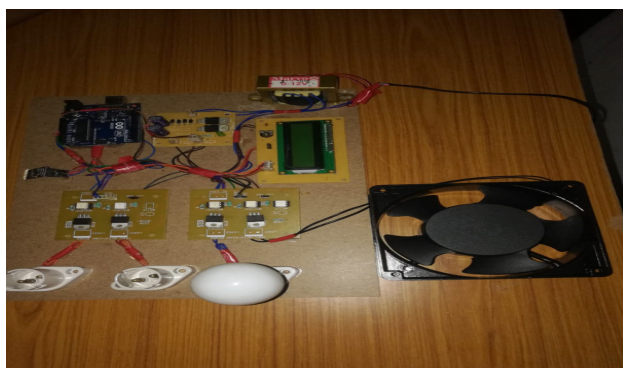


Figure 3: Complete module with input devices

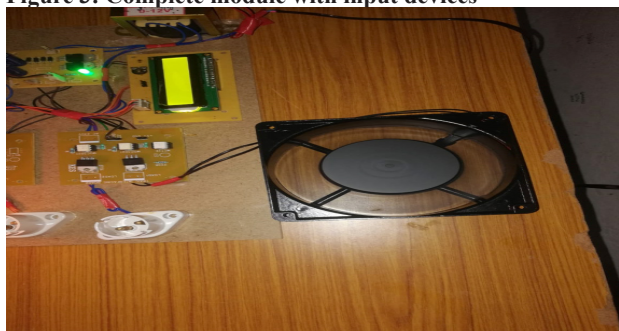


Figure 4: Output When Fan is ON

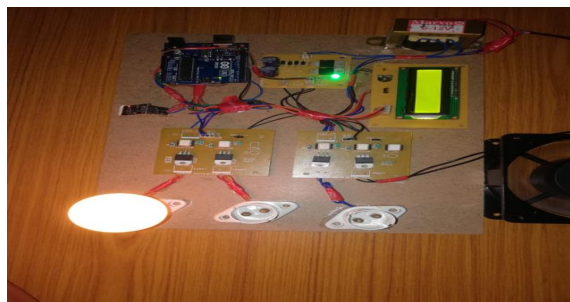


Figure 5: Output when load1 is ON

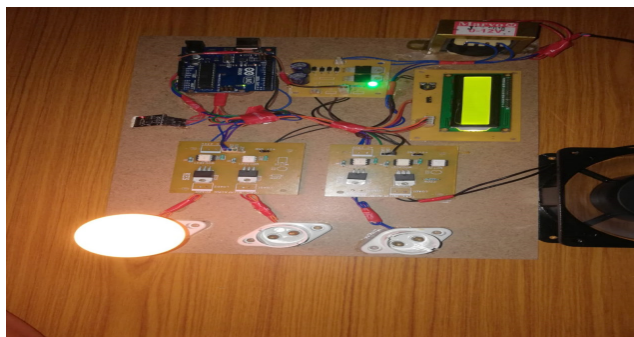


Figure 6: Output when load2 is ON

Mobile app:

By using this mobile application to control all the home appliances from one place. In this application first access the IP address then the loads will control.

CONCLUSION

At last presumed that our strategy works adequately on smart home appliances by utilizing android

application controlled through Wi-Fi module. With the demonstration of genuine model controlling appliances in homes. The feasibility of an intelligent universal remote control system for home appliances with intuitive and user-friendly features is verified. In future work will extend the controller as raspberry pi 3, by using this the cost of the design will reduced because of raspberry pi 3 is have on board Wi-Fi module. The range can also increased by using advanced wireless technologies.

Ethical Clearance: Taken from CMR Engineering College.

Source of Funding: Self

Conflict of interest: Authors have no conflict of interest to declare regarding the publication of this paper.

REFERENCES

- [1] Wang F, Hu L, Zhou J, Zhao K. A study from the viewpoint of transformative process in the Internet of Things. *Int. J. Distrib. Sens. Netw*, Jan 2015, Vol. 2015, No. 9, pp. 1–9.
- [2] Javier M. From the web of things to the web of individuals. *IEEE Int. Comput*, Mar 2015, Vol. 19, No. 2, pp. 40–47.
- [3] Zhang L, Zheng L, Yang H, Skillet TJ. Exploration of the key advances of the shrewd locally situated on IOT. *Appl. Mech. Mater*, Jan 2015, Vol. 713–715, pp. 2304–2307.
- [4] Alam MR, Reaz MBI, Ali MAM. An audit of shrewd homes—past, present, and future. Nov 2012, *IEEE Trans. Syst., Man, Cyber*, Vol. 42, No. 6, pp. 1190–1203.
- [5] Ben K, Sachin P, Pieter A, Ken G. A study of research on cloud apply autonomy and computerization. Apr 2015, *IEEE Trans. Autom. Sci. Eng*, Vol. 12, No. 2, pp. 398–409.
- [6] Lu H. Vitality responsive total setting for vitality sparing in a multi-inhabitant condition. Jul 2014, *IEEE Trans. Autom. Sci. Eng*, Vol. 11, No. 3, pp. 715–729.
- [7] Tadimeti HC. Pulipati M. Review of robotization frameworks and home apparatuses control utilizing PC and microcontroller. Apr 2013, *Int. J. Sci. Res*, Vol. 2, No. 4, pp. 127–131.
- [8] Kim T, Lee H, Chung Y. Propelled all inclusive remote controller for home robotization and security. Nov 2010, *IEEE Trans. Shopper Electron*, Vol. 56, No. 4, pp. 2537–2542.

TMD Material A Revolution for Next Generation Transistors

N Soujanya¹, T Satyanarayana², T Madhavi³

¹Asst Prof, ²Assoc Prof, ³Assoc. Professor, CMR Engineering College

ABSTRACT

Today's world is technologically emerging world. In which everything is technology oriented. In this changing environment every well equipped system need to be very efficient. In this new era of electronics industry there is need of devices which are having high speeds, enough band gap, high On/Off ratio and also high efficiency in-turn having less leakage current and occupancy. Up to some extent this can be achieved by using a new generation 2-D materials. In this paper we present an extensive study on TMD material Molybdenum Disulphide (MoS₂) which is a combination of Transition metal and di-Chalcogenide atoms (TMD). These are rigorously researched now a day due to their excellent semi conductor properties and also excellent temperature sensitivity. Not only in the area of semiconductor devices, these TMD's are also applicable in many areas like Optoelectronic devices, Gas sensing devices (GSD), Energy storage devices (ESD) etc.

Key Terms: TMD, MoS₂, GSD, ESD, Leakage current, On/Off ratio, Ballistic conduction, Band gap etc.

INTRODUCTION

The days when devices made of vacuum tubes sat murmuring in whole devoted rooms and could do around 360 duplications of 10 digit numbers in a second. In spite of the fact that they were proclaimed as the quickest figuring devices of that time, they definitely don't stand a shot when contrasted with the cutting edge devices. Current semiconductor devices are getting littler, quicker, and less expensive and more power proficient each advancing second. Be that as it may, what drove this change? The entire space of figuring introduced another day break of electronic scaling down with the appearance of semiconductor transistor by Bardeen (1947-48) and afterward the Bipolar Transistor by Shockley (1949) in the Bell Laboratory. Since the development of the primary IC (Integrated Circuit) as a Flip Flop by Jack Kilby in 1958, our capacity to pack an ever increasing number of transistors onto a solitary chip has multiplied generally at regular intervals, as per the Moore's Law. Such exponential advancement had never been found in some other field despite everything it keeps on being a noteworthy territory of research work^[1].

The advancement of microelectronics traverses a period, which is considerably lesser than the normal future of a human, but then it has seen upwards of four ages. Mid 60s saw the low-thickness creation forms

arranged under Small Scale Integration (SSI), in which transistors were restricted to around 10. This quickly offered approach to medium-scale integration in the late 60's when around 100 transistors could be put on a solitary chip.

It was the time when the expense of research started to decay and private firms began entering the opposition rather than the prior years, where the principle load was borne by the military. Transistor-transistor logic (TTL) offering higher coordination densities that outlived other IC families like ECL turned into the premise of the primary incorporated circuit insurgency. It was the creation of this family that offered force to semiconductor goliaths like Texas Instruments, Fairchild, and National Semiconductors. Mid seventies denoted the development of transistor check to around 1000 for every chip, called the expansive scale reconciliation ^[2].

By mid-eighties, the transistor depend on a solitary chip had just surpassed 1000, and consequently came the period of Very Large Scale Integration or VLSI. In spite of the fact that numerous enhancements have been made the most of and the transistor is as yet rising, additionally names of ages like ULSI are for the most part maintained a strategic distance from. It was amid this time TTL lost the fight to MOS family inferable from similar issues that had pushed vacuum tubes into carelessness.

VLSI is ruled by the CMOS innovation and much like other rationale families ^[3], this too has its confinements which have been combat and enhanced since years. Taking the case of a processor, the procedure innovation has quickly contracted from 180 nm in 1999 to 60nm out of 2008 and now it remains at 45nm and endeavors being made to decrease it further (32nm) while the surface area which had contracted at first presently is expanding attributable to the additional advantages of more prominent pressing thickness and a bigger element measure which would mean more number of transistors on a chip. ^[4]

As the quantity of transistors increment, the power dispersal is expanding. In the event that warmth created per unit region is to be viewed as, the chips have just neared that of the spout of a stream motor. In the meantime, the Voltage scaling of edge voltages past a specific point presents genuine impediments in furnishing low unique power scattering with expanded many-sided quality. The quantity of metal layers and the interconnects be it worldwide and nearby likewise have a tendency to get chaotic at such nano levels.

Indeed, even on the creation front, we are before long drawing nearer towards the optical furthest reaches of photolithographic forms past which the element measure can't be lessened because of diminished exactness. This opened up Extreme Ultraviolet Lithography strategies. Fast tickers utilized presently make it difficult to diminish clock skew and thus putting timing requirements. This has opened up another outskirts on parallel preparing. Or more all, we appear to be quick moving toward the Atom-Thin Gate Oxide layer thickness where there may be just a solitary layer of atoms filling in as the oxide layer in the CMOS transistors. New options like TMD innovation are turning into a functioning territory of research inferable from this ^[5]. Numerous businesses are calling for gadgets that can work dependably in an unforgiving domain, including extraordinary temperatures over 200° Celsius. Precedents of the high temperature applications incorporate turbine motor control in aviation and gadgets or sensors utilized for boring activity in oil and gas industry. Albeit conventional cooling frameworks can

enable gadgets to work at high temperatures, in a few applications, cooling may not be conceivable or it might be additionally engaging for the hardware to work hot to enhance framework unwavering quality or decrease cost. Be that as it may, the accessibility of transistors and circuits for high temperature task is extremely constrained. This issue is also answered to some extent by TMD's.

II EVOLUTION OF TMD's

Silicon is quickly achieving its cutoff points yet client interest for control is continually expanding. Soon another material needs to venture in and give the truly necessary handling power ^[6]. Molybdenum disulphide gadgets indicate much guarantee in the field of nanometer scale gadgets however whether they turn into the semiconductor without bounds stays misty.

A group of analysts from Stanford have made transistors from molybdenum disulphide utilizing standard modern compose generation systems. Will silicon at long last be supplanted once transistors can't be made any littler utilizing silicon? Transition metal dichalcogenides (TMD) mono layers are atomically thin semiconductors of the type MX_2 , with M a transition metal atom (Mo, W, etc.) and X a Chalcogenide atom (S, Se, or Te) as shown in the periodical table of Figure 1. The structure of a monolayer TMD is shown in the Figure 2. One layer of M atoms is sandwiched between two layers of X atoms ^[7]. They are part of the large and new family of the so-called 2D materials, name used to emphasize their extraordinary thinness. For example a MoS_2 monolayer is only 6.5 Å thick. The key feature of these materials is the interaction of large atoms in the 2D structure as compared with first-row transition metal dichalcogenides, e.g., WTe_2 exhibits nearly a great amount of magneto resistance and superconductivity properties which make these materials interesting to study ^[8]. Having a direct band gap these TMD's have become promising materials in optoelectronics ^[9]. They also have many applications in various areas like digital switches ^[10], analog amplifiers etc.

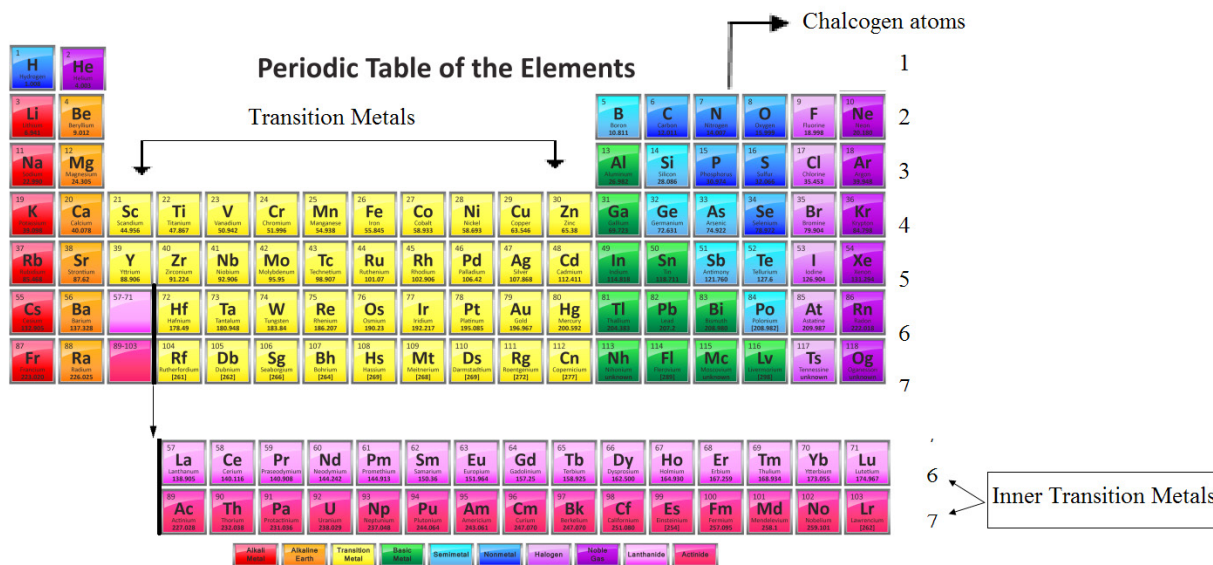


Figure: 1 Periodic table showing transition metals and Chalcogenide atoms

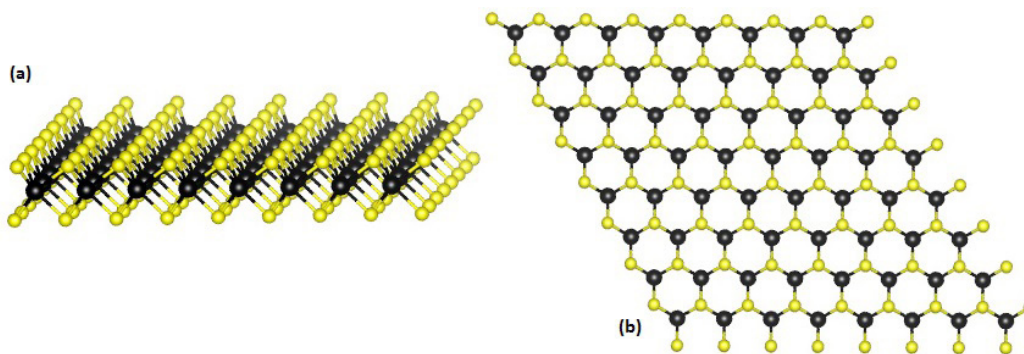


Figure: 2 (a) Structure of a hexagonal TMD monolayer. M atoms are in black and X atoms are in yellow. (b) A hexagonal TMD monolayer seen from above.

The discovery of graphene^[11] shows how new bodily properties emerge while a bulk crystal of macroscopic dimensions is thinned all the way down to one atomic layer. Like graphite, TMD bulk crystals are fashioned of mono layers bound to each different by Van-der-Waals appeal^[12]. TMD mono layers have properties which are tremendously one-of-a-kind from those of the semimetal graphene.

- TMD mono layers MoS₂, WS₂, MoSe₂, WSe₂, and MoTe₂ have a direct band hole, and can be utilized in electronics as transistors and in optics as emitters and detectors^[13].
- The TMD monolayer crystal shape has no inversion center, which permits to access a new diploma of freedom of price vendors, particularly the okay-valley

index, and to open up a brand new area of physics: valleytronics

- The strong spin-orbit coupling in TMD mono layers results in a spin-orbit splitting of masses in the valence band and some within the conduction band, which allows management of the electron spin through the excitation laser photon strength and handedness.

The paintings on TMD mono layers is an emerging studies and development area for the reason that discovery of the direct band gap and the capability programs in electronics and valley physics. TMDs are often blended with different 2d materials like graphene and hexagonal boron nitride to make Vander Waals hetero structures.

PROPERTIES OF MoS2

Thermally steady and highly versatile at high temperatures: Utilizing standard lithography systems in a spotless room condition, Balandin’s group at Stanford University fabricated molybdenum disulfide transistors on silicon substrates for high-temperature tests. Some had only a couple of layer and others had increasingly, numerous layers . The generally thick layers were all the more thermally steady and exhibited a higher versatility at hoisted temperatures, as per Balandin.

Ballistic conduction: As per the Stanford specialists, when molybdenum disulfide transistors are on the size of 10nm, electrons diffuse by employing ballistic conduction, which is when electrons quit dispersing as they travel through the material. This diffusing is the thing that causes resistivity in materials—without it, a material basically has almost 0 resistances [14].

Higher-speed: Eric Pop trusts that, if the nature of the semiconductor material is enhanced and the transistor decreased in estimate, this ballistic conduction number will increment. This would result in higher-speed gadgets which can direct more present without warming up as much as a silicon gadget.

Larger Band Gap: A solitary layer molybdenum disulfide demonstrates a band gap of 1.9 eV, which is bigger than that of silicon and gallium arsenide. This is valuable for the high temperature applications. The nearness of a bigger band gap implies that a gadget can be effortlessly turned on and off, a significant property for transistor’s activity.[15]

High switching speed: Not at all like graphene, molybdenum disulfide has a vitality band gap, which means its conductivity can be turned on and off. Such a characteristic is basic for semiconductor gadgets utilized in processing.

Optical Ability: Another distinction is that molybdenum disulphide transmits light, which means it could be utilized in applications like LEDs, self-detailing sensors and optoelectronics.

High On/Off ratio: If a transistor is manufactured using MoS2it can have a very high on/off ratio. We need 1’s and 0’s to do computation; graphene can only give us 1’s and .5’s and MoS2 gives the required one’s due to its high band gap [16].

Less Energy Consumption: The researchers also report that transistors made from molybdenite will use 100,000 times less energy in a standby state than traditional silicon transistors.

Low contact resistance of 0.21micro ohm

Less power dissipation: Being just a single layer thick, they speak to a definitive point of confinement of scaling in the vertical course and could offer decreased power dissipation due to littler short channel impacts [17].

Easy to Fabricate [10]: The fabrication and also synthesis of MoS2 is simpler and also similar to that of Silicon [18].

Formation of high K dielectric on the surface: Upgraded oxygen plasma treatment of MoS2 surface can fundamentally enhance the development conduct of ALD high-k dielectrics on MoS2, giving an imperative ramifications to coordination in FET applications [19]

The Table 1 below summarizes the properties of MoS₂.

SNo	Property	Range
	Thermal stability	High
	Ballistic conduction	High
	Time Delay	Less
	Band Gap	1.9eV
	switching speed	high
	On/Off ratio	high
	Energy Consumption	Less
	contact resistance	0.21micro ohm
	Power Dissipation	Less
	Fabrication Process	Easy

Table: 1 Table showing the properties of MoS₂

MoS₂ TRANSISTOR DESIGN

Professors from Stanford University have designed the transistors using MoS₂ [20]They have rigorously worked on it and they have brought down the wafer size of 31 layers of MoS₂ to 10nm. Also these transistors were found to have good properties for the next generation electronics. The devices so found were able to work with high stability even at high temperatures of above 200 degree Celsius. Hence forth the requirement of coolers can be reduced to some extent. These devices

can have applications in harsh environments like sensors used for drilling in Oil & Gas Industry, Turbine Engine control in aero space Industry etc. Where these are high temperature required applications MoS₂ transistors can withstand such high temperatures. The below Figure 3 shows the construction of a FET using TMD.

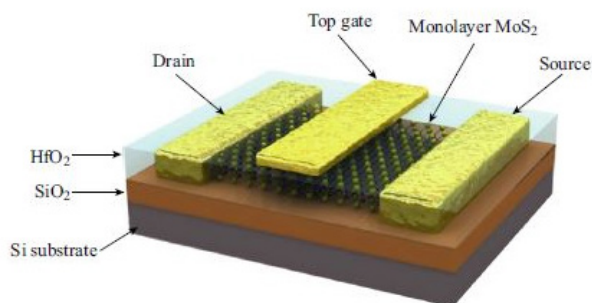


Figure 3: MoS₂ Transistor Structure

The device in the Figure 3 comprises of two field-effect transistors in series and characterized by three gold leads that fill in as source and drain terminals for the two transistors. Monolayer MoS₂ is secured by 30 nm of ALD-with HfO₂ deposited on it which acts as both gate dielectric and a mobility enhancer.

Single layers of MoS₂ have an extensive characteristic band gap of 1.8 eV already revealed mobilities in the range of $0.5 \times 10^{-3} \text{ cm}^2$ which were found to be very low. Hence Hafnium oxide was used as a gate dielectric to get the expected characteristics. At room temperature the FET was able to exhibit the mobility of $200 \text{ cm}^2 \text{ V}^{-1} \text{ S}^{-1}$ and also an ON/OFF ratio of 1×10^8 . They also exhibited very less power dissipation and due to their direct band gap they are able to provide less power consumption. It has also provided a less leakage of $2 \text{ pA } \mu\text{m}^{-2}$. Below Table 2 exhibits some of the properties of MoS₂ FET's.^[21]

Table 2: Properties of MoS₂

ON/OFF ratio	mobility	Gate dielectric	Leakage current
1×10^8	$200 \text{ cm}^2 \text{ V}^{-1} \text{ S}^{-1}$	HfO ₂	$2 \text{ pA } \mu\text{m}^{-2}$.

CONCLUSION

Observing all the above properties it can be assumed that the 2-D material MoS₂ can be a promising material for the next generation transistor fabrication. It has all the properties which a semiconductor should possess to operate as perfect device with a better control. Properties

of monolayer MoS₂ like high thermal stability, chemical inertness, transparency, flexibility, and relative inexpensiveness give MoS₂ transistors a unique advantage for several low cost electronic applications.

Ethical Clearance: Taken from CMR Engineering College.

Source of Funding: Self

Conflict of interest: Authors have no conflict of interest to declare regarding the publication of this paper.

REFERENCES

1. Wikipedia contributors. VLSI Technology. Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, Oct 2018, Web. 14 Nov. 2018.
2. Wikipedia contributors. Very Large Scale Integration. Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, Nov 2018, Web. 14 Nov. 2018.
3. Nikonov DE, Young IA. Benchmarking of beyond-CMOS exploratory devices for logic integrated circuits. IEEE Journal on Exploratory Solid-State Computational Devices and Circuits. Dec 2015, Vol. 1, pp. 3-11.
4. Ionescu AM, Riel H. Tunnel field-effect transistors as energy-efficient electronic switches. nature. 2011 Nov, Vol. 479, No. 7373, pp. 329.
5. Ghosh RK, Mahapatra S. Monolayer transition metal dichalcogenide channel-based tunnel transistor. IEEE Journal of the electron devices society. Oct 2013, Vol. 1, No. 10, pp. 175-180.
6. Low T, Li MF, Samudra G, Yeo YC, Zhu C, Chin A, Kwong DL. Modeling study of the impact of surface roughness on silicon and Germanium UTB MOSFETs. IEEE transactions on electron devices. 2005 Nov, Vol. 52, No. 11, pp. 2430-2439.
7. Chhowalla M, Shin HS, Eda G, Li LJ, Loh KP, Zhang H. The chemistry of two-dimensional layered transition metal dichalcogenide nanosheets. Nature chemistry. 2013 Apr, Vol. 5, No. 4, pp. 263.
8. Eftekhari A. Tungsten dichalcogenides (WS₂, WSe₂, and WTe₂): materials chemistry and applications. Journal of Materials Chemistry A. 2017, Vol. 5, No. 35, pp. 18299-18325.
9. Lopez-Sanchez O, Lembke D, Kayci M, Radenovic A, Kis A. Ultrasensitive photodetectors based on

- monolayer MoS₂. *Nature nanotechnology*. Jul 2013, Vol. 8, No. 7, pp. 497.
10. Ionescu AM, Riel H. Tunnel field-effect transistors as energy-efficient electronic switches. *nature*. Nov 2011, Vol. 479, No. 7373, pp. 329.
 11. Ameen TA, Ilatikhameneh H, Klimeck G, Rahman R. Few-layer phosphorene: An ideal 2D material for tunnel transistors. *Scientific reports*. Jun 2016, Vol. 6, pp. 28515.
 12. Cadiz F, Courtade E, Robert C, Wang G, Shen Y, Cai H, Taniguchi T, Watanabe K, Carrere H, Lagarde D, Manca M. Excitonic linewidth approaching the homogeneous limit in MoS₂-based van der Waals heterostructures. *Physical Review X*. May 2017, Vol. 7, No. 2, pp. 021026.
 13. Choi W, Choudhary N, Han GH, Park J, Akinwande D, Lee YH. Recent development of two-dimensional transition metal dichalcogenides and their applications. *Materials Today*. Apr 2017, Vol. 20, No. 3, pp. 116-130.
 14. English CD, Smithe KK, Xu RL, Pop E. Approaching ballistic transport in monolayer MoS₂ transistors with self-aligned 10 nm top gates. *Int. El. Devices Meet*. Dec 2016, Vol. 5, pp. 1-5.
 15. Conley HJ, Wang B, Ziegler JI, Haglund Jr RF, Pantelides ST, Bolotin KI. Bandgap engineering of strained monolayer and bilayer MoS₂. *Nano letters*. Jul 2013, Vol. 13, No. 8, pp. 3626-3230.
 16. Radisavljevic B, Whitwick MB, Kis A. Integrated circuits and logic operations based on single-layer MoS₂. *ACS nano*. Nov 2011, Vol. 5, No. 12, pp. 9934-9938.
 17. Bertolazzi S, Krasnozhan D, Kis A. Nonvolatile memory cells based on MoS₂/graphene heterostructures. *ACS nano*. Mar 2013, Vol. 7, No. 4, pp. 3246-3252.
 18. Novoselov KS, Jiang D, Schedin F, Booth TJ, Khotkevich VV, Morozov SV, Geim AK. Two-dimensional atomic crystals. *Proceedings of the National Academy of Sciences*. Jul 2005, Vol. 102, No. 30, pp. 10451-10453.
 19. Wang X, Zhang TB, Yang W, Zhu H, Chen L, Sun QQ, Zhang DW. Improved integration of ultra-thin high-k dielectrics in few-layer MoS₂ FET by remote forming gas plasma pretreatment. *Applied Physics Letters*. Jan 2017, Vol. 110, No. 5, pp. 053110.
 20. Data available http://www.ssrsl.srlac.stanford.edu/research/mos2_summary.html
 21. Yin Z, Li H, Li H, Jiang L, Shi Y, Sun Y, Lu G, Zhang Q, Chen X, Zhang H. Single-layer MoS₂ phototransistors. *ACS nano*. Pub Med. Dec 2011, Vol. 6, No. 1, pp. 74-80.

A Thorough Investigation on Designs of Digital Hearing Aid

T Madhavi¹, N.soujanya², A Chaitanya Krishna³

¹Assoc Prof, ²Asst Prof, ³Asst.Professor, CMR Engineering College

ABSTRACT

Hearing loss which looks a very common health issue but affects nearly 10% of the world population as indicated by many international studies. Hearing disorders effectively frail sensitivity to the sounds ordinarily heard. Deafness and speech perception are two different categories of hearing losses. Any Hearing Impaired (HI) person is an applicant of wearing a hearing aid. This paper describes various design techniques and speech enhancement algorithms of Digital Hearing Aids (DHA).

Keywords: DHA, HI, DSP's, Filter bank speech enhancement, Noise Reduction

INTRODUCTION

HI typically experience more frustration, anxiety, irritability, depression, and disorientation than those with normal hearing levels. People who are suffering from deafness are not able to understand discourse even in the presence of amplification.^[1] Another aspect is speech perception, which involves the speech clarity rather than amplitude. Hearing disorders may occur due to birth defects or it may occur due to accident. The two main categories of hearing losses are conductive and sensor neural. Hearing loss can also be attributed to a combination of both types, a mixed hearing loss ^[2].

The audible frequency range for human ears is 20 Hz to 20 kHz and human hearing is most sensitive in the range of 1 kHz to 4 kHz ^[3]. Hearing is measured in decibels. In all frequencies 0 to 20 db is the normal hearing range. To identify the hearing loss pattern, technical researches have been conducted and conclude some plots, like spectrograms and other is audiogram. With the help of Audiogram, hearing can be plot on graph or in other words audiogram may define as, a graph that shows the audible threshold for standardized frequencies as measured by an audiometer^[4].The horizontal axis of audiogram represent frequency in Hz, vertical axis indicates the amplitude in db as shown in Figure 1.

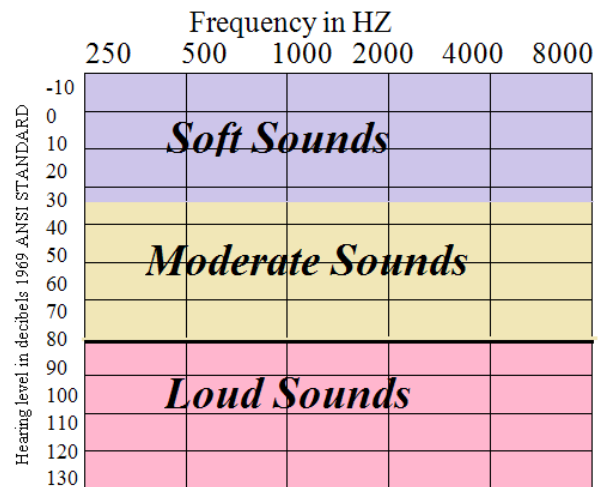


Figure1: Frequency versus Amplitude of Hearing Level

At the end of a hearing test, hearing levels decide the degree of hearing loss. Hearing loss is measured in decibels hearing level (dB). If person can hear sounds across a range of frequencies at -10dB-20dB it will be considered as having normal hearing. Now days digital hearing aid are preferred over analog hearing aid, as these are programmable. Digital hearing aids have greater precision in adjusting electro acoustic parameters with self monitoring capabilities, have also feature of acoustic feedback. Noise in hearing aids can be reduced by advanced signal-processing techniques it also helps in automatic control of signal level.

DESIGNS

In 1980's the development of fast DSP chip technology in a small size has brought a number of notable efforts in the design of wearable DSP hearing

aids [5]. As the technology developed there are so many advancement and changes taking place in designing process of digital hearing aids using DSP's. The following Figure 2 shows the basic block diagram of DHA using DSP [6].

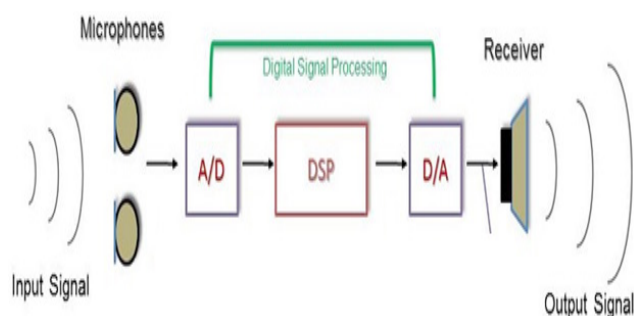


Figure2: Basic DHA using DSP

The introduction of DSP in hearing aid designed by using DSP's noise reduction, compressions, directionality of the signals can be achieved rigorously as compared to analog processors.

Hardware Designs

The variations in the hardware designs are mainly the changes in filter banks of DSP. Some of them are discussed below.

The design of digital hearing aid with digital IIR filter was discussed in paper [7]. The structure of filter had a combination in parallel form of IIR (Infinite Impulse Response) a low-pass, a band-pass and a high-pass filter. The filter coefficients of IIR filter were obtained from the optimization procedure by Genetic Algorithm (GA). The error between desired magnitude response and actual magnitude response was minimized by GA.

Uniform filter bank design for digital hearing aid application has meet the following requirements such as strong alias suppression, with low delay and sufficient frequency resolution^[8] which simplifies sub sampling of the bands and thus helps saving power.

In the application report [9], was describe the development of a low power binaural wearable digital hearing aid platform based on the TMS320C5000E fixed point digital signal processor (DSP). It provided for frequency shaping using multichannel FIR filters, noise suppression, multiband amplitude compression, and frequency dependent intraoral time delay algorithms.

The focus of this [10] paper was on the algorithms used to build digital compression systems. Of the various

approaches that could be used to design a digital hearing aid, this paper considers broadband compression, multi-channel filter banks, a frequency-domain compressor using the FFT, the side-branch design that separates the filtering operation from the frequency analysis, and the frequency-warped version of the side-branch approach that modifies the analysis frequency spacing to more closely match auditory perception.

In [11], a 3-channel VFB approach has been proposed for digital hearing aid applications. As compared with traditional filter-banks with fixed bandwidths, the proposed 3-channel VFB was constructed by parallelizing variable low pass, band pass and high pass digital filters whose both magnitudes (gains) and bandwidths could be independently tuned for matching various hearing loss patterns.

Software Designs

Software design variations are of algorithms developed for further improvements in noise reductions and enhancement of speech quality. Algorithms are designed to support the minicomputers of digital hearing aids to know how to sort and categorize different noises and environments. Some of them are described below.

In this algorithm [12](2017), the gains are calculated in the time domain, which avoids the process of the inverse Fourier transform and leads to a decrease in computational complexity. Compared with the traditional spectral subtraction and basic Wiener filtering method, the delay in this algorithm is reduced by 40.4 and 60.6%, respectively. It is also compared with the modulation depth integrated into hearing aids under an experimental simulation and a real scenario. The results indicate that the output SNR is improved by 1 dB under the software simulation and 3.1 dB in the real scenario when the input SNR is set as 10 dB. Compared with the simulation environment, the proposed algorithm only fell by 1.5% in the real scenario.

Santosh et al (2013) [13] proposed a spectral subtraction technique is in modern hearing aids utilized for real-time speech enhancement in the aids used by hearing impaired listeners. For reducing computational complexity and memory requirement, he used a cascaded-median based estimation of the noise spectrum without voice activity detection. The technique is implemented and tested for satisfactory real-time operation, with sampling frequency of 12 kHz, processing using

window length of 30 ms with 50% overlap, and noise estimation by 3-frame 4-stage cascaded-median, on a 16-bit fixed-point DSP processor with on-chip FFT hardware. Enhancement of speech with different types of additive stationary and non-stationary noise resulted in SNR advantage of 4 – 13 dB.

Heinrich and Peter Vary (2012) in ^[14] proposed A beamformer for binaural speech enhancement systems for digital hearing aids. Its single modules for the estimation of the time-difference-of-arrival (TDOA) and time-alignment operate in the frequency-domain and have a low computational complexity. The TDOA estimation is performed efficiently by a generalized cross-correlation with phase transform weighting. The estimation accuracy for filter-banks with a limited number of subbands, which are needed for hearing aids to meet tight delay constraints, is improved by a histogram-based TDOA estimation. The subsequent time-alignment is accomplished by a simple multiplication with spectral phase factors.

Ulrik Kjems et al (2012) ^[15] has proposed Multi-microphone speech enhancement systems can often be decomposed into a concatenation of a beam former, which provides spatial filtering of the noisy signal, and a single channel (SC) noise reduction filter, which reduces the noise remaining in the beam former output. Here they proposed a maximum likelihood based method for estimating the inter microphone covariance matrix of the noise impinging on the microphone array. This method allows prediction of this co-variance matrix for non-stationary noise sources even in signal regions where the target speech signal is present. they used it in for estimating the power spectral density (psd) of the noise entering the SC filter.

John Woodruff et al (2011) ^[16] proposed methods for using the directionality of sound energy as a criterion to estimate single- and multichannel linear filters for suppression of diffuse noise and reverberation in a hearing aid application. They compare conservative strategies where direction of arrival is unknown and more aggressive strategies where their proposed methods can be used to derive a fast acting post-filter for the output of a beam former. They showed that in situations where a target of interest is near to the listener while interfering sources are more distant, simple features that capture the directionality of sound energy can be used to attenuate significant undesired signal energy and can be more

effective .

JEON Yu-yong, LEE Sang-min 2011,^[17] proposed a algorithm, to enhance the speech quality that is degraded by environmental noise, reinforce the speech. The minima controlled recursive averaging (MCRA) algorithm was used to estimate the noise spectrum and the partial masking effect which is one of the psychoacoustic properties was introduced to reinforce speech. The performance evaluation was performed by comparing the PESQ (perceptual evaluation of speech quality) and segSNR (segmental signal to noise ratio) by the proposed algorithm with the conventional algorithm. As a result, average PESQ by the proposed algorithm was higher than the average PESQ by the conventional noise reduction algorithm and SNR was higher as much as 3.2 dB in average than that of the noise reduction algorithm.

Junfeng Li, Shuichi Sakamoto, Satoshi Hongo, Masato Akagi and Yoiti Suzuki 2009,^{“ [18]} presented a equalization-cancellation (EC) model which has been extensively studied for expressing binaural masking level difference (BMLD) in psychoacoustics. In this paper, they proposed a two-stage binaural speech enhancement with Wiener filter (TS-BASE/WF) based on the EC model. In this TS-BASE/WF, interfering signals are first estimated by equalizing and cancelling the target signal based on the EC model, and a time-variant Wiener filter is then applied to enhance the target signal given noisy mixture signals. The main advantages of this TS-BASE/WF are: (1) effectiveness in dealing with non-stationary multiple-source interfering signals; (2) success in localizing the target sound source after processing.

HeinrichW. Löllmann and Peter Vary 2009 ^[19] presented a new system for single-channel speech enhancement , which achieves a joint suppression of late reverberant speech and background noise with a low signal delay and low computational complexity. It is based on a generalized spectral subtraction rule which depends on the variances of the late reverberant speech and background noise. The calculation of the spectral variances of the late reverberant speech requires an estimate of the reverberation time (RT) which is accomplished by a maximum likelihood (ML) approach. The enhancement with this blind RT estimation achieves almost the same speech quality as by using the actual RT.

Tim Van et al (2007) [20] described the binaural cue preservation of a noise reduction algorithm for bilateral hearing aids. The researcher utilized multi channel Wiener filter along with interaural transfer function extension (MWF- ITF).

Young et al (2007) [21] proposed a modified spectral subtraction and companding for increasing the speech quality in digital hearing aids. Here the noise level is completely reduced through the adjustment of the biases of the evaluated noise spectrum that depends on the subtraction factor. The channel format is improved

by means of speech indicator via implementing the companding. In this method the weak speech components are extracted during that extraction the noise level is diminished. The algorithm is experimented based on a variety of objective and subjective evaluation. The performance metrics utilized in this paper for evaluating the algorithm is SNR and log likelihood ratio. The Likelihood Ratio (LLR) has a less correlation and SNR has the more correlation with subjective appraises.

The below Table 1 shows various algorithms described till now.

Table 1: Various Algorithms

Author Name	Proposed Algorithm
Jiang, Tao & Liang, Ruiyu	Speech Noise Reduction Algorithm (2017).
David	Based on supervised machine learning and time frequency masking 2013
Santosh	Spectral subtraction technique for real time speech enhancement 2013
Heinrich and Peter vary	Beam former method using Time-Difference-of-Arrival(TODA).2012
Ulrik Kjems	Noise matrix calculation by estimating the power spectral density of the noise present 2012
John Woodruff	Single and multichannel linear filters 2011
JEON-YU-Yong	Minima controlled recursive averaging (MCRA)2011
kluas	Blind source separation(BSS)2010
Apte	Phase spectrum and constant magnitude spectrum are combined 2010
Junfeng Li	Two-stage binaural speech enhancement based on the EC model with Wiener filter(TS-BASE/WF) 2009
HEINrich &Peter	Single channel speech enhancements by using generalized spectral subtraction 2009
TIM Van	Multi channel Wiener filter along with interaural transfer function extension(MWF-ITF) 2007
Sunitha	DCT-LMS 2007
Simon Doclo	Generalized Singular value decomposition (GSVD) 2002

CONCLUSION

Digital technology, in today’s world offers better hearing aid designs. In this paper many designing and speech enhancements techniques of digital hearing aids have been discussed. By studying all these hardware designs and algorithms It has been observed that there is a large scope to develop digital hearing aids by using Open hardware and algorithms using free and open source software which are playing vital role in the current trend technologies and giving custom made solutions. Hence my view by using those we may provide well equipped

digital hearing aids for Indian hearing impaired patients may be at reduced prices.

Ethical Clearance: Taken from CMR Engineering College.

Source of Funding: Self

Conflict of Interest: Authors have no conflict of interest to declare regarding the publication of this paper.

REFERENCES

1. Wikipedia contributors. Deaf history. Wikipedia,

1. The Free Encyclopedia. Wikipedia, The Free Encyclopedia. Oct 2018, Web. 14 Nov. 2018.
2. Data available at: <http://www.hearingloss.org/content/types-causes-and-treatment>
3. Wikipedia contributors. Audiometry. Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, Feb 2018. Web. 14 Nov. 2018.
4. Data available at : <http://www.earinfo.com/Howread/howread7.html>
5. Schweitzer C. Development of digital hearing aids. Trends in amplification. Jun 1997, Vol. 2, No. 2, pp. 41-77.
6. Wikipedia contributors. Hearing aid. Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia. Oct 2018, Web. 14 Nov. 2018.
7. Srisangngam P, Chivapreecha S, Dejhan K. A design of IIR based digital hearing aids using genetic algorithm. In Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON). 2011 8th International IEEE Conference. May 2011, pp. 967-970.
8. Bäuml RW, Sörgel W. Uniform polyphase filter banks for use in hearing aids: design and constraints. In 2008 16th IEEE European Signal Processing Conference. Aug 2008, pp. 1-5.
9. Stetzler T, Magotra N, Gelabert P, Kasthuri P, Bangalore S. Low power real-time programmable DSP development platform for digital hearing aids. In Acoustics, Speech, and Signal Processing, 1999. Proceedings., 1999 IEEE International Conference. Mar 1999, Vol. 4, pp. 2339-2342.
10. Kates JM. Principles of Digital Dynamic-Range Compression. Trends in Amplification. 2005, Vol. 9, No. 2, pp. 45-76.
11. Deng TB. Three-channel variable filter-bank for digital hearing aids. published in IET Signal Processing, ISSN 1751-9675, Vol. 4, No. 2, pp 181-196.
12. Deng TB. Three-channel variable filter-bank for digital hearing aids. IET Signal Processing. Apr 2010, Vol. 4, No. 2, pp. 181-196.
13. Jiang T, Liang R, Wang Q, Bao Y. Speech Noise Reduction Algorithm in Digital Hearing Aids Based on an Improved Sub-band SNR Estimation. Circuits, Systems, and Signal Processing. Mar 2018, Vol. 37, No. 3, pp. 1243-1267.
14. Waddi SK, Pandey PC, Tiwari N. Speech enhancement using spectral subtraction and cascaded-median based noise estimation for hearing impaired listeners. In Communications (NCC), 2013 IEEE National Conference, Feb 2013, pp. 1-5.
15. Löllmann HW, Vary P. Beamformer for driving binaural speech enhancement. In Acoustic Signal Enhancement; Proceedings of IWAENC 2012. International Workshop VDE. 2012 Sep, pp. 1-4.
16. Kjems U, Jensen J. Maximum likelihood based noise covariance matrix estimation for multi-microphone speech enhancement. In Signal Processing Conference (EUSIPCO), 2012 Proceedings of the 20th European IEEE. Aug 2012, pp. 295-299.
17. Woodruff J, Wang D. Directionality-based speech enhancement for hearing aids. In Acoustics, Speech and Signal Processing (ICASSP), 2011 IEEE International Conference. May 2011, pp. 297-300.
18. Jeon YY, Lee SM. A speech enhancement algorithm to reduce noise and compensate for partial masking effect. Journal of Central South University of Technology. Aug 2011, Vol. 18, No. 4, pp. 1121-1127.
19. Li J, Sakamoto S, Hongo S, Akagi M, Suzuki Y. Two-stage binaural speech enhancement with Wiener filter based on equalization-cancellation model. In Applications of Signal Processing to Audio and Acoustics, 2009. WASPAA'09. IEEE Workshop. Oct 2009, pp. 133-136.
20. Löllmann HW, Vary P. Low delay noise reduction and dereverberation for hearing aids. EURASIP Journal on advances in signal processing. Jan 2009, Issue 2009:1.
21. Van den Bogaert T, Wouters J, Doclo S, Moonen M. Binaural cue preservation for hearing aids using an interaural transfer function multichannel Wiener filter. In Acoustics, Speech and Signal Processing, 2007. ICASSP 2007. IEEE International Conference. Apr 2007, Vol. 4, pp. IV-565.
22. Lee YW, Lee SM, Ji YS, Lee JS, Chee YJ, Hong SH, Kim SI, Kim IY. An efficient speech enhancement algorithm for digital hearing aids based on modified spectral subtraction and companding. IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences. Aug 2007, 90, No. 8, pp. 1628-35.

10T Sram Cell Designing Single Ended Decoupled Read Bit Line

R Bhanuchandar¹, B Harikrishna², Suman Mishra²

¹M.Tech Student, Department of Electronics and Communication Engineering, ²Professor, Department of Electronics and Communication Engineering, CMR Engineering College, Hyderabad

ABSTRACT

Read stability and read speed are the most likely problems encountered in the cells of the SRAM. The access transistors used to access the basic latch takes extra time to read the cell data during the read operation, and more over there exists a possibility of external noise corrupting the cell data. The problem of consumption of extra read time and possibility of noise corrupting the cell data can be circumvented by making use of 10T SRAM cell, modified with single ended decoupled read bit line, providing advantage of speed and noise margin. The conventional 6T SRAM cell is equipped with word line for both read and write processes, but the proposed 10T SRAM cell uses a different read enable line to read the stored bit. This allows the memory element to remain isolated from the external disturbance, additionally the extra time required to activate the access transistors is not required as the read operation in this cell does not require it. The design of read behaviour is analyzed using tanner tool 180nm technology and compared with the reported basic 6T structure.

Keywords: Read Stability, 10TSRAM Cell, Noise Margin, Access Transistor, Tanner Tool

INTRODUCTION

Control dissemination has turned into a top of the line ^[1], ^[2]. As we have hit the usage divider, the low power circuit design, and frame work level methods are searched out ^[3], ^[4]. Moreover, the static random-access memory (SRAM) is the most critical advanced large-scale framework on-chip (SoC) that is ever increasing ^[5]. Diminishing the power dissemination of SRAM won't just lower the general frame work control dispersal but will additionally increment the yield and enhance the SoC unwavering quality ^[6]. Decrease of the supply voltage is the most direct system to lessen the dynamic power dissipation. Be that as it may, 6T SRAM control supply can't be lessened forcefully because of its RSNM debasement. Numerous SRAM cells have been suggested that enhance the RSNM. In this work, the full V_{DD} pre-charge and charge reusing strategy for low power read task is presented. A 4T read port is intended to utilize the proposed strategy. Read BL (RBL) is charged and released through the read port as indicated by the condition of put away piece. Read port is fuelled by virtual power rails that run even and are shared by the

cells of a word. The dynamic control of read port power rails diminishes the RBL spillage considerably.

LITERATURE SURVEY

In this section, description about the different SRAMs is proposed. In the ^[7] the author proposed 9T SRAM cell which exhibited by a 72 Kb SRAM large scale with a Negative Bit-Line (NBL) Write-help and a versatile Read task timing following circuit actualized in 65 nm low-spillage CMOS innovation. Estimated full Read and Write usefulness is without mistake with V_{DD} down to 0.35 V (0.15 V lower than the edge voltage) with 229 KHz recurrence and 4.05 μ W control. In ^[8] the author proposed 9T cell used a plan with independent read and composes word lines; it is demonstrated that the 9T cell accomplishes changes in control dispersal, execution and dependability contrasted and past outlines (that require 10T and 8T) for low-control task. The 9T plot is amiable to little element sizes as experienced in the profound sub-micron/nano scopes of CMOS innovation. The author ^[9] investigated the cut off points of low-voltage task for conventional six-transistor (6T) SRAM and proposes an option bit cell that capacities

an excessive amount of lower voltages. Estimations affirm that a 256-kb 65-nm SRAM test chip utilizing the proposed bit cell works into sub-limit to beneath 400 mV. At this low voltage, the memory offers significant power and vitality reserve funds at the cost of speed, influencing it to appropriate to vitality compelled applications. The author in [10] have manufactured a 64-kb SRAM large scale utilizing 90-nm CMOS innovation and have acquired with it a base VDD of 440 mV and a 20-ns get to time with a 0.5-V supply. In [11] proposed method cell works down to 0.35 V with a read clamour edge of 74 mV and a compose commotion edge of 92 mV. Under this condition, the read and compose commotion edges of the customary six-transistor (6T) cell are 18 and 27 mV, individually. The cell territory is 1.57× the ordinary 6T SRAM cell zone in 45-nm configuration rules.

Existing System

The existing 10T SRAM using half-V_{DD} pre-charge and row-wise dynamically powered read port for low switching power and ultra low RBL leakage is shown in Figure 1.

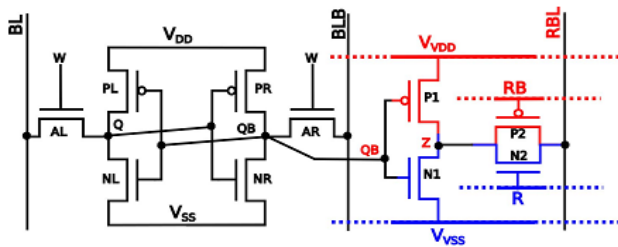


Figure 1: Existing Circuit Diagram

As shown in the circuit diagram of Fig 1, the 6T SRAM circuit has 6T transistor, which is used for the write operation and 4T transistor, that is used for the read bit line for read operation. This circuit performs read and write operation simultaneously, BL and BLB are the inputs to the circuit for the write operation, whereas Q and QB are the output. In read operation QB is the input of the 4T transistor circuit where as R and RB are the inputs for the read operation and RBL is the output.

Write Operation

Case 1: When W=1, BL=1 and BLB=0.

The operation, when above inputs are given to the circuit, AL and AR transistor are ON. When the BL line goes high, it is conveyed to inverter circuit, making the PR transistor OFF and the NR transistor ON; the data is stored in the memory as QB=0. The BLB line is to go low, so the PL transistor is ON and NL transistor is OFF, which makes the V_{dd} to store as Q=1 in the memory, so the data stored is Q=1 and QB=0.

Case 2: When inputs W=1 and BL=0 and BLB=1.

The operation, when above inputs are given to the circuit AL and AR transistor are ON. When the BL line goes low, it is conveyed to inverter circuit, making the NR transistor is OFF and the PR transistor is ON; the data stored in the memory as QB=0. The BLB line goes to high, so that the PL transistor is OFF and NL transistor ON, which makes V_{dd} to store as Q=1 in the memory, so the stored data is Q=1 and QB=0.

Read Operation

In the read operation, the data that are stored in the memory can be read by the read bit line RBL. RBL is considered as the Q, and the inversion of RBL is considered as the QB.

Case 1: Read operation inputs when R=1 and RB=0 QB=0.

The operation when the input of the inverter circuit QB is low, the N1 transistor is OFF and the P1 transistor is ON. When V_{dd} is at Z node and then R=1, makes the N2 transistor to turn ON, and when RB=0, P2 transistor is ON. This acts as transmission gate then output of the RBL=1. So, the stored data RBL=Q=1 and then QB=0.

Case 2: Read operation inputs when R=1 and RB=0 QB=1.

The operation when the input of the inverter circuit QB is high, the P1 transistor is OFF and the N1 transistor is ON. When V_{dd} is grounded at Z node which goes low and then R goes high. The N2 transistor turns ON and RB goes high to make the P2 transistor ON. It acts as transmission gate then output of the RBL=0, So the stored data RBL=Q=0 and then QB=1.

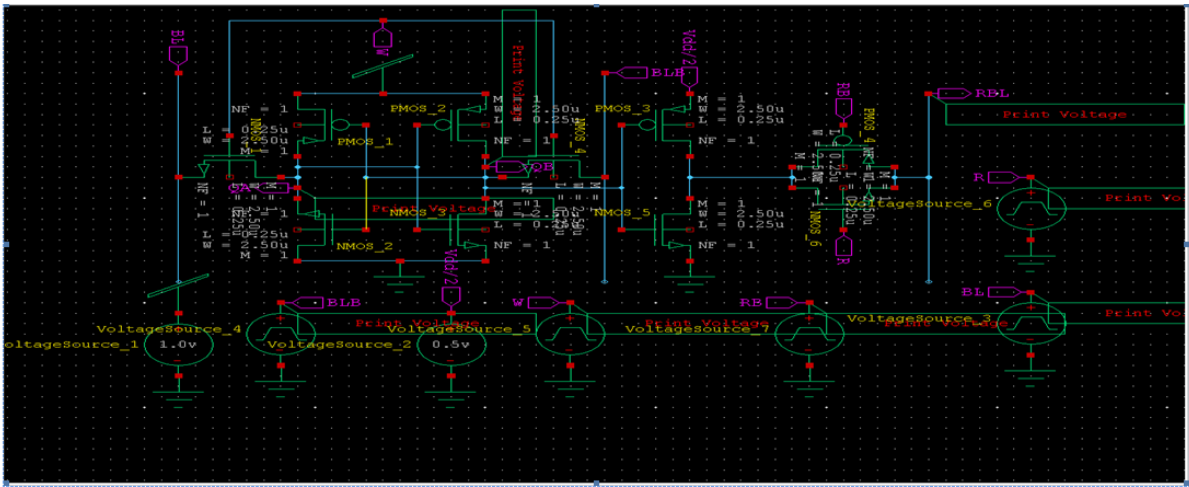


Figure2: Existing 10T SRAM Design Implementation usingTanner Tool

Case 3: When $W=0$, at any instant, the mode is going to be the hold mode. The circuit is realized using the tanner tool and the outputs are shown in the Figure 2. The corresponding results are shown in results section.

Proposed 10T SRAM with Single Ended Decoupled Read Bit Line

The proposed circuit has 10 number of transistors out of which 6 transistors connected to 6T SRAM for write operation. NMOS2 transistors and PMOS1 transistors forms an inverter circuit with NMOS3 and PMOS2 transistors. The inverters circuits are connected in decoupled manner. The design of proposed circuit is shown in Figure 3 and Figure 4 refers to the design in tanner software. The W line, BL line and the BLB line are the inputs to the circuit. For write operation Q and QB are the output. For the read operation QB is the input of the inverter circuit. R and RB lines are the inputs for the read operation and RBL is the output.

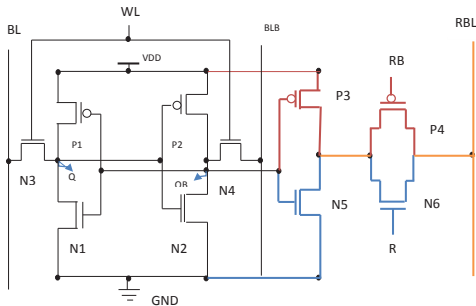


Figure 3: Proposed Circuit Design for 10T SRAM

Write Operation

Case 1: When $W=1, BL=1, BLB=0$.

The operation when inputs are high to the circuit, the NMOS-1 transistor and the NMOS-5 transistor are ON.

BL goes high and the high input is given to the inverter circuit, the PMOS-2 transistor is turned OFF and the NMOS-3 transistor is turned ON. The data is stored in the memory as $QB=0$. When $BLB=0$, the PMOS-1 transistor is ON, and V_{dd} is stored in the memory as $Q=1$ which makes the NMOS-2 transistor OFF. So, the data is stored in memory as $Q=1$ and $QB=0$.

Case 2: When inputs $W=1$ and $BL=0$ AND $BLB=1$.

The operation when the above inputs are given to the circuit, the NMOS-1 transistor and NMOS-5 transistor are ON. BL goes low and the low input is given to the inverter circuit, the NMOS-3 transistor is turned OFF and PMOS-2 transistor is turned ON. The data is stored in the memory as $QB=0$.When $BLB=1$, the PMOS-1 transistor is OFF, and the NMOS-2 transistor is ON, and V_{dd} is stored in the memory as $Q=1$.So, the data stored in memory as $Q=1$ and $QB=0$.

Read Operation

During the read operation, the data stored in the memory can be read by the read bit line RBL. RBL is considered as the Q inversion of RBL and is denoted as QB.

Case1:Read operation inputs when $R=1$ and $RB=0$ $QB=0$.

The operation when the input of inverter circuit $QB=0$, NMOS-4 transistor and the PMOS-3 transistor are OFF. When the V_{dd} is at Z node, then R goes high and the NMOS-6 transistor is ON. The RB goes low and the PMOS-5 transistor is ON. This acts as a transmission gate, with the output of the $RBL=1$.So, the data stored in memory as $RBL=Q=1$ and $QB=0$

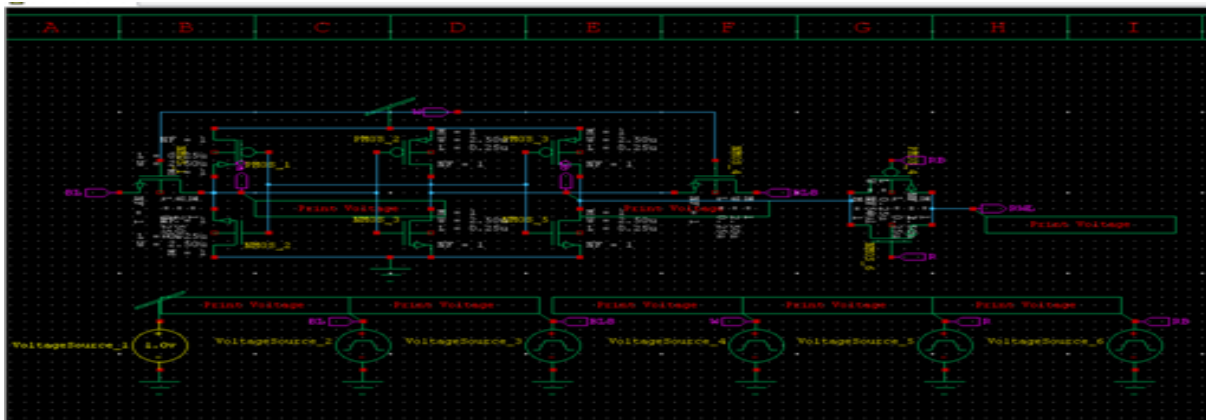


Figure 4: Proposed Circuit Design 10T SRAM Implemented in Tanner Tool

Case 2: Read operation inputs when R=1 and RB=0 QB=1.

The operation when the input to inverter circuit QB goes high, the PMOS-3 transistor is OFF and NMOS-4 transistor is ON. When V_{dd} is grounded and node Z=0, then R goes high and the NMOS-6 transistor is ON, this makes the RB go to low making the PMOS-5 transistor to ON. This acts as a transmission gate with the output as RBL=0. So, the data stored in memory as RBL=Q=0 and automatically QB=1.

Case 3: When the W=0 the circuit goes to the hold mode.

RESULTS AND DISCUSSION

The existing 10T SRAM cell simulation wave form is shown in Figure 5 for read and writes operation, with the read and writes inputs high. The corresponding results are tabulated in the Table 1. Table 2 shows the parameters comparison between the existing method with the proposed method.

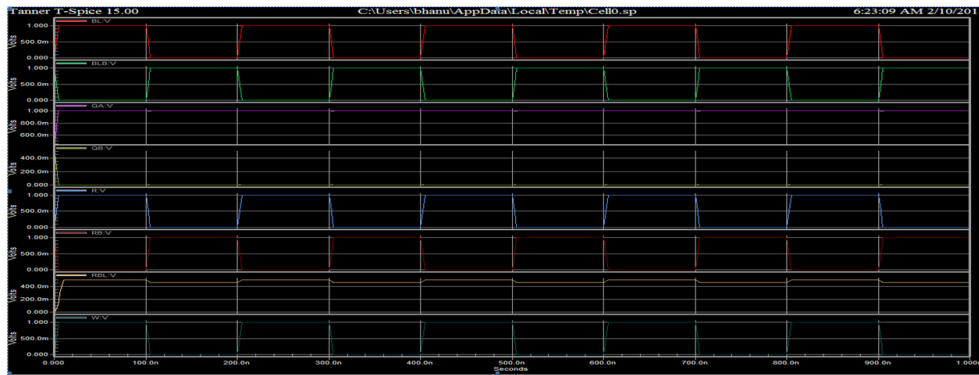


Figure 5: Existing Design Results of 10T SRAM Outputs Read and Write Operation in Tanner Tool

Table 1: Result Analysis for Existing Method and Proposed Method

Parameters	Existing Method	Proposed Method
Max Power	2.287543e-008 at time 1e-006	3.354735e-008 at time 1e-006
Parsing	0.00 seconds	0.00 seconds
Setup	0.03 seconds	0.03 seconds
DC Operating point	0.06 seconds	0.06 seconds
Transient Analysis	0.11 seconds	0.11 seconds
Overhead	0.69 seconds	0.41 seconds
Total Read and Write Time	0.89 seconds	0.61 seconds

The proposed 10T SRAM cell simulation wave form is shown in Figure 6 for read and writes operation, with the read and writes inputs being high. Table 2 shows the comparison of 10T proposed system with 6T, 7T, 8T, 9T, 10T existing systems.

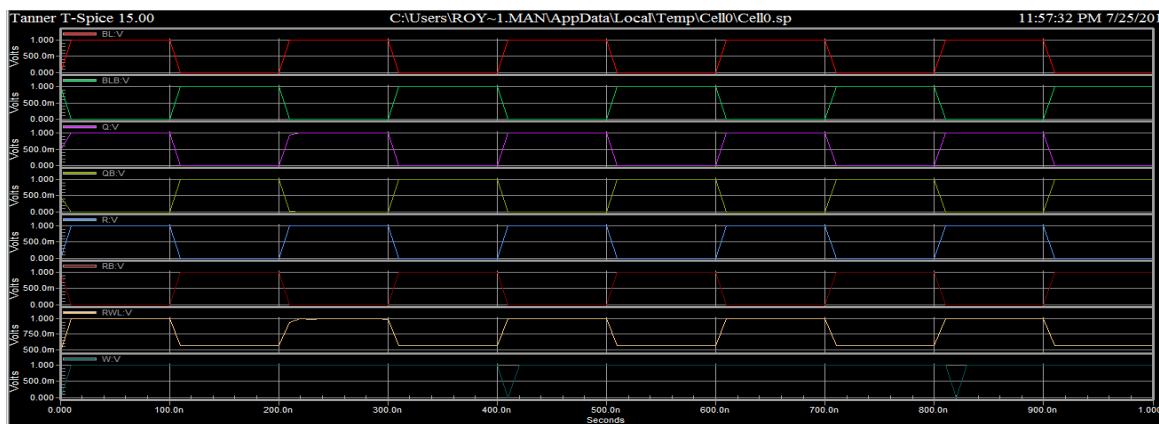


Figure 6: Proposed 10T SRAM Outputs Read and Write Operation Outputs

Table 2: Comparison with 10T Proposed System with 6T, 7T, 8T, 9T, 10T Existing System

Different parameters	6T	7T	8T	9T	10T Existing method	10T Proposed method
Write Stability	Low	Low	Low	Low	Low	High
Read Stability	Low	Low	Low	Low	Low	High
Cell Supply Reduction	Low	Low	Low	Low	Low	High
Power Dissipation	High	High	High	High	High	Low
Leakage Current	High	High	High	High	High	Low
Bit Line I_{On} and I_{Off} Ratio	High	High	High	High	High	Low
Variability	High	High	High	High	High	Low
ReadStaticNoise Margin	High	High	High	High	High	Low
Transient Analysis Time	High	High	High	High	High	Low
Speed of Operation	High	High	High	High	High	High

CONCLUSION

The proposed 10T SRAM circuit and the existing 10T SRAM circuit are simulated using the Tanner Tool software. The performances of both the circuits have been compared. For the proposed 10T SRAM system, the parameters of the system like the Read delay and Read Noise are improved. Hence it is evident that the proposed method produced better performance and high-speed operation. The power consumption of the proposed system is also compared with different types of 6T to 10T SRAMs, which shows advantage over

existing systems. This system can be used in modern satellite communication systems, graphic cards, mobile phones and other low-power applications.

Ethical Clearance: Taken from CMR Engineering College.

Source of Funding: Self

Conflict of Interest: Authors have no conflict of interest to declare regarding the publication of this paper.

REFERENCES

- [1] Naeem Maroof, Bai-Sun Kong. 10TSRAM Using Full Vdd with Single Ended Decoupled Read Bit Line. *IEEE Transactions on Very Large-Scale Integration (VLSI) Systems* 2017.
- [2] Kim NS, Austin T, Baauw D, Mudge T, Flautner K, Hu JS, Irwin MJ, Kandemir M, Narayanan V. Leakage current: Moore's law meets static power. *computer*. Dec 2003, Vol. 36, No. 12, pp. 68-75.
- [3] Venkatesh G, Sampson J, Goulding N, Garcia S, Bryksin V, Lugo-Martinez J, Swanson S, Taylor MB. Conservation cores: reducing the energy of mature computations. In *ACM SIGARCH Computer Architecture News*, Mar 2010, Vol. 38, No. 1, pp. 205-218.
- [4] Goulding-Hotta N, Sampson J, Venkatesh G, Garcia S, Auricchio J, Huang PC, Arora M, Nath S, Bhatt V, Babb J, Swanson S. The greendroid mobile application processor: An architecture for silicon's dark future. *IEEE Micro*. Mar 2011, Vol. 31, No. 2, pp. 86-95.
- [5] Pavlov A, Sachdev M. *CMOS SRAM Circuit Design and Parametric Test in NANO-Scaled Technologies: Process-Aware SRAM Design and Test*. The Netherlands: Springer. 2008, Vol. 40.
- [6] Chang L, Fried DM, Hergenrother J, Sleight JW, Dennard RH, Montoye RK, Sekaric L, McNab SJ, Topol AW, Adams CD, Guarini KW. Stable SRAM cell design for the 32 nm node and beyond. In *VLSI Technology, 2005. Digest of Technical Papers. 2005 Symposium*. Jun 2005, pp. 128-129.
- [7] Tu MH, Lin JY, Tsai MC, Lu CY, Lin YJ, Wang MH, Huang HS, Lee KD, Shih WC, Jou SJ, Chuang CT. A single-ended disturb-free 9T subthreshold SRAM with cross-point data-aware write word-line structure, negative bit-line, and adaptive read operation timing tracing. *IEEE Journal of Solid-State Circuits*. Jun 2012, Vol. 47, No. 6, pp. 1469-82.
- [8] Mudge T. Power: A first-class architectural design constraint. *Computer*, Apr 2001, Vol. 34, No.4, pp. 52-58.
- [9] Calhoun BH, Chandrakasan AP. A 256-kb 65-nm sub-threshold SRAM design for ultra-low-voltage operation. *IEEE J. Solid-State Circuits*. Mar 2007, Vol. 42, No. 3, pp. 680-688.
- [10] Takeda K, Hagihara Y, Aimoto Y, Nomura M, Nakazawa Y, Ishii T, Kobatake H. A read-static-noise-margin-free SRAM cell for low-VDD and high-speed applications. *IEEE journal of solid-state circuits*. Jan 2006. Vol. 41, No. 1, pp. 113-121.
- [11] Saeidi R, Sharifkhani M, Hajsadeghi K. A subthreshold symmetric SRAM cell with high read stability. *IEEE Trans. Circuits Syst. II, Express Briefs*. Jan 2014, Vol. 61, No. 1, pp. 26-30.

IOT Enabled Waste Management System In Smart Cities

S. Keerthika¹, G Pravalika², Subramanyachari³

¹M.Tech Student, ²Assistant Professor, CMR Engineering College, ³Assistant Professor, CMR Engineering College, Hyderabad, Telangana

ABSTRACT

This paper proposes a waste management system in smart cities. As India is a developing nation, the important challenge is making the country as a smart city. The important concept of smart cities is the waste management which is very much trending and helpful these days. In the earlier existing systems, there is no indication whether the dustbin is over flow, It is more time consuming task and it is less effective. It also makes more traffic and noise. In this system the level of the dustbin will not be known and create the bad smell spreads and cause illness to human beings. In this proposed system, multiple dustbins from the different areas throughout the cities are connected using IOT technology. The dustbin uses low cost embedded devices and it will sense the level of dustbin, then it is sent to the municipality officer. Then the information is sent to the truck driver to collect the waste. The proposed system will help to avoid the overflow of dustbin. It will give the real time information about the level of the dustbin. It will send the message immediately when the dustbin is full. Cost of this system is minimum. Improves environment quality by reducing the smell and make the city clean. It will also reduce the wastage of time and energy for truck drivers.

Keywords: IOT, Smart cities, Waste management, Ultrasonic Sensor, WIFI, GPS.

INTRODUCTION

The Internet of Things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enable these objects to connect and exchange data. This network allows the objects to be sense and controlled automatically across the existing infrastructure. This network creates the opportunities to integrate the things into computer based network system for improving the efficiency, accuracy, and economic benefits. Things that are connected to the Internet and those devices controlled from the Internet is called Internet of Things. In this system, the smart bin is connected with the internet to display the exact information about the dustbin level and to which area it belongs. In present there was a rapid growth in the population which leads to large quantity of waste disposal in the cities. The overflow of dustbin will create a unpleasant environment and it affect many people by spreading the deadly disease. The implementation of proper waste management system will avoid the spreading of such disease. The dustbins are properly managed and information is seen regularly and the municipality officer make immediate response

by intimating to truck driver. The truck driver will go immediately and collect the waste form the dustbin. Multiple dustbins are connected through the cities. The Dustbins are integrated with ultrasonic sensor, Raspberry pi. The ultrasonic sensor is used to detect the level of dust in the dustbin. After detecting the level of dustbin the information is send to the Raspberry pi at the Central System and Internet connection is enabled through the connection of Wi-Fi module. The Dustbin status whether the dustbin is full or empty and the location of the dustbin will displayed in TELNET APP ^[1]. A definition is required which best suits to the IoT-enabled waste collection in Smart Cities, which is ^[2]: “A Smart City is a city well performing in a forward-looking way in the following fundamental components (i.e., Smart Economy, Smart Mobility, Smart Environment, Smart People, Smart Living, and Smart Governance), built on the ‘smart’ combination of endowments 978-1-4799-8325-4/115/\$31.00 ©2015 IEEE and activities of self-decisive, independent and aware citizens”. This definition contains the fundamental component of Smart Environment which is relevant to environmental pollution. A municipality service which acts as a countermeasure to environmental pollution within the

Smart City is the 10Tenabled waste collection. Related research in the literature addresses the treatment of waste collection as an essential municipal service^[3]. The key issue in the waste management is that the garbage bin at public places gets overflowed well in advance before the commencement of the next cleaning process. This in turn leads to various hazards such as bad odor due to waste decomposition & ugliness to that place which may be the root cause for spread of various diseases^[4]. Our proposed system, 'IoT enabled dustbins' can ease these major issues and will have two major functionalities. First, improvising current waste collection system so that the hazards of waste accumulation and costs in collection process are minimized. Second, prevents spilling of the waste all over the roads maintaining cleanliness. Also, it rewards users with points if it is put in right dustbin so that more citizens can be engaged in proper recycling of waste by use of dustbins. costs related to waste collection are also minimized by routing system based on capacity of municipal trucks and the fullness of the dustbins, in order to get all the waste collected efficiently. In present scenario of digitalizing world everything in our surroundings have been equipped with modern technology and internet to ease our work and gain more efficiency. But the systems existing today for waste management are the same as they were before in most of the countries. Currently, for collection of waste in some countries, we have door to door collection systems that require a lot of efforts and money. A waste collector has to visit everybody's place, knocking the doors, and has to wait till each resident brings the waste to them^[5]. Authors propose a novel IoT-enabled dynamic routing model for waste collection in a Smart City. The proposed model is robust in case of emergency (i.e., a road under construction, unexpected traffic congestion). Related research in waste collection focuses on dynamic scheduling and routing models. However less research states the waste collection as a Smart City service. Concretely, models reported in the literature have not close relation with the concepts of IoT and Smart Cities. This is the focus of the current paper; to enable IoT for efficient waste collection in Smart Cities. Specifically, only in ^[6].it is addressed the waste collection as a problem which can be solved with IoT infrastructure; incorporated in Smart Cities. There are

two main classifications of collecting waste: collecting implementing bins and collecting door-to-door. In the first case on take s into consideration the bin is size and emptied over an area whereas in the second case waste is directly collected from houses and other areas by vehicles^[7]. The Smart Waste Management system that we have proposed and executed in this paper ensures proper storage and retrieval of the waste within a given a period. As waste gets dumped in the garbage pail, on reaching a maximum capacity it will lock down (so as to avoid spillage) and send an SMS so as to inform the authority mentioning that the trash in this particular can is decomposed or the can is full ^[8-11].

PROPOSED WASTE MANAGEMENT SYSTEM:

Figure 1 refers to the over view of proposed design of waste management system using IOT for smart cities. As the power supply given to the board through rectifier circuit which gives the regulated voltage of 5v to the raspberry pi3 model B. Raspberry pi has 40 GPIO pins. Devices interfaced to Raspberry pi are connected through these pins. Two ultrasonic sensors are connected to different pins of Raspberry pi. Ultrasonic sensor HC-SR04 contains 4 pins they are: vcc, trigger, echo, ground. The current consumed by the sensor is less than 15mA and hence can be directly powered by the on board 5V pins (If available). The Trigger and the Echo pins are both I/O pins and hence they can be connected to I/O pins of the Raspberry pi. when dust is dropped in bin slowly. It will detect the level of dustbin .5v d.c power supply is given to all components except Relay it requires 12 dc supply. wifi module ESP 8266 and GPS module is connected to Raspberry pi. GPS module will track the longitude, latitude values and location of the bin .This information is transferred to Raspberry pi through wi-fi. GPS and wifi module transmit the serial data but Raspberry pi will have TTL input So MAX 232 converts the signals from RS 232 Serial port to signals suitable for use in TTL compatible logic. TELNET app is created with IP address 192.168.4.1 in mobile phone. The status of the dustbin is displayed on LCD and Telnet app. The Municipality officer continuously moniter through Telnet app.

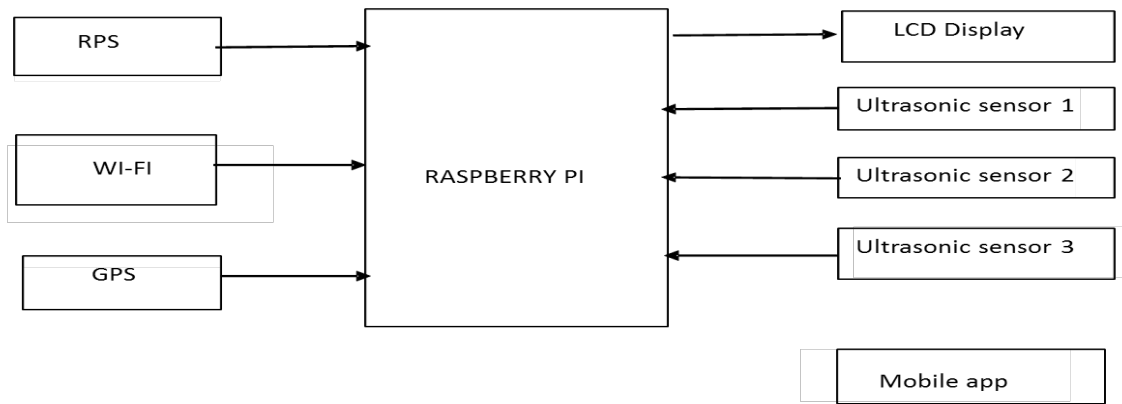


Figure 1: Overall implementation of waste management system

FLOW CHART

Figure 2 represents the flow model of IOT enabled waste management system. In starting process if the dustbin is full it will send the message to the garbage

collection department. If the dustbin is empty it will not send any message it will again go for starting process .if the dustbin is full department will send message to the truck driver. He will collect the dust from the location and the dustbin will be empty and the process stopped. if the dustbin is full the process continues.

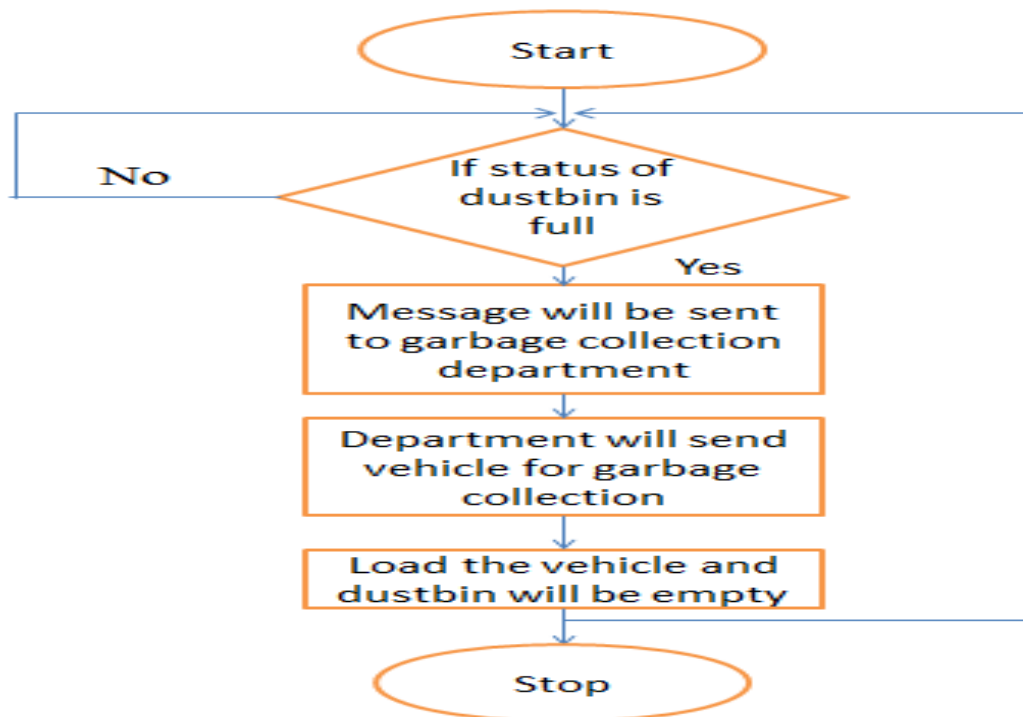


Figure 2: Flow chart of waste management system

RESULTS & DISCUSSION

Figure 3 represents the circuit diagram when power supply connected. It contains the modules as Raspberry pi, Regulated power supply, ultrasonic sensor, wifi, GPS module, max 232,RS232, Relay and LCD display. These devices are interfaced to the Raspberry pi. The data collected from the ultrasonic sensor and the location is identified from GPS module. For nearer communication WI-FI modem ESP 8266 used to facilitates wireless connections. When power supply connected all LED 's will blink . the output is displayed on 16*2 LCD display.

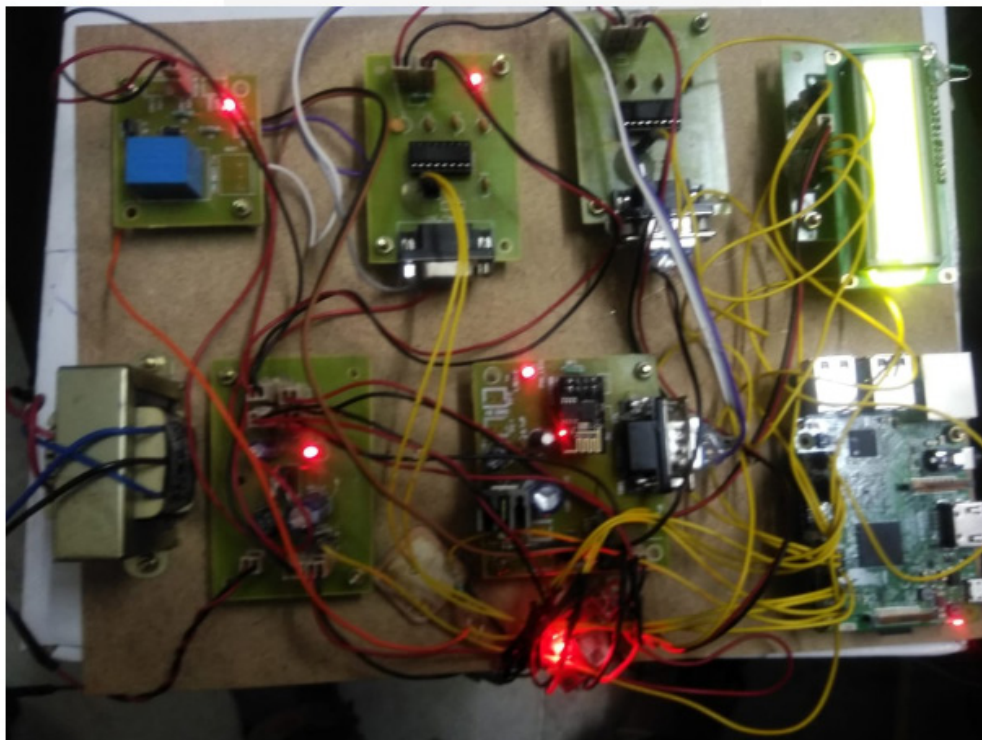


Figure 3: Circuit connection of waste management system

The Figure 4 Shows ultrasonic sensor is placed at the top of the dustbin.it will detect the level of dustbin whether it is filled or empty. These information is displayed on LCD and Telnet app.

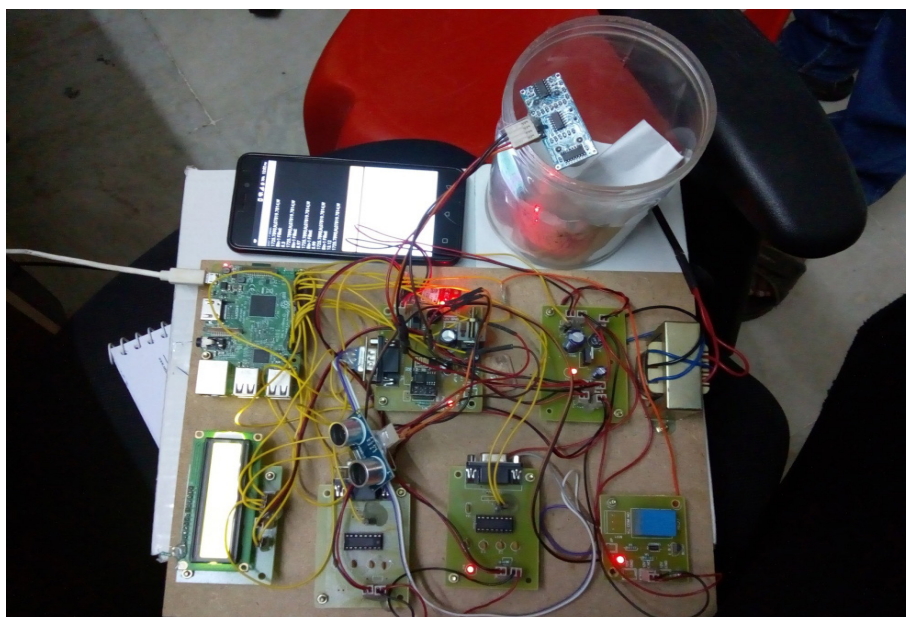


Figure 4: when dustbin is placed and output status in mobile phone

The Figure 5 depicts two ultrasonic sensor values. These two will be placed above the dustbin. The ultrasonic sensor will continuously monitor the dustbin level. These values will be sent the Raspberry pi. 16*2 LCD display will connected to the pins of the Raspberry pi. These information are displayed on LCD display.

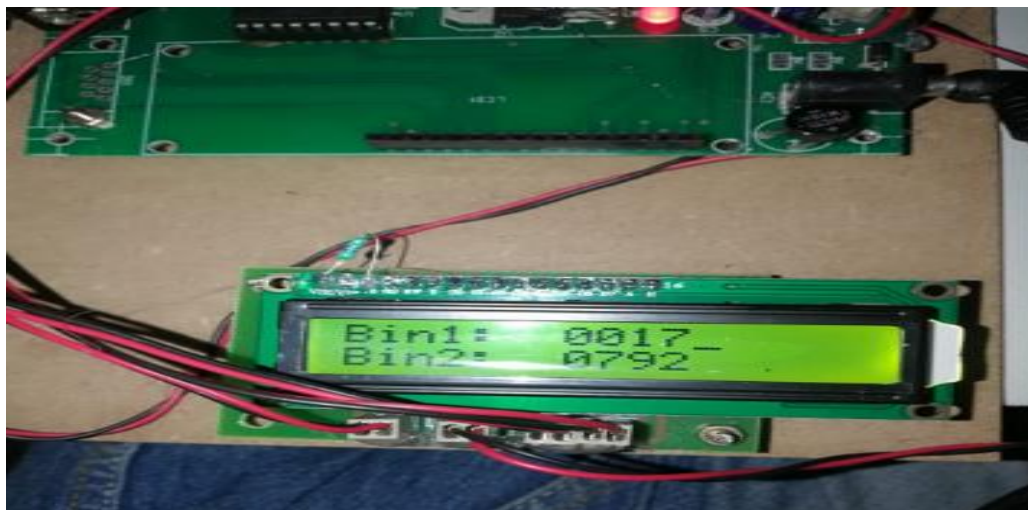


Figure 5: Dustbin values on LCD display

The Figure 6 shows the dustbin status whether it is filled or empty and longitude and latitude values of the bin. TELNET app is created with an IP address 192.168.4.1 and it is installed in mobile phone .wifi is enable in mobile phone and dustbin status continuously monitor through TELNET app.

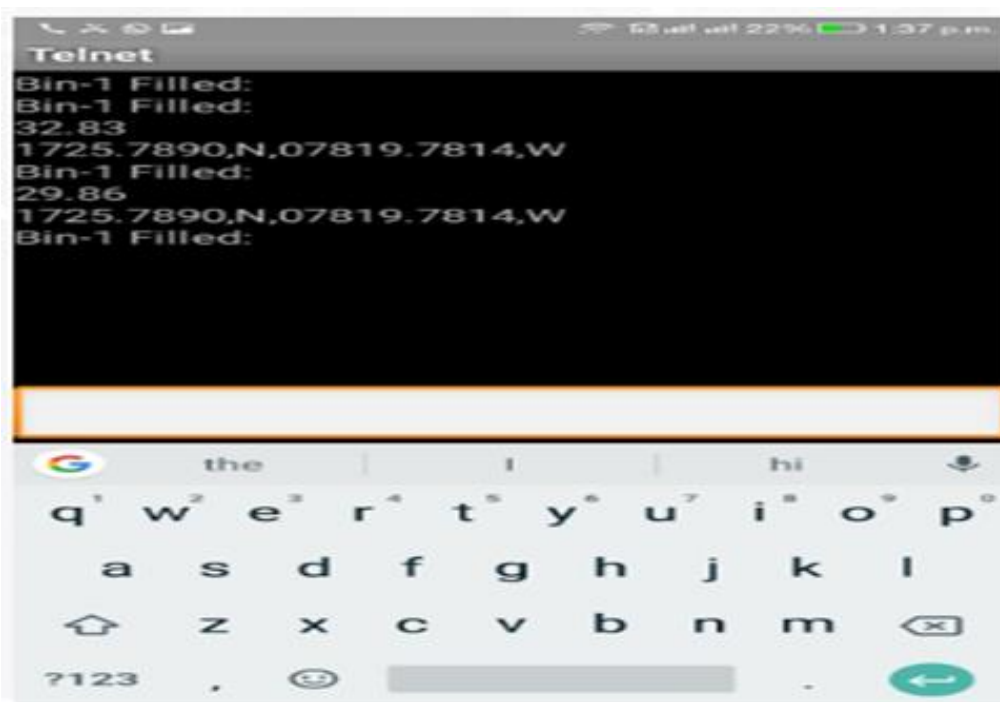


Figure 6: Dustbin status in TELNET app.

The Figure 7 shows the location. With GPS coordinates longitude and latitude values it identifies the exact location of the dustbin. The concerned officer will identifies the location and status of the dustbin and these information is sent to the garbage collection vehicle.

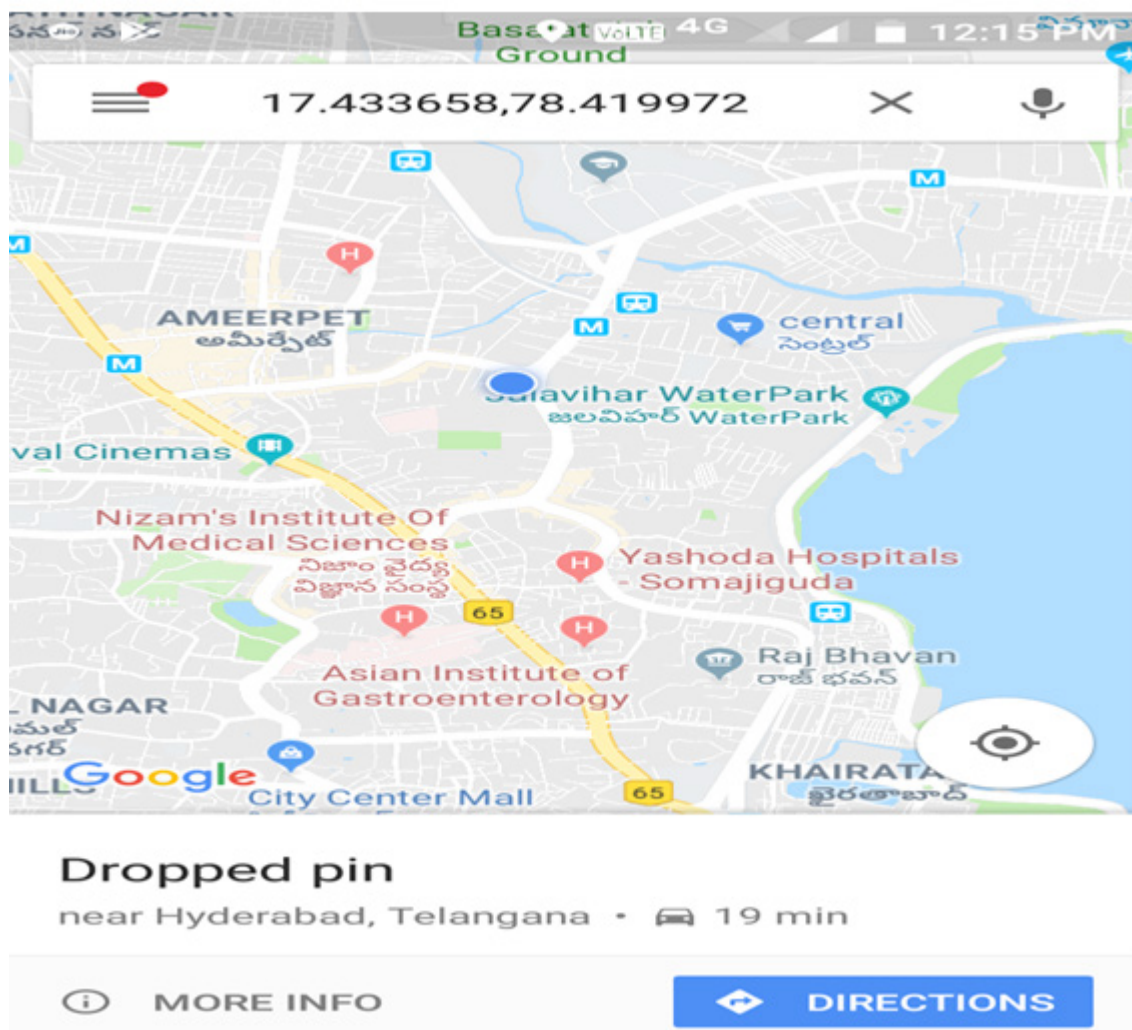


Figure 7: Location of the dustbin

CONCLUSION

This study ‘s emphasis gets on even more energy-efficient IoT as an enabler of different applications consisting of waste administration. Particularly, it intends to provide a big collection of versions handling the effective waste monitoring. Unique interest is paid on the waste collection. We offer initiatives for the smart transport within the context of IoT as well as Smart Cities for waste collection. We suggest an inductive taxonomy to execute relative evaluation of the evaluated designs. Ultimately, our future job is concentrated on the interpretation of an efficient IoT-enabled design for waste collection, which will certainly discuss the consolidation of high capability waste vehicles as mobile depots. On top of that, waste containers are positioned to enhance convenience of citizens.

Ethical Clearance: Taken from CMR Engineering College.

Source of Funding: Self

Conflict of Interest: Authors have no conflict of interest to declare regarding the publication of this paper.

REFERENCES

[1] Fazio M, Paone M, Puliafito A, Villari M. Heterogeneous Sensors Become Homogenous Things in Smart Cities. IEEE 6th International Conference on Innovative Mobile and Internet Services in Ubiquitous Computing (IMIS). Jul 2012, pp.775-780.

[2] Centre of Regional Science. Vienna University of Technology. Smart Cities. Ranking of European Medium-Sized Cities. 2014, <http://www>.

- smartcities.eu, [Accessed on: December 7,].
- [3] Suakanto S, Supangkat SH, Saragih R. Smart city dashboard for integrating various data of sensor networks. InICT for Smart Society (ICISS), 2013 International Conference, Jun 2013, pp. 1-5.
- [4] Kumar NS, Vuayalakshmi B, Prarthana RJ, Shankar A. IOT based smart garbage alert system using Arduino UNO. InRegion 10 Conference (TENCON), 2016 IEEE 2016 Nov, pp. 1028-1034.
- [5] Dugdhe S, Shelar P, Jire S, Apte A. Efficient waste collection system. InInternet of Things and Applications (IOTA), International Conference, Jan 2016, pp. 143-147.
- [6] Anagnostopoulos TV, Zaslavsky A. Effective waste collection with shortest path semi-static and dynamic routing. InInternational Conference on Next Generation Wired/Wireless Networking. Springer, Cham. Aug 2014, pp. 95-105.
- [7] Anghinolfi D, Paolucci M, Robba M, Taramasso AC. A dynamic optimization model for solid waste recycling. Waste management. Feb 2013, Vol. 33, No. 2, pp. 287-296.
- [8] Al Mamun MA, Hannan MA, Hussain A, Basri H. Integrated sensing systems and algorithms for solid waste bin state management automation. IEEE Sensors Journal. Jan 2015, Vol. 15, No. 1, pp. 561-567.
- [9] Kulcar T, Optimizing solid waste collection in Brussels. 1996, Eur.J.Oper.Res., Vol. 90, No.1, pp 71-77.
- [10] Faccio M, Persona A, Zanin G. Waste collection multi objective model with real time traceability data. 2011, Waste Manage., Vol. 33, No. 1, pp. 2391-2405.
- [11] Guerrero AL, Maas G, Hogland W. Solid Waste Management challenges for cities in developing countries. 2013, Waste Manage., Vol. 33, No. 1, pp. 220-232.

Cervical Cancer (CC) Causes and Identification Techniques

K Vani¹, S Ram Kishore Reddy², S Poongodi³

¹Asst Prof, ²Assoc Prof, ³Professor, CMR Engineering College

ABSTRACT

In today era most of the people caused by the cancers globally. One of the cancer mostly hits women because of their unawareness is cervical cancer. In this Paper, we present an extensive study on the causes and different identification methods technically available PAP smear test on cervical cancer in today's world.

Keywords: Cervical Cancer, Identification Techniques, PAP smear test

INTRODUCTION

Cervical Cancer growth is caused by the uncontrolled development of cells in the cervix. The cervix is the limited base bit of a lady's uterus^[1]. It look like a cone, it associates with the uterus to the vagina. Cervical cancer diseases caused by the human papillomavirus (HPV). HPV is an unusually regular sexually transmitted virus.

Cervical cancer is most often diagnosed between the ages of 35 and 44. About 15% of cervical cancers are diagnosed in women over age 65. Few women under the age of 20 are diagnosed with cervical cancer. ^[1]The 5-year survival rate tells you what percent of women live at least 5 years after the cancer is found. Percent means how many out of 100. The 5-year survival rate for all women with cervical cancer is 67%. For white women, the 5-year survival rates are 69%, and for black women, the 5-year survival rate is 56%. Survival rates depend on many factors, including the stage of cervical cancer that is diagnosed.

When Cervical cancer recognized at a early stage, the 5-year survival rate for ladies with intrusive cervical tumor is 92%. Only 46% of women with cervical Cancer are identified at early stages^[2]. That the CC has spread to encompassing tissues or organs or potentially the territorial lymph hubs, the 5-year survival rate is 57%. If the growth has spread to a removed piece of the body, the 5-year survival rate is 17%. It is vital to recollect that insights on the survival rates for ladies with cervical tumor are a gauge. The estimate may not demonstrate the after effects of better finding or treatment accessible

for fewer than 5 years.

In 2018, an estimated 13,240 women in the United States diagnosed with invasive cervical cancer. Occurrence rates for the disease dropped by 50% between 1975 and 2014 due to an increase in screening, which can find cervical changes before they turn cancerous. It is estimated that 4,170 deaths from the disease will occur in 2018.

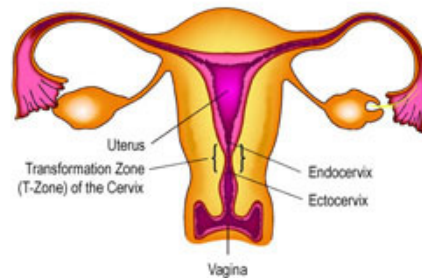


Figure 1 Cervix of the women

Causes of Cervical Cancer

The Risk factors which develops cervical cancer:

Human papillomavirus (HPV) infection: The most important risk factor for cervical cancer is infection with HPV ^[3]. HPV is one of the most risk factor for cause of CC. Sexual action with somebody who has HPV is the most widely recognized way somebody gets HPV. There are more than 100 distinct sorts of HPV, not which are all connected to tumor. The HPV composes that with cervical malignancy are HPV16 and HPV18.

Immune system deficiency: Women with lowered immune systems have a higher risk of developing cervical cancer [4]. A lowered immune system can be caused by immune suppression from corticosteroid medications, organ transplantation, treatments for other types of cancer, or from the human immunodeficiency virus (HIV), which is the virus that causes acquired immune deficiency syndrome (AIDS). When a woman has HIV, her immune system is less able to fight off early cancer.

Herpes: Women who have genital herpes have a higher risk of developing cervical cancer.

Smoking: Women who Are having smoke habit frequently, chances is their too get CC Compare to who do smoke..

Socioeconomic factors: Cervical malignancy is more typical among gatherings of ladies who are more averse to approach screening for CC. Those populaces will probably incorporate dark Women, Hispanic Women, and Native American Women.

Oral contraceptives: Some examination ponders recommend that oral contraceptives, which are conception prevention pills, might be related with an expansion in the danger of cervical cancer [5]. In any case, more research is expected to see how oral preventative utilize and the improvement of cervical disease are associated.

Test's for Cervical Cancer

The following tests may be used to identify cervical cancer:

Pelvic examination: In this examination, the specialist feels a lady's uterus, vagina, ovaries, cervix, bladder, and rectum to check for any strange changes. A Pap test is regularly done in the meantime.

Pap test: Amid a Pap test, the specialist tenderly scratches the outside of the cervix and vagina, [6] taking examples of the cells for testing. Enhanced Pap test strategies have made it simpler for specialists to discover carcinogenic cells. Conventional Pap tests can be difficult to peruse in light of the fact that cells can be dried out, secured with bodily fluid or blood, or cluster together on the slide.

HPV test: A HPV test is like a Pap test, in which the test is done on an example of cells from the patient's cervix. The specialist may test for HPV in the meantime

as a Pap test or after Pap test results demonstrate irregular changes to the cervix [7]. Certain strains of HPV, for example, HPV-16 and HPV-18, are seen all the more frequently in ladies with cervical malignancy and may help affirm an analysis. On the off chance that the specialist says the HPV test is "certain," this implies the test found the nearness of HPV [8]. Numerous ladies have HPV yet don't have cervical growth, so HPV testing alone isn't a precise test for cervical disease

Existing Identification Techniques for CC

In [9], this paper proposes a method for automatic cervical cancer detection using cervical cell segmentation and classification. A single cervical cell image is segmented into cytoplasm, nucleus and background using Radiating Gradient Vector Flow (RGVF) Snake. Herlev dataset consists of 7 cervical cell classes, i.e. superficial squamous, intermediate squamous, columnar, mild dysplasia, moderate dysplasia, severe dysplasia, and carcinoma in situ is considered. Different cellular and nuclei features are extracted for training the system. Dataset is tested on Support Vector Machine (SVM) and artificial neural networks (ANN) and Euclidean distance based system to classify seven different types of cells and to segregate abnormal from normal cells. In [10], this paper, the Author propose an automatic method to detect and classify the grade of cervical cancer using both geometric and texture features of Pap smear images and classifying accordingly using multi SVM. The geometric features are obtained through segmentation of nucleus and cytoplasm using independent level sets, detecting whether the cell is cancerous or normal, with reference to the ground truth. By extracting well defined GLCM texture features and using a combination of PCA and the best class of multi SVM, the images are classified with an accuracy of 95%. In [11], this paper, the author propose An efficient and practical algorithm to detect the cervical cancerous area is presented. Edge detection is applied on the image to find edges of tumor area. The hybrid segmentation is done on the sampled image i.e. combination of thresholding and watershed segmentation to extract the tumor infected area. The image is then processed using morphological image processing tools to detect the accurate dimensions of the tumor. The fine detection of tumor area is a challenging task in medical image science. Using this proposed method it is possible to detect infected area. The table 1 clearly explains that the identification of the tumor cells with accuracy and also it contains the algorithms which are proposed by various authors.

Table 1. Accuracy of the tumor cells identification

Author Name	Worked/proposed Algorithm/method and year	Accuracy
<i>S.Athinarayanan,M.V.Srinath</i>	ETCM+SVM and CFE+SVM 2016	86% & 90%
Rahmadwati,G.Maghdy,M.Ros	Gobar Filters,Segmentation(K-Means Clustering) 2011	89%
<i>Debashree Kashyap and Abhishek Somani</i>	Segmentation(PDE), Multi SVMs 2016	95%
<i>G.Karthigai Lakshmi,K.Krishnaveni</i>	Segmentation algorithms 2016	-
<i>Seugarg,ShabanaUrooj</i>	Thresholding and Watershed Segmentation 2015	-
<i>M.Anousouya Devi,S.Ravi</i>	Segmentation algorithms 2016	-
<i>Siti Noraini Sulaiman,Nor Ashidi Mat-Isa</i>	Adaptive Fuzzy-k-Means Clustering,Pseudo Colour Feature Extration 2015	76.35%
<i>Paridhi Agawal,Anil Sao</i>	A Novel Nuclei Mean shift Segmentation 2015	87.65%

In^[12], this paper describes a way of designing a hybrid decision support system in soft computing paradigm for detecting the different stages of cervical cancer. Hybridization includes the evolution of knowledge-based sub network modules with genetic algorithms (GA's) using rough set theory and the Interactive Dichotomizer3 (ID3) algorithm. Crude sub networks obtained via rough set theory and the ID3 algorithm is evolved using GA's. The evolution uses a restricted mutation operator which utilizes the knowledge of the modular structure, already generated, for faster convergence in. In this paper, the author explore various support vector based classifiers, namely support vector machine (SVM), twin support vector machine (TWSVM), and twin-hyper sphere support vector machine (THSVM), and test their performance on cervical cancer cell classification in 2-class and 4-class scenarios. The cervical cancer cell dataset named the LCH dataset used in this paper was collected and extracted from Lampang Cancer Hospital in Thailand. The experimental results show that TWSVM is preferable to SVM and THSVM in the cervical cancer cell classification.

CONCLUSION

This paper enlightens different algorithms for identification and level detection of Cervical Cancer.

Each one has its own advantage over the other. It is identifiable by the above study that there is large scope to develop algorithms based on Artificial intelligence. The current trend in medical image processing is around deep learning techniques which yields good results. Hence my perspective is that employing deep learning in identification and detection of Cervical Cancer may improve accuracy.

Ethical Clearance: Taken from CMR Engineering College.

Source of Funding: Self

Conflict of Interest: Authors have no conflict of interest to declare regarding the publication of this paper.

REFERENCES

1. Wikipedia contributors. List of cancer types. Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, 31 Oct. 2018. Web. 14 Nov. 2018.
2. Wikipedia contributors. "Cervical cancer." Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, 8 Nov. 2018. Web. 14 Nov. 2018.

3. Wikipedia contributors. "Cancer prevention." Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, 11 Nov. 2018. Web. 14 Nov. 2018.
4. Wikipedia contributors. "Diet and cancer." Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, 21 Oct. 2018. Web. 14 Nov. 2018.
5. Wikipedia contributors. "The Cancer Imaging Archive (TCIA)." Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, 22 Jul. 2018. Web. 14 Nov. 2018
6. Lakshmi GK, Krishnaveni K. Comparative Study of Segmentation Methods applied on Cervical Cytology Images. *International Journal of Computer Science and Information Technologies*. 2016, Vol. 7, No. 1, pp. 91-93.
7. Devi MA, Ravi S, Vaishnavi J, Punitha S. Detection of Cervical Cancer using the Image Analysis Algorithms.
8. Sajeena TA, Jereesh AS. Automated cervical cancer detection through RGVF segmentation and SVM classification. In *Computing and Network Communications (CoCoNet)*, 2015 International Conference. Dec 2015, pp. 663-669.
9. Garg S, Urooj S, Vijay R. Detection of cervical cancer by using thresholding & watershed segmentation. In *Computing for Sustainable Global Development (INDIACom)*, 2015 2nd International Conference. Mar 2015, pp. 555-559.
10. Kashyap D, Somani A, Shekhar J, Bhan A, Dutta MK, Burget R, Riha K. Cervical cancer detection and classification using Independent Level sets and multi SVMs. In *Telecommunications and Signal Processing (TSP)*, 2016 39th International Conference. Jun 2016, pp. 523-528.
11. Mitra P, Mitra S, Pal SK. Staging of cervical cancer with soft computing. *IEEE Transactions on Biomedical Engineering*. Jul 2000, Vol. 47, No. 7, pp. 934-940.
12. Teeyapan K, Theera-Umporn N, Auephanwiriyakul S. Application of support vector based methods for cervical cancer cell classification. In *Control System, Computing and Engineering (ICCSCE)*, 2015 IEEE International Conference. Nov 2015, pp. 514-519.

Use of Break-Even Analysis in Financial Appraisal of Projects

K Nagarajan¹, D Visagamoorthi¹

¹Professor, School of Management, Sri Krishna college of Engineering and Technology,
Coimbatore, Tamil Nadu, India

ABSTRACT

Break-even analysis plays an important role in financial appraisal of projects. Preparation of the financial profitability statement is a major milestone in financial appraisal. This is because of the reason that it involves many assumptions. The assumptions must be realistic. Out of the many assumptions made, the assumption on capacity utilisation for different years is a crucial one since many other parameters in the financial projection depend on this. Suppose a realistic financial projection has been made. The top management is in need of certain key performance indicators (KPI) to monitor. One such KPI is the Break-even point. If the top management has this indicator in hand for every year of operation, it will prove to be a very useful tool in having a check on whether the on-going operations are in order and whether the volume of output being produced/likely to be produced is above the required Break-even volume. This article explores the use of Break-even point as a Key Performance Indicator. Further, the article touches upon the finer aspects of classifying the costs into fixed and variable costs in arriving at the Break-even point.

Key words: Break-even point, Fixed Cost, Variable Cost, Cost of equity capital, Key Performance Indicator

INTRODUCTION

Break-even analysis plays a major role in financial appraisal of projects. Break-even output indicates the level of output at which an organization neither earns profit nor incurs any loss. In other words, at this level of output the cost of production is just recovered. Though the logic behind arriving at the Break-even output sounds very simple, there are many intricate issues in correctly assessing it. The crux of the problem in assessing the Break-even output lies in identifying all costs and correctly categorising the cost of production into two heads, viz., fixed costs and variable costs.

MATERIALS AND METHOD

For arriving at the Break-even point, the first thing to be done is to divide the total cost of production into fixed costs and variable costs. Though prima facie it appears simple, it is a rather difficult task since neither all fixed costs remain fixed over a period of time nor all variable costs vary in the same proportion as the level of output^[1]. For example, let us consider selling expenses. Though selling expenses will increase with the volume of output, it will not be in direct proportion to the volume of output. An organization will be spending proportionately more

at lower volumes of production. This means that selling expenses can't be considered as a variable cost, in the strict sense. The same is applicable for the expense under the head 'wages and salaries'. Thus, wherever there is a cost component that does not fall strictly under variable cost category, we need to split it into 'fixed component of the cost' and 'variable component of the cost'. Such a refinement will improve the accuracy of the analysis

Though many heads of expenses show a tendency to fluctuate between the boundary of fixed and variable costs, we need to arrive at some consensus. Banks and financial institutions treat the following as fixed costs for the calculation of Break-even point^[2]:

1. Wages and salaries
2. Repairs and maintenance
3. Factory supervision
4. Administrative expenses
5. Loyalty / know-how payments
6. Depreciation (on straight line basis)
7. Interest on Term-loan
8. Fixed portion of the selling expenses.

The costs incurred under the following heads are treated as variable in nature:

1. Raw material
2. Power & fuel
3. Consumable stores & spares

4. Interest on working capital loan
5. Variable selling expenses.

Let us revisit the formula for arriving at the Break-even point.

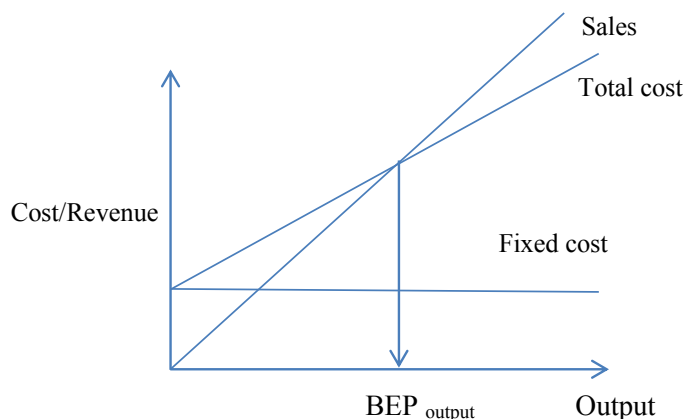


Figure.1 Break-even Point – Graphical Representation

Referring to Figure. 1, the Break-even point is identified at the point of intersection of the Total cost line and the Revenue line.

$$\begin{aligned} \text{Total Sales revenue} &= \text{Total Cost of production} \\ \text{i.e., } \text{BEP}_{\text{Output}} \times (\text{Selling price per unit}) &= \text{Fixed cost} + \text{Variable cost} \\ \text{BEP}_{\text{Output}} \times (\text{Selling price per unit}) &= \text{Fixed cost} + [\text{Variable cost per unit} \times \text{BEP}_{\text{Output}}] \\ \text{BEP}_{\text{Output}} &= \frac{\text{Fixed cost}}{(\text{Selling price per unit}) - (\text{Variable cost per unit})} \end{aligned}$$

Figure.1 Break-even Point – Graphical Representation

While applying the above formula for arriving at the Break-even output, care should be taken to include all relevant costs. It is customary to include all the fixed and variable costs enumerated in para-2 above. However, the Break-even output so arrived at, may not be the appropriate indicator [3]. For example, let us take a project that is newly implemented and that has a Term-loan component. The interest payable on the Term-loan is accounted for under the head ‘Fixed cost’ in BEP calculations. Suppose the BEP arrived at shows a Break-even output of, say 55%. It will give a notion that as long as the volume of output is above 55%, there is nothing much to worry about, since it guarantees that the organization will not run into a loss making situation. It may sound all right. But, there lies some

point that we have overlooked. Since the organization has borrowed Term-loan (may be for asset creation), it is under obligation to repay the Term-loan as per the agreed upon schedule of repayment. Hence, the profit earned should be sufficient enough to repay the Term-loan principal amount also, apart from meeting the interest commitments on Term-loan. Just as the Term-loan interest is a fixed cost, being an amount payable irrespective of the operating performance of the organization, the principal component of Term-loan repayment is also a fixed cost to the organization since the loan is to be repaid at any cost and it is not in any way linked to the volume of output achieved.

On the same logic, let us consider an organization

that does not have Term-loan component but is fully funded through equity. There is no interest payable on equity; there is also no repayment obligation on the equity capital. Does this mean that there is no fixed cost on account of equity in the capital structure? As equity has a cost, the cost of equity capital is a deemed fixed cost that the organization is required to pay [4]. The organization may either pay dividend to the equity share-holders or plough back the earnings either in full or part, which in turn will increase the share-holder value. Whatever may be the case, for a realistic assessment

of the Break-even point, cost of equity capital is to be considered as a fixed cost in the BEP calculations.

Obviously, if an organization has both Term-loan and equity capital in its capital structure, both Term-loan principal repayment obligation and cost of equity capital should be considered as fixed costs for BEP calculation [5].

In the light of the above discussion, we can modify the relationship for arriving at the BEP_{Output} as under:

$$BEP_{Output} = \frac{\text{Fixed cost of production) + (Repayment commitment of Term-loan) + (Cost of equity capital)}}{\text{(Selling price per unit) – (Variable cost per unit)}}$$

Figure 2 indicates the modified Break-even point chart that takes into account the repayment obligation of Term loan and the cost of equity capital

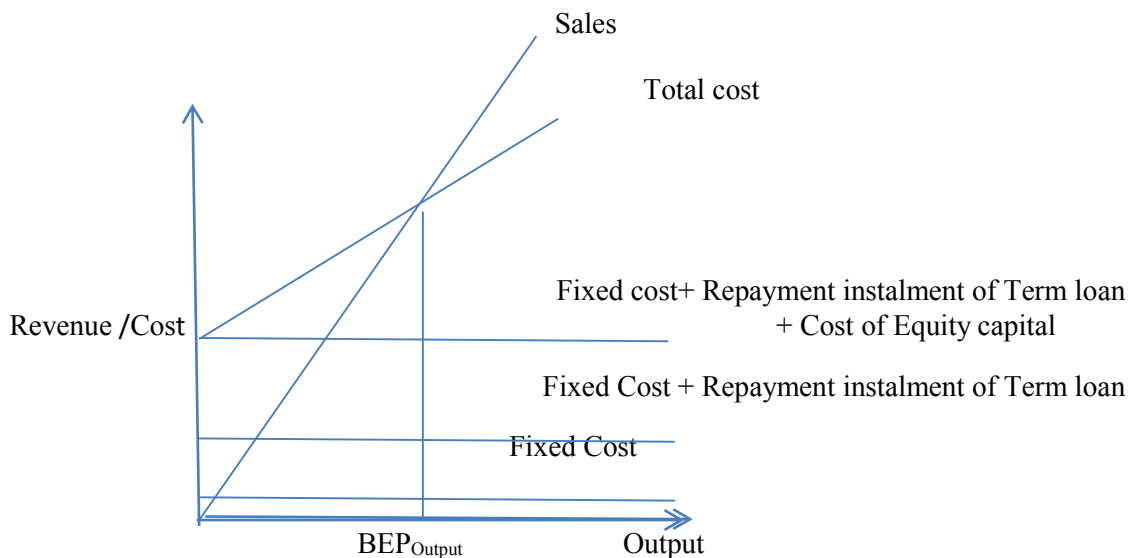


Figure 2: Modified Break-even Chart

Findings

In financial projection, capacity utilisation of the plant is predicted for future years, based on the demand and production constraints. Even if there are no production constraints, it is customary not to increase the capacity utilization beyond 80%, to be on the safer side and to take care of unexpected eventualities [6].

The projected profitability estimate of a new project is considered for illustration.

Estimated project cost: Rs.75.00 lakhs

Capital structure:

Equity shares: Rs.30.00 lakhs

Term loan : Rs.45.00 lakhs

Rs.75.00 lakhs

Additional inputs:

- 25% of the selling expenses can be treated as fixed expenses
- & 75% of the selling expenses can be treated as variable expenses, which vary according to the level of output.
- The project is meant for the manufacture of standard size of industrial valves.
- The installed capacity of the plant is 1,20,000 valves per annum and the selling price per valve is Rs. 187.50
- The capacity utilization of the plant is estimated at 60% in the first year of operation, 70% in the second year of operation and 80% from the third year onwards.
- Tax rate is assumed at 40%
- Interest on Term loan is charged on reducing balance of the loan amount.

The interest chargeable on the term loan and on the working capital loan, year wise, are suitably calculated and incorporated in the projected profitability statement. Table 1 indicates the probability statement.

Table 1: Probability Statement

Rs. in lakhs								
	I Year	II Year	III Year	IV Year	V Year	VI Year	VII Year	VIII Year
Capacity Utilization	60%	70%	80%	80%	80%	80%	80%	80%
1.Raw Material	50.00	60.67	69.33	69.33	69.33	69.33	69.33	69.33
2.Power	2.00	2.33	2.67	2.67	2.67	2.67	2.67	2.67
3.Fuel	3.00	3.50	4.00	4.00	4.00	4.00	4.00	4.00
4.Consumables	5.00	5.83	6.67	6.67	6.67	6.67	6.67	6.67
5.Wages & Salaries	30.00	33.00	36.30	39.93	43.92	48.32	53.15	58.46
6.Repairs & Maintenance	2.00	2.10	2.21	2.32	2.43	2.55	2.68	2.81
7.Factory supervision	4.00	4.40	4.48	5.32	5.88	6.44	7.09	7.79
8.Depreciation	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
9.Cost of production (Total of 1 to 8)	102.50	118.33	130.18	134.74	139.38	144.48	150.09	156.23
10.Sales	135.00	157.50	180.00	180.00	180.00	180.00	180.00	180.00
11.Gross Profit (10 – 9)	32.50	41.17	49.84	45.26	40.62	35.52	29.91	23.77
Less:								
12.Operating Expenses:	2.50	2.92	3.33	3.33	3.33	3.33	3.33	3.33
i. Admn. expenses	3.75	4.38	5.00	5.00	5.00	5.00	5.00	5.00
ii. Selling expenses								
13.Operating Profit (EBIT) (11 – 12)	26.25	33.87	41.51	36.93	32.29	27.19	21.58	15.44
Less:								
14.Interest on Term-loan	7.65	6.84	5.02	3.32	2.04	1.02	0.34	0.04
15.Interest on Working Capital loan	4.20	4.90	5.60	5.60	5.60	5.60	5.60	5.60
16.Earnings before tax (EBT)	14.40	22.13	30.89	28.01	24.65	20.57	15.64	9.80
Less:								
17.Tax	5.76	8.85	12.36	11.20	9.86	8.23	6.26	3.92
18.Earnings after tax – Net Profit (EAT)	8.64	13.28	18.53	16.81	14.79	12.34	9.38	5.88
Add:								
19.Depreciation	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
20.Cash accrual (18 + 19)	13.14	17.78	23.03	21.31	19.29	16.84	13.88	10.38
21.Term-loan repayment	Nil	9.50	12.00	8.00	7.00	5.00	3.00	0.50
	Overall Debt Service Coverage Ratio: 2.27:1.00							

An observation of the profitability statement will reveal that raw material, power, fuel and consumables fall strictly under the head of variable expenses. These expenses vary in direct proportion to the volume of output. The expense under the heads 'Wages & Salaries' and 'Factory supervision' increase at the rate of 10% every year; the expense under the head 'Repairs and Maintenance' increases at the rate of 5% every year. Thus, the expenses under the above heads can neither be considered as fixed nor as variable expenses. Though they have some variability, it is not strictly related to the volume of output. They are semi-variable in nature.

Thus, we run into the problem of not being able to segregate certain costs under two distinctive heads as 'fixed' and 'variable'. However, the structure of the equation for arriving at the Break-even volume does not get affected as long as we are able to classify the costs under the two heads, with reasonable degree of accuracy ^[7].

Let us calculate the Break-even output for the first year of operation. Though some of the costs are semi-variable in nature as explained above, we are required to segregate all the costs into fixed and variable costs, for which, let us follow the classification adopted by banks and financial institutions, as given in para-2. Table 2 indicates the calculation of BEP for the first year of operation.

Table 2 Calculation of BEP for the first year of operation: (Volume of out-put: 72,000 units - @60% of the installed capacity of 1,20,000 units)

Fixed Costs	(Rs. In lakhs)	Variable costs	(Rs. In lakhs)
Wages & Salaries :	30.00	Raw material:	50.00
Repairs & Maintenance:	2.00	Power:	2.00
Factory supervision:	4.00	Fuel:	3.00
Administrative expenses:	2.50	Consumables:	5.00
Depreciation:	4.50	Interest on working capital loan:	4.20
Interest on Term-loan:	7.65	Variable selling expenses (@75%)	2.81
Fixed selling expenses (@ 25%):	0.94	Total variable costs:	67.01
Total fixed costs:	51.59	Variable cost per unit : 67,01,000/72,000 Rs. 93.07	=

51,59,000

$$\begin{aligned} \text{Break-even output} &= \frac{51,59,000}{(187.50 - 93.07)} \\ &= 51,59,000 / 94.43 \\ &= 54,633 \text{ units} \end{aligned}$$

Note: In the first year of operation, the capacity utilisation is 60%; hence the expected output is only 72,000 units as against the installed capacity of 1,20,000 units. Since the BEP_{Output} is only 54,633 units, the

position is comfortable.

Though we have included the interest components in the cost, we have not given thought to the equity portion of the capital. Since equity has a cost, it should

be recovered by the business like any other cost. For the equity component of Rs.30.00 lakhs, assuming a cost of capital of, say 20%, the equity cost component comes to Rs.6.00 lakhs per annum. If we take this as a fixed cost, the modified BEP_{Output} will be as below:

$$\begin{aligned} \text{Break-even output} &= \frac{(51,59,000 + 6,00,000)}{(187.50 - 93.07)} \\ &= 57,59,000 / 94.43 = 60,989 \text{ units} \end{aligned}$$

We are still in a comfortable position since the capacity planned for the first year of operation is 72,000 units, which well above the BEP.

Since the fixed costs also change over the years and as there are certain costs that do not vary strictly in proportion to the volume of output, we need to calculate the Break-even output for every year of the operation. Table 3 indicates the calculation of BEP for the second year of operation.

Table 3 Calculation of BEP for the second year of operation: (Volume of out-put:84,000 units - @70% of the installed capacity of 1,20,000 units)

Fixed Costs	(Rs. In lakhs)	Variable costs	(Rs. In lakhs)
Wages & Salaries :	33.00	Raw material:	60.67
Repairs & Maintenance:	2.10	Power:	2.33
Factory supervision:	4.40	Fuel:	3.50
Administrative expenses:	2.92	Consumables:	5.83
Depreciation:	4.50	Interest on working capital loan:	4.90
Interest on Term-loan:	6.84	Variable selling expenses (@75%)	3.28
Fixed selling expenses (@ 25%):	1.10	Total variable costs:	80.51
Total fixed costs:	54.86	Variable cost per unit : 80,51,000/84,000	= Rs. 95.85

$$\begin{aligned} \text{Break-even output} &= \frac{54,86,000}{(187.50 - 95.85)} \\ &= 54,86,000 / 91.65 \\ &= 59,858 \text{ units} \end{aligned}$$

As we have seen above, this BEP_{Output} needs revision, by accounting for the cost of equity capital. There is one more thing to be considered in the second year of operation. In the second year of operation principal

repayment of the Term loan starts. The organisation is required to repay Rs.9,50,000 /- towards repayment of Term loan. The BEP_{Output} calculated without considering this aspect will fall short of the requirement. Though theoretically it will be correct, the organization has the obligation to repay long term debts within the stipulated period. The volume of production should be such that it generates adequate revenue to repay the Term loan instalments also apart from meeting other costs.

Considering the Term loan repayment component and the cost of equity capital, the revised BEP_{Output} will be as calculated below:

$$(51,59,000 + 6,00,000 + 9,50,000)$$

$$\text{Break-even output} =$$

$$\frac{(187.50 - 95.85)}{91.65}$$

$$= 70,36,000 / 91.65$$

$$= 76,770 \text{ units}$$

Since the expected output in the second year of operation is 84,000 units, it is above the Break-even output. Thus, the Break-even output calculated, taking into account the cost of equity capital and the repayment obligations of long term loans can act as a Key Performance Indicator.

In the illustration given, we have worked out the BEP_{Output} for the first two years of operation and we have found that our projections are safe and comfortable. As the year progresses, in general, the Term loan repayment obligations will increase, while the interest payable on Term loan will reduce (This is on the assumption of charging interest on the remaining unpaid principal amount). Further, while the volume of operation may reach a saturation level, the semi-variable costs may keep on increasing. For example, Wages & Salaries, Repairs & Maintenance etc., will keep on increasing in spite of constant level of output. Hence, it becomes essential to arrive the Break-even output for all the years (for which financial projections are made) and keep this data as a ready reference, so that it will come handy tool for monitoring the performance. Table 4 indicates the BEP_{Output} for the operation of years and Table 5 indicates the Break-even output computations from third to eighth year.

Table 4 BEP_{Output} calculated for the remaining years of operation are given below:

Year of operation	III	IV	V	VI	VII	VIII
Projected output	96,000	96,000	96,000	96,000	96,000	96,000
BEP_{Output}	59,880	62,902	66,470	70,769	76,748	82,236

Table 5 Break-even output computations from the third to the eighth year

Year:	III	IV	V	VI	VII	VIII
Fixed Costs:						
Wages & Salaries :	36.30	39.93	43.92	48.32	53.15	58.46
Factory supervision:	4.48	5.32	5.88	6.44	7.09	7.79
Administrative expenses:	3.33	3.33	3.33	3.33	3.33	3.33
Depreciation:	4.50	4.50	4.50	4.50	4.50	4.50
Interest on Term-loan:	5.02	3.32	2.04	1.02	0.34	0.04
Fixed selling expenses (@ 25%):	1.25	1.25	1.25	1.25	1.25	1.25
Total:	54.88	57.65	60.92	64.86	70.34	75.37
Variable Costs:						
Raw material:	69.33	69.33	69.33	69.33	69.33	69.33
Power:	2.67	2.67	2.67	2.67	2.67	2.67
Fuel:	4.00	4.00	4.00	4.00	4.00	4.00
Consumables:	6.67	6.67	6.67	6.67	6.67	6.67
Interest on working capital loan:	5.60	5.60	5.60	5.60	5.60	5.60
Variable selling expenses (@75%):	3.75	3.75	3.75	3.75	3.75	3.75
Total variable costs:	92.02	92.02	92.02	92.02	92.02	92.02
Variable cost per unit(Rs.):	95.85	95.85	95.85	95.85	95.85	95.85
Break-even output:	59880	62902	66470	70769	76748	82236

The BEP_{Output} for all the years, from the third to the eighth year are all below the projected output of 96,000 units. If due to any reason, the output gets reduced below the projected output of 96,000 units, the top management will be in a position to assess the risk involved, if the BEP_{Output} data are available for all the years. For example, when the output in a particular year, say, in the sixth year falls closer to 70,000 units, it will give an indication that the Break-even point is closer and the operations need closer monitoring.

CONCLUSION

Though many assumptions go into the preparation of projected profitability statements of projects, the appraisal will be on a sound footing if it arrives at the BEP_{Output} taking into account the cost of equity capital and loan repayment obligations. The BEP_{Output} can be calculated for the all the years for which financial projections are made. This will act as an indicator of performance measurement at the hands of the top management. Thus, taking all the costs and repayment obligations into account, including repayment of principal component of Term loans and cost of equity capital, and calculating the BEP_{Output} for a reasonable period in the future will help in better monitoring of operational performance of projects.

Ethical Clearance: Taken from Sri Krishna College of Engineering and Technology.

Source of Funding: Self

Conflict of Interest: Authors have no conflict of interest to declare regarding the publication of this paper.

REFERENCES

1. Nagarajan K. Search for Break-even point. The Management Accountant – Student Edition, 2002 Aug 1(8).
2. Sharma MP. Study of Banking Break Even Point: An Innovative Tool for Banking Industry. International Journal of Innovative Research and Development. 2014 Dec 1;3(11).
3. Alnasser N, Shaban OS, Al-Zubi Z. The Effect of Using Break-Even-Point in Planning, Controlling, and Decision Making in the Industrial Jordanian Companies. International Journal of Academic Research in Business and Social Sciences. 2014 May 1;4(5):626.
4. Amy Gallo. A quick guide to Break-even Analysis. Harvard Business Review. 2014 July.
5. Kaviani M. A Modern Theory to Analysis of Break-Even Point and Leverages with Approach of Financial Analyst. Research Journal of Finance and Accounting, 5 (11). 2014:68-76.
6. Tui RN, Anas AV, Fitriani N. Break-Even point and incremental analysis in Decision making of Lease-purchase option of heavy equipment at Nickel Mining. ARPN Journal of Engineering and Applied Sciences, 12(13). 2017 July.
7. Park W, Lee K, Doo S, Yoon SS. Investments for New Product Development: A Break-Even Time Analysis. Engineering Management Journal. 2016 Jul 2;28(3):158-67.

Synovial Sarcoma of the Head and Neck Region-Our Experiences at a Tertiary Care Hospital of Eastern India

Santosh Kumar Swain¹, Smrutipragnya Samal², Mahesh Chandra Sahu³, Priyanka Debta⁴

¹Professor, Department of Otorhinolaryngology, ²Research Scholar, Department of Otorhinolaryngology,

³Assistant Professor, Medical Research Laboratory, IMS and SUM hospital, Siksha "O" Anusandhan (Deemed to be University), Bhubaneswar, Odisha, India. ⁴Associate Professor, Department of Oral Pathology & Microbiology, I.D.S., Siksha "O" Anusandhan, Deemed to be university, BBSR, Odisha, India

ABSTRACT

Introduction: Synovial sarcoma is a rare malignant tumour in the head and neck region. It has an aggressive nature and poor prognosis. The treatment of the synovial sarcoma is essentially surgical followed by postoperative chemoradiation.

Objective: To study the details of clinical profile and management of synovial sarcoma in the head and neck region at a tertiary care teaching hospital of eastern India.

Materials and Method: Between January 2009 and October 2015, six patients were diagnosed as synovial sarcoma in the head and neck area. Out of six patients, five were male and one was female. The age ranges from 21 to 48 years. All were diagnosed by histopathology and immunohistochemistry. There were surgically treated followed by chemoradiation.

Result: The common clinical presentations of head and neck synovial sarcoma are dysphagia, foreign body sensation in throat. The patients were in the range of 21-48 years old, among them five were male and one was female. The diagnosis was made by histopathologically and immunohistochemistry. All were treated with surgery followed by chemoradiation. One patient died due to distant metastasis.

Conclusion: Synovial sarcoma is an uncommon malignant lesion in the head and neck area. Imaging, histopathology and immunohistochemistry are essential for the diagnosis. Surgical excision and post operative chemoradiation are the ideal treatment. Early diagnosis helps the patients from the aerodigestive complications and death.

Keywords: Synovial sarcoma, neck, hypopharynx, Oropharynx, dysphagia.

INTRODUCTION

Synovial sarcoma is a rare malignant tumour of the head and neck area, originating from the pluripotent mesenchymal cells.¹ Although its name synovial sarcoma, it rarely arises from synovial membrane.² It is

commonly found near the large joints and may arise in close association with tendons, tendon sheaths, bursae and juxta-articular membrane and in 10% cases involve the joints. Synovial sarcoma usually affect knee, hip, ankle and shoulder joints whereas 3 to 10% of them seen in head and neck region. The behavior of the head and neck synovial sarcoma is almost similar to synovial sarcoma affecting the extremities where these lesions are commonly seen. Hypopharynx and parapharyngeal space are the most commonly affected in head and neck area although few cases are reported from larynx, nasopharynx, gingival sulcus, pyriform fossa, cheek, parotid gland, infratemporal fossa and

Corresponding author:

Santosh K. Swain

Professor, Dept. of Otorhinolaryngology,
IMS&SUM Hospital, Kalinga Nagar, Bhubaneswar-3,
Odisha, India. Email: santoshvoltaire@yahoo.co.in,
Cell: +91-9556524887

middle ear.³ The first synovial sarcoma was first reported by Jernstrom in 1954.⁴ The diagnosis is confirmed from the histopathological examination and supported by immunohistochemistry, cytogenetic analysis and electron microscopy. Treatment of the localized synovial sarcoma is complete surgical excision and supplemented with chemoradiation.⁵ The correct diagnosis, planning for surgery and supportive therapies for synovial sarcoma at oropharynx threatening airway, is always a challenge to the Otolaryngologist. Here we are reporting six cases of synovial sarcoma arising in head and neck area during 2009 to 2015.

MATERIALS AND METHOD

A retrospective study of six patients with synovial sarcoma at head and neck region was done during 2009 to 2015 at the Otorhinolaryngology department of our tertiary care teaching hospital.

The diagnoses of synovial sarcoma of all six cases were confirmed on the basis of histopathological examination and immunohistochemistry. The clinical profiles, demographic details, histopathological, immunohistochemistry, imaging of all six patients were analyzed.

RESULT

A total of six cases head and neck synovial sarcoma were reported during last 6 years of study period. Of these six patients, five were male and one was female. Age ranged from 21 to 48 years (mean age is 30.16). History of dysphagia, foreign body sensation in throat and shortness of breath were present among six cases. In three of the cases, the tumours were located in the oropharynx while in two cases in hypopharynx and one was in oral cavity. Detail clinical profiles of the patients are given in Table.1.

Table1: Demographic data and clinical profile of all patients

Case	Age in Years	Gender	Site of tumour	Clinical profile	Treatment	Follow up
1	29	Male	Hypopharynx	Muffled voice, Discomfort in throat	Partial Pharyngectomy and chemoradiation	Disease free since 1 year
2	48	Male	Posterior pharyngeal wall	Dysphagia	Partial Pharyngectomy and chemoradiation	Death due to distant metastasis
3	32	Male	Oropharynx	Discomfort in throat	Partial Pharyngectomy and chemoradiation	Disease free since 2 years
4	21	Female	Base of tongue	Dysphagia	Chemoradiation	Disease free since 3 years
5	25	Male	Oropharynx	Dysphagia, mild breathing difficulty	Partial Pharyngectomy and chemoradiation	Not attended after treatment
6	26	Male	Oropharynx	Foreign body sensation in throat	Chemoradiation	Disease free since 2years

Case 1

A 29 year old man attended the out patient department of Otorhinolaryngology with complaints of muffled voice and recurrent discomfort in the throat since 3months.He denied any history of smoking and alcohol consumption. Fiberoptic nasopharyngolaryngoscopy

revealed a smooth and pinkish coloured smooth mass arising from the left lateral hypopharyngeal wall and completely obstructing the supraglottic airway and hiding the glottic area of the larynx (Fig.1).

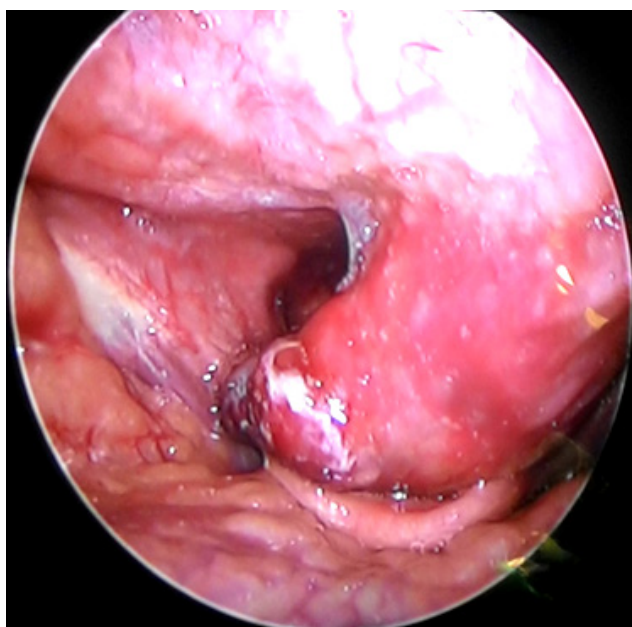


Fig.1: Nasopharyngolaryngoscopy picture of oropharynx showing mass arising from left lateral wall.

There was no cervical lymphadenopathy. Examinations of the nose, ear and oral cavity showed no abnormality. Routine hematological investigations were within normal limit. A lateral X-ray of the neck showed protrusion of the abnormal mass from the left lateral wall of oropharynx compromising the supraglottic airway. Computed tomography (CT scan) of the neck with contrast showed a hyper vascular mass arising from the left lateral wall of the oropharynx with size of 8cmx7cm obstructing the supraglottic area (Fig.2).

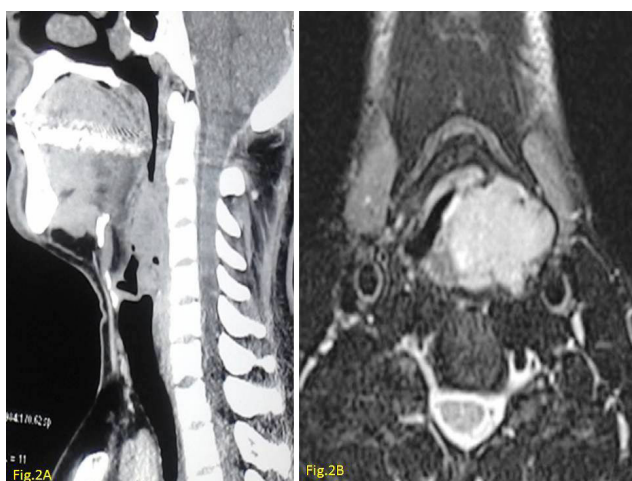


Fig. 2(A&B): CT (Sagittal cut) and MRI (Coronal Cut) scan showing mass in oropharynx obstructing the laryngeal airway.

X-ray of the chest was normal. Tracheostomy was done before surgery for safe airway and anticipating difficult intubation for general anesthesia. Endoscopic approach was done for excision of the tumour under general anesthesia. Partial Pharyngectomy with tumour

was done by endoscopic approach. Histopathology report revealed two types cells (Biphasic pattern): spindle cells and glandular cells which are characteristic of synovial sarcoma (Fig.3).

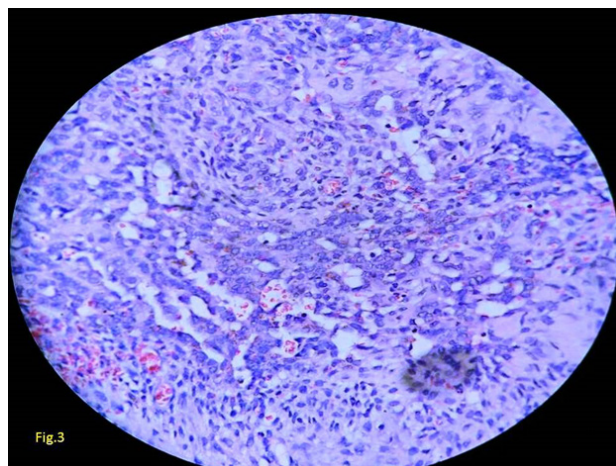


Fig.3: Histopathology picture showing Biphasic pattern of synovial sarcoma with spindle and glandular epithelial cells.

Immunohistochemistry showed strongly positive results for CD99, EMA, CBL2 and Vimentin (Fig.4).

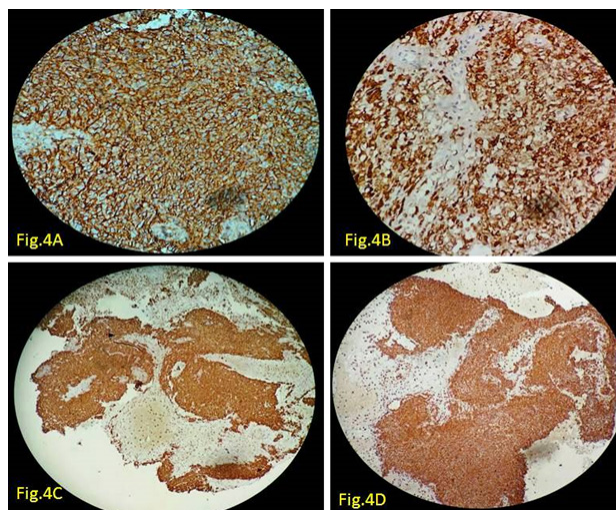


Fig.4: Immunohistochemistry showing strong positivity with CD99 (Fig.4A), EMA (4B), BCL2 (4C) and Vimentin (4D).

As the tumour was involving the local tissue, the patient received five cycles of injectable chemotherapy of Doxorubicin (30mg/m²), Decarbazine (400mg/m²) and ifosfamide (2mg/m²). After that, the patient was given 66Gy radiotherapy to the head and neck region for six weeks duration. The patient was stable postoperatively. Patient follow-up was done by an oncologist with further treatment with chemotherapy and radiotherapy. After one year follow-up, the patient was disease-free without any swallowing defect or any dyspnea.

Case2

A 48 year old man came to out patient department of Otorhinolaryngology with complaints of progressive dysphagia. He had no other symptoms related to the ear, nose and throat. He had no history of weight loss or loss of appetite. He was not a known smoker and alcoholic. Indirect laryngoscopy showed pedunculated smooth mucosal mass attached to the posterior wall of hypopharynx above the pyriform sinus. There was no cervical lymphadenopathy. CT scan demonstrated an abnormal soft tissue mass on the posterior pharyngeal wall at the level of C4. Direct laryngoscopy was done under general anesthesia and mass removed as Excisional biopsy and sent for histopathological examination. The histopathology report revealed fibroblast like spindle cells and glandular cells. The immunohistochemistry showed strong positivity to the vimentin and EMA. The diagnosis was confirmed as synovial sarcoma followed by he underwent partial Pharyngectomy under general anesthesia with healthy margin. Later he sent for chemoradiation but he died after 2years due to distant metastasis.

Case-3

A 32 year old man attended the Outpatient department of Otorhinolaryngology with complaints of discomfort in throat with occasional bloody sputum. He had smoking habit with 10 cigarettes per day since five years. CT contrast of neck revealed hypervascular mass arising from right lateral wall of pharynx at the oropharynx. Biopsy from this lesion confirmed the biphasic synovial sarcoma. There was no neck node enlargement. Patient underwent partial Pharyngectomy endoscopically and sent for chemoradiation. Patient was disease free after chemoradiation and was on follow up.

Case-4

A 21 year old girl presented to the out patient department of Otorhinolaryngology with complaints of painless swelling at the left side of the oral cavity since four months. He was complaining mild dysphagia due to that mass. On examination there was a firm to soft tissue mass in the left side of base of the tongue (Fig.5).

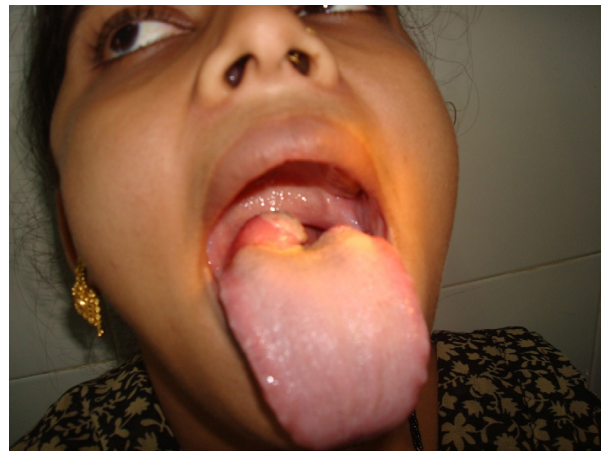


Fig.5: Synovial sarcoma at the base of tongue.

She was not a chronic smokers and examination of ear, nose and throat were within normal limit. Computed tomography from skull base to the superior mediastinum showed a homogenous nonenhancing mass in the floor of the mouth. Biopsy was taken from the oral cavity mass and sent for histopathological examination which revealed biphasic of spindle cells in the matrix and epithelial cells making the gland like configuration. He was diagnosed as synovial sarcoma. After wide excision of the mass, She was advised for chemoradiation. After complete treatment, patient is under follow up with no evidence of recurrence till date.

Case-5

A 25 year male admitted to the Otorhinolaryngology department with history of dysphagia and mild breathing difficulty since one month. He had no fever and no habit of smoking and alcohol consumption. Examination of the oral cavity and oropharynx revealed a mass at the left lateral wall of oropharynx near the base of tongue. Ear and nasal examination were normal. Fiberoptic nasopharyngolaryngoscopy showed a rounded mass at the left lateral wall of the oropharynx near the base of tongue touching the epiglottis. Direct laryngoscopy was done with excision of mass and the mass was sent for histopathological examination. The histopathology report revealed biphasic pattern of synovial sarcoma with positive margin. Partial Pharyngectomy was done under general anesthesia with disease free margin. Postoperative chemoradiation was given to the patient. Patient is now in follow up period.

Case-6

A 26 year old man attended out patient department of Otorhinolaryngology with complaints of foreign body

sensation in throat since 3 months. He had no history of breathing difficulty or hemoptysis or hematemesis. There was no cervical lymphadenopathy. Indirect laryngoscopy showed a smooth bulging behind the right posterior tonsillar pillar. CT scan revealed a heterogenous mass at the right side of the oropharynx with size of 3x2 cm. Direct laryngoscopy was done for biopsy under general anesthesia. Mass was excised and send for biopsy where histopathology report and immunohistochemistry confirmed the diagnosis of synovial sarcoma. He was treated with radiotherapy with total dose of 50Gy followed by chemotherapy.

DISCUSSION

Sarcomas are the mesenchymal tumours which constitute 1% of all malignancy in the body whereas in head and neck region, constitutes 4-10%.⁶ Synovial sarcoma is a high grade tumour originating from the primitive undifferentiated pluripotent mesenchymal cells and unrelated to the synovial membrane.⁷ Synovial sarcoma is a malignant tumour originating from non-epithelial soft tissue. The name of this tumour is misnomer as it does not arise from the joint synovial. Synovial sarcoma is common among healthy young adults of age less than 40 years with slight male preponderance. Patients usually presents with painless mass progressive increase in size. According to site of origin in the head and neck area, patient present with dysphagia in oropharyngeal or hypopharyngeal involvement and complain change in voice or breathing difficulty in case of laryngeal involvement. This tumour is well circumscribed, rubbery and spherical mass. Histopathologically it shows two types: monophasic and biphasic patterns. The biphasic type consists of sarcomatous and epithelial components whereas monophasic type contains one component. The histopathological subtype does not correlate with prognosis of the synovial sarcoma. Out of the two type, biphasic one is most commonly seen. The epithelial cells are cuboidal or columnar types arranged in glandular configuration, compact nests or cleft like areas. They may show capillary projections. The stroma of this neoplastic tissue consists of sarcomatous fibroblasts like spindle cells. These cells show variable mitosis. Hyalinized collagen may be found in stroma which makes spindle cells into fascicles. There may be focal necrosis and hemorrhage may or may not be found in the neoplasm. Metastasis of the synovial sarcoma from the head and neck area is mainly occurs to the lungs followed by lymph nodes and bone. This metastasis may occur in late period

of the disease.⁸ Although synovial sarcoma is a slow growing neoplasm, long term survival of the patient is not satisfactory.⁹ The five year survival in head and neck synovial sarcoma is approximately 40% to 60%.¹⁰ The confirmation of diagnosis of synovial sarcoma is based on the histopathology. Immunohistochemistry, electron microscopy study and cytogenetic analysis are the supportive to the exact diagnosis of synovial sarcoma. The histopathology shows spindle cells which are elongated cells with scanty cytoplasm and monophasic pattern consists of solely spindle cells or biphasic pattern contains both spindle cells and epithelial elements. The immunohistochemistry showed markers for cytokeratin and epithelial membrane antigen and genetic analysis yields t(X; 18; P11; q11) translocation in more than 90% cases of synovial sarcoma.¹¹ Treatment of sarcoma in the head and neck region is mainly surgical. The ideal surgical treatment is wide excision of the tumour in order to achieve negative surgical margins for improved local control of the lesion and longer survival.¹² Along with surgical treatment, radiation and chemotherapy have been studied as treatment options to improve the outcomes, sometimes it's role is controversial.¹³ Some studies suggest chemoradiation has beneficial effect in synovial sarcoma.¹⁴ The type of surgical technique is decided on depth and site of the tumour, adjacent structure involvement, need for reconstruction where it need wider and more radical resection of the sarcomatous tumour. Wide resection with negative margins remains the foundation of the treatment, which is not easily achieved in the oropharynx. Surgical excision of this tumour is the mainstay of the treatment. Surgery of the synovial sarcoma at the oropharynx or hypopharynx creates challenge as other tumour in this difficult location. Open approach for large tumour at oropharynx or hypopharynx involves lip-splitting mandibulotomy and free flap reconstruction which may lead to speech and swallowing problems cosmetic problem and lower quality of life.¹⁵ Endoscopic approach for removal of oropharyngeal tumour is often successful technique. Trans Oral Robotic Surgery (TORS) is a recent application to this difficult area for resection of the tumour. Surgical excision with postoperative radiotherapy decreases the recurrence rate. Radiation with or without chemotherapy appears to be ideal treatment for increased survival of the patient. It is very important for the otolaryngologists to be familiar with the aggressive nature of this neoplasm which carries high morbidity and mortality. Multiple factors are responsible for prognosis of the synovial sarcoma.

Most significant prognostic factors are size of the tumour and extension of the tumour into surrounding structures at the time of treatment.¹⁶ The survival of the patients inversely proportional to these two factors. Although synovial sarcoma occurs among young adults, head neck synovial sarcoma does not give better prognosis in this early age. The rate of long term survival declines due to distant metastasis where lungs are the most common site followed by bone marrow. Synovial sarcoma is an aggressive neoplasm with a five year disease free survival is 72% and overall five year survival is 74-76%.¹⁷ Pediatric patients with synovial sarcoma have a significantly lower mortality rate in comparisons to the adult patients(16% vs 34%).¹⁸ Patient should be under constant follow up to check local recurrence or any distant metastasis. The prognosis of the synovial sarcoma is poor but in the head and neck region it is less particularly patients with tumour size less than 5cm, containing fewer than 10 mitoses/10 high power microscopic fields and lack of a poorly differentiated component.¹⁹ The larger size of the tumour and presence of poorly differentiated components have significance in adverse prognostic factors.

CONCLUSION

Synovial sarcoma is an extremely rare malignant tumour of the head and neck region. Often patient is asymptomatic and biopsy of the tumour confirms the diagnosis. As there are no specific clinical and radiological features, and tumour mass is smooth appearance and well circumscribed, delay the diagnosis of the malignant nature of this lesion. It always constitutes a challenge for both diagnosis and treatment, need multidisciplinary approach. The synovial sarcoma at the oropharynx obstructing the supraglottic airway creates threatens patient's life. Safety of the airway is the first concern before treating the tumour proper. The treatment of this tumour is wide surgical excision along with neoadjuvant chemoradiation. Early diagnosis and treatment of the synovial sarcoma improves the prognosis and survival of the patients. Long term follow up is must to rule out any local recurrence and distant metastasis.

Conflict of Interest: Nill

Source of Funding: Self

Ethical Clearance: Not required

REFERENCES

1. Balakrishnan V, Flatman S, Dixon BJ, Lyons B. Synovial sarcoma of the pharynx causing airway obstruction. *Med J Aust* 2012; 196 (1):72-73.
2. Betal D, Babu R, Mehmet V. Monophasic synovial sarcoma of the pharynx: a case report. *Int Semin Surg Oncol* 2009; 6:9.
3. Anand N, Rai AK, Chaudhary N, Lade H, Dravid C. Synovial sarcoma of unusual site treated with chemoradiation. *Indian J Otolaryngol Head Neck Surg* 2008; 60:166-168.
4. Jernstrom P. Synovial sarcoma of the pharynx; report of a case. *Am J Clin Pathol* 1954; 24(8):957-961.
5. Kartha S, Bumpous J. Synovial cell sarcoma: diagnosis, treatment, and outcomes. *Laryngoscope* 2002;112 : 1979-1982.
6. Harb WJ, Luna MA, Patel SR, Ballo MT, Roberts DB, Sturgis EM. Survival in patients with synovial sarcoma of the head and neck: association with tumor location, size, and extension. *Head Neck* 2007;29:731-740.
7. Meer S, Coleman H, Mdent, Altini M. Oral synovial sarcoma. A report of 2 cases and a review of literature. *Oral surg Oral Med Oral Pathol Oral Radiol Endod* 2003;96(3):306-315.
8. Lee N, Shin E. Treatment outcomes for patients with synovial sarcoma of the head and neck. *Expert Rev Anticancer Ther* 2008;8:371-373.
9. Ameerally PJ, Sira SK, Barrett AW, Hallows P. Synovial sarcoma of hard palate. *Br J Oral Maxillofac Surg* 2004;42(3):261-263.
10. Harb WJ, Luna MA, Patel SR, et al. Survival in patients with synovial sarcoma of the head and neck: association with tumor location, size, and extension. *Head Neck* 2007; 29: 731-740.
11. Kamhieh Y, Fox H, Holland P, Passant C. Synovial sarcoma of the hypopharynx—a case report and literature review. *Brazilian j of otorhinolaryngol* 2016 Apr 26.
12. Crowson MG, Lalich I, Keeney MG, Garcia JJ, Price DL. Clinicopathologic factors and adjuvant treatment effects on survival in adult head & neck synovial cell sarcoma. *Head Neck* 2014 Jan 15.
13. Vogel U, Wehrmann M, Eichhorn W, Bültmann B, Stiegler M, Wagner W. Molecular and

- clinicopathological findings in a tonsillar synovial sarcoma. A case study and review of the literature. *Head Neck Pathol* 2010;4(3):257-260.
14. Mullins BT, Hackman T. Adult Synovial Sarcoma of the head and neck: An institutional study and literature review. *Journal of Nature and Science* 2015; 1(4):68.
 15. O'Malley Jr BW, Weinstein GS, Snyder W, Hockstein NG. Transoral robotic surgery (TORS) for base of tongue neoplasms. *Laryngoscope* 2006; 116 :1465– 1472.
 16. Italiano A, Penel N, Robin YM, et al. Neoadjuvant chemotherapy does not improve outcome in resected primary synovial sarcoma: a study of the French Sarcoma Group. *Ann Oncol* 2009;20(3):425–430.
 17. Krieg AH, Hefti F, Speth BM, Jundt G, Guillou L, Exner UG, et al. Synovial sarcomas usually metastasize after >5 yrs: a multicenter retrospective analysis with minimum follow up of 10 years for survivors. *Ann Oncol* 2011; 22: 458–467.
 18. Sultan I, Rodriguez-Galindo C, Saab R, Yasir S, Casanova M, Ferrari A. Comparing children and adults with synovial sarcoma in the surveillance, epidemiology and end results program 1983–2005. *Cancer* 2009; 115: 3537–3547.
 19. De Bree R, van der Valk P, Kuik DJ, van Diest PJ, Doornaert P, Buter J, et al. Prognostic factors in adult soft tissue sarcomas of the head and neck: a single centre experience. *Oral Oncol* 2006; 42:703–709.

Association of Neuroretinal Parameters with Diabetic Neuropathy and Nephropathy

Ankita Choudhury¹, Lolly Pattnaik², Madan Mohan Mahapatra³

¹Post graduate Student, ²Professor, ³Professor, Department of Ophthalmology IMS and SUM Hospital, Siksha 'O' Anusandhan university, Bhubaneswar, Odisha

ABSTRACT

Aim and objective:- To evaluate OCT based associations of retinal neuropathy with nephropathy and peripheral neuropathy in a cohort of 100 diabetic patients utilizing eGFR, nerve conduction velocity (NCV) and ganglion cell layer (GCL) and retinal nerve fibre layer (RNFL) thickness as potential neuroretinal biomarkers of diabetic microvascular damage.

Materials and method:- TOPCON : 3D OCT- 1 Maestro version 8.3 X; Glaucoma analysis in the macula, 3D: macula V mode was used for obtaining mean layer thickness of 7mm x 7mm area surrounding the fovea after automated segmentation of SD-OCT images. eGFR and NCV were recorded.

Statistical analysis:- SPSS 20 statistical software package was utilized for analysis. Bivariate correlation analysis was done for determining relationship between nerve conduction velocities of sensory and motor nerves, eGFR and mean RNFL and GCL thickness. Regression analysis and Chi-square test was done to evaluate the extent of these associations.

Results:- There was strong interrelationship between all variables except triglycerides which had a minimal effect on age and duration of diabetes. Regression analysis showed significant association between eGFR and RNFL or GCL thickness (F=14.40; F=10.18) but not between nerve conduction velocity and the same (F=1.76;F=2.62) but Chi-square revealed significant relationship between grades of nephropathy ($\chi^2=25.87$; $p<0.001$ for RNFL, $\chi^2=12.943$; $p<0.005$ for GCL) neuropathy ($\chi^2=12.94$; $p=0.44$ for RNFL, $\chi^2=25.65$; $p=0.002$ for GCL) with RNFL and GCL thickness.

Conclusion:- The study provides evidence of the concept that such a classification is possible but larger population based studies are needed for framing a dependable and flawless corroboration.

Keywords: OCT, diabetes, neuropathy, nephropathy, retinal neuropathy.

INTRODUCTION

Diabetes is a chronic disease characterised by hyperglycaemia and affects the blood vessels and the nerves predominantly. There is significant association between the ensuing neuropathy, retinopathy and nephropathy¹.

Over the years association between the microvascular complications have intrigued investigators^{1,2,3,4,5,6,7}. Studies have shown close association of diabetic retinopathy with neurodegeneration of retina^{8,9,10,11,12,13}. With the introduction of optical coherence tomography (OCT) accurate measurement of the retinal layers in vivo is possible with a high degree of accuracy. Thinning of the inner retinal layers that is diabetic neurodegeneration is associated with duration of diabetes and is independent of visible retinal vasculopathy and glycaemic control¹⁵.

The prevalence of diabetic retinopathy (DR) in patients with diabetic peripheral neuropathy (DPN)

Corresponding author

Lolly Pattnaik,

Professor, Department of Ophthalmology
Siksha 'O' Anusandhan university, Bhubaneswar,
Odisha, India, Email ID : lollypattnaik@gmail.com

was 2.75 times than in case without diabetic peripheral neuropathy⁷. Salwa et al, Katulanda et al and Ji et al have found almost equal ratio of association between retinopathy and neuropathy cases^{16,17,18}. Further Ramachandran et al correlated the equal prevalence of retinopathy and neuropathy¹⁹.

OCT allows quantitative measurement of the retinal thickness and morphological changes.

Nerve conduction study is done to record the electrical response of a muscle to stimulation of a particular nerve at two or more points along its course. Glomerular filtration rate (GFR) allows us to determine the renal function. Normal GFR is 90 mL/min/1.73 m² or higher. Estimated GFR below 60 mL/min/1.73 m² is abnormal, if that persists for 3 months or more indicates chronic kidney disease. GFR below 15 mL/min/1.73 m² is suggestive of kidney failure.

In our study we have attempted to utilize the differential thinning of various retinal layers specifically ganglion cell layer (GCL) and retinal nerve fibre layer (RNFL), as potential neuroretinal biomarkers of microvascular damage in the kidney and peripheral nerves.

The concept of early diabetic retinopathy including a neurodegenerative component was pre-existing, but this is the first time OCT based association of diabetic retinopathy, neurodegeneration, nephropathy and peripheral neuropathy will be highlighted in a broader perspective.

MATERIAL AND METHOD

The aim of the study was to elaborate a few diabetes related microvascular complications in the retina, kidney and peripheral nerves. In this study we have attempted to link the results of compromised microcirculation which leads to diabetic neuropathy with nephropathy in the kidney and neuropathy in the peripheral nerves. OCT derived ganglion cell layer and retinal nerve fibre layer parameters of right eye of diabetic and non-diabetic patients (control) were

assessed and correlated with diabetic nephropathy and neuropathy. This was done to find a useful tool for early detection of these complications and help in formulation of a simple correlating classification that can be used by ophthalmologists, neurologists, and nephrologists independently.

Method

This study was conducted in a multispecialty hospital and medical college from December 2016 to August 2018. Diabetic patients were enrolled from Endocrine Department as per the inclusion and exclusion criteria. Demographic data was collected using a predesigned questionnaire. Venous blood sample was taken for elaboration of blood tests such as fasting blood sugar, post-prandial blood sugar, HbA1c, blood urea and serum Creatinine. Diabetic retinopathy status was assessed and graded using indirect ophthalmoscopy and digital non-mydratric fundus photograph. Macular scan was done using TOPCON: 3D OCT- 1 Maestro version 8.3 X; Glaucoma analysis in the macula, 3D: macula V mode of a 7x7 mm area and scan resolution of 512x128.

This function analysed the thickness of RNFL (RNFL and ILM), GCL+ (GCL and IPL). Diabetic nephropathy was diagnosed and graded using MDRD formula for calculating eGFR $186 \times (\text{Creatinine}/88.4)^{-1.154} \times (\text{Age})^{-0.203} \times (0.742 \text{ if female}) \times (1.210 \text{ if black})^{20}$

Diabetic neuropathy was diagnosed and grading done using nerve conduction study by Nicolet EDX with Viking Software and Nicolet AT2+6 amplifier. Summation of motor and sensory nerve conduction velocities of all the nerves was done separately before labelling the patient having sensory, motor or sensory motor deficit.

RESULTS

100 diabetic patients and 50 controls participated in the study. There were almost equal numbers of male and female patients in the study group. The demographic details including the HbA1c and RNFL and GCL mean values are tabulated in table 1.

TABLE 1: DEMOGRAPHIC DETAILS INCLUDING THE HbA1c, RNFL AND GCL MEAN VALUE OF DIABETIC AND NON-DIABETIC GROUP

	Diabetic (n=100)	Non-diabetic (n=50)
Age	41.95±14.20	47.70±10.00
Gender (male:female)	51:49	29:21
Duration of diabetes	10-29±5.48	
HbA1c	7.70±1.76	4.92±0.45
Triglycerides	108±37.50	69±11.26
eGFR	101.21±29.66	123.32±18.75
RE RNFL	27.14±3.61	34.73±2.58
RE GCL	58.71±27.67	67.56±3.58
LE RNFL	27.67±3.88	34.54±2.92
LE GCL	58.96±4.74	66.38±3.20

There existed significant difference with respect to eGFR, RNFL and GCL thickness between diabetic patients and non-diabetic patients ($p < 0.05$)(table 2)

TABLE 2: showing one way ANOVA to assess the mean difference of eGFR, RNFL and GCL layers between diabetic and non-diabetic.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1915.213	1	1915.213	175.173	.000
Within Groups	1618.120	148	10.933		
Total	3533.333	149			

Cross tabulation data showed significant association between the various grades of neuropathy and the retinal layers (GCL and RNFL) thickness $p < 0.05$ for RNFL and $p = 0.002$ for GCL (Table 3)

TABLE 4: DIFFERENT GRADES OF NEUROPATHY AND RNFL AND GCL THICKNESS

TYPE OF NEUROPATHY	RIGHT EYE RNFL			RIGHT EYE GCL				Total no. of patients
	20-25 um	26-30 um	31-35 um	50-55 um	56-60 um	61-65 um	66-70 Um	
NO NEUROPATHY	0	11	6	0	2	12	3	17
SENSORY NEUROPATHY	15	18	12	15	11	13	6	45
SENSORY MOTOR NEUROPATHY	16	15	6	14	15	6	2	37
MOTOR NEUROPATHY	1	0	0	0	1	0	0	1
Total no. of patients	32	44	24	29	27	31	11	100

Chi –square value for neuropathy grades and right eye RNFL thickness-12.94;df -6;(p=0.044)
 Chi Square value for neuropathy grades and right eye GCL thickness-25.5;df-9;(p=0.002)

Similarly, the Chi-Square Test showed a significant Chi-square value for association between eGFR indicative of Kidney function and the retinal nerve layers (RNFL AND GCL) thickness $p < 0.01$ for both RNFL and GCL thickness (table 4)

TABLE 5: DIFFERENT GRADES OF NEPHROPATHY AND RNFL AND GCL THICKNESS

NEPHROPATHY	RIGHT EYE RNFL			RIGHT EYE GCL				Total no. of patients
	20-25 um	26-30 um	31-35 um	50-55 um	56-60 um	61-65 um	66-70 um	
eGFR 90+	13	40	20	13	24	26	10	73
eGFR 60-89	7	2	2	6	2	3	0	11
eGFR 30-59	12	2	2	10	3	2	1	16
Total no of patients	32	44	24	29	29	31	11	100

Chi square value for nephropathy grades and right eye RNFL thickness-25.876;df-4;(p<0.0001).

Chi square value for nephropathy grades and right eye GCL thickness -17.56;df-6;(p=0.007)

DISCUSSION

With changing lifestyle, diabetes and its complications are globally assuming epidemic proportions^{2,21,22,,23,24,25}. Diabetic retinopathy, retinal neuropathy, peripheral neuropathy are well established complications of the diabetic process^{21,26,27,28}.

The correlation between these processes has been established pathophysiologically⁶⁹. Anatomical correlation between retinal neuropathy with nephropathy and peripheral neuropathy is possible following the introduction of newer generation SD-OCT machine with higher axial resolution and image quality.

In our study we have attempted to correlate the renal function (in terms of eGFR using MDRD equation) and the neuropathy status (using nerve conduction velocity) with the changes in thickness of RNFL and GCL (the third order neurons and its axons of the visual pathway).

In corroboration with previous studies the mean RNFL and GCL layers were much less in our diabetic patients compared to non-diabetic as shown in table 115,29,30. This differential thinning of the neuroretinal layer has been utilised by us as a neuroretinal biomarker of microvascular damage of the kidneys and the peripheral nerves. The concept of neurodegenerative damage was pre-existing but this is the first time that OCT

based association of diabetic retinal neurodegeneration, nephropathy and peripheral neuropathy will be highlighted

Estimated GFR showed a high correlation with age. HbA1c level was negatively correlated ($r = -0.384$) which denoted that with increasing HbA1c levels eGFR decreased increasing the risk of nephropathy. RNFL and GCL thickness and DPN also shows negative correlation ($r = -0.351$) which signified that with increasing HbA1c levels there was decrease in nerve conduction velocity thereby increasing risk for peripheral neuropathy at the level of $p < 0.01$ whereas it was minimally correlated with duration of diabetes $p = 0.01$ (Table-5 supplementary file).

RNFL and GCL thickness showed a high negative correlation ($r = -0.204$ for RE RNFL thickness ; $r = -0.399$) with duration of diabetes which signified that with increasing duration of diabetes there occurred decrease in thickness of RNFL and GCL ($p < 0.01$). RNFL and GCL values also showed high correlation with HbA1c ,eGFR values and peripheral neuropathy at the level $p < 0.01$ (Table-5 supplementary file).

Diabetic peripheral neuropathy showed extremely significant correlation value $p < 0.01$ with age, eGFR, RNFL and GCL thickness and significant correlation of $p < 0.05$ with duration of diabetes and HbA1c levels. DPN was negatively correlated with eGFR (nephropathy) and

RNFL and GCL thickness which implied that if there was peripheral neuropathy there was associated presence of nephropathy and retinal neuropathy (decrease in RNFL and GCL thickness) (Table-5 supplementary file).

Linear regression of conduction velocity of the nerve and the retinal nerve layers failed to elicit any correlation but it ought to be recollected that in diabetes the preferentially affected nerves are the sensory nerves and the motor nerves are affected rarely and that too in the later phases of uncontrolled diabetes. (Tables 3,6 and 7- supplementary file). So with further subdivision of the neuropathy into several groups there was a significant influence of the nerve conduction velocity status of the neurodegeneration process (Table 3: Chi Sq. value for RNFL=12.943 and $p=0.04$ and Chi Sq. value for GCL=25.655, $p=0.002$)

Previously Shahidi et al utilizing a neuropathy disability score had found inferior quadrant retinal nerve fibre thinning to be associated with peripheral neuropathy. Nerve conduction study used by us can elicit much earlier forms of peripheral neuropathy³⁰.

Triglyceride had a minimal effect on age and duration of diabetes and was not correlated with the other variables. The result of linear regression analysis showed there existed significant effect of eGFR on RNFL and GCL at $p<0.01$ (Table 8 and 9- supplementary file) A strong correlation of HbA1c value with diabetic nephropathy and retinal neuropathy reiterated the importance of appropriate blood sugar control for prevention of diabetic microvascular damage³² Unlike the study done by Kareem et al³² we did not find appreciable evidence of correlation between triglyceride levels, nephropathy, retinal neuropathy and peripheral neuropathy in our group of diabetic patients. But there was some association between the triglyceride levels and the age and duration of diabetes.

Gokhale et al have found significant correlation of the sensory neuropathy with retinopathy score (0.29 at $p=0.01$) and minimal correlation of 0.02 of motor neuropathy with the retinopathy score. But the retinopathy scores referred to by them are the clinically evident diabetic retinopathy levels classified into 5 groups.

In our study the association of peripheral neuropathy with changes in GCL was more prominent (Chi-sq. value =25.65, $p=0.002$), than the changes in RNFL (Chi-sq.

value 12.943, $p=0.04$) (table 3).

The association of nephropathy in terms of eGFR with inner retinal nerve fibre layer thickness was much stronger compared to neuropathy (Chi Sq. value for GCL=17.561, $p=0.007$ and Chi Sq. value for RNFL=25.876, $p=0.000$) (table 4).

Limitation

The small sample of patients cannot be extrapolated to the entire population. Thereby warranting larger population based studies.

Although our machine is a SD-OCT, the absolute GCL and RNFL values have not been taken as the TOPCON machine measures the GCL along with the IPL thickness and RNFL measure is the actual RNFL along with ILM.

CONCLUSION

In conclusion, this study shows a significant association of diabetic nephropathy and neuropathy grades with diabetic retinal neurodegeneration evidenced by the thinning of the GCL and RNFL, arranged in identical groups of increasing thickness. Mean age of diabetic patients was 41.95 ± 14.20 and male: female ratio was almost the same i.e. 51:49.

Sensory neuropathies followed by mixed neuropathy were the most common types of neuropathy and were significantly associated with thinning of the RGCL and RNFL.

Nephropathy grades were more strongly associated with inner retinal layer thickness (i.e. GCL and RNFL thickness) (table 4)

All these suggest retinal neuropathy process preceding clinically evident diabetic retinopathy and is significantly associated with diabetic microvascular changes in the kidney and the peripheral nerves.

Conflict of Interest – Nil

Source of Funding- SOA University

Ethical Clearance– Institutional ethical committee approval taken .

REFERENCES

1. P. J. Dyck KMKJLKWJLRKJMPDMWPCOLJM. The prevalence by staged severity of various

- types of diabetic neuropathy, retinopathy and nephropathy in a population-based cohort. The Rochester Diabetic Neuropathy Study. *American Academy of NEUROLOGY*. April 1993:817-824.
2. Sang-Ho Byun SHMJJKWJBP. Screening for Diabetic Retinopathy and Nephropathy in Patients with Diabetes: A national Survey in Korea. *PLoS ONE* 8(5). May 2013.
 3. Won June Lee LSMJLMHKMSHC. The Relationship Between Diabetic Retinopathy and Diabetic Nephropathy in a Population-Based Study in Korea (KNHANES V-2, 3). *Invest Ophthalmol Vis Sci*. 2014(55):6547-6553.
 4. Giuseppe Penno ASGZEOGZRTea. Rate and Determination of Association Between Advance Retinopathy and Chronic Kidney Disease in Patients With Type 2 Diabetes. *Diabetes Care*. 2012(35(11)):2317-2323.
 5. Ronald Klein BZRGSSSMDea. The Relationship of Diabetic Retinopathy to Preclinica; Diabetic Glomerulopathy Lesion in Type 1 Diabetic Patients. The Renin-Angiotensin System Study. *Diabetes*. February 2005(54(2)):527-533.
 6. Ali Jawa JKVAF. Diabetic nephropathy and retinopathy. *THE MEDICAL CLINICS OF NORTH AMERICA*. 2004(88):1001-1036.
 7. Virendra K. Sharma MVJAAV. Interrelation of retinopathy with peripheral neuropathy in diabetes mellitus. *Journal of Clinical Ophthalmology and Research*. 2016;4:83-87.
 8. Gregory R. Jackson AJB. Visual Dysfunction Associated with Diabetic Retinopathy. *Current Diabetes Reports*. October 2010;10(5):380-384.
 9. Alistair J. Barber TWGSFA. The Significance of Vascular and Neural Apoptosis to the Pathology of Diabetic Retinopathy. *Invest Ophthalmol Vis Sci*. 2011(52):1156-1163.
 10. Garvin M AMWXRSTSM. Automated 3-D Intraretinal Layer Segmentation of the Macular Spectral-Domain Optical Coherence Tomography Images. *IEEE Trans Med Imaging*. 2009(27):1495-1505.
 11. Garvin MK AMKRRSWXSM. intraretinal layer segmentation of the macula optical coherence tomography images using optimal 3-D graph search. *IEEE Trans Med Imaging*. 2008(27):1495-1505.
 12. Diagnosis and classification of diabetes mellitus. American Diabetes Association. *Diabetes Care*. 2012(35):S64-S71.
 13. Kyungmoo Lee MDAMSMKG. Automated segmentation of intraretinal layers from spectral-domain macular OCT: Reproducibility of layer thickness measurement. *Proc SPIE Med Imaging*. 2011;7965:796523-1-8.
 14. Abramoff M MPRS. Image processing with ImageJ. *Biophotonics*. 2004;11:36-42.
 15. Hille W. van Dijk FDVPHBKMSMKGMSJHDROSaMDA. Early Neurodegeneration in the Retina of Type 2 Diabetic Patients. *Investigative Ophthalmology & Visual Science*. May 2012;53.
 16. Salwa Selim Ibrahim Abougambou ASA. Explorative study on diabetes neuropathy among type II diabetic patients in Universiti Sains Malaysia Hospital. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*. July-September 2012;6(3):167-172.
 17. Prasad Katulanda PRRJGRCMHRSDRM. The prevalence, pattern and predictors of diabetic peripheral neuropathy in a developing country. *Diabetology & Metabolic Syndrome*. 2012(4:21).
 18. Ji N ZNRZJKWLNJMJ. Risk factor and pain status due to diabetic neuropathy in chronic long-term diabetic patients in a Chinese urban population. *Chinese Medical Journal*. December 2012:4190-4196.
 19. Ramachandran A SCSKLESRVV. *The Journal of the Association of Physicians of India*. December 1999(47(12)):1152-1156.
 20. Levey AS GTKJBG. A simplified equation to predict the glomerular filtration rate from serum creatinine. *J Am Soc Nephrol*. 2000 (11: 115A).
 21. Kalpana. R. KKAP. Association of peripheral neuropathy with retinopathy in diabetic patients. *Indian Journal of Clinical and Experimental Ophthalmology*. January-March 2018;4(1):115-119.
 22. Zheng Y HMCN. The worldwide epidemic of diabetic retinopathy. *Indian Journal of Ophthalmology*. September-October; 60(5) 2012:428-431.

23. Grauslund J GASA. Blindness in a 25-year follow-up of a population-based cohort of Danish type 1 Diabetic patients. *Ophthalmology*. 2009;2170-2174.
24. Wild S RGGASRKH. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care*. 2004;27(1047-1053).
25. Sicree R SJZP. Diabetes and impaired glucose tolerance. In: Gan D, editor. *Diabetes Atlas*. International Diabetes Federation. 2006:15-103.
26. Standard of Medical Care in Diabetes. *Diabetes Care*. 2015;38:S58-S67.
27. Ali Abdollahi SMATMTRBS. Neuropathy and retinopathy in diabetes: Is there any association?. *International Journal of Ophthalmology*. March 2009;2(1).
28. Karoline Boegeberg Jonsson UFOJG. Vascular Changes and Neurodegeneration in the Early Stages of Diabetic Retinopathy: Which Comes First? *Ophthalmic Research*. 2016(565):1-9.
29. A Verma PRRRSPGLMGCSKVTS. Is neuronal dysfunction an early sign of diabetic retinopathy? Microperimetry and Spectral Domain Optical Coherence Tomography (SD-OCT) Study in individuals with diabetes, but no diabetic retinopathy. *Eye(Lond)*. September 2009(23):1824-1830.
30. Aleksandra Araszkiewics D Z Z M M J B M S P A R F D N B W W . Neurodegeneration of the retina in type 1 diabetic patients. *Pol Arch Med Wewn*. August 2012;122(10):464-470.
31. A. M. Shahidi GPSNPKEDVAWRRAMNE. Retinal nerve fibre layer thinning associated with diabetic peripheral neuropathy. *Diabetic Medicine*. January 2012;29:e106-e111.
32. Ishrat Kareem SAJJSBVPP. Study of magnesium, glycosylated hemoglobin and lipid pfile in diabetic retinopathy. *Indian Journal of Clinical Biochemistry*. 2004;19(2):124-127.

An Unusual and Interesting Cause of Headache-A Case Report

Santosh Kumar Swain¹, Smrutipragnya Samal², Mahesh Chandra Sahu³, Priyanka Debta⁴

¹Professor, Department of Otorhinolaryngology, ²Research Scholar, ³Assistant Professor, Medical Research Laboratory, IMS and SUM hospital, Siksha "O" Anusandhan University, K8, Kalinganagar, Bhubaneswar, Odisha, India, ⁴Associate Professor, Department of Oral Pathology & Microbiology, I.D.S., Siksha "O" Anusandhan, Deemed to be university, BBSR, Odisha, India

ABSTRACT

Headache is a common complaint in day to day clinical practice. Although rarely life threatening, it is a major cause behind the suffering and lack of productivity at work place. Improper diagnosis leads to delayed treatment which gives financial burden to the patient. Clinical evaluation of a headache patient is almost dependent on adequate history taking. By careful diagnosis and appropriate treatment give a great help to the patient. Cutaneous larva migrans, a zoonotic helminthiasis, causes morbidity due to severe, intractable pruritus. However, here we are presenting an unusual cause of frontal headache due to cutaneous larva migrans in frontal area, which is an extremely rare and an interesting incidence in medical literature.

Keywords: Headache, Helminthiasis, cutaneous larva migrant.

INTRODUCTION

The most frequent painful condition that affects human being is the headache. Headache is not a disease, but a symptom reflecting presence of myriad disease spectrum. The most critical task of the treating physician is establishing the proper diagnosis from the patient suffering from headache. In fact, most treatment failure arises due to misdiagnosis. When headache is persistent, it becomes a source of misery to the sufferers as well as to those who venture to treat it. Computed tomography (CT scan) and diagnostic nasal endoscopy resolve most of the puzzles in *rhinosinusogenic* headaches and provide solution. Hookworm larvae, specifically *Ancylostoma braziliense*, excreted from infected cats, dogs and cattle which can enter the exposed skin of human being and commonly affect the hands, buttocks and feet. If larvae migrate give rise to characteristic serpiginous lesion ¹, ². Staying beneath the skin, the larva migrant causing

headache is an extremely rare clinical manifestation. Here we are presenting an interesting case where frontal headache is due to cutaneous larva migrans.

CASE REPORT

A 32 year old male came to Out patient department of Otorhinolaryngology with complaints of headache since 3 months. The patient was referred from neurology clinic to rule out any nose and sinus causes. The previous CT scan of brain was normal. The pain was confined to right frontal area. He had no history of nausea and vomiting. He had no complaints of photophobia and phonophobia. He had no travel history to any other country. General and systemic examinations of the patients were within normal limits. There was no tenderness over any sinuses on palpation. There were mild erythematous changes on the skin over right frontal area. We advised CT scan of paranasal sinus which was also normal. Routine blood tests were within normal limits except increase eosinophilic count. His complain was only right side frontal headache along with irritation and mild crippling sensation at right frontal area. As patient also complained something crippling below the skin of right frontal area along with headache, so he was planned for exposure of the target area and had undergone an incision (Fig.1). This revealed a helminthes just below the skin of right

Corresponding author

Dr. Santosh K. Swain,

Professor, Department of Otorhinolaryngology,
IMS and SUM Hospital, Bhubaneswar, Odisha, India
Email: santoshvoltaire@yahoo.co.in
Cell: 09556524887

frontal area (Fig.2). On microbiological evaluation, it confirmed a cutaneous larva migrans. The patient was treated with a single dose of ivermectin 12mg and albendazole 400mg once daily for 3 consecutive days along with analgesics and antihistamines. Follow up after two weeks showed complete disappearance of frontal headache and erythematous changes over the frontal area.



Fig.1: Intraoperative picture showing incision on right frontal area.

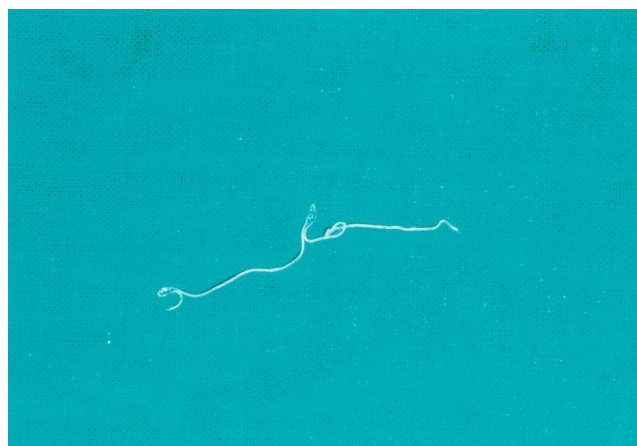


Fig.2: Helminthes recovered from right frontal area which stayed below the skin.

DISCUSSION

Headache is probably one of the commonest symptom, which every person in their life has experienced and sometime or other. Headache is not a disease, but a symptom reflecting presence of myriad of pathological spectrum. Sometimes there are serious and life threatening causes of headache and it is imperative that the clinical evaluation must be sufficiently to diagnosis these causes so that adequate investigations and therapy can be limited. Headache may be primary or secondary. Primary headache is often recurrent, benign and has no underlying serious cause and not

associated with neurological deficit. Majority of the headache are primary whereas secondary headaches usually have underlying etiology such as meningitis, intracranial hemorrhages, glaucoma, tumours, sinusitis and arteritis. A complete neurologic, Otolaryngological and ophthalmological examinations are needed for proper diagnosis and treatment. Frontal headache due to presence of cutaneous larva migrans is an extremely rare clinical observation in medical literature. Cutaneous larva migrans is skin infection caused by a parasite and diagnosed on the basis of clinical presentation of the patient. It often presents with serpiginous lesions seen over the dorsum and soles of the foot. These infections usually occur due to sunbathing, tropical climate, walking on sea beach with barefoot, over crowded area and poor hygiene³. Other body parts affected are thigh, back and buttock which rest on the contaminated area like sands. Rare sites of the body affected by this parasitic infection are penis, oral mucosa and anterior abdominal wall⁴. Cutaneous larva migrans is caused by the accidental percutaneous penetration and migration of nematode larva along the epidermis. These are usually of animal hookworms and most commonly *Ancylostoma braziliense*, *Ancylostoma canium* and *Gnathostoma* species⁵. The ova of the nematodes are excreted via the primary host fecal materials and they hatch to become larva in warm environment, humid area in gardens, fields and sea beaches being the preferred sites. The larva penetrate the human skin when come in contact with infected soil, so mostly affect farmers, gardeners and those taking sunbath in sea beaches. Once it matures, the filariform larva penetrate the intact skin by using their protease and migrate to different places usually between *stratum granulosum* and *stratum corneum*⁶. These larvae are thought to lack the collagenase enzyme needed to enter the human basement membrane of the dermis and so the lesions are confined to the epidermis. These larvae are not developed further in human being as humans are not their natural hosts. So human act as incidental, dead-end hosts and the disease is self limiting in many cases. This disease is usually seen in developing country like Brazil, India and West Indies. It occurs in the persons those have visited the tropics or spread in the form of an epidemic. The patients often give a history of foreign visit and barefoot walk over sandy soil or beaches. Cutaneous larva migrans enter or penetrate the intact or exposed skin and migrate via epidermis. The symptoms are highly variable and ranges from simple itching over the skin to severe morbidity of

the patient affecting daily life of the patient. Cutaneous larva migrans causes morbidity of the patient due to severe and intractable pruritis and pain by cutaneous larva migration of cat or dog hookworm which enters intact skin by direct touch with contaminated sand or soil. Due to rash and intense pruritic rash and pain leads to impaired concentration, mood disturbance and sleep disturbance. Transmission of cutaneous larva migrans occurs during lying on sea beaches or walking on the sands at sea beaches. Laboratory findings have no role for the diagnosis. Some patient may show increased eosinophil count. In our case, due to severe headache and skin irritation, mild erythematous changes and patient repeatedly told something below the skin of forehead, so an incision made on right frontal area, which revealed a hook worm and finally diagnosed as cutaneous larva migrans. The classical skin lesion in cutaneous larva migrans is itchy, erythematous serpiginous track. Most common sites are over the dorsa of feet, buttocks and dorsa of hands even also involve genitalia, oral cavity mucosa and the breast region have been reported. Intense itching is also a common association in this lesion and sometimes secondary infected with bacteria due to repeated scratching. Sometimes vesicubullous lesions are also seen over the skin lesions⁷. Ivermectin is usually the treatment of choice in cutaneous larva migrans. A single oral dose of 200µg/kg body weight kills the larva effectively. If the first dose fails to cure, a second dose gives a definite help. A single dose of ivermectin is better and more effective than single dose of albendazole. In ivermectin is not available, repeated treatment with albendazole are better alternative⁸.

CONCLUSION

The most frequent painful condition that affects humans is headache. Headache due to subcutaneous larva migrans is an extremely rare in medical literature. Cutaneous larva migrans is a non-communicable disease

and has little public health relevance. It causes significant morbidity to the patient. Even it is an extremely rare, after remove of hook worm larva below the skin of forehead, the headache was disappeared. Although it is an interesting and extremely rare clinical incidence in medical literature, should be kept in mind during evaluation of headache.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Not required

REFERENCES

1. Gupta M. Bullous cutaneous larva migrans – A case report. *Journal of Dermatology & Dermatologic Surgery* 2016; 20: 65-6.
2. Roshe A, McStay CM 2012. Cutaneous larva migrans. *J Emerg Med* 2012; 43:135-36.
3. Padmavathy L, Rao LL. Cutaneous Larva Migrans - A Case Report. *Indian J Med Microbiol* 2005; 23:135-6.
4. Malhotra, SK; Raj, Rakesh T; Pal, Manjeet; Goyal, Vippan; & Sethi, Shweta. Cutaneous larva migrans in an unusual site. *Dermatology Online Journal*, 2006; 12:11.
5. Gillespie SH. Cutaneous larva migrans. *Curr Infect Dis Rep* 2004; 6:50-3.
6. Veraldi S, Bottini S, Persico MC, La Vela V. Larva migrans cutanea. Rome: Mediprint; 2010: 39-41.
7. Veraldi S, Arancio L. Giant bullous cutaneous larva migrans. *Clin Exp Dermatol* 2006; 31: 613-14.
8. Feldmier H, Schuster A. Mini review: hookworm-related cutaneous larva migrans. *Eur J Clin Microbiol Infect Dis* 2012; 31: 915-18.

Recurrent Aphthous Ulcer among Family Members Affected with HIV/AIDS infection-A Case Report

Santosh Kumar Swain¹, Swayamprabha Sahoo², Mahesh Chandra Sahu³, Priyanka Debta⁴

¹Professor, ²Research Scholar, ³Assistant Professor Medical Research Laboratory, Medical Research Laboratory, IMS and SUM Hospital, Siksha "O" Anusandhan Deemed to be University, K8, Kalinganagar, Bhubaneswar, Odisha, India, ⁴Associate Professor, Department of Oral Pathology & Microbiology, I.D.S., Siksha "O" Anusandhan, Deemed to be University, BBSR, Odisha, India

ABSTRACT

Recurrent aphthous ulcer is a clinical condition characterized by painful ulcer with different size affecting the mucosa of oral cavity. Its etiology and pathogenesis is not clearly known and the diagnosis is based on the clinical picture. These lesions may be classified into minor, major and herpetiformis. The aphthous ulcers in the oral cavity affect speech and feeding, leading to poor quality of life. The aphthous ulcers in immunocompromised patients like AIDS cause severe type of ulceration. Here we are presenting a report of two patients (daughter and mother) in a family suffering from AIDS with major recurrent aphthous ulcers in the oral cavity.

Keywords: Aphthous ulcer, HIV infections, Oral ulcer.

INTRODUCTION

The term 'aphthous' in medicine is derived from a Greek word 'aphtha' which means ulceration. Recurrent aphthous ulcer is seen worldwide and characterized by multiple, recurrent, small ovoid or round ulcers with circumscribed margins, erythematous haloes and grey or yellow floors¹. It is seen commonly in childhood or adolescent age group. Recurrent aphthous ulcer or Canker sores is commonly seen in the oral cavity, characterized by recurrent episodes of a single or multiple and painful ulcers covered by fibrin and surrounded by erythematous rim locating in the non-keratinizing mucosa of the oral cavity. Recurrent aphthous ulcers seen in 5-25% of the general population and it is more than 50% among students at the time of examination². Although recurrent aphthous ulcers are self-limited, this lesion causes pain and discomfort and interfere in eating, speaking and

swallowing which leads to poor quality of life. Early and effective treatment of recurrent aphthous ulcer minimizes the discomfort in speaking and painful swallowing. Here, we are presenting a case of two patients from same family where both are immunocompromised by HIV infections presenting with recurrent aphthous ulcers.

Case Report

A 12 year old girl attended the out patient department of Otorhinolaryngology along with her mother with complaints of recurrent ulcers in the oral cavity. Both daughter and mother were known cases of HIV positive under the treatment with antiretro-viral drugs. The child was affected with HIV by vertical transmission from her mother. Intraoral examinations showed ulcers on the labial mucosa, tongue, buccal mucosa and floor of the mouth. Ulcer in the oral cavity looks necrotic background, raised borders and an erythematous halo (Fig.1). Both mother and daughter complained severe pain in the oral cavity, difficulty during feeding and brushing teeth. According to the father, these lesions in the oral cavity occurring frequently. Both had bilateral enlargement of submandibular lymph nodes. Personal history revealed that the mother was chronic alcoholic, smoker, hypertensive and HIV positive since 5years under

Corresponding author:

Dr. Santosh K. Swain,

Professor, Department of ENT, IMS and SUM Hospital, Bhubaneswar, Odisha, India

Email: santoshvoltaire@yahoo.co.in

Cell: 09556524887

the treatment with antiretroviral and anti-hypertensive drugs. They have low socioeconomic background and both patients were treated with povidone iodine mouth gargle, triamcinolone local ointment and anesthetic local application for seven days. They were advised not to swallow medicine. After one week treatment, they still had some residual lesions but no complaints of pain or discomfort in the oral cavity during feed and ulcers showed signs of remission. After two weeks of treatment, aphthous ulcers were completely disappeared.



Figure-1 Image showing upper aphthous ulcer at upper pellet

DISCUSSION

Aphthous ulcers are often recurrent and multiple lesions seen in the oral cavity mucosa particularly in buccal mucosa, labial mucosa, floor of the mouth and tongue. The etiopathogenesis of recurrent aphthous ulcer remains unclear. Several etiological factors are thought to relate for causing this lesion such as trauma, immunological dysfunction, psychological stress, systemic diseases, nutritional deficiency, infections and so on³. The other possible etiologies are drug use, lack of folic acid, vitamin B12, iron and other dietary factors, stress, hormonal changes, metabolic diseases and infections⁴. AIDS patients may presents with different clinical conditions like mouth ulcers. Mouth ulcers caused by herpes simplex and cytomegalovirus are most prevalent during the disease period of AIDS⁵. Thus the diagnosis must include history taking and clinical presentations⁶. In this case, the diagnosis of the recurrent major aphthous ulcer was established. The clinical presentations like multiple ulcers greater than 1cm, lesions seen in non-keratinized mucosa, presence of scar and history of recurrence established the diagnosis in our case. This clinical entity can be classified into three types such as minor, major and herpetiformis⁷. As per “Classification and Diagnostic

Criteria for Oral Lesions in HIV Infection” (proposed by Ec-Clearing- house on Oral Problems Related to HIV Infection and WHO Centre on Oral Manifestations Collaborating on the Immunodeficiency Virus in 1993), the recurrent aphthous ulcer is part of the group 3 (lesions observed in HIV infection). This classification states that the incidence of major and herpetiformis types of aphthous ulcers are increased in patients with HIV infection and particularly for children with HIV infection, this classification is modified and recurrent aphthous ulcer is in the group 1 (lesions commonly associated with pediatric HIV infection)⁸. In our case, patients presented with severe oral ulcerations with size of approx. 1cm with recurrence pattern and scars due to previous ulcers. Aphthous ulcers were seen in the buccal mucosa, labial mucosa, floor of the mouth and tongue. A genetic predisposition is associated with approximately 40% of patients with recurrent aphthous ulcer and these patients have a family history of aphthous ulcers in the oral cavity. These patients present with early and severe presentation of ulcerations. Recurrent aphthous ulcers may be associated with HLA-B51 which control heat shock proteins or cytokines⁹. It is likely that immunologically mediated mechanism are involved in the etiopathogenesis of recurrent aphthous ulcer. It may be due to excessive production of IL-1 or IL-6¹⁰. This clinical condition is considered as recurrent aphthous ulcers as these are painful, deeper, repair slowly and may be healed with scar. These lesions of the oral cavity are usually more than 1cm in diameter¹¹. The exact etiology of the aphthous ulcer is till not clear and many predisposing factors like trauma, stress, immunological, viral infections etc., are taken into consideration. Management of recurrent aphthous ulcers remains unsatisfactory. Most of the treatment done in aphthous ulcers are only for reducing severity of the ulceration but not meant to stop recurrence. As there multiple causes for aphthous ulcer, the objective of the treatment is always to give symptomatic treatment of pain by different topical application of anesthetic or antiseptic agents. To enhance healing process, different anti-inflammatory and anti-allergic agents are often tried. Treatment of recurrent aphthous ulcer in the oral cavity is always challenging to clinician regardless to its type. Although there are numerous treatment options for aphthous ulcer, there is no effective treatment option till now. Medications used in recurrent aphthous ulcer are mainly meant to relieve pain, discomfort and decrease the healing period. The topical anesthetic agent is used for patient with less

frequent minor recurrent aphthous ulcer or herpetiformis types. In major type of aphthous ulcer or in more frequent minor and herpetiformis types, there are numerous topical treatment options are available like topical anesthetics, sucralphate, corticosteroids (Clobetasol propionate 0.05%, dexamethasone 0.5mg/5ml, fluocinonide 0.05%)¹². Systemic treatment options of recurrent aphthous ulcer are corticosteroids like prednisolone, intralesional triamcinolone and immunomodulators like thalidomide (200mg/day)¹². Amlexanox (C₁₆H₁₄N₂O₄) is a topical antiallergic, anti-inflammatory drug and has been used as a 5% topical paste for the treatment of patients with recurrent aphthous ulcer¹³. Treatment of recurrent aphthous ulcers done occasionally with systemic corticosteroids. The prolonged use of systemic corticosteroids are not advised due to its side effect particularly in immunocompromised patients¹⁴. The systemic steroids, Colchicines, Azathioprin, Thalidomide, Levamisole, Cyclophosphamide, Pentoxiphylline, Dapsone may be reserved in case of refractory condition as these drugs have many side effects in comparison to topical medications¹⁵. Allicin is a component derived from the garlic extracts can be used for the treatment of recurrent aphthous ulcer due to their multiple bioactivities such as anti-inflammatory, anti-microbial, anti-oxidant and immunomodulatory properties². Application of low powered lasers is thought to stimulate the reepithelization of the ulcer and helpful for healing of the recurrent aphthous ulcer¹⁶. In our case the recurrent aphthous ulcer of daughter and mother are relieved by topical application of steroid, anesthetic agents and antiseptic mouth gargle.

CONCLUSION

Aphthous ulcers are common lesions in the oral mucosa characterized by multiple, recurrent, small, round or ovoid ulcers with circumscribed margins, erythematous haloes and yellow grey floors. Recurrent aphthous ulcers in HIV patients give rise to severe pain and significant morbidity. Recurrent painful aphthous ulcers affect oral functions and reduce quality of life. Early attention should be given for diagnosis and treatment for relieving pain by maintaining proper nutrition and preventing recurrence.

Conflict of Interest: There is no conflict of interest

Source of Funding: Nil

Ethical Clearance: Approved from Institutional

Ethics Committee

REFERENCES

1. Jurge S, Kuffer R, Scully C, Porter SR. Recurrent aphthous stomatitis. *Oral Dis*. 2006;12:1-21.
2. Jiang XW, Hu J, Mian FI. A new therapeutic candidate for oral aphthous ulcer: Allicin. *Medical Hypotheses* (2008) 71, 897-899.
3. Brocklehurst P, Tickle M, Glenny AM, Lewis MA, Pemberton MN, Taylor J, et al. Systemic interventions for recurrent aphthous stomatitis (mouth ulcers). *Cochrane Database Syst Rev* 2012; 9.
4. Preeti L, Magesh K, Rajkumar K, Karthik R. Recurrent aphthous stomatitis. *J Oral Maxillofac Pathol* 2011; 15(3): 252-256.
5. Patton LL, Ramirez-Amador V, Anaya-Saavedra G, Nittayananta W, Carrozzo M, Ranganathan K. Urban legends series: oral manifestations of HIV infection. *Oral Dis* 2013; 19(6):533-550.
6. Toche PP, Salinas LJ, Guzmán MMA, Afani SA, Jadue AN. Recurrent oral ulcer: clinical characteristic and differential diagnosis. *Rev Chilena Infectol* 2007; 24 (3):215-219.
7. Akintoye SO, Greenberg MS. Recurrent aphthous stomatitis. *Dent Clin North Am* 2014; 58(2):281-297.
8. Patton LL, Ramirez-Amador V, Anaya-Saavedra G, Nittayananta W, Carrozzo M, Ranganathan K. Urban legends series: oral manifestations of HIV infection. *Oral Dis* 2013;19 (6):533-550.
9. Bazrafshani MR, Hajeer AH, Ollier WE, Thornhill MH. Recurrent aphthous stomatitis and gene polymorphisms for the inflammatory markers TNF-alpha, TNF-beta and the vitamin D receptor: no association detected. *Oral Dis* 2002;8: 303-307.
10. Scully C, Porter S. Oral mucosal disease: Recurrent aphthous stomatitis. *British Journal of Oral and Maxillofacial Surgery* 2008; 46:198-206.
11. Toche PP, Salinas LJ, Guzmán MMA, Afani SA, Jadue AN. Recurrent oral ulcer: clinical characteristic and differential diagnosis. *Rev Chilena Infectol* 2007; 24 (3):215-219.
12. Kerr AR, Ship JA. Management strategies for HIV-associated aphthous stomatitis. *Am J Clin Dermatol* 2003; 4(10):669-680.

13. Uma Maheswari TN, Shanmugasundaram P. Amlexanox in treatment of aphthous ulcers: A systematic Review. *J pharmacy Res* 2013(6) 214-217
14. Silverman Jr S, Lozada-Nur F, Migliorati C. Clinical efficacy of prednisone in the treatment of patients with oral inflammatory ulcerative diseases: a study of fifty-five patients. *Oral Surg Oral Med Oral Pathol* 1985; 59(4):360–363.
15. Srinivas Rao P. Recurrent aphthous stomatitis: a review. *J Orofac Sci.* 2010;2: 60-65.
16. Najeeb S, Khurshid Z, Zohaib S, Najeeb B, Qasim SB, Zafar MS. Management of recurrent aphthous ulcers using low-level lasers: A systematic review. *Medicina* 2016; 52:263–268

Clinico-Epidemiological Study of Oral Potentially Malignant and Malignant Lesions in a Tertiary Care Centre of Odisha- A Five Year Longitudinal Study

Fakir Mohan Debta¹, Priyanka Debta², Ekagrata Mishra³, Santosh Kumar Swain⁴,
Mahesh Chandra Sahu⁵, Smrutipragnya Samal⁶, Anurag Dani⁷

¹Associate Professor, Department of Oral Medicine and Radiology, S.C.B. Dental College & Hospital, Cuttack, India, ²Associate Professor, Department of Oral Pathology & Microbiology, I.D.S., Siksha "O" Anusandhan, Deemed to be university, BBSR, Odisha, India, ³Post graduate Student, Department of Oral Medicine and Radiology, S.C.B. Dental College and Hospital, Cuttack, Odisha, India, ⁴Professor, Department of Otorhinolaryngology, IMS and SUM Hospital, Siksha "O" Anusandhan, Deemed to be University, K8, Kalinganagar, Bhubaneswar, Odisha, India, ⁵Assistant Professor, ⁶ PhD Scholar, Department of Medical Research Laboratory, IMS and SUM Hospital, Siksha "O" Anusandhan, Deemed to be University, Kalinganagar, Bhubaneswar, Odisha, India, ⁷Professor, Department of Prosthodontia, C.D.C.R.I. Rajnandgaon, Chhattisgarh, India

ABSTRACT

Introduction: The nomenclature of potentially malignant disorders (PMDs) of the oral mucosa, with the risk of conversion to oral squamous cell carcinoma (OSCC) have been very diverse. Despite the ability to identify PMD, clinicians have been unable to predict the behavior of lesions or quantify the risk of malignant transformation. This study aims to qualitatively and quantitatively over a five year period using clinical spectrum of presentation and frequency distribution, prevalence, malignant transformation rates of PMD's.

Materials and Method: This study follows a longitudinal prospective study design which was conducted in the Department of Oral Medicine, Oral Diagnosis and Radiology, at S.C.B. Dental College and Hospital, Cuttack over 5 years, from January 2013 to December 2017. The study intended to primarily address and document the clinical diversity, 5year frequency distribution, prevalence, malignant transformation rates of OPMD's.

Results: The frequency of OPMD's was 55% with 36.88 % males. The most and least frequently encountered OPMD included Pouch keratosis (30.96% of OPMD's) and Discoid Lupus Erythematosus (0.002% of OPMD's). The mean age of malignant transformation was 41 years with a male predilection (68 %) and was largely habit associated (72%). Over the 5 year period the highest rate of malignant transformation was observed for actinic cheilitis (20.66%) and least for oral lichen planus (0.35%).

Discussion and Conclusion: During the 5 year study period, 55.01% were OPMD's and 6.34% were head and neck cancers. The significantly higher rate of transformation noted in our population can be attributed to late presentation for treatment, rampant production and continued use of smokeless forms of tobacco. To the best of our knowledge, this study is one of the few to recruit a large population presenting with varied lesions.

Keywords:- Potential malignant disorders, Malignant lesions, Head and neck cancer.

Corresponding Author:

Dr. Fakir Mohan Debta

Associate Professor, Department of Oral Medicine and Radiology, S.C.B. Dental College & Hospital, Cuttack, India. Email- fm_debta@rediffmail.com

INTRODUCTION

Potentially malignant disorders (PMDs) of the oral mucosa, with the risk of conversion to oral squamous cell carcinoma (OSCC), are described in the literature

as ‘pre-cancer’¹⁻³, ‘precursor lesions’⁴, ‘pre-malignant’, ‘intraepithelial neoplasia’⁵, and ‘potentially malignant’⁶. The clinical concept of malignant transformation in oral mucosa has been proposed for more than 100 years. Sir James Paget first described malignant transformation of an oral lesion into tongue carcinoma in 1870⁷. Schwimmer also reported the same finding in 1877⁸. Several years later, the term “potentially malignant disorders”⁶ was defined by World Health Organization (WHO) as the risk of malignancy being present in a lesion or condition either during the time of initial diagnosis or at a future date. WHO earlier has also classified PMDs into two subgroups⁹ as follows: a) precancerous lesion, a benign lesion with morphologically altered tissue, which has a greater than normal risk of transforming into malignancy; b) precancerous condition, a disease or patients’ habit that does not necessarily alter the clinical appearance of local tissues but is associated with a greater than normal risk of precancerous lesion or cancer development in that tissue.

Despite the ability to identify PMD, clinicians have been unable to predict the behaviour of lesions or quantify the risk of malignant transformation. Overall estimates of outcome are mostly anecdotal and retrospective. Moreover the natural history of PMDs is unfortunately, not only inconsistent but also unpredictable.

This study aims to address the above shortcoming qualitatively and quantitatively over a five year period using clinical spectrum of presentation and frequency distribution, prevalence, malignant transformation rates respectively, following a longitudinal prospective study design.

MATERIAL AND METHOD

The present longitudinal study was conducted in the Department of Oral Medicine, Oral Diagnosis and Radiology, at S.C.B. Dental College and Hospital, Cuttack. The period of study was 5 years, from January

2013 to December 2017. This study aims:

- To observe the clinical spectrum of presentation of OPMD’s
- To document the 5year frequency distribution of various OPMD’s and malignant lesions of head and neck region
- To estimate the prevalence of these lesions in the presenting population
- To observe the gender predilections of the above OPMD’s and malignant lesions
- To estimate the malignant transformation rates of various OPMD’s into OSCC
- To put forth a comparative evaluation of malignant transformation rates amongst the studied OPMD’s
- To calculate the net 5 year cancer burden

Patients presenting with any OPMD as per the new classification proposed by Sarode et.al¹⁰ were included in the study. Also included were patients who presented with malignant pathologies of head and neck region. The present follow up study was based on clinical, cytological, histopathological, radiographic, hematological or other needful investigations, all part of the routine treatment and follow up protocol. The follow-up time for this study is defined as the duration between the initial diagnosis and the occurrence of confirmed oral cancer. A schematic representation of the diagnostic approach is shown in Fig-1. Institutional Review board was of the opinion that an ethical approval was not deemed necessary as protocols adopted were part of routine patient care and follow up. The patients were treated under the domain of implied consent. However, due information was provided to each patient about the nature of the disease, treatment protocols and it effects.

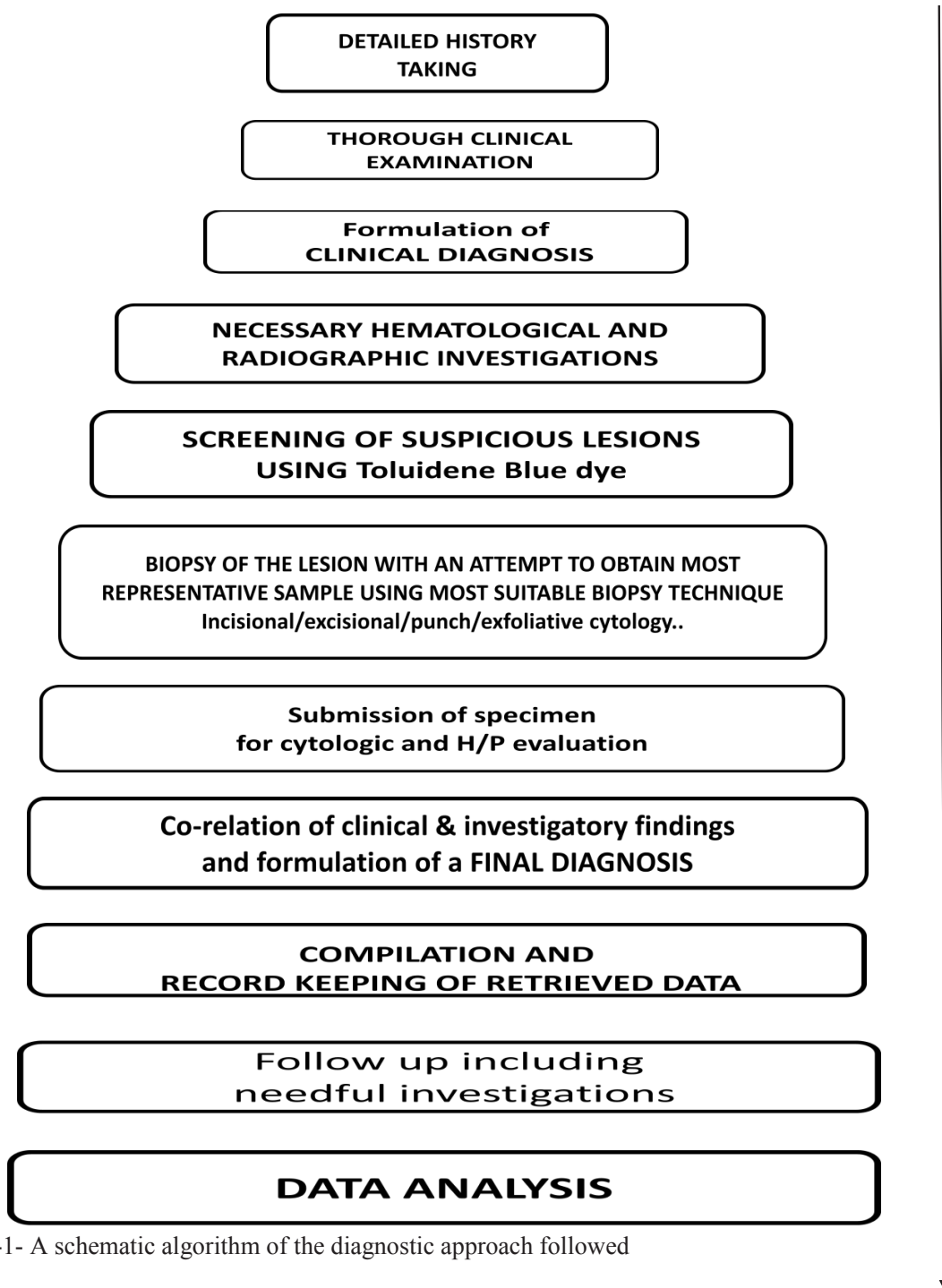


Fig-1- A schematic algorithm of the diagnostic approach followed



Fig- 2a

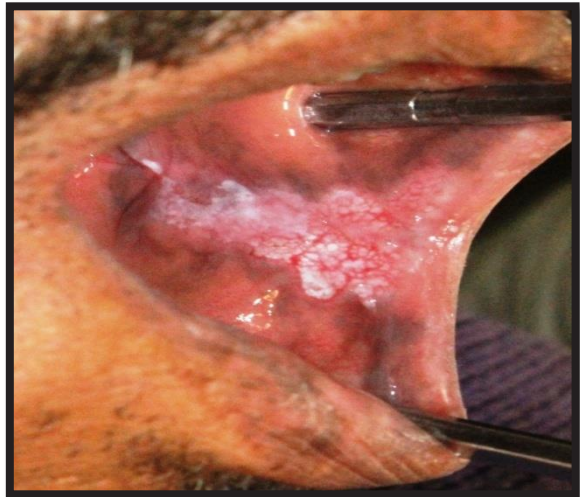


Fig- 2b



Fig-2c

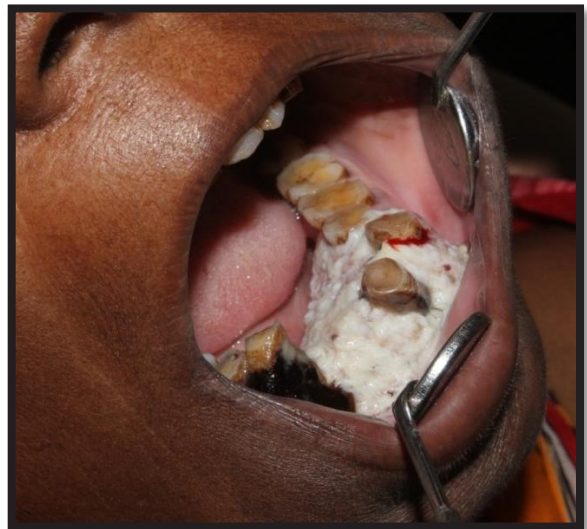


Fig-2d



Fig-2e

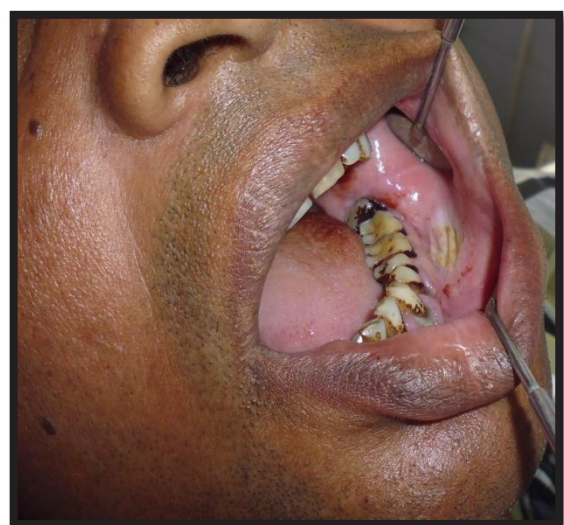


Fig-2f



Fig-2g



Fig-2h

Fig-2: Spectrum of clinical presentation of various OPMD's; Fig-2a-Homogenous Leukoplakia, Fig-2b-Nonhomogenous nodulo-speckled Leukoplakia, Fig-2c-Verrucous Leukoplakia, Fig-2d-Proliferative Verrucous Leukoplakia, Fig-2e-Oral Submucous Fibrosis, Fig-2f-Tobacco pouch keratosis, Fig-2g-Erosive Oral Lichen Planus, Fig-2h-Actinic Chelitis



Fig-3 a,b

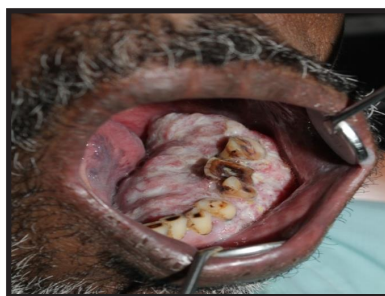


Fig-3 c,d



Fig-3 e,f,g



Fig-3 h

Fig-3: varied clinical presentations of oral squamous cell carcinoma; 3 a,b- OSCC tongue, 3 c,d- OSCC mandibular gingivobuccal complex, 3 e,f,g- OSCC palate, 3 h- OSCC left buccal mucosa perforating left cheek.

Fig-2: Spectrum of clinical presentation of various OPMD's; Fig-2a-Homogenous Leukoplakia, Fig-2b-Nonhomogenous nodulo-speckled Leukoplakia, Fig-2c-Verrucous Leukoplakia, Fig-2d-Proliferative Verrucous Leukoplakia, Fig-2e-Oral Submucous Fibrosis, Fig-2f-Tobacco pouch keratosis, Fig-2g-Erosive Oral Lichen Planus, Fig-2h-Actinic Chelitis

RESULTS

The study included all patients who were clinically and/or histopathologically diagnosed as any one of the OPMD's (Fig-2). Patients lost to follow up were excluded from the study. The net patient inflow over 5

years (January 2013 to December 2017) was 2,51,702 . The frequency distribution has been depicted in table-1. The frequency of patients with OPMD's was 55% with 17.06 % females and 36.88 % males. The lesions with a male predominance included Leukoplakia (74.24%), Oral Submucous Fibrosis (83.55%), Pouch keratosis (71.26%) and Actinic chelitis (82.75%) while Oral lichen planus (77.63%) had a female preponderance (fig-4). Cases of Discoid Lupus Erythematosus occurred exclusively in females. In our study, patients with Epidermolysis Bullosa were equitably distributed amongst males and females.

Table-1: Annual and 5-year frequency distribution with 5 year prevalence.

Year	Leukoplakia	Oral submucous fibrosis	Pouch keratosis	Oral lichen planus	Actinic chelitis	Smokers palate	Discoid Lupus Erythematosus	Epidermolysis Bullosa
2013	5307	5565	7400	4866	4	1098	0	1
2014	6060	5937	9533	5171	5	2380	0	0
2015	6342	4139	8578	5241	6	2036	2	0
2016	6450	5964	8633	5370	6	2206	1	1
2017	7253	6168	8731	5392	8	2617	0	2
5 YR BURDEN	31412	27763	42875	26040	29	10337	3	4
5 YR PREVALENCE	12.47%	11.03%	17.03%	10.34%	0.011%	4.10%	0.001%	0.002%

The most and least frequently encountered OPMD included Pouch keratosis (30.96% of OPMD's) and Discoid Lupus Erythematosus (0.002% of OPMD's) respectively while Oral Submucous Fibrosis (20.05% of OPMD's) and Oral Lichen Planus (18.80% of OPMD's) presented nearly equally in patients reporting at our tertiary care centre. The male:female ratio of various OPMDs reported were 2.88 for Leukoplakia, 5.08 for Oral Submucous Fibrosis, 3.16 for Pouch keratosis, 0.28 for Oral Lichen Planus, 4.8 for Actinic chelitis, 23.96 for Smokers Palate, and 1 for Epidermolysis Bullosa. The mean age of presentation of OPMDs was 33.6 years. Amongst males, the mean age was 29.6 years while for females it was 37.5 years. The age group most commonly affected by any of the OPMD's was 20-40 years. Patients with lichen planus presented early (mean age 28 years) while cases with leukoplakia presented

late (mean age 36 years). Smokers palate was more of an incidental finding (79%) than a primary presentation (21%).

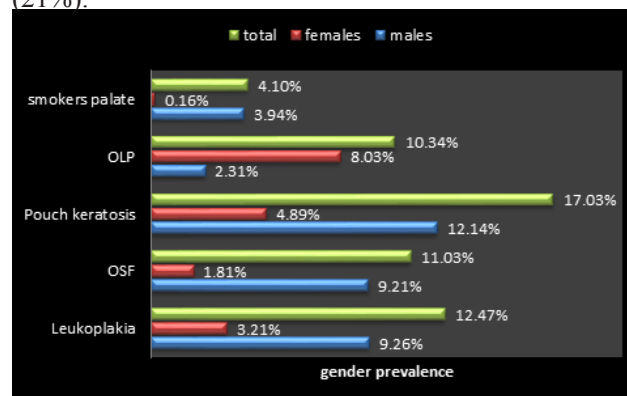


Fig-4: Gender distribution of various OPMD's.

With respect to site predilection, lower left buccal vestibule (53%) and left buccal mucosa(28%) were the chief sites for Leukoplakia, lower left buccal vestibule

was the primary site for Pouch keratosis (77%), bilateral buccal mucosa (42%) and gingivae (32%) for Lichen planus and lower lip for Actinic cheilitis (100%). Remaining patients had involvement of multiple intraoral sites. Oral submucous fibrosis had more of a panoral involvement. About 47% of the OPMDs showed candidal colonization.

The various predictors for malignant transformation in our study included age, gender, site, appearance and presence of deleterious habits. The net 5 year malignant transformation rates of various OPMDs to oral squamous cell carcinoma have been depicted in fig-5.

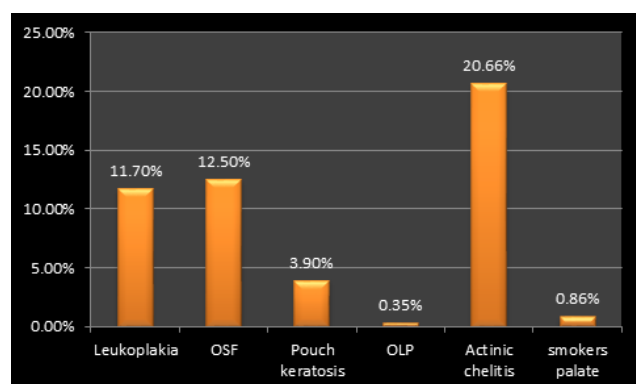


Fig-5: 5 year malignant transformation rates of various OPMDs.

The lesion with highest rate of malignant transformation was Actinic cheilitis (20.66%) while Oral lichen planus (0.35%) had least conversion in our population. 2 cases of idiopathic OSMF and 3 cases of cryptogenic leukoplakia were encountered over the period of study. The mean age of malignant transformation was 41 years with a male predilection (68 %) and was largely habit associated (72%). The type of tobacco consumed and other relevant attributes have been summarized in table-2. Smokeless tobacco forms were consumed by 66.25% while smoking by 35.08%. Overall, 22.99 % were addicted to both. Cessation of tobacco habits were reported in 8.24%. Lesions presenting with erosions, ulcerations, surface elevations, nodularity or other features contributing to clinical non homogeneity in appearance of the lesions were more susceptible to malignant transformation (66%).

Cases presenting primarily as malignancy were 6.34 %. Out of these, 8(0.05%) were of salivary origin, 2(0.012%) melanoma, 1(0.006%) metastatic carcinoma, 2(0.012%) lymphoma, 3(0.018 %) malignant ameloblastoma. The remaining cases 15949 (99.9%) presented as a primary intraoral malignancy (fig-3).

Table-2:

SMOKING FORMS OF TOBACCO	Age of initiation		Duration since		Average number/day		Predominant type of smoking		
	USERS	<20Y	18062	1-3Y	9312	1-5	18992	Crude	36520
	20-30Y	20173	3-5Y	10462	5-10	17609	Filtered	12056	
	>30Y	10341	5-10Y	11340	>=1 pack	11975			
			10-20Y	12622					
			>=20Y	4840					
EX-USERS	Age of initiation		Duration since		Average number/day		Type of smoking		
Cessation since									
Few days	674	<20Y	1588	1-3Y	597	1-5	3688	Crude	2647
Few wks	908	20-30Y	3609	3-5Y	3422	5-10	1533	Filtered	3066
Few mon	2991	>30Y	516	5-10Y	972	>=1 pack	492		
Few yrs	1140			10-20Y	593				
				>=20Y	129				
SMOKELESS FORMS OF TOBACCO	Age of initiation		Duration since		Average frequency/day		Mode of use of smokeless tobacco		
USERS	<20Y	36106	1-3Y	11059	1-5	24375	Sw	14934	
	20-30Y	41530	3-5Y	18153	5-10	37305	Po	21215	
	>30Y	14107	5-10Y	24618	>10	30063	Sp	12876	

Cont... Table-2:

		10-20Y	27112			All	42718
		>=20Y	10801				
EX-USERS	Age of initiation	Duration since		Average frequency/day		Mode of use of smokeless tobacco	
Cessation since							
Few days	233	<20Y	671	1-3Y	1740	1-5	1204
Few wks	562	20-30Y	3802	3-5Y	506	5-10	3008
Few mon	2650	>30Y	1228	5-10Y	2628	>10	1489
Few yrs	2256			10-20Y	455		
				>=20Y	372		

sw-swallow, po-pouch, sp-spit

DISCUSSION

During the 5 year study period (January 2013 to December 2017), 55.01% were OPMD's and 6.34% were head and neck cancers (HNCA). According to various studies, the estimated prevalence HNCA with respect to total body malignancies varies from 9.8% to 42.7%.¹¹⁻¹³

The diverse spectrum of clinical presentations of various oral potentially malignant disorders were encountered. The overall prevalence over 5 years was 55% with a mean yearly prevalence of 11%. This was higher than the rates observed in other studies.¹⁴⁻¹⁶

The most frequently encountered OPMD was leukoplakia (12.47%). Majority cases of the cases were habit associated with only 3 being idiopathic. The 5 year malignant transformation rate was 11.70%. Transformation occurred in the habit associated group and in 1 case in the cryptogenic group. The noted malignant transformation rate (5.374%) was higher compared to study by Tung-Yuan Wang et al.¹⁷ According to study by Gupta PC et al, the overall malignant transformation rates were very low (0.3%–2.19%)¹⁸. Warnakulasuriya and Ariyawardana¹⁹ carried out a systematic review of 24 studies and found an overall malignant transformation rate of 0.13% to 34% making our observation conformant to this range.

The next most common disorder encountered was oral sub mucous fibrosis (11.03%). All but 2 cases were habit associated. The 2 idiopathic cases gave no history of tobacco habits, both presented in females in late second decade, with 1 giving a similar familial history. None of the idiopathic cases showed malignant transformation. The five year transformation rate was documented as 12.50%, in agreement with the often cited metric of a

7-13% malignant transformation rate of OSF stems from a Taiwanese study.²⁰ As demonstrated in a long-term follow-up study in India, scrutinizing 99 patients with OSF for 17 years, a malignant transformation rate of 7.6% was documented.²¹ In contradistinction, more recent, larger studies have suggested a lower rate; in a recent review by Ray et al the transformation rate varied from 1.9% to 7.6%.²²

The significantly higher rate of transformation noted in our population can be attributed to late presentation for treatment, rampant production and continued use of smokeless forms of tobacco, ease of availability at cheaper costs and lower tax rates and ill belief that smokeless tobacco is good for health increasing appetite and vigor.

Oral lichen planus, presented in our population with a prevalence rate of 10.34%, chiefly manifesting amongst women (77.63%). The overall 5 year malignant transformation rate documented was only 0.35% entirely sparing the reticular variant. As reported by Sana Maher Hasan Aghbari et al²³, 1.1% of OLP patients developed OSCC, while the rate of malignant transformation among OLL cases was 2.5%. Studies by Ingafou M et al²⁴, Carbone M et al²⁵, Pakfetrat Abbas et al²⁶, Kaplan Ilana et al²⁷, Bermejo-Fenoll A et al²⁸, Torrente-Castells Eulàlia et al²⁹ and Shen Zheng Yu et al³⁰ have reported malignant transformation rates for OLP that ranged between 0.07% and 5.8%. Studies by Alves Mônica Ghislaine Oliveira et al³¹ and Rode Matjaz et al³² showed no malignant transformation.

Other less frequently encountered lesions were actinic cheilitis (0.011%) and smokers palate (4.10%). The malignant transformation rate of actinic cheilitis and smokers palate were respectively 20.66% and 0.86%, over the 5 year study period. Actinic cheilitis can progress

to OSCC in approximately 15% of cases as documented by Main JH et al³³, Robinson JK³⁴, Kaugars GE et al³⁵ and Markoupoulos A et al.³⁶ In our study, malignant transformation is higher. This can be attributed to occupational exposures and also to application of unauthenticated products over the lesion. Although most of the studies in literature elaborates on reverse smoking being causative to oral cancer development and an OPMD, our study did find cases of heavy smokers in whom dysplastic changes occurred (0.86%). This serves to elucidate the fact that any surface and/or symptomatic finding in the palate of a chronic smoker should be evaluated with caution. During the course of this study, dysplastic changes were also documented in lesions originally diagnosed as tobacco pouch keratosis (3.90%).

CONCLUSION:

To the best of our knowledge, this study is one of the few to recruit a large population presenting with varied lesions. It serves to present an overview of few epidemiologic associations between disease, gender, site, age and deleterious habits. However, owing to a large sample recruitment, various parameters still remain unaddressed which can be a potential ground for future research. Association between the diseases studied and various systemic co-morbidities can be introspected. Chances of underestimation of transformation rates does exist which can be ruled out with a longer follow up period. Also integration of chairside screening and histologic prognostic factors into routine diagnostic and treatment procedures might serve to change the natural course of the disease.

Conflict of Interest: There is no conflict of interest

Source of funding: Nil

Ethical clearance: Approved from Institutional Ethics Committee

REFERENCES

- Baillie, Simms, et al. Queries and responses from the Medical Committee of the Society for Investigating the Nature and Cure of Cancer. *Edinburgh Med Surg J* 1806;2:382-9.
- Prabhu RS, Wilson DF, Daftari DK, Johnson NW. *Oral diseases in tropics*. Oxford: Oxford Medical; 1992. p. 402.
- Paget J. Cancer following ichthyosis of the tongue. *Trans Clin Soc Lond* 1870;3:88-90.
- Goodson ML, Sloan P, Robinson CM, Cocks K, Thomson PJ. Oral precursor lesions and malignant transformation--who, where, what, and when? *Br J Oral Maxillofac Surg*. 2015 ;53(9):831-5.
- Saman Warnakulasuriya. Clinical features and presentation of oral potentially malignant disorders. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2018;125:582–590.
- Van der Waal I. Potentially malignant disorders of the oral and oropharyngeal mucosa; terminology, classification and present concepts of management. *Oral Oncol*. 2009;45:317–323.
- N. K. Priya , R. Shruthy , Ashwini Ramakrishna , N. K. Sowmya , G. S. Madhushankari. Enigma of oral potentially malignant disorders - A brief overview. *Journal of Advanced Clinical & Research Insights* (2016), 3, 156–159.
- Schwimmer E. Die idiopathischen Schleimhaut plaques der Mundhöhle (Leukoplakia buccalis). *Arch DermatSyph*.1877; 9:570-611.
- World Health Organization. Report of a meeting of investigators on the histological definition of precancerous lesions. Geneva: World Health Organization; 1973.
- Sachin C Sarode, Gargi S Sarode, and Jagdish V Tupkari. Oral potentially malignant disorders: A proposal for terminology and definition with review of literature. *J Oral Maxillofac Pathol*. 2014 Sep; 18(Suppl 1): S77–S80.
- Bhatia PL, Jha BK. Pattern of head and neck cancers in Manipur. *Indian J Cancer* 1982;19:241–8.
- Padmanabhan TK, Vasudevan DM. A statistical analysis of cancer registered at the Regional Cancer Centre, Trivandrum. *Indian Journal of Cancer* 1982;19:189–96.
- Thakur S, Chaturvedi V, Singh AK, Puttewar MP, Raizada RM. Pattern of ear, Nose, pharynx, larynx and esophagus (ENPLO) cancers in rural based hospital. *Indian J Otolaryngol Head Neck Surg* 2001;53:93–9.
- Bouquot JE. Oral leukoplakia and erythroplakia: a review and update. *Pract Periodontics Aesthet Dent* 1994;6(6):9–17.
- Smith LW, Bhargava K, Mani NJ, et al. Oral

- cancer and precancerous lesions in 57,518 industrial workers of gujarat, India. *Indian J Cancer* 1975;12(2):118–23.
16. Petti S. Pooled estimate of world leukoplakia prevalence: a systematic review. *Oral Oncol* 2003;39(8):770–80.
 17. Tung-Yuan Wang, Yu-WeiChiu, Yi-TzuChen, Yu-HsunWang, Hui-ChiehYu, Chuan HangYu, Yu-Chao Chang. Malignant transformation of Taiwanese patients with oral leukoplakia: A nationwide population-based retrospective cohort study. *Journal of the Formosan Medical Association*.2018;1179(5): 374-380.
 18. Gupta PC, Mehta FS, Daftary DK, et al. Incidence rates of oral cancer and natural history of oral precancerous lesions in a 10-year follow-up study of Indian villagers. *Community Dent Oral Epidemiol* 1980; 8: 287–333.
 19. Warnakulasuriya S , Ariyawardana A. Malignant transformation of oral leukoplakia: a systematic review of observational studies. *J Oral Pathol Med*. 2016;45(3):155-66.
 20. Yang PY, Chen YT, Wang YH, Su NY, Yu HC, Chang YC. Malignant transformation of oral submucous fibrosis in Taiwan: A nationwide population-based retrospective cohort study. *J Oral Pathol Med*. 2017;46(10):1040-1045.
 21. Murti PR, Bhonsle RB, Pindborg JJ, Daftary DK, Gupta PC, Mehta FS. Malignant transformation rate in oral submucous fibrosis over a17-yr period. *Community Dent Oral Epidemiol*. 1958;13:340-341.
 22. Ray JG, Ranganathan K, Chattopadhyay A. Malignant transformation of oral submucous fibrosis: overview of histopathological aspects. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2016; 122:200-209.
 23. Sana Maher Hasan Aghbari, Abdelrahman Ibrahim Abushouk MBBS, Attia Attia, Ahmed Elmaraezy, Amr Menshawy, Mohamed Shehata Ahmed, Basma Abdelaleem Elsaadany, Eman Magdy Ahmed. Malignant transformation of oral lichen planus and oral lichenoid lesions: A meta-analysis of 20095 patient data. *Oral oncology* 68 (2017); 92-102.
 24. Ingafou M, Leao JC, Porter SR, Scully C. Oral lichen planus: a retrospective study of 690 British patients. *Oral Dis*. 2006;12:463–8.
 25. Carbone M¹, Arduino PG, Carrozzo M, Gandolfo S, Argiolas MR, Bertolusso G, Conrotto D, Pentenero M, Broccoletti R. Course of oral lichen planus: a retrospective study of 808 northern Italian patients. *Oral Dis*. 2009;15(3):235-43.
 26. Atessa Pakfetrat , Abbas Javadzadeh-Bolouri , Samira Basir-Shabestari, Farnaz Falaki. Oral lichen planus: A retrospective study of 420 Iranian patients. *Med Oral Patol Oral Cir Bucal*. 2009;14 (7):E315-8.
 27. Ilana Kaplan, Yael Ventura-Sharabi, Gavriel Gal, Shlomo Calderon, and Yakir Anavi .The Dynamics of Oral Lichen Planus: A Retrospective Clinicopathological Study. *Head Neck Pathol*. 2012; 6(2): 178–183.
 28. Bermejo-Fenoll A, Sánchez-Siles M, López-Jornet P, Camacho-Alonso F, Salazar-Sánchez N. A retrospective clinicopathological study of 550 patients with oral lichen planus in south-eastern Spain. *J Oral Pathol Med*. 2010;39(6):491-6.
 29. Eulàlia Torrente-Castells, Rui Figueiredo, Leonardo Berini-Aytés , Cosme Gay-Escoda. Clinical features of oral lichen planus. A retrospective study of 65 cases. *Med Oral Patol Oral Cir Bucal*. 2010;15 (5):e685-90.
 30. Zheng-Yu Shen, Wei Liu, Jin-Qiu Feng, Hai-Wen Zhou, Zeng-Tong Zhou. Squamous cell carcinoma development in previously diagnosed oral lichen planus: de novo or transformation? *OOO*; 2011;112(5):592-596.
 31. Mônica Ghislaine Oliveira Alves, Janete Dias Almeida, Ivan Balducci and Luiz Antonio Guimarães Cabral. Short Report Oral lichen planus: A retrospective study of 110 Brazilian patients. Oliveira Alves et al. *BMC Research Notes* 2010, 3:157.
 32. Matjaž Rode, Margareta Strojjan-Fležar, Mirela Kogoj-Rode, Marija Us-Krašovec. DNA ploidy and nuclear texture features of the reticular form of oral lichen planus. *Zdrav Vestn* 2008; 77: 13–7.
 33. Main JH, Pavone M. Actinic cheilitis and carcinoma of the lip. *J Can Dent Assoc*. 1994 Feb;60(2):113-6.
 34. June K. Robinson. A Prospective Study Comparing Four Treatment Methods. *Arch Otolaryngol Head Neck Surg*. 1989;115(7):848-852.
 35. Kaugars GE, Pillion T, Svirsky JA, Page DG, Burns

- JC, Abbey LM.. Actinic cheilitis: a review of 152 cases. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1999 ;88(2):181-6.
36. A Markopoulos, E Albanidou-Farmaki, I Kayavis. Actiniccheilitis:clinicalandpathologiccharacteristics in 65 cases. *Oral Diseases.* 2004;10(4): 212-216.

Efficacy of Photodynamic Therapy in the Treatment of Oral Lichen Planus by use of Amino Levulinic Acid

Fakir Mohan Debta¹, Jayanta Kumar Das², Prashant Kumar Goyal³, Priyanka Debta⁴, Ekagrata Mishra⁵, Santosh Kumar Swain⁶, Mahesh Chandra Sahu⁷

¹Associate Professor, Department of Oral Medicine and Radiology, ²Principal, S.C.B. Dental College & Hospital, Cuttack, India, ³Assistant Surgeon, C.H.C., Sarkipalie Bargarh, Odisha, India, ⁴Associate Professor, Department of Oral Pathology & Microbiology, I.D.S., Siksha "O" Anusandhan, Deemed to be University, BBSR, Odisha, India, ⁵Post graduate Student, Department of Oral Medicine and Radiology, S.C.B. Dental College and Hospital, Cuttack, Odisha, India, ⁶Professor, Department of Otorhinolaryngology, ⁷Assistant Professor, Department of Medical Research Laboratory, IMS and SUM Hospital, Siksha "O" Anusandhan, Deemed to be University, Kalinganagar, Bhubaneswar, Odisha, India

ABSTRACT

Objective: Photodynamic therapy (PDT) is a contemporary and non-invasive therapeutic approach, used in the treatment of non-oncological diseases as well as cancers. The present study was conducted to evaluate the efficacy of 5-aminolevulinic acid-mediated PDT (5-ALA-PDT) as an alternative therapeutic modality for oral lichen planus (OLP) as well as its role in OLP calcitrant to conventional pharmacologic treatments.

Methods: This study was based on the premise of non-randomized, non-comparative prospective split mouth design. The study sample of 36 patients was selected from the patients attending the Outpatient Department of Oral Medicine and Radiology, SCBDCH based on predefined inclusion and exclusion determinants. Objective (REU score) and subjective symptom assessment (VAS score) was done at baseline and at 2 weeks, 4 weeks and 3 months follow up post 5-ALA mediated PDT.

Results: Statistically significant intra group difference was observed in REU and VAS score ($p=0.000$) was observed. Statistically significant results were obtained for VAS at 4 weeks ($p=0.000$) and 3 months ($p=0.000$) and at 3 months ($p=0.008$) for REU.

Conclusion: This study shows promising results favoring the use of PDT for oral lichen planus, both as a curative and palliative measure. Effectiveness of multimodal approach combining PDT with conventional treatment is a potential ground for future research.

Keywords: Photodynamic Therapy, Lichen Planus, Amino Levulinic Acid

INTRODUCTION

Photodynamic therapy (PDT) is a contemporary and non-invasive therapeutic approach, used in the treatment of non-oncological diseases as well as cancers of various types and locations. Photodynamic therapy (PDT), also known as photoradiation therapy, phototherapy, or photochemotherapy, involves the use of a photoactive dye (photosensitizer) that is activated by exposure to light of a specific wavelength in the presence of oxygen.¹ This causes "direct" reactive oxygen species-induced cytotoxic effects, major changes by disrupting

blood and lymphatic vessels, upregulation of heat shock proteins and a myriad of other effects.² Photodynamic therapy (PDT) has received increased attention since the regulatory approvals have been granted to several photosensitizing drugs and light applicators worldwide.³ A photosensitive agent or photosensitizer can be classified by their chemical structures and origins into three broad families: porphyrin-based (e.g. photofrin, 5-aminolevulinic acid (ALA, BPD-MA), chlorophyll based (chlorins, purpurins, bacteriochlorins) and dye (phtalocyanine, naphthalocyanine).⁴ One of the commonly used photosensitisers, Aminolevulinic acid

(ALA) is a prodrug that is metabolized intracellularly to form the photosensitizing molecule protoporphyrin IX (PpIX) which when activated by light produces cytotoxic reactive oxygen species and free radicals which are phototoxic.⁵ One of the remarkable outcomes seen with long drug incubation period photosensitizers, is an associated downtime as a result of erythema, edema, crusting, healing, and pigmentary changes, which can take up to a week or more to resolve in many individuals. Pain associated with ALA-PDT has also been documented and reported in the literature as the “PDT effect”.⁶

The present study was conducted to evaluate the efficacy of 5-aminolevulinic acid-mediated PDT (5-ALA-PDT) as an alternative therapeutic modality for oral lichen planus as well as its role in OLP calcitrant to conventional pharmacologic treatments.

MATERIAL AND METHOD

The following study protocol encompassed a non-randomized, non-comparative prospective split mouth study design. Ethical approval was deemed a priority and duly obtained prior to the commencement of the study from the Institutional Ethics Committee, S.C.B Medical College, Cuttack [Regd. No. ECR/B4/Inst/OR/2013, Issued under rule 122DD of Drugs and Cosmetics Rules 1945, status assigned- recommended]. The study sample was selected from amongst the patients attending the

Outpatient Department of Oral Medicine and Radiology, SCBDCH. Sample selection was done based upon a pre defined set of inclusion and exclusion criteria. Inclusion determinants included a clinical diagnosis of any one of the typical variants of oral lichen planus (OLP) of buccal mucosa present bilaterally, which was histopathologically confirmed; also patients previously diagnosed and under conventional treatment for oral lichen planus who were nonresponsive or calcitrant and/or dissatisfied or reluctant to continue the conventional treatments were included. However, prior to their inclusion they were clinically and histopathologically reassessed. Participants were 20 to 70 years of age. Patients were weighed out against the following exclusion determinants: histopathologic non-confirmation or signs of dysplasia, lichenoid reactions with clinical improvement after removal of suspected etiology, any past or current systemic compromise or debility and pharmacologic treatments that could predispose to and/or alter the course of OLP and treatments instituted in the study hence, OLP with dermatologic manifestations, allergy to phototherapy and photosensitizers, pregnancy, lactation, patients with deleterious oral habits (smoking and smokeless tobacco, alcohol) and parafunction. An informed consent was obtained from all subjects after detailed explanation of study protocol, advantages and disadvantages with a clause allowing voluntary discontinuation of participation on behalf of the subject at any point during the study.



Fig- 1 Transparent flexible grid with smallest square measuring 1 mm².



Fig- 2 Measurement of R and E component of REU score with the grid.

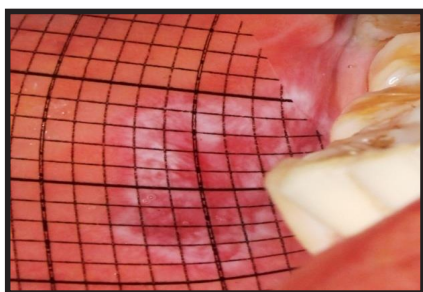




Fig- 4 Punch biopsy kit



Fig- 5 Selection of most representative site for biopsy.



Fig- 6 Punch biopsy performed



Fig 7 Sutures placed at site of biopsy.

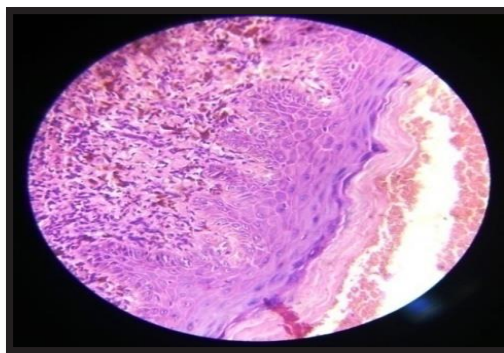


Fig- 8 Histopathology confirming OLP

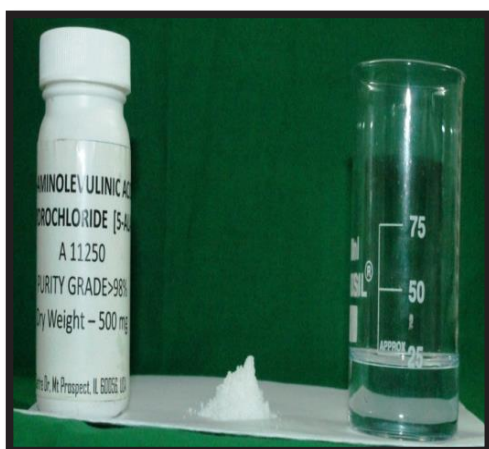


Fig- 9 Dispensing of 5-ALA powder and distilled water to prepare 10% solution.



Fig- 10 Application of 10% solution of 5ALA to the test site.

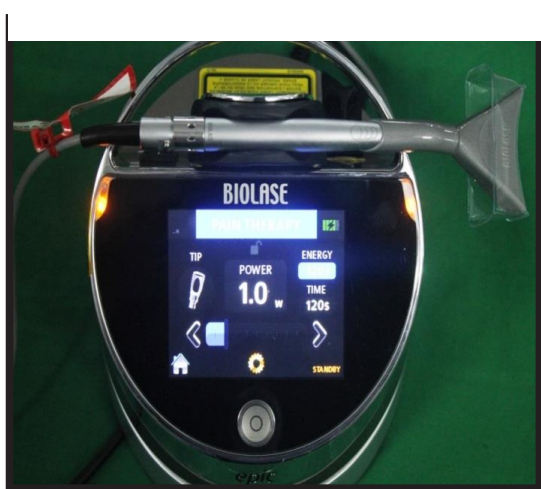


Fig- 11 Epic10 Biolase, operating voltage-100 V to 240 V, wavelength-940+/-10nm, maximum power output-10W.

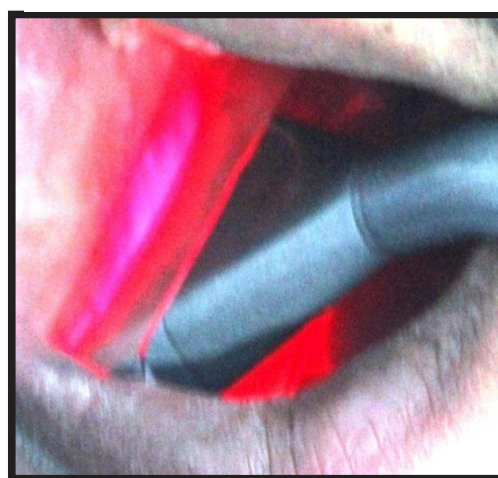


Fig- 12 Irradiation at 120 J/cm² with a wavelength range of 625-675nm of red light.

A sample of 36 patients was recruited into this study based upon the outlined inclusion and exclusion criteria and an in depth appraisal of history. Pre treatment assessment was done for clinical characteristics of the lesions, symptom evaluation, and histopathological confirmation. Care was taken during enrollment of patients that lesions were present on bilateral buccal mucosa with similar clinical manifestations. Pre treatment assessment of the intraoral lesions on buccal mucosa was done in accord with the REU scale.⁷ The severity of the lesion in each site was scored according to the following: presence of reticular/hyperkeratotic/white papular (R) lesions (0-none, 1-presence), presence of erosive/erythematous (E) lesions and/or ulcerative

(U) lesions (0-none, 1-lesions smaller than 1 cm², lesions from 1 to 3 cm², 3-lesions larger than 3 cm²). The total weighted score was a summation of reticulation score, erythematous score (weighted 1.5), and ulcerative score (weighted 2.0). To measure dimensions using REU scale, transparent flexible grid with marking squares of 1x1 mm² of minimum dimension was used (fig-1.1, 1.2, 1.3). The clinical examination was performed by two examiners (Oral Medicine specialist and Oral Pathologist) separately to rule out any bias concerning the scoring. Also a recording of symptom (burning and pain) was done using VAS score. These values were treated as baseline. Following this, a punch biopsy was taken from the most representative site of buccal mucosa. Only

unilateral biopsy was done with the side of biopsy being treated as control and the contralateral lesional buccal mucosa was treated as test site (PDT intervention), to avoid any untoward effects of wound healing on appearance hence subsequent scoring of lesions. The biopsy specimen was harvested as aseptically as possible under local anesthesia (2% lignocaine with 1:200000 adrenalin) using a 4mm diameter and depth disposable punch instrument (fig-2.1, 2.2, 2.3). The specimen was transported in screw capped vials with 10% buffered formalin and sent for histopathological confirmation (fig-2.4). A period of 2 to 4 weeks was allowed to lapse with supervision for adequate healing of biopsy site.

Before application of the photosensitizer, an atopic patch testing was done. None of the subjects tested positive. The lesions on test and control site were cleaned with cotton wool soaked in a soap free cleansing lotion. 5-ALA 10% (Research Product International, purity grade $\geq 98\%$, molecular weight-167.6; fig-3.1) was applied to the test site and distilled water to control site using a cotton swab (fig-3.2). The patient was instructed to refrain from consumption of food and water during the test period. After an incubation period of 2 hours, the test site was given a radiant exposure of 120 J/cm² with a wavelength range of 625-675nm of red light, at irradiances of 100-130 mW/cm² using a light emitting diode source (Epic10 Biolase, operating voltage-100 V to 240 V, wavelength-940 \pm 10nm, maximum power output-10W, continuous power mode, fig- 4.1, 4.2) for a period of 120 seconds. The control site was spared of

the above procedure. However, the aiming beam of the laser equipment was flashed at control site. The distilled water application with the aiming beam was chosen as placebo to ALA-PDT. The subjects were followed up after 2 weeks, 1 month and 3 months from baseline with post treatment REU and VAS recorded at each visit for the test and control site separately. During the study period, 2 patients were lost to follow up at 2 weeks and 1 patient reported an increase in burning and pain for which conventional treatment regimen was instituted.

OBSERVATIONS AND RESULTS

The study enrolled a final sample of 36 patients. 33 patients completed the study and 2 patients were lost to follow up after the first follow up visit (2 weeks). Hence to test the hypothesis intention to treat analysis was performed by taking Last Observation Carried Forward (LOFT). For all statistical evaluation, the subjects' one side was maintained as a unit of measurement. The compliance of parameters to normal distribution was evaluated using Shapiro-Wilk test. The balancing of groups by age and gender was tested by Mann Whitney U test. Quantitative data were recorded as median value + SD (Standard Deviation) for the investigated parameters. Friedman test was used to compare intra group parameters. The statistical significance was set at $p < 0.05$. The Bon-Ferroni corrected Wilcoxon signed rank test was used to evaluate the intra group comparison. The Bon-Ferroni corrected Mann Whitney U test was used to compare inter group parameters ($p < 0.008$).

Table-1: Intra and inter group comparisons of clinical parameters (mean + SD). Intra group comparison by Friedman test ($p < 0.05$) and inter group multiple comparison by Bonferroni corrected Wilcoxon signed rank test ($p < 0.0008$). Significant values are in bold.

	TEST SITE					CONTROL SITE					
	Baseline (Mean \pm SD)	2 weeks (Mean \pm SD)	4 weeks (Mean \pm SD)	3 month (Mean \pm SD)	<i>p</i>	Baseline (Mean \pm SD)	2 weeks (Mean \pm SD)	4 weeks (Mean \pm SD)	3 month (Mean \pm SD)	<i>p</i>	
Age (years)	39.27 \pm 9.65					-	39.27 \pm 9.65				
Gender (M/F)	13/23					-	13/23				
REU	2.79 \pm 0.60	2.79 \pm 0.60	2.58 \pm 0.61	2.16 \pm 0.81	0.000*	2.54 \pm 0.25	2.54 \pm 0.25	2.54 \pm 0.25	2.54 \pm 0.25	-	
VAS	4.33 \pm 0.86	3.97 \pm 0.73	2.66 \pm 0.92	2.38 \pm 1.10	0.000*	3.91 \pm 0.60	4.08 \pm 0.55	4.30 \pm 0.57	4.61 \pm 0.72	0.000*	

Table-2: Post hoc analysis of REU score among various visits (in weeks and months) in PDT test group

VISIT		MEDIAN	Z	P
BASELINE	2 weeks	2.50	0.00	1.000
	4 weeks	2.50	-2.23	0.020
	3 months	2.50	-3.87	0.000*
2 WEEKS	4 weeks	2.50	-2.23	0.020
	3 months	2.50	-3.87	0.000*
4 WEEKS	3 months	2.50	-3.16	0.002*

Table-3: Post hoc analysis of REU score among various visits (in weeks and months) in PDT test group.

VISIT		Z	P
BASELINE (median=4.00)	2 weeks	-2.96	0.003
	4 weeks	-4.88	0.000
	3 months	-4.65	0.000*
2 WEEKS (median=3.00)	4 weeks	-4.83	0.000
	3 months	-4.64	0.000*
4 WEEKS (median=2.00)	3 months	-1.74	0.081

Table-4: Mann Whitney U test, p<0.05 significant.

Inter group comparison of REU and VAS score at various visits between study groups.

Study interval	Variable	CASE SITE (Median±SD) N=36	CONTROL SITE (Median±SD) N=36	MANN WHITNEY U	P
BASELINE	REU	2.50±0.60	2.50±0.25	540.000	0.025
	VAS	4.00±0.86	4.00±0.60	469.500	0.028
2 ND WEEK	REU	2.50±0.60	2.50±0.25	540.000	0.025
	VAS	4.00±0.73	4.00±0.55	593.000	0.484
4 TH WEEK	REU	2.50±0.61	2.50±0.25	629.000	0.677
	VAS	3.00±0.92	4.00±0.57	84.500	0.000*
3 Months	REU	2.5±0.81	2.5±0.25	491.000	0.008*
	VAS	2.00±1.10	5.00±0.72	73.500	0.000*

In table-1, the intra and inter group comparison of REU and VAS has been depicted by taking mean+SD of baseline visit and follow up visits at 2 weeks, 4 weeks and 3 months. Statistically significant intra group difference was observed in REU and VAS score ($p=0.000$).

In table-2 and table-3, Wilcoxon Signed Rank test was done with post-hoc analysis of REU and VAS score among various visits in test group. Statistically significant result was found between baseline and 3 months for REU and baseline and 4 weeks and 3 months for VAS. Table-4 elaborates inter group comparison of REU and VAS scores at various visits between study groups. Statistically significant results were obtained for VAS at 4 weeks and 3 months and at 3 months for REU.

DISCUSSION

Oral lichen planus (OLP) is one of the most prevalent chronic diseases of the oral cavity and due to the complexity in establishing the etiopathogenesis, therapy chiefly takes on a symptomatic approach. Photodynamic therapy due to its considerable tissue specificity, excellent safety profile, and competence to cover anatomically complex and diverse areas is a potential contender for treatment of oral conditions, allowing to preserve important healthy tissues, rendering both curative and palliative benefits.^{7,8} Oral lichen planus is a therapeutic challenge for complete symptom redressal. Photodynamic therapy (PDT) has been reported as a very potential treatment method as it does not cause scarring because of the eradication of microfoci after PDT, which cannot be seen upon macroscopical examination. This method also decreases the risk of recurrence.⁹

Our study was based on the premise of a split mouth design to objectively (REU) and subjectively (VAS) study the effect of 5% ALA- light emitting diode source PDT on oral lichen planus against distilled water application with the aiming beam as placebo. The study included a sample of 36 patients with 13 (36.11%) males and 23 (63.89%) females, giving a female predilection of 1.76. The mean age of the participants was 39.27 years with 37.15 years as mean age amongst males and 40.47 years amongst females.

Various laser and non laser light sources have been used for PDT. Lasers at 635 nm were used as light source in researches by Kubler et al¹⁰, Fan et al¹¹, Sieron et al¹², Tsai et al¹³ Chen et al¹⁴, and Lin et al¹⁵; 585 nm was used in studies by Franco¹⁶, Shafirstien et al¹⁷. But our study

relied upon LED source at 625-675 nm in corroboration with studies by Mc Gillis and Fein¹⁸, Rivard and Ozog¹⁹, Erickson et al²⁰, and Jerjes et al²¹. Factors like reasonable cost, convenience and safety of use have promoted its use.

In our study, the mean REU score did not change over the first 2 weeks. However, a significant reduction was seen at 4 weeks and 3 months follow up on the test site ($p=0.000^*$). The control site had no fluctuation whatsoever in the REU score. With respect to evaluation of symptoms, subjective VAS score decreased significantly on the test site through 2 weeks, 4 weeks, 3 months follow up from baseline ($p=0.000^*$). The VAS score on the placebo site evidently increased from baseline through the follow up visits as documented in table-1. In a study by Kvaal et al²², clinical behavior and response to topical methyl 5-aminolevulinate (MAL) photodynamic therapy (PDT) of oral lichen planus; as a result of 1 treatment session, there was a significant improvement of oral lichen planus after 6 months ($P = 0.02$). Savarimuthu Wilfred Prassana et al²³, performed PDT on 15 OLP lesions wherein the mean size score showed a reduction of 0.8 ± 0.8 pre and post PDT.

This study included 2 patients who were unresponsive or calcitrant to maximum tolerable doses of topical and systemic steroids used alone and also in combination with adjuvant therapy. However, upon application of 5% ALA-PDT, symptomatic relief was obtained by the patients (baseline VAS was and ; VAS at 3 months was and respectively). This reflected objectively in their REU scores (baseline REU was - and; REU at 3 months was and respectively).

Literature concerning the treatment of oral lichen planus using 5% ALA mediated PDT is scarce. However, a number of reports exist highlighting its potential role in treating dermatologic lichen planus lesions. Kirby et al²⁴ in 1999 reported a case of hypertrophic lichen planus on penis wherein for the first time PDT using 5-ALA was done for 2 weeks. In a study by Kotya Naik et al²⁵, about 66.6% patients responded to PDT as shown by a decrease in mean size score from 2.22 ± 0.79 to 1.41 ± 0.74 after therapy. PDT the most promising therapeutic regimens which can be integrated into mainstream treatment owing to minimal normal tissue toxicity and greatly reduced long-term morbidity.²⁶ According to ZhiXia Fan et al¹¹, complete response rate of 71% was achieved by using 10% ALA cream with 635 nm diode laser at

100J/cm² after 1 to 4 courses of treatment; patients who achieved complete response showed no recurrence.

This study shows promising results favouring the use of PDT for oral lichen planus, both as a curative and palliative measure. This method of non invasive treatment excludes dependence on patient compliance to seek outcome as treatment is instituted by the clinician. Results in favour were also obtained for calcitrant cases stressing on the scope of this therapeutic modality to cure cases unresponsive to routine treatment strategies. However, this study has a few drawbacks like small sample size, short follow up period, exclusion of atypical variants of the disease per se, lack of generalisability of results owing to difference of population parameters and manufacture specifications of dye and light source and lack of suitable blinding which can be a source of potential bias to the study. More clinical studies and verifications with multi centre randomised controlled trials, with larger sample size, and longer follow up periods are required to evaluate the effectiveness of PDT in OLP.

CONCLUSION

This study does have a few drawbacks which need to be addressed in future studies. Various other photosensitisers like methylene blue can also be studied and a comparison with ALA can be established. Also effectiveness of multimodal approach combining PDT with conventional treatment is a potential ground for future research.

Conflict of Interest: There is no conflict of interest

Source of Funding: Nil

Ethical Clearance: Approved from Institutional Ethics Committee

REFERENCES

- Konopka K, Goslinski T. Photodynamic therapy in dentistry. *J Dent Res.* 2007; 86(8):694-707.
- Vieri Grandi, Maurizio Sessa, Luigi Pisano, Riccardo Rossi, Arturo Galvan, Riccardo Gattai, Moira Mori, Luana Tiradritti, Stefano Bacci, Giuliano Zuccati, Pietro Cappugi, Nicola Pimpinelli. Photodynamic therapy with topical photosensitizers in mucosal and semimucosal areas: review from a dermatologic perspective. *Photodiagnosis and Photodynamic Therapy.* <https://doi.org/10.1016/j.pdpdt.2018.04.005>.
- Zheng Huang. A Review of Progress in Clinical Photodynamic Therapy. *Technol Cancer Res Treat.* 2005; 4(3): 283–293.
- Magdalena Sulewska, Ewa Duraj, Stefan Sobaniec, Alfreda Graczyk, Robert Milewski, Marta Wróblewska, Jan Pietruski, Małgorzata Pietruska. A clinical evaluation of the efficacy of photodynamic therapy in the treatment of erosive oral lichen planus: A case series. *Photodiagnosis and Photodynamic Therapy.* <http://dx.doi.org/doi:10.1016/j.pdpdt.2017.01.178>.
- Michael H. Gold. ALA–PDT and MAL–PDT: What Makes Them Different. *J Clin Aesthetic Derm.* 2009;2(2):44–47
- Gupta AK, Ryder JE. Photodynamic therapy and topical aminolevulinic acid: an overview. *Am J Clin Dermatol.* 2003;4(10):699-708.
- Hee-Kyung Park, Shelley Hurwitz, and Sook-Bin Woo. Oral lichen planus: REU scoring system correlates with pain. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology.* 2012;114(1): 75-82.
- Martin LK, Otterson GA, Bekaii-Saab T. Photodynamic therapy (PDT) may provide effective palliation in the treatment of primary tracheal carcinoma: a small case series. *Photomed Laser Surg.* 2012;30(11):668-71.
- Kamil Jurczyszyn, Piotr Ziółkowski, Hanna Gerber, Beata J. o Siecka. Potentiality of Photodynamic Therapy in Dentistry – Literature Review. *Dent. Med. Probl.* 2007, 44, 2, 255–258.
- Kübler AC, Kaus M, Hofele C, Zoller J. Photodynamic therapy of oral leukoplakia by topical application of 5aminolevulinic acid (ALA) (abstract). *J Craniomaxillofac Surg.* 1996;24(1 Suppl):141
- Fan KF, Hopper C, Speight PM, Buonaccorsi G, MacRobert AJ, Bown SG. Photodynamic therapy using 5aminolevulinic acid for premalignant and malignant lesions of the oral cavity. *Cancer.* 1996;78:13741383.
- Sieroń A, Adamek M, Kawczyk Krupka A, Mazur S, Ilewicz L. Photodynamic therapy (PDT) using topically applied 5aminolevulinic acid (ALA) for the treatment of oral Leukoplakia. *J Oral Pathol Med.*

- 2003;32:330336.
13. Tsai JC, Chiang CP, Chen HM, et al. Photodynamic therapy of oral dysplasia with topical 5aminolevulinic acid and light emitting diode array. *Lasers Surg Med* 2004. ;34:1824.
 14. Chen HM, Chen CT, Yang H, et al. Successful treatment of oral verrucous hyperplasia with topical 5aminolevulinic acid mediated photodynamic therapy. *Oral Oncol*.2004;40:630637.
 15. Lin HP, Chen HM, Yu CH, Yang H, Wang YP, Chiang CP. Topical photodynamic therapy is very effective for verrucous hyperplasia and oral erythroleukoplakia. *J Oral Pathol Med*.2010;39:624630.
 16. Franco R Jr . Photodynamic treatment of laryngeal leukoplakia with ALA. *Otolaryngol Head Neck Surg*. 2006;135(2):1978.
 17. Shafirstein G, Bäuml W, Sigel E, Fan CY, Berry K. Utilizing 5aminolevulinic acid and pulsed dye laser for photodynamic therapy of oral leukoplakia–pilot study. *Head Neck Oncol*.2010;2(Suppl 1):O40.
 18. McGillis ST, Fein H. Topical treatment strategies for nonmelanoma skin cancer and precursor lesions. *Semin Cutan Med Surg* 2004 ;23:174183.
 19. Rivard J, Ozog D. Henry ford hospital dermatology experience with levulan kerastick and blue light photodynamic therapy. *J Drugs Dermatol*. 2006;5(6):556561.
 20. Ericson MB, Wennberg AM, Larkö O. Review of photodynamic therapy in actinic keratosis and basal cell carcinoma. *Ther Clin Risk Manag*.2008 ; 4(1):19.28.
 21. Jerjes W, Hamdoon Z, Hopper C. Photodynamic therapy in the management of potentially malignant and malignant oral disorders. *Head Neck Oncol*. 2012.; 4(16):17.
 22. Kvaal SI, Angell Petersen E, Warloe T. Photodynamic treatment of oral lichen planus. *Oral Surg Oral Med Oral Pathol Oral Radiol*.2013 ;115(1):6270.
 23. Savarimuthu Wilfred Prasanna,. Photodynamic therapy of oral leukoplakia and oral lichen planus using methylene blue: A pilot study. *Journal of Innovative Optical Health Sciences*. 2015;8:15400051540016.
 24. Kirby B, Whitehurst C, Moore JV, Yates VM. Treatment of lichen planus of the penis with photodynamic therapy. *Br J Dermatol*.1999;141:765-766.
 25. Kotya Naik Maloth1, Nagalaxmi Velpula. Photodynamic Therapy – A Noninvasive Treatment Modality for Precancerous Lesions. *J Lasers Med Sci*. 2016;7(1):3036.
 26. Patrizia Agostinis, Kristian Berg, Keith A. Cengel, Thomas H. Foster, Albert W. Girotti, Sandra O. Gollnick, Stephen M. Hahn, Michael R. Hamblin, Asta Juzeniene, David Kessel, Mladen Korbelik, Johan Moan, Pawel Mroz, Dominika Nowis, Jacques Piette, Brian C. Wilson, and Jakub Golab. Photodynamic Therapy of cancer: an update. *CA Cancer J Clin*. 2011; 61(4): 250–281.

Efficacy and Outcome of 0.7mg Sustained Release Dexamethasone Implant in a Tertiary Eye Care Hospital Over a Period of One Year – A Retrospective Study

Lolly Pattnaik¹, Santosh Kumar², Anirudha Maiti³

¹Associate Professor, Department of Ophthalmology, IMS and SUM Hospital, Siksha 'O' Anusandhan University, Bhubaneswar, Odisha, India, ²Fellow, Vitreo-Retina Department, ³Fellow, Vitreo-retina Services, Sushrut eye Foundation and Research centre, Kolkata, india

ABSTRACT

The present article retrospectively elaborates the indication and the final visual acuity at 1 year in a cohort of 28 patients administered with 1 or more doses of 0.7 mg intravitrealozurdex over a period of 1 year. Data of 28 eyes of 28 patients was retrieved from the medical record division. Majority of the patients were in the age group of 50 -60 years. The most common indication was vascular occlusion (n=15) followed by post cataract extraction (n=7), diabetic macular edema (n=6). 5 patients had raised IOP one –two months following injection. 19 pts had prior intravitreal anti-VEGF injection. 2 patients repeated ozurdex injection at 6 months. There was a difference of 173 +/-90.5 (p<0.0001) in the 1 year CRT value.

Keywords : Dexamethasone implant; diabetic macular edema; vascular occlusion; central retinal thickness; visual acuity

INTRODUCTION

Anti-VEGF's and triamcinolone acetonide were the mainstay in the treatment of macular edema due to vascular occlusion, non-infectious posterior uveitis and diabetes till the introduction of sustained release steroid implants.¹

This was done primarily to mitigate the risks, complications and frequent dosing of the previous modalities of treatment.² Sustained release flucinolone acetonide and dexamethasone were consequently introduced for use as Retisert, Iluvien and Ozurdex.^{3,4,5,6,7,8}

Ozurdex is an Allergan manufactured and FDA approved biodegradable dexamethasone intravitreal implant marketed in USA and in India. It is available in two strengths, 0.35 mg and 0.7 mg.

Cross study comparison for the various therapeutic options was difficult due to variation in the baseline visual acuity at enrolment, duration of macular edema along with the primary outcome measures.^{1,9,10} Till date there have been no large RCT's comparing all the therapeutic options in the patient with comparable baseline inclusion

criteria's and outcome measures.

The present article retrospectively elaborates the indication and the final visual acuity at 1 year in a cohort of 28 patients administered with 1 or more doses of 0.7 mg intravitrealozurdex over a period of 1 year.

MATERIAL AND METHOD

This was a retrospective study in a tertiary care eye hospital of eastern India. The medical records were searched for all patients who had one or more injection of intravitrealozurdex over a period of 3 years and had a minimum period of follow up of at least one year.

The outcome was assessed in terms of visual acuity, central retinal thickness (CRT), mean foveal thickness (MFT), total macular volume (TMV) and frequency of complications.

SPSS 20 software package were used for evaluating the results.

Procedure

In all cases 0.7 mg ozurdex had been used. All the injections were performed by a single surgeon

under strict asepsis .For every patient topical 0.5% paracaine drop was instilled followed by periocular area cleaning with povidine iodine solution and sterile draping followed by subconjunctival 2% xylocaine injection . A 22 G applicator needle was used for injecting ozurdex as described in the product manual . Indirect ophthalmoscopy was performed after injection to confirm its position in the vitreous cavity.

Findings

Data of the 28 eyes of 28 patients was retrieved from the medical record division. Majority of the patients were in the age group of 50 -60 years . The most common

indication for ozurdex injection was vascular occlusion (n=15) followed by post cataract extraction (n=7), diabetic macular edema (n=6). 13 patients were diabetic and 10 patients were hypertensive .From amongst the 15 vascular occlusion cases who had received ozurdex 5 were only hypertensive. 5 patients had raised IOP one –two months following injection .the raised intraocular pressure ranged between 25 to 30 mm Hg. 19 pts had prior intravitreal anti VEGF injection (accentrix) 2 patients repeat ozurdex injection at 6 months. The preinjection and the post injection values have been depicted in table 1.

TABLE- 1 Baseline characteristics of the study eyes

Mean age of patients	52.46
Systemic disease	diabetes 13 (46.42%), HTN 10 (35.71%)
Pre inj VA	<6/60 -7 (18.42%) ; 6/60-6/18- 15(53.57%) ; >6/18- 2(7.14%)
Indication of ozurdex	Vascular occlusion 15 BRVO 9 (32.14%) CRVO 6 (21.42%) ; DME 6 (21.42%) ; post cat ME 7 (25%)
History of procedure	Anti VEGF used 19(67.85%) ; LASER 1 (3.5%) ; intravitreal TA 1 (3.5%), Cataract surgery –19 (67.85)%
Abbreviations:	HTN - hypertension BRVO-branch retinal vein occlusion, CRVO – central retinal vein occlusion, DME – diabetic macular edema ,ME – macular edema ,TA –triamcinolone acetonide.

The mean pre injection and post injection values of CRT,MFT AND TMV at one year have been depicted in table 2

Table -2 : Pre and post injection visual acuity values

Visual acuity in log MAR units	Preinjection No. of pts	1 month Post inj. No. of pts	2 months post inj. No. of pts	3 months post inj. No. of pts	4 months post inj. No. of pts	6 months post inj. No. of pts	1 yr post inj. No. of pts	P value Pre and 1 yr post inj. No. of pts
< 1	7	4	4	3	3	5	2	0.0004
1-0.5	19	10	10	15	13	14	20	0.589
>0.5	2	15	15	11	13	10	6	0.0039

Abbreviations:pts –patients, inj – injection, yr– year

Table - 3 (Pre and post sustained release dexamethasone – 1year follow up)

Retinal parameters	Preinjection	1 year Post injection	Difference	P value
CRT	469.64 +/-136.93	296 +/-91.68	173 +/-90.5	<0.0001
MFT	446.64 +/-151.76	276.85 +/- 115.22	170 +/- 73.08	<0.0001
TMV	10.11 +/- 2.35	8.4 +/- 1.86	1.71 +/-1.98	= 0.0039

Abbreviations: CRT:central retinal thickness, MFT – mean fovealthickness, TMV – Total macular volume

Discussion

Sustained release biodegradable dexamethasone intravitreal implant was initially approved by FDA for treatment of macular edema due to vascular occlusions (CRVO & BRVO) and non infectious posterior uveitis and was marketed under the trade name ozurdex.¹¹

In the later part of 2014 it was approved for use in the general diabetic macular edema patient population.

It is hydrophilic and five times more potent than triamcinolone acetonide allowing for higher vitreous concentration but has a very short half life in the vitreous cavity.

It is manufactured in 2 strengths 0.35 mg and 0.7 mg and has a biphasic drug release pattern with high doses upto 60 days followed by rapid decline between day 60-90 days and a steady lower level till 6 months.

This delivery system ensures a higher concentration of the drug directly in the posterior segment without encountering the associated systemic side effect.

In comparison to flucinoloneacetonide (Retisert), Ozurdex is less expensive, implantation procedure less invasive and post injection patients have a significantly lower rate of cataract and raised intraocular pressure.

The purpose of our study was to have an idea of the present indications of sustained release dexamethasone implant in a tertiary eye care center of India and the efficacy outcome in terms of BCVA from baseline pre-injection levels and central retinal thickness parameters using stratus 3000, Zeis OCT machine.

In DME and vascular occlusion patients there is a breakdown of blood retinal barrier with upregulation of proinflammatory mediators. Ozurdex targets the inflammatory pathway by decreasing the expression of VEGF and other inflammatory mediators thereby reducing vascular permeability and oxidative stress induced damage and promoting stabilization of inner and outer blood retinal barrier.^{12,13,14,15}

The non-injection ocular complications associated with phase III trial of Ozurdex are cataract (66% in phakic patient), intraocular pressure elevation >25mmHg (29.7%),conjunctival hemorrhage (23.5%),vitreous

hemorrhage (10%),Macular fibrosis (8.3%),Conjunctival hyperaemia (7.2%),eye pain (6.1%), vitreous detachment (5.8%) and dry eye (5.8%) .Macular edema, a frequent cause of decreased visual acuity has been tackled till date with antiVEGF and steroids.

AntiVEGF target the VEGF's directly in the vitreous whereas corticosteroids target the very expression of these VEGF's.^{12,16}

These modalities of intravitreal therapy have been used as monotherapy or in combination with each other and lasers.

Flucinoloneacetonide,another soluble biodegradable steroid derivative though having a longer duration of activity and thereby less frequent implantation requirements had a much higher incidence of cataract and raised intraocular pressure complications necessitating further surgical procedures (FAME study).^{3,17}

Use of sustained release dexamethasone implant substantially reduced incidences of these side effects.³

Though it has been FDA approved for use in RVO, DME and non-infectious uveitis there have been off level use in cases of post uveitic and cataract surgeries CME.^{18,19}

Sorkin et al has elicited the effect of these implants in macular edema of different etiologies. They had a follow up period of 22±6.9 weeks but we had a longer followup period (1 year).²⁰

The reduction in central retinal thickness from baseline of our patients was marginally less than the result of Sorkin et al. This is corroborative to the effect ofOzurdex in various clinical trials.

It normally shows peak value around 60-90 days with tapering effect towards 6 months and a further decrease to almost a plateau at 1 year.Our preference for use of the implant was psudophakia, vitrectomised eyes, recalcitrant cases unresponsive to routine anti VEGF's,patients with cardiovascular risks,central retinal thickness more than 400 milli micron. Complications associated with flucinolone such as cataract progression and need for glaucoma therapy were substantially reduced with the use of sustained release dexamethasone implant.¹¹Post cataract Cystoid macular edema is an off label use of dexamethasone implant.

CONCLUSION

Ozurdex is a potent biodegradable sustained release intravitreal implant with minimal side-effects. It can be used effectively in vitrectomised and non-vitrectomised eyes with maximal efficacy at 2 months. It has been used frequently in recalcitrant cases after repeated anti-VEGF therapy.

Conflict of Interest – Nil

Source of Funding- Nil

Ethical Clearance – Not required

REFERENCES

- Garweg JG, Zandi S. Retinal vein occlusion and the use of a dexamethasone intravitreal implant (ozurdex) in its treatment. *Graefes Arch Clin Exp Ophthalmol.* 2016;254:1257-1265.
- Al Dhibi HA, Arevalo JF. Clinical trials on corticosteroids for diabetic macular edema. *World journal of diabetes.* 2013;4(6):295-302.
- Dugel PU, Bandello F, Lowenstein. Dexamethasone intravitreal implant in the treatment of diabetic macular edema. *Clinical Ophthalmology.* 2015;9:1321-1335.
- Cunha-Vaz J, Ashton P, Lezzi R, Campochiaro P, Dugel P, Holz F. Sustained delivery flucinolone acetonide vitreous implant. *Ophthalmology.* 2014;121:1892 - 1903.
- Boyer D, Faber D, Gupta S, Patel S, Tabandeh H, Li X. Dexamethasone intravitreal implant for treatment of diabetic macular edema in vitrectomized patients. *Retina.* 2011;31:915-923.
- Campochiaro P, Brown D, Pearson A, Chen S, Boyer D, Ruiz Moreno J. Sustained release flucinolone acetonide vitreous inserts provide benefit for at least 3 years in patients with diabetic macular edema. *Ophthalmology.* 2012;119:2125-2132.
- Mayer WJ, Wolf A, Kernt M, Cook D, Kampik A, Ulbig M. Twelve-month experience with ozurdex for the treatment of macular edema associated with retinal vein occlusion. *Eye (Lond).* 2013;27(7):816-822.
- Garcia -Layana A, Figueroa M, Arias L, Adan A, Cabrera F, Abraldes M. Clinical decision making when treating diabetic macular edema patients with dexamethasone intravitreal implants. *Ophthalmologica.* 2018.
- Mayer W, Hadjigoli A, Wolf A, Herold T, Haritoglou C. Intravitreal Ranibizumab as a first-line treatment of macular oedema due to Retinal vein occlusion. *Klin Monbl Augenkl. 2015;232(11):1289-1296.*
- Singer MA, Jansen ME, Tyler L, Woods P, Ansari F, Jain U. Long term results of combination therapy using Anti-VEGF agents and dexamethasone intravitreal implant for retinal vein occlusion :an investigational case series. *Clin Ophthalmol.* 2017:31-38.
- Arcinue CA, Ceron MO, Foster CS. A comparison between the flucinolone acetonide (Retisert) and dexamethasone (ozurdex) intravitreal implants in uveitis. *Journal of ocular pharmacology and therapeutics.* 2013;29(5):501 - 507.
- Ashraf m, Souka AAR. Steroids in central retinal vein occlusion: is there a role in current treatment practice. *Journal of Ophthalmology.* 2015;2015:1-7.
- Glacet Bernard A, Coscas G, Zoudani G, Soubrane G, Eric HS. Steroids and macular edema from retinal vein occlusion. *Eur J Ophthalmol.* 2011;21:suppl 6:S37- 44.
- Medeiros MD, Postorino M, Navarro R, Garcia Arumi J, Mateo C, Corcostegui B. Dexamethasone intravitreal implant for treatment of patients with persistent diabetic macular edema. *Ophthalmologica.* 2014;231:141-146.
- Callnan DG, Gupta S, S. Boyer D, A. Ciulla T, Singer MA, Cupperman BD. Dexamethasone intravitreal implant in combination with laser photocoagulation for the treatment of diffuse diabetic macular edema. *Ophthalmology.* 2013;120:1843-1851.
- Lattanzio R, Cicinelli MV, Bandello F. Intravitreal steroids in diabetic macular edema. *Dev Ophthalmol.* 2017;60:78-90.
- Dhibi HAA, Arevalo JF. Clinical Trials on corticosteroids for diabetic macular edema. *World journal of diabetes.* 2013(6):295-302.

18. Meyer LM, Schonfeld CL. Cystoid macular edema after complicated cataract surgery. *Ophthalmology*. 2011;2:319-322.
19. Williams G, Haller J, Kuppermann B, et al. Dexamethasone DDS Phase II study group: dexamethasone posterior segment drug delivery system in the treatment of macular edema resulting in uveitis or Irvine Gass syndrome. *Am J Ophthalmol*. 2009;147:1048-105.
20. Nir Sorkin ZH, Goldenberg D, Lowenstein A, Goldstein M. Long term outcome of an intravitreal dexamethasone implant for the treatment of noninfectious uveitic macular edema. *Ophthalmologica*. 2013;232:77-82.
21. Korobelnick JF, Do DV, Erfurth US, Boyer DS, Holz FG, Heier JS. Intravitreal Aflibercept for diabetic macular edema. *Ophthalmology*. 2014;121:2247-2257.
22. Hadayer A, Schaal S. Delivery of steroids into the eye for the treatment of macular edema. *Expert Opin drug deliv*. 2016;13(8):1083-1091. x

Therapeutic Effectiveness of Oxcarbazepine in Intractable Trigeminal Neuralgia

Fakir Mohan Debta¹, Priyanka Debta², Ekagrata Mishra³, Santosh Kumar Swain⁴, Mahesh Chandra Sahu⁵, Anurag Dani⁶, Kunal agrawal⁷

¹Associate Professor, Department of Oral Medicine and Radiology, S.C.B. Dental College & Hospital, Cuttack, India, ²Associate Professor, Department of Oral Pathology & Microbiology, I.D.S., Siksha "O" Anusandhan, Deemed to be university, BBSR, Odisha, India, ³Post graduate student, Department of Oral Medicine and radiology, S.C.B. Dental College and Hospital, Cuttack, Odisha, India, ⁴Professor, Department of Otorhinolaryngology, IMS and SUM hospital, Siksha "O" Anusandhan, Deemed to be University, K8, Kalinganagar, Bhubaneswar, Odisha, India, ⁵Assistant professor, Department of Medical Research Laboratory, IMS and SUM hospital, Siksha "O" Anusandhan, Deemed to be University, Kalinganagar, Bhubaneswar-751003, Odisha, India, ⁶Professor, Department of Prosthodontia, C.D.C.R.I. Rajnandgaon, Chhattisgarh, India, ⁷Assistant Surgeon, Department of Oral Medicine, S.C.B. Dental College & Hospital, Cuttack, India

ABSTRACT

Trigeminal neuralgia (TN) is one of the ancient neuropathic disorders which torments a significant proportion of the population. Although Carbamazepine is the first line drug of choice in the treatment of this debility, cases falling into the domain of intractable neuralgia fail to respond to maximum tolerable doses of the drug. In such cases, Oxcarbazepine (OXC) may be given more preference owing to the minor risk for drug interactions and its better tolerability in comparison with CBZ. This study was designed to study the therapeutic effectiveness of OXC in intractable TN using Efficacy index of Clinical Global Impressions (CGI) score, also accounting for the adverse effects using Liverpool Adverse Events Profile.

Keywords: Intractable TN, Clinical Global Impressions (CGI) score, Efficacy index, Liverpool Adverse Events Profile.

INTRODUCTION

Although early descriptions of Trigeminal Neuralgia (TN) can be inferred from the writings of Galen¹, Aretaeus of Cappadocia^{2,3}, the first accurate descriptions of TN were not officially documented until the 1700s. In 1756, Nicholas Andre⁴ conceptualized TN in terms of convulsive behavior, believing that it belonged to the same continuum of diseases as tetanus or spasms. He coined the term *tic douloureux* to indicate both the pain his patients described and the facial spasms that he documented. In 1773, John Fothergill described TN as 'a painful affection of the face', in which excruciating episodes come on abruptly, and irregularly, with each episode lasting for short intervals⁵. He also remarked how daily activities like eating, talking or tactile contact might elicit these episodes. He disapproved the notion of TN belonging to convulsive disorders and instead

suggested that it might be the manifestation of some type of cancer.

International Association for Study of Headaches (IASH) describes TN as 'painful, unilateral affliction of the face, characterized by brief electric shock-like (lancinating) pain, limited to the distribution of one or more divisions of the trigeminal nerve. Pain is commonly evoked by trivial stimuli, including washing, shaving, talking, brushing of teeth, but may also occur spontaneously. The pain is abrupt in onset and termination, and may remit for varying periods'⁶.

According to the American Academy of Neurology (AAN), the European Federation of Neurological Societies (EFNS)^{7,8} and also other recent guidelines, carbamazepine (CBZ) and oxcarbazepine (OXC) are the first-line medical treatments for pain alleviation in TN. They exert their action through frequency dependent

blockade of voltage-gated sodium channel. OXC may be given more preference owing to the minor risk for drug interactions and its better tolerability in comparison with CBZ.

The AAN-EFNS guidelines recommended that patients unresponsive or that cannot reach the therapeutic dosage of the drug because of adverse events should be made aware of the availability of surgery. Surgical procedures include Gasserian ganglion percutaneous techniques⁹, microvascular decompression in the posterior fossa¹⁰, and gamma knife radiosurgery¹¹. Microvascular decompression may be considered over other surgical techniques to provide the longest duration of pain freedom. According to the available evidence no oral treatment is better than CBZ or OXC, but in case of refractory trigeminal neuralgia, among the non-surgical option, lamotrigine and botulinum toxin injections should be considered¹².

AIM OF THE STUDY

- To study the therapeutic effectiveness of Oxcarbazepine (OXC) in intractable TN.
- To document the adverse effect profile of OXC.

MATERIAL AND METHOD

Sample: The present study on intractable TN was conducted amongst 57 patients randomly selected from the Department of Oral Medicine and Radiology, SCBDCH, Cuttack, Odisha.

Inclusion Criteria:

Patients with unilateral, bilateral episodic electric shock-like pain, paroxysmal, confined to any branch of the trigeminal nerve without other causes of orofacial pain or organic pathology (as screened with MRI), unresponsive to first line drugs.

Patients on Carbamazepine (CBZ) Monotherapy, who are unresponsive to its maximum tolerable dose (MTD).

Patients unresponsive to MTD of any non-carbamazepine (N-CBZ) group of drugs, who were shifted to N-CBZ group because they did not respond to MTD of CBZ and/or showed intolerable adverse effects to CBZ.

Patients who showed relapse after an effective

period of CBZ therapy, currently on MTD of CBZ or N-CBZ drugs.

Exclusion Criteria:

Patients with organic pathology precipitating TN like multiple sclerosis, TN-post nerve trauma, idiopathic sensory trigeminal neuropathy, etc.

Patients with debilitating diseases, liver or hepatic pathology.

Patients with history of other neurological disorders, undergoing treatment for the same.

Pregnant or lactating women or women on oral contraceptives.

Study Design

A total of 57 patients were recruited into this interventional study, based on the above inclusion and exclusion criteria, from the outpatient department of Department of Oral Medicine and Radiology, SCBDCH, Cuttack. Diagnosis of TN was confirmed by a detailed history and clinical examination by a neurologist and a dental practitioner, separately, to rule out inter-examiner variability and bias. Intraoral and Extraoral radiographs were taken to rule out odontogenic factors for orofacial pain. Patients who did not have pain paroxysms at the time of history taking and examination were kept under observation without any intervention until the real attack was observed. Pretreatment documentation of number of pain attacks was done by asking the patient to maintain a pain diary, wherein the number of daily pain episodes was recorded for a week. On the subsequent weekly follow-up, the mean attacks per day was calculated by the examiner, which was taken as the baseline value. Out of these 57 patients, 42 patients were on MTD of CBZ, and the remaining 13 were on MTD of N-CBZ drugs. The drug regimen was converted to OXC monotherapy.

Protocol adopted for conversion of existing monotherapy (CBZ or N-CBZ) to OXC monotherapy

For patients on MTD of CBZ (1200 mg/d): Out of 57 patients, 42 patients were on CBZ monotherapy at MTD of 1200 mg/d (400 mg TDS). Any attempted increase in CBZ dose beyond 1200mg/d either led to intolerable side effects or had no effect on reducing pain frequency (side effect profile outweighed therapeutic efficacy and/or response to dose escalation

was minimal). Hence 1200mg/d was taken as the last titratable value of CBZ in this group of patients. The strategy adopted for monotherapy conversion to OXC was in accordance with SPECTRA CONCENSUS PANEL RECOMMENDATIONS¹³ and UK OXCARBAZEPINE ADVISORY BOARD¹⁴. In first week (week 1; ie. At the end of observation week, week 0), the CBZ dose was tapered by approximately 20% of MTD (1200 mg/d). In the subsequent week (week 2), further dose reduction was done by 20% of original dose. Based on the type of oral tablet formulation available and patient compliance, daily dose regimen (no. of. divided doses) was determined. No inadvertent increase in pain frequency was observed during the taper over 2 weeks. In the beginning of third week (week 3), overnight shift was done to OXC 900 mg/d (300mg TID), following 1:1.5 switch. Dose escalation of OXC was done at 300mg/d weekly, with the dose being titrated upwards through 1200 mg/d, 1500mg/d, 1800mg/d, 2100mg/d to 2400 mg/d.

Patients on MTD of N-CBZ group: Drug switch was done following the guidelines outlined in SPECTRA CONCENSUS PANEL RECOMMENDATIONS¹³ and UK OXCARBAZEPINE ADVISORY BOARD¹⁴, taking needful consultation from a neurologist.

The patients were followed up on a weekly basis; their pain diaries were evaluated to calculate the mean number of pain attacks per day for the preceding week, with changes in mean attacks per day documented, if any. Scoring of therapeutic efficacy of OXC was recorded by using the Efficacy Index of Clinical Global

Impressions (CGI) Scoring¹⁵. Also, the adverse effects, if any, due to OXC were recorded using the Liverpool Adverse Event Profile^{16,17} on a weekly basis. Routine hematological examinations were done to keep track of any biochemical or blood panel derangements. The OXC dose with maximal therapeutic effect and minimal adverse effect was chosen for each patient by proper dose adjustment and monitoring.

In due course of the study, a sample attrition of 5 patients occurred; 3 were lost to follow-up, 1 dropped out due to adverse effects of OXC, and 1 was excluded as the drug side effects outweighed the therapeutic efficacy. This patient was, however, given proper medical treatment.

FINDINGS

The final sample included in the study exhibited a strength of 52 patients. Out of these, 13 (25%) reported a duration of diagnosed trigeminal neuralgia of less than 6 months, 26 (50%) for a period of 6 months to less than 3.5 years, 6 (11.5%) reported a duration within 3.5 to less than 7.5 years, 5(9.5%) within 7.5 to less than 10.5 years and 2 (4%) reported this duration to be greater than 10.5 years.

The side effect spectrum as documented with the Liverpool Adverse Events Profile reflected that 67% of patients reported central nervous system symptoms, 45% experienced gastrointestinal ailments while 36% reported back with an array of other symptoms. These presentations have been graphically summarized in table1.

Table 1: Spectrum of side effects as recorded with Liverpool Adverse Events Profile (in percentages).

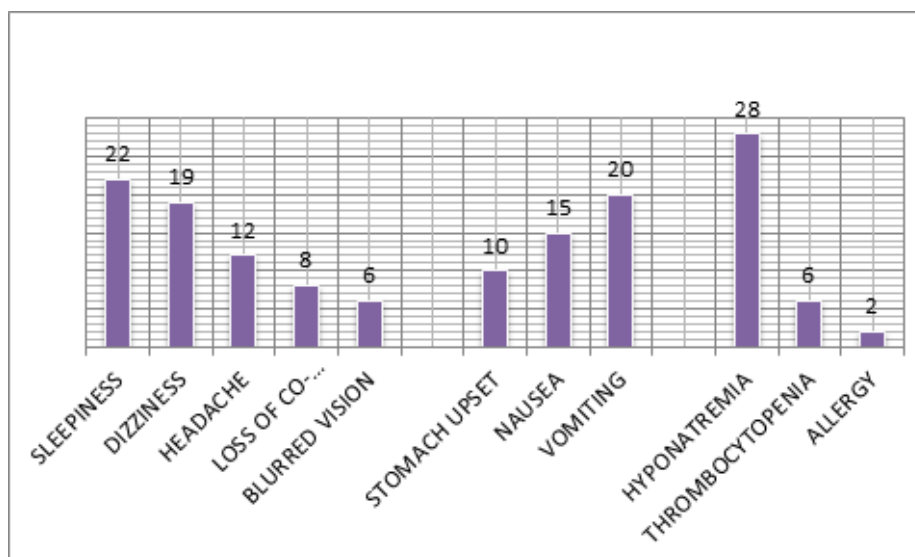


Table 2: Scoring of therapeutic efficacy of OXC as recorded by Efficacy Index of CGI Scoring (number of patients).

THERAPEUTIC EFFECT	SIDE EFFECTS			
	none	do not significantly interfere with patient functioning	significantly interferes with patient functioning	outweighs therapeutic effect
MARKED	5	15	4	0
MODERATE	8	13	1	0
MINIMAL	3	1	1	0
UNCHANGED	1	0	1	1
			<i>drop out</i>	<i>excluded from study</i>

The most commonly encountered central nervous system effect was sleepiness as reported by 11(22%) of patients. 10 (20%) of patients complained of vomiting which was documented as the predominant gastrointestinal symptom post drug switch. Only 1 (2%) patient reported allergy to the new drug. Blood electrolyte profile revealed that 13 (28%) of patients had hyponatremia.

The therapeutic effect of OXC was weighed against its observed and/or experienced adverse effects and scoring done using CGI, the results of which have been shown in table 2.

Majority of the recruits reported an efficacy index of 2, followed by a score of 6. None of the patients reported a score of 4, 8, 12 and 14. Patient with a documented score 15 dropped out of the study. Patient with efficacy index of 16 was excluded from the study with suitable referral and follow up with a neurologist as continued therapy with the drug per se was not deemed advisable.

CONCLUSION

The present study was conducted with a focus on trying to evaluate the therapeutic benefit against adverse effects of OXC in patients with intractable TN. The results of the study showed a promising outcome. 44.44% of patients experienced marked

therapeutic effect, of whom 83.33% reported none to minimal interference with patient functioning. There is compelling evidence suggesting that oxcarbazepine can provide significant analgesia in varied neuropathic pain presentations, including trigeminal neuralgia. The analgesic effects of oxcarbazepine, and its generally improved safety and tolerability profile compared with other standard Antiepileptic drugs, suggests that oxcarbazepine will be an important add on to the neuropathic pain armamentarium. However, the validity and generalisability of such a study as above can be strengthened and tested by multicentric trials.

Conflict of Interest: There is no conflict of interest.

Source of Funding: None.

Ethical Clearance: Duly obtained from the Institutional Ethics Committee.

REFERENCES

1. Chaemmaghami AB, Minagar A, et al. Avicenna and his description of trigeminal neuralgia. *Neurology* 2000;54 (Suppl 3):A176.
2. Lewy FH: The first authentic case of major trigeminal neuralgia and some comments on the history of this disease. *Ann Med Hist* 10:247–250, 1938.

3. Cole CD, Liu JK, Appelbaum RI: Historical perspectives on the diagnosis and treatment of trigeminal neuralgia. *Neurosurg Focus* 18:E4, 2005.
4. André M: Practical observations on urethral diseases, and factual information on convulsive facial contortions with principles for cure of associated gangrenous and cancerous conditions by use of various solvents and caustics. College of the Royal Academy [in French]. Paris, De Chir.rue S. Jacq. A l'Olivier, 1756.
5. Fothergill J: On a painful affliction of the face. *Med Observ Inquiries* 5:129–142, 1773.
6. Headache Classification Committee of the International Headache Society (IHS). The international classification of headache disorders, 3rd edition (beta version). *Cephalalgia*. 2013;33(9):629–808.
7. Cruccu G, Gronseth G, Alksne J, et al; American Academy of Neurology Society; European Federation of Neurological Society. AAN-EFNS guidelines on trigeminal neuralgia management. *Eur J Neurol*. 2008;15(10):1013–1028.
8. Bowsher D. Trigeminal neuralgia: a symptomatic study on 126 successive patients with and without previous intervention. *Pain Clin*. 2000;12:93–101.
9. Bergenheim AT, Asplund P, Linderth B. Percutaneous retrogasserian balloon compression for trigeminal neuralgia: review of critical technical details and outcomes. *World Neurosurg*. 2013;79(2):359–368.
10. Gu W, Zhao W. Microvascular decompression for recurrent trigeminal neuralgia. *J Clin Neurosci*. 2014;21(9):1549–1553.
11. McNatt SA, Yu C, Giannotta SL, Zee CS, Apuzzo ML, Petrovich Z. Gamma knife radiosurgery for trigeminal neuralgia. *Neurosurgery*. 2005;56(6):1295–1301.
12. Mark Obermann. Treatment options in trigeminal neuralgia. *Ther Adv Neurol Disord*. 2010 Mar; 3(2): 107–115.
13. St Louis, E.K., Gidal, B.E., Henry, T.R., Kaydanova, Y., Krumholz, A., McCabe, P.H., Montouris, G.D., Rosenfeld, W.E., Smith, B.J., Stern, J.M., Waterhouse, E.J., Schulz, R.M., Garnett, W.R., Bramley, T. (2007) Conversions between monotherapies in epilepsy: expert consensus. *Epilepsy Behav.*, 11, 222-234.
14. Smith PE. Clinical recommendations for oxcarbazepine (for the 24. UK Oxcarbazepine Advisory Board). *Seizure* 2001; 10 (2): 87-91.
15. Melissa K. Spearinga, Robert M. Posta, Gabriele S. Levericha, Diane Brandtb, Willem Nolenc. Modification of the Clinical Global Impressions (CGI) scale for use in bipolar illness (BP) : the CGI –BP. *Psychiatry Research* 73 (1997) 159-171.
16. Panelli RJ, Kilpatrick C, Moore SM, Matkovic Z, D'Souza WJ, O'Brien TJ. The Liverpool Adverse Events Profile: relation to AED use and mood. *Epilepsia* 2007;48:456
17. Baker GA, Frances P, Middleton A. Initial development, reliability, and validity of a patient-based adverse event scale. *Epilepsia* 1994; 35:80.

GLUT-1: An Important Adjunct in Predicting Prognosis of VC & OSCC

Saswati Siddhartha¹, Priyanka Debta², Fakir Mohan Debta³, Santosh Kumar Swain⁴, Mahesh Chandra Sahu⁵, Anurag Dani⁶, Somali Mahapatra⁷

¹Lecturer, Dept of Oral Pathology & Microbiology, Hi Tech Dental College & Hospital, BBSR, Odisha,

²Associate Professor, ⁷Tutor, Dept of Oral Pathology & Microbiology, Institute of Dental Science, BBSR, Odisha,

³Associate Professor, Dept of Oral Medicine & Radiology, SCB Dental College & Hospital, Cuttack, Odisha,

⁴Professor, Department of Otorhinolaryngology, ⁵Assistant Professor, Department of Medical Research Laboratory, IMS and SUM hospital, Siksha "O" Anusandhan, Deemed to be University, K8, Kalinganagar, Bhubaneswar, Odisha, India, ⁶Professor, Department of Prosthodontia, C.D.C.R.I. Rajnandgaon, Chhattisgarh, India

ABSTRACT

Introduction- GLUT-1 is an endogenous marker of hypoxia which has been identified in diverse human tumors and there is evidence that GLUT-1 is associated with tumor aggressiveness in head and neck squamous cell carcinoma.

Aim - Evaluation and comparison of GLUT-1 expression in verrucous carcinoma & various grades of squamous cell carcinoma.

Objective- Our study aims to find the correlation of GLUT-1 expression with the clinical and histopathological features of various lesions included in the study which are Verrucous carcinoma and various grades of squamous cell carcinoma. It also aims at evaluating the aggressiveness of each individual lesion.

Materials & method- Study group - Histopathologically diagnosed 10 verrucous carcinoma(VC) cases, 30 oral squamous cell carcinoma (OSCC) cases, 10 each of well differentiated, moderately differentiated and poorly differentiated were selected. Only primary carcinoma cases were considered. For control group- 10 biopsy specimen of normal oral mucosa that are taken during minor oral surgical procedures with patient consent. Immunohistochemistry method was employed to evaluate the GLUT-1 expression in the various tissue sections.

Results- GLUT-1 expression is increased VC and OSCC in comparison to normal mucosa. Its expression in various OSCC cases is correlated with the aggressiveness, local metastasis.

Conclusion- Immunoexpression of GLUT-1 of tumor cells (VC & OSCC) can act as an adjunct in predicting the aggressiveness of each lesion and better prognosis can be achieved by modified treatment planning as per the need of the individual lesion.

Keywords: *Glut-1, Squamous cell Carcinoma, Verrucous Carcinoma.*

Corresponding author:

Dr. Saswati Siddhartha

Lecturer, Dept of Oral Pathology & Microbiology, Hi Tech Dental College & hospital, BBSR, Odisha.

Email- saswati20@gmail.com

INTRODUCTION

Glut-1 is a hypoxic tumor marker which is used to determine the metabolic activity of tumor cells. Our study comprises of immunohistochemical comparison of Glut-1 expression in normal mucosa, Verrucous

carcinoma & all the three histological grades of oral Squamous cell carcinoma.¹⁻³ There are some prognostic tumor biomarkers associated with the clinical outcome of Oral Squamous Cell Carcinoma (OSCC) and there are diverse types of cell and tissue molecular biomarkers that can provide information complementary to that which can be obtained from clinical examination and histopathological studies.²⁻⁵

It has been suggested that, like CA IX and HIF-1 alpha, GLUT-1 might represent an endogenous marker of hypoxia which has been identified in diverse human tumors and there is some evidence that GLUT-1 might relate to aggressiveness in Head and Neck Squamous Cell Carcinoma (HNSCC).⁶⁻⁸ In animal cells, sugars are the major source of metabolic energy.⁸⁻¹⁰ However, as the plasma membrane is impermeable to polar molecules, membrane-associated carrier proteins are necessary for the introduction of sugars in cells. GLUT transporters use existing gradients in sugar concentration, between external and internal sides of plasma membrane, to facilitate its translocation.¹¹⁻¹⁴ SCC is a histologically distinct form of cancer. It arises from the uncontrolled multiplication of cells of epithelium, or cells showing particular cytological or tissue architectural characteristics of squamous cell differentiation, such as the presence of keratin, tonofilament bundles or desmosomes, structures involved in cell-to-cell adhesion.¹⁵ Verrucous carcinoma

is a low grade histopathological variant of Squamous cell carcinoma with intact basement membrane and pushing border rete ridges and intraepithelial keratinisation.¹⁶ It is considered a potentially malignant disorder as often it has been seen that it eventually leads to Squamous cell carcinoma. Some of the studies are carried out in evaluating the expression of GLUT-1 in epithelial dysplasia and carcinoma but not many have been carried out in Verrucous carcinoma.¹⁷⁻¹⁹ Our study is evaluating the expression of Glut-1 in verrucous carcinoma and the various grades of squamous cell carcinoma.

MATERIALS & METHOD

Materials included Glut 1 antibody and IHC kit from Path N Situ. Positively charged slides and the other materials required for IHC were obtained. The study group comprised of 10 well differentiated OSCC, 10 moderately differentiated OSCC, 5 poorly differentiated OSCC, 10 VC and 5 normal epithelium tissues. Formalin fixed paraffin embedded tissue blocks were taken of the earlier diagnosed cases from the institution. Patients with immunocompromised diseases or who are already undergoing treatment were excluded. IHC was performed with the given tissue sections using Glut- 1 antibody (Fig.1,2,3,4,5). The slides were studied and scored on the basis of stained cells with glut-1.

Immunoexpression of Glut-1 :

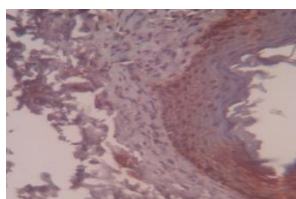


Fig-1-Normal mucosa



Fig-2- Verrucous Carcinoma

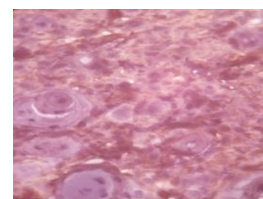


Fig-3- WDSCC

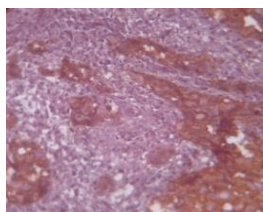


Fig4-MDSCC

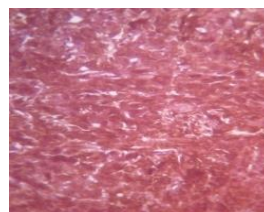


Fig-5-PDSCC

FINDINGS

When clinical parameters like age, sex, site, habit and TNM staging of OSCC cases were compared, there was significant association of Glut-1 expression with age group of patients (p=0.01, table 2) whereas in VC Glut-1 expression was significantly associated with habits of patients (p=0.02, table 1). On comparing the expression of Glut-1 in normal, VC and different grades of OSCC it was seen that mean value of Glut-1 expression increased in VC and different grades of OSCC in comparison to

normal tissue.

Results clearly indicated that Glut-1 expression showed mixed results in relation to the various clinical parameters like age, sex, site, habit etc whereas histopathologically its expression was directly proportional to the aggressiveness of the lesion. Its expression increased from normal epithelium to Verrucous carcinoma and in various grades of squamous cell carcinoma progressively along with the grade of OSCC. P was found to be highly significant histopathologically. (table 3;P=0,p<.05)

Table 1 : Glut-1 expression in VC (in terms of clinical parameters)

Clinical Parameters		VC cases	% of Cases	Glut 1 expression	P value
Age	<50	2	20%	14	0.111
	>50	8	80%	40	
Sex	M	6	60%	31	0.597
	F	4	40%	23	
Site	B.M	5	50%	27	0.919
	A.M	3	30%	17	
	A.R	2	20%	10	
habit	Smoking	5	50%	27	0.024 P<.05
	Chewing	3	30%	12	
	Both	2	20%	15	

Table 2 : Glut-1 expression in OSCC (in terms of clinical parameters)

Clinical Parameters		OSCC cases	% of Cases	Glut 1 expression	P value
Age	<50	5	20%	58	0.013, p<0.05
	>50	20	80%	187	
Sex	M	20	95%	232	0.796
	F	5	5%	13	
Site	B.M	6	24%	55	0.708
	A.M	6	24%	54	
	Tongue	6	24%	61	
	A.R	2	8%	17	
	Lip	1	4%	8	
	Retromolar Pad	2	8%	20	
	GB sulcus	2	8%	20	

Cont... Table 2 : Glut-1 expression in OSCC (in terms of clinical parameters)

Habit	Smoking	5	20%	58	0.1
	Chewing	13	52%	121	
	Both	5	20%	46	
	None	2	8%	10	
TNM	I	5	20%	49	0.718
	II	10	40%	103	
	III	8	32%	74	
	IV	2	8%	19	

Table 3: Glut-1 expression in normal and different lesions

Cases	Frequency	Total Score	Mean of Glut-1 expression	SD	P value
Normal	5	6	1.2	1.1	0.00 (p<0.05)
VC	10	54	5.4	1.58	
WDSCC	10	88	8.8	1.93	
MDSCC	10	103	10.3	1.33	
PDSCC	5	54	10.8	2.05	

DISCUSSION

GLUT-1 expression has been studied extensively in HNSCC; however the prognostic value of this parameter has not been analyzed systematically in OSCC.^{16,18} Not many studies have been done on Verrucous carcinoma before. Enhancement of glucose utilization, especially of glycolytic (anaerobic) metabolism is widespread characteristic of malignant cells. Malignant cells show an increase glucose uptake and utilization when compared to their benign/normal counterpart invitro and invivo.⁹⁻¹¹ Glycolytic metabolism helps to maintain the increased energy requirement of rapidly proliferating cells and represent an important adaptive change believed to be necessary to overcome the adverse micro environmental conditions existing in tumors.¹³⁻¹⁵ For this reason, these metabolic changes have been traditionally used to provide diagnostic and prognostic information.¹⁵⁻¹⁶ In tumors, increased glucose uptake is chiefly achieved through the up regulation of several large families of facilitative glucose transporters and these are regulated by various oncogenes and growth factors.¹⁷ In particular, facilitative glucose transporter (GLUT-1) is one of the proteins up regulated in hypoxic

conditions. GLUT-1 staining occurs in outer epithelial layers which may be a function of the differentiation and invasion process. However, GLUT-1 staining also exists in central tumor nests, distal to blood vessels, may signify the existence of hypoxia-induced GLUT-1. The role of GLUT-1 in OSCC is controversial. Several studies have reported an association between GLUT-1 expression and neoplastic progression in various tumors such as malignancies of head and neck, esophageal, lung etc.¹⁸ However, little is known about the expression in various histological grades of OSCC. Hence, the present study was undertaken to evaluate GLUT-1 expression in normal mucosa and in various histological grades of OSCC and also in Verrucous carcinoma as it denotes low grade histopathological variant of squamous cell carcinoma.¹⁹ Thus, the present study aims at analyzing GLUT-1 expression in normal mucosa and different grades of OSCC and Verrucous carcinoma to assess the reliability of GLUT-1 as a promising prognostic marker. The present study revealed statistically significant difference between expression of GLUT-1 in normal mucosa and OSCC cases, showed negative or weak expression of GLUT-1 in normal epithelium and GLUT-1 immunostaining was detected in cell layers

above parabasal layer and its expression increased with increase in grading of OSCC.¹⁶⁻¹⁹

In the present study normal mucosa showed focal to homogenous GLUT-1 expression seen in basal compartment and few places of suprabasal cell layer which was similar to the results of Reisser et al and their results showed weak expression of Glut-1 in normal mucosa in comparison to OSCC. This finding is in concordance with the studies performed by Ayala et al²⁰, Burnstein et al²¹. We found less expression of GLUT-1 in the keratinized pearl area which was also seen by Angadi V C et al suggesting the pro stromal pattern of Glut-1 expression which is, low in central differentiated areas of WDSCC as it is inversely related to the glycogen content.¹² GLUT-1 expression was more in stage III cases of PDSCC which supported the findings of Harshani et al²² who showed positive correlation between GLUT-1 expression and TNM staging whereas Yamada et al²³ Demeda et al²⁴ found no significant association of GLUT-1 expression with tumor size or clinical stage of the tumor in OSCC patients. On comparing overall OSCC cases with clinical staging of the tumor we did not find any significant correlation of TNM staging with GLUT-1 expression in contrast to the study done by Azad N et al, who compared the GLUT-1 expression between the tobacco & non tobacco users in OSCC cases and found that there was more expression of GLUT-1 in tobacco user groups.¹⁷ Various other carcinomas like gastric carcinoma²⁶, bladder carcinoma, colorectal carcinoma²⁷, rectal carcinoma²⁸, eosophageal carcinoma²⁹, laryngeal carcinoma, pancreatic carcinoma have also been associated with poor overall survival with GLUT-1 expression. In order to understand the tumor biology, the energy metabolism of tumor cells has been investigated. Many authors (Ayala F R et al²⁰, Kunkel M et al⁴, Ohba S et al¹¹, Schutter H D et al³¹, Eckert A W et al⁹, Grimm M et al³², Harshani J M et al²², Li C X et al³³) reached a conclusion that GLUT-1 can act as a predictive marker in head & neck squamous cell carcinoma specially the oral squamous cell carcinoma but only one study done by Baer³⁴ et al, reported that in OSCC expression of GLUT-1 is ineffective as a prognostic indicator. Kunkel M et al⁴ & Ayala F R et al²⁰ suggested that Glut-1 over expression is associated with shorter survival which was also supported by other studies carried out by Schutter H D et al³¹ & Eckert A W et al¹⁵ (survival $p=0.001$) who found out that Glut-1 can be used as an independent marker in routine assessment

of OSCC.

CONCLUSION

The present study concludes that a significant increased expression of GLUT-1 may serve as a promising immunomarker which may help the clinicians to analyze the behaviour of VC & OSCC. GLUT-1 can be used as an aid in assessing the aggressiveness of Verrucous Carcinoma and it also helps us in predicting which lesions are more likely to develop into malignancy. In OSCC cases GLUT-1 acts as an adjunct in deciding the individual prognosis of each case.

Conflict of Interest: There is no conflict of interest

Source of Funding: Nil

Ethical Clearance: Approved from Institutional Ethics Committee

REFERENCES

1. Harber RS, Rathan A, Weiser KR, Pritsker A, Itzkowitz SH, Bodian C et al. Glut-1 glucose transporter expression in colorectal carcinoma- a marker for poor prognosis. *Cancer* 1997. 80. 1046-51.
2. Reisser C, Eichhorn K, Herold-Mende C, Born AI, Bannasch P. Expression of facilitative glucose transport proteins during development of squamous cell carcinomas of the head and neck. *Int J Cancer*. 1999; 80:194-8.
3. De Vicente JC, Recio OR, Pendas SL, Lopez Arranz JS et al. Oral Squamous cell carcinoma of the mandibular region; a survival study. *Head Neck* 23:536-543,2001.
4. Kunkel M, Reichert TE, Benz P, Lehr H A, Jeong JH, Wieand S, Bartenstein P et al. Overexpression of Glut-1 and increased glucose metabolism in tumors are associated with a poor prognosis in patients with oral squamous cell carcinoma. *American Cancer society*. 2003; 97(4): 1015-24.
5. Oliver RJ, Woodward RTM, Sloan P, Thakker NS, Stratford IJ, Airley RE. Prognostic value of facilitative glucose transporter GLUT-1 in oral squamous cell carcinomas treated by surgical resection. *Eur J of Cancer*. 2004; 40(4): 503-507.
6. Tohma T, Okazumi S, Makino H, Cho A, Mochizumi R, Shuto K et al. Overexpression of

- glucose transporter-1 in oesophageal squamous cell carcinoma; a marker for poor prognosis. *Dis Esophagus* 2005; 18: 185-9.
7. Arcasoy MO, Amin K, Vollmer RT, Jiang X, Demark-Wahnefried W et al. Erythropoietin and Erythropoietin receptor expression in head and neck cancer: relationship to tumour hypoxia. *Cin Cancer Res* 2005;20-7.
 8. Kato Y, Tsuta K, Seki K, Maeshima AM, Watanabe S, Suzuki K et al. Immunohistochemical detection of Glut-1 can determine between reactive mesothelium and malignant mesothelioma. *Mod Pathol* 2007;(2): 215-20.
 9. Eckert AW, Launtner MM, Taubart H, Shurtze A, Schubert J, Bilkenroth U. Expression of GLUT-1 is a prognostic marker for oral squamous cell carcinoma patients. *Oncol Rep*. 2008 Dec; 20(6): 1381-1385.
 10. Warnakulasuriya S. Global epidemiology of oral and oropharyngeal cancer. *J. oral oncology*. 2009; 45: 309 – 316.
 11. Ohba S, Fuji H, Ito S, Fujimaki M, Matsumoto F, Furukawa M, Yokoyama J. Overexpression of GLUT-1 in the invasion front is associated with depth of oral squamous cell carcinoma and prognosis. *J Oral Pathol Med*. 2010; 39:74-8.
 12. Angadi VC, Angadi PV. GLUT-1 immunoexpression in oral epithelial dysplasia, oral squamous cell carcinoma, and verrucous carcinoma. *J Oral Sci*. 2015;57:115-122.
 13. Lodi G, Porter S. Management of potentially malignant disorders: evidence and critique. *J Oral Pathol Med*. 2008;37:63-67.
 14. Choi YS, Kim SJ, Kim DS, Park SJ, Park Y, Shin HJ, Jungk Y, Baek JK et al. Glucose transporter-1 expression in squamous cell carcinoma of the tongue. *Cancer Res Treat*. 2007;39(3):109-115.
 15. Eckert A, Launter MM, Taubert H, Shurtze A, Schubert J, Bilkenroth U. Co expression of HIF-1 α and glucose transporter -1 is associated with poor prognosis in oral squamous cell carcinoma patients. *Wiley Online Library*. 2011;58(7):1136-1147.
 16. Tian M, Zhang H, Nakasone Y, Moji K, Endo K. Expression of Glut-1 & Glut-3 in untreated oral squamous cell carcinoma compared with FDG accumulation in a PET study. *Eur J Nucl Med Mol Imaging*. 2004(31):5-12.
 17. Azad N, Maurya MK, Kar M, Goel MM, Singh AK, Sagar M, Mahotrar D et al. Expression of Glut-1 in oral squamous cell carcinoma in tobacco and non tobacco users. *J Oral Biol Craniofac Res*. 2016;6(1):24-30.
 18. Shimanishi M et al. Silencing of Glut-1 inhibits sensitisation of oral cancer cells TP cisplatin during hypoxia. *J Oral Pathol Med*. 2013;42:382-388.
 19. Fenske W, Volher HU, Adam P, Hahner S, Johanssen S, Wortmann S et al. Glucose transporter Glut-1 expression is a stage independent predictor of clinical outcome in adrenocortical carcinoma. *Endocrine-related cancer*. 2009;16:919-928.
 20. Ayala FR, Rocha RM, Carvalho KC, Carvalho AL, Cunha IW, Laurencio SV, Soares FV. GLUT1 and GLUT3 as potential prognostic markers for oral squamous cell carcinoma. *Molecules*. 2011;15: 2374-87.
 21. Burstein DE, Nagi C, Kohtz DS, Lumerman H, Wang BY. Immunohistochemical detection of GLUT1, p63 and phosphorylated histone H1 in head and neck squamous intraepithelial neoplasia: evidence for aberrations in hypoxia-related, cell cycle- and stem-cell regulatory pathways. *Histopathology*. 2006; 48 (6): 708–716.
 22. Harshani JM, Yeluri S, Guttikonda VR. Glut-1 as a prognostic biomarker in oral squamous cell carcinoma. *J Oral Maxillofac Pathol*. 2014;18(3):372-378.
 23. Yamada T, Uchida M, Lee KK, Kitamura N, Lee K, Kitamura N, Yoshimura N, Sasabe E, Yamamoto T. Correlation of metabolism/hypoxia markers and flourodeoxyglucose uptake in oral squamous cell carcinoma. *Oral surg Oral Med Oral Pathol Oral Radiol*. 2012;113:464-471.
 24. Demeda CF, Carvalho CH, Aquino ARL, Nonaka CF, Souza LB, Pinto LP. Expression of Glucose Transporters 1 and 3 in Metastatic and non metastatic lower lip carcinoma. *Brazilian Dental Journal*. 2014;25(5):372-378.
 25. Kawamura T, Kasukabe T, Sugino T, Watanabe K, Fukada T, Nashimoto A, Honma K, Suzuki T. Expression of Glucose Transporter-1 in Human Gastric carcinoma. *Cancer*. 2001;92:634-41.
 26. Hoskin PJ, Sibtain A, Daley FM, Wilson GD. GLUT1 and CA IX as intrinsic markers of hypoxia in bladder cancer: relationship with vascularity

- and proliferation as predictors of ARCON. *British Journal of Cancer*. 2003;82:1290-1297.
27. Wincewicz A, Koda M, Sulkowaska M, Sulkowski S, Kanczyga KL, Witkoususka E. Significant coexpression of GLUT-1, Bcl-xL and Bax in colorectal cancer. *Ann NY Acad*. 2007;1095:53-61.
 28. Brophy Sheehan KM, Namara DA, Deasy J, Bokchin HDJ, Kay EW. GLUT-1 expression and response to chemoradiotherapy in rectal cancer. *Int J Cancer*. 2009;125:2778-2782.
 29. Chiba I, Ogawa K, Morioska T, Shimoji S, Sunagawa N, Iraha S, Nishimaki T, Yoshimi N, Muryama S. Clinical significance of Glut-1 expression in patients with esophageal cancer treated with concurrent chemoradiotherapy. *Oncology Letters*. 2011;2:21-28..
 30. Ohba S, Fuji H, Ito S, Fujimaki M, Matsumoto F, Furukawa M, Yokoyama J. Overexpression of GLUT-1 in the invasion front is associated with depth of oral squamous cell carcinoma and prognosis. *J Oral Pathol Med*. 2010; 39:74-8.
 31. Schutter HD, Landuyt W, Virbeken E, Hirmans R, Nuyts S. The prognostic value of the hypoxia markers CA IX and Glut-1 and the cytokines VEGF and IL 6 in head and neck squamous cell carcinoma treated by radiotherapy+ -chemotherapy. *BMC Cancer*. 2005, 5-42.
 32. Grimm M, Munz A, Terieti P, Nadtoschi T, Reinent S. Glut 1/TKTL coexpression predicts poor outcome in oral squamous cell carcinoma. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2014;117:743-753.
 33. Li CX, Sun JL, Gong ZC, Lin ZQ, Liu H. Prognostic value of Glut-1 expression in oral squamous cell carcinoma. *Medicine (Baltimore)*. 2016;95(45):e5324.
 34. Baer SC, Casauboun L, Schwartz MR, Marcogliese A, Marcogliese A, Younes M. Glut-3 expression in biopsy specimens of laryngeal carcinoma is associated with poor survival. *The Laryngoscope*. 2002;112(2):393-396.

Efficacy of Photodynamic Therapy in the Treatment of Oral Lichen Planus by Use of Methylene Blue

Fakir Mohan Debta¹, Jayanta Kumar Das², Prashant Kumar Goyal³, Priyanka Debta⁴, Ekagrata Mishra⁵, Santosh Kumar Swain⁶, Mahesh Chandra Sahu⁷

¹Associate Professor, Department of Oral Medicine and Radiology, ²Principal, S.C.B. Dental College & Hospital, Cuttack, India, ³Assistant surgeon, C.H.C., Sarkipalie Bargarh, Odisha, India, ⁴Associate Professor, Department of Oral Pathology & Microbiology, I.D.S., Siksha "O" Anusandhan, Deemed to be university, BBSR, Odisha, India, ⁵Post graduate student, Department of Oral Medicine and radiology, S.C.B. Dental College and Hospital, Cuttack, Odisha, India, ⁶Professor, Department of Otorhinolaryngology, ⁷Assistant professor, Department of Medical Research Laboratory, IMS and SUM hospital, Siksha "O" Anusandhan ,Deemed to be University, Kalinganagar, Bhubaneswar, Odisha, India

ABSTRACT

Introduction: Methylene blue, widely used as a histologic dye, has potential photochemical and photobiological properties favoring its use as a photosensitizer in photodynamic therapy (PDT) of varied diseases. This study was designed to assess the efficacy of MB mediated PDT in treatment of Oral Lichen Planus.

Materials and Method: A sample selection of 37 patients was done based upon a predefined set of inclusion and exclusion determinants from the Outpatient Department of Oral Medicine and Radiology, SCBDCH, Cuttack This study encompassed a non-randomized, non-comparative prospective split mouth study protocol. Pre-treatment assessment of clinical presentation and symptoms was done using REU and VAS score respectively. The subjects were treated with a single session of MB-PDT and followed up after 2 weeks, 1 month and 3 months from baseline. The post treatment REU and VAS recorded at each visit for the test and control site separately.

Findings: For the final sample of 35 recruits, Repeated measure ANOVA was used for analysis of REU and VAS score among various visits in test group. With respect to REU scores, statistically significant results were obtained for baseline with 3 months follow up , for 2 weeks with 3 months follow up and for 4 weeks with 3 months follow up. The VAS score was statistically significant amongst all comparisons.

Conclusion: MB is photochemically and photobiologically a dynamic molecule which can be effectively harnessed to target various premalignant and malignant pathologies to prevent its progression.

Keywords: Methylene blue, Photodynamic therapy, REU score

INTRODUCTION

Photodynamic therapy (PDT) is a promising modality for the management of various tumors and

non malignant diseases, based on the combination of a photosensitizer that is selectively localized in the target tissue and illumination of the lesion with visible light, resulting in photodamage and subsequent cell death.^{1,2} Early preparations of photosensitizers for PDT , based on a complex mixture of porphyrins called haematoporphyrin derivatives were first generation photosensitizers.³ Ongoing research in photochemotherapy has uncovered new photosensitizers that belong to the different classes of compounds

Corresponding author:

Dr. Fakir Mohan Debta

Associate Professor, Department of Oral Medicine and Radiology, S.C.B. Dental College & Hospital, Cuttack, India. Email- fm_debta@rediffmail.com

including porphyrins, chlorins, phthalocyanines, texafrins and phenothiaziniums.⁴ Methylene blue is a widely known histological dye. Chemico-structurally MB is a phenothiazinium compound. Its favorable photochemistry and photophysics confers upon this molecule a great potential for application in PDT. This molecule has a well characterized and effective photochemistry that triggers both photosensitization mechanisms type I and type II⁵. Its photodisruptive effect damages biomolecules and efficiently induces death in several target cells, tissues and organisms. Therefore, upon photoactivation, it can be used to treat an array of cancerous and non-cancerous diseases.

MATERIAL AND METHOD

(a) Research design and study sample: The subsequent research design relied upon a non-randomized, non-comparative prospective split mouth study protocol. The study recruited participants from amongst the patients attending the Outpatient Department of Oral Medicine and Radiology, SCBDCH, Cuttack. Sample selection was done based upon the following outlined inclusion and exclusion criteria.

(b) Inclusion criteria:

1. clinical diagnosis of any one of the typical variants of oral lichen planus (OLP) of buccal mucosa present bilaterally, with histopathological confirmation
2. patients previously diagnosed and under conventional treatment for oral lichen planus who where nonresponsive or calcitrant
3. dissatisfied or reluctant to continue the conventional treatments

(Patients included as per criteria 2 and 3 were clinically and histopathologically reassessed prior to their inclusion in the study.)

(c) Exclusion criteria:

1. histopathologic non-confirmation of oral lichen planus
2. dysplastic features histopathologically
3. lichenoid reactions with clinical improvement after removal of suspected etiology
4. systemic compromise or debility and

pharmacologic treatments that could predispose to and/or alter the course of OLP and effect of treatments instituted in the study hence

5. OLP with dermatologic manifestations
6. Documented allergy to phototherapy and photosensitizers
7. pregnancy, lactation
8. patients with deleterious oral habits (smoking and smokeless tobacco, alcohol) and parafunction.

An informed consent was obtained from all subjects after detailed explanation of study protocol, advantages and disadvantages with a clause allowing voluntary discontinuation of participation on behalf of the subject at any point during the study.

d. Methodology

A sample of 37 patients was recruited into this study based upon the outlined norms. Pre treatment evaluation included 3 stages: assessment of clinical characteristics of the lesions, symptom evaluation , and histopathological confirmation. During recruitment of patients, it was ensured that lesions were present on bilateral buccal mucosa with similar clinical manifestations. Pre treatment assessment (Stage-1) of the intraoral lesions on buccal mucosa was done in corroboration with the REU scale⁶. Lesion severity in each site was scored according to the following: presence of reticular/hyperkeratotic/white papular (R) lesions (0-none, 1-presence), presence of erosive/erythematous (E) lesions and/or ulcerative (U) lesions (0-none, 1-lesions smaller than 1 cm², lesions from 1 to 3 cm², 3-lesions larger than 3 cm²). The total weighted score was a summation of reticulation score, erythematous score (weighted 1.5), and ulcerative score (weighted 2.0). To measure dimensions using REU scale, transparent flexible grid with marking squares of 1x1 mm² of minimum dimension was used. The clinical examination was performed by two examiners (Oral Medicine specialist and Oral Pathologist) separately to rule out any bias concerning the scoring. Also a recording of symptom (burning and pain) was done using VAS score (pretreatment stage-2). These were baseline pretreatment data. Following this, a punch biopsy was taken from the most representative site of buccal mucosa (pre-treatment stage-3). Only unilateral biopsy was done with the side of biopsy being treated as control and the

contralateral lesional buccal mucosa was treated as test site (PDT intervention), to avoid any untoward effects of wound healing on appearance hence subsequent scoring of lesions. The biopsy specimen was harvested as aseptically as possible under local anesthesia (2% lignocaine with 1:200000 adrenalin) using a 4mm diameter and depth disposable punch instrument. The specimen was transported in screw capped vials with 10% buffered formalin and sent for histopathological confirmation. A period of 2 to 4 weeks was allowed to lapse with supervision for adequate healing of biopsy site.

Before application of the photosensitizer, an atopic patch testing was done. None of the subjects tested positive. The lesions on test and control site were cleaned with cotton wool soaked in a soap free cleansing lotion. The subject was instructed to swish with freshly prepared 5% MB solution (Sigma , Life Sciences, purity grade $\geq 97\%$, molecular weight-319.85) for 5 minutes

(fig-1,2). The patient refrained from consumption of food and water during the test period. Twenty minutes after application of the dye, the test site was given a radiant exposure of 120 J/cm² with a wavelength range of 625-675nm of red light, at irradiances of 100-130 mW/cm² using a light emitting diode source (Epic10 Biolase, operating voltage-100 V to 240 V, wavelength-940+/-10nm, maximum power output-10W, continuous power mode, fig-3,4) for a period of 120 seconds. The control site was spared of the above procedure. However, the aiming beam of the laser equipment was flashed at control site. The distilled water application with the aiming beam was chosen as placebo to MB-PDT. The subjects were assigned a follow up visits after 2 weeks, 1 month and 3 months from baseline with post treatment REU and VAS recorded at each visit for the test and control site separately. During the study period, 2 patients were lost to follow up at 2 weeks and were excluded from the study giving a net sample strength of 35 patients.



Fig- 1

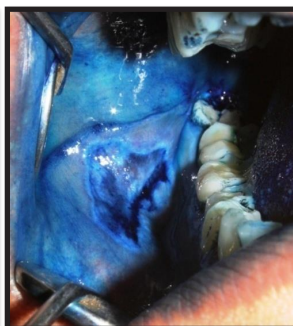


Fig- 2

Fig-1- dispensing of MB powder and distilled water to prepare 5% solution.
Fig-2- lesional site after swishing mouth with prepared solution.

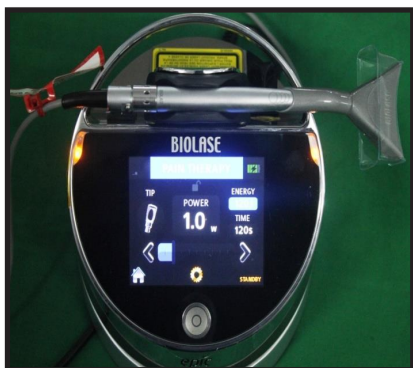


Fig- 2

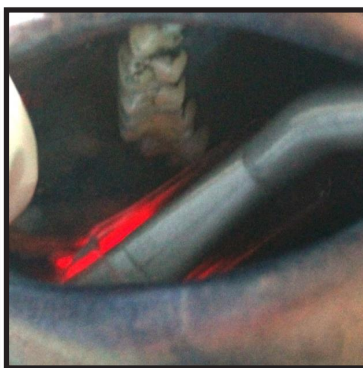


Fig- 3

Fig-2- Epic10 Biolase, operating voltage-100 V to 240 V, wavelength-940+/-10nm, maximum power output-10W.
Fig-3- Irradiation at 120 J/cm² with a wavelength range of 625-675nm of red light.

FINDINGS

The intra and intergroup (test and control sites) comparisons of both objective and subjective parameters (REU and VAS) at baseline and subsequent follow up visits have been documented in table 1. Out of 35 patients recruited in the final sample, 14 were males and 21 were females giving a percentage distribution of 60% and 40% in favor of female predilection. Statistically significant change in both REU and VAS score was observed at the test site in contrast to the side of non intervention.

Table 1: Intra and inter group comparisons of clinical parameters (mean ±SD).

	TEST SITE					CONTROL SITE					
	Baseline (Mean±SD)	2 weeks (Mean±SD)	4 weeks (Mean±SD)	3 month (Mean±SD)	<i>p</i>	Baseline (Mean±SD)	2 weeks (Mean±SD)	4 weeks (Mean±SD)	3 month (Mean±SD)	<i>p</i>	
Age (years)	41.45±10.46					-	41.45±10.46				
Gender (M/F)	14/21					-	14/21				
REU	2.67±0.48	2.67±0.48	2.54±0.25	1.72±0.76	0.000*	2.50±0.00	2.50±0.00	2.50±0.00	2.50±0.00	-	
VAS	4.60±8.11	4.20±0.71	3.14±0.80	1.88±0.796	0.000*	4.33±0.86	3.97±0.73	2.66±0.92	2.38±1.10	1.00	

Table 2: Analysis with Repeated measure ANOVA of REU score among various visits (in weeks and months) with Bon ferroni correction in PDT test group.

VISIT		MEAN DIFFERENCE	<i>P</i>
BASELINE	2 weeks	0.000	-
	4 weeks	0.129	0.499
	3 months	0.943	0.000*
2 WEEKS	4 weeks	0.129	0.499
	3 months	0.943	0.000*
4 WEEKS	3 months	0.814	0.000*

Table 3: Analysis with Repeated measure ANOVA of VAS score among various visits (in weeks and months) with Bon ferroni correction in PDT test group.

VISIT		MEAN DIFFERENCE	P
BASELINE	2 weeks	-0.40	0.002*
	4 weeks	1.45	0.000*
	3 months	2.714	0.000*
2 WEEKS	4 weeks	1.057	0.000*
	3 months	2.314	0.000*
4 WEEKS	3 months	1.257	0.000*

Table 4: Mann Whitney U test, p<0.05 significant.

Study interval	Variable	CASE SITE (Median±SD) N=35	CONTROL SITE (Median±SD) N=35	MANN WHITNEY U	P
BASELINE	REU	2.50±0.48	2.50±0.00	542.500	0.041
	VAS	5.00±0.81	3.00±0.49	157.500	0.000*
2 ND WEEK	REU	2.50±0.35	2.50±0.00	542.500	0.041
	VAS	4.00±0.71	3.00±0.50	270.000	0.000*
4 TH WEEK	REU	2.50±0.25	2.50±0.00	595.000	0.317
	VAS	3.00±0.80	4.00±0.32	217.000	0.000*
3 Months	REU	1.00±0.76	2.5±0.00	297.500	0.000*
	VAS	2.00±0.79	4.00±0.65	0.000	0.000*

Inter group comparison of REU and VAS score at various visits between study groups.

In table-2 and table-3, repeated measure ANOVA was used for analysis of REU and VAS score among various visits in test group. With respect to REU scores, statistically significant results were obtained for baseline with 3 months follow up, for 2 weeks with 3 months follow up and for 4 weeks with 3 months follow up. The VAS score was statistically significant amongst all comparisons.

Table-4 elucidates inter group comparison of REU and VAS scores at various visits between study groups. Statistically significant results were obtained for VAS at all follow up visits and at 3 months for REU.

CONCLUSION

Nearly a century ago, the antibacterial characteristics of MB which is a phenothiazine dye were described and attributed to its photodynamic properties. MB itself has been used in medical practice for more than 100 years and is recognized as having very low tissue toxicity. Clinical uses of MB include the treatment of ifosfamide encephalopathy, methemoglobinemia, urolithiasis, and cyanide poisoning.^{7,8} Photodynamic therapy (PDT) has been considered as an alternative/complimentary therapeutic modality for the management of premalignant lesions. The results from this study highlight the potential role of methylene

blue mediated PDT in alleviating subjective symptoms whilst also causing regression in clinical lesion. MB is photochemically and photobiologically a dynamic molecule. Its photoaction occurs in direct contact with membranes, polyelectrolytes and in the presence of reducing agents. Photosensitization reactions induced by MB excitation are known to cause damage to several biomolecules.^{9,10} these mechanisms can be effectively harnessed to target various premalignant and malignant pathologies to prevent its progression.

Conflicts of Interest: None to declare.

Source of Funding: Self.

Ethical Clearance: Duly obtained from Institutional Ethical Committee.

REFERENCES

1. Dougherty TJ. Photochemistry in the treatment of cancer. *Adv Photochem* 1992;17:275—311.
2. Kalka K, Merk H, Mukhtar H. Photodynamic therapy in dermatology. *J Am Acad Dermatol* 2000;42:389—413.
3. Spikes JD. Chlorins as photosensitizers in biology and medicine. *J Photochem Photobiol*. 1990;6:259—274.
4. Brown SB, Brown EA, Walker I. The present and the future role of photodynamic therapy in cancer treatment. *Lancet Oncol* 2004;5:497—508.
5. Tuite EM, Kelly JM. Photochemical interactions of methylene blue and analogues with DNA and other biological substrates. *J Photochem Photobiol B* 1993;21:103—24.
6. Hee-Kyung Park, Shelley Hurwitz, and Sook-Bin Woo. Oral lichen planus: REU scoring system correlates with pain. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, Volume 114, Number 1, 75-82.*
7. AHFS Drug Information 2000.
8. Kupfer A, Aeschilmann C, Wermuth B, Cerny T. Prophylaxis and reversal of ifosfamide encephalopathy with methylene-blue. *Lancet* 1994;343:763—764.
9. Voet D, Voet J. *Biochemistry*. 2nd ed. New York: Wiley; 1995.
10. Baptista MS. Supramolecular assemblies of natural and synthetic polyelectrolytes. In: Tripathy SK, Kumar J, Nalwa HS, editors. *Handbook of polyelectrolytes and their applications*, vol. 1. American Scientific Publishers; 2002. p. 165—81.

Short Term PV Power Forecasting Using Empirical Mode Decomposition based Orthogonal Extreme Learning Machine Technique

Niranjan Nayak¹, Alok Kumar Pani²

¹Associate Professor, ²Assistant Professor, Department of Electrical and Electronics Engineering, ITER, Siksha 'O' Anusandhan (Deemed to be University)

ABSTRACT

In present power scenario solar power generation plays a significant role, but due to its instability and irregularity nature the grid management problem becomes a prominent and challenging task. To avoid these types of problems here we have investigated an EMD based orthogonal extreme learning machine technique, which can continuously replace the old data with new data. EMD is used to decompose the data before application of various type of ELM, which eliminates the instability of the system. This paper presents the development of a reliable algorithm for short term forecasting of PV generated power of an existing solar power plant situated in Bhubaneswar, odisha, India (the detailed specification is given in table-1) . Here the PV power is forecasted EMD based orthogonal ELM algorithm and the results are compared with ELM, EMD-ELM and OS-ELM .The results depict that the proposed machine learning technique performs better than other mentioned algorithms.

Keywords: PV power, Orthogonal Extreme Learning Machine (O-ELM), Empirical Mode Decomposition,(EMD), OS-ELM, and PV power forecasting;

INTRODUCTION

The huge consumption of fossil fuel, fast growing of environment pollution the researchers are more encouraged for the clean energy i.e, renewable and sustainable energy like solar and wind energy etc¹. As per the survey of the international energy agency the present Photovoltaic power production growth has overcome that of last 40 years. China has played a major role in global market followed by Japan and USA in 2013.The PV power generation and its penetration to the conventional grid reduces the power shortage in a great extent. Further the roof top PV power generation has been encouraged by the Governments which partially balance the power demand. It is expected by 2050 the

solar energy may contribute about 16% of the global generation capacity. Research on photovoltaic power offers solutions to many challenges like irregularity of solar irradiance, nonlinear characteristics of PV cell and the power system itself^{2,3}. The extensive studies have conducted to improve the overall performance of the PV system. Besides many advantages the PV system faced many challenge for its instability and Random intermittent power output⁴.During on grid operation the fluctuating PV power generation produces grid stability problem challenges the network protection, which makes difficulty to prepare generation planning. Thus an accurate calculation of PV power output is essential to frame healthier generation plan and proper energy management which includes temporary compensation, coordinated power control and cost reduction ⁵.

Further better forecasting of PV power improves the system security and stability along with optimized system operation⁶.Forecasting generally conducted in two methods such as physical method and statistical methods. The physical method of prediction deals with the parameters which affect the PV power output directly

Corresponding Author:

Niranjan Nayak,

Associate Professor, Department of Electrical &Electronics and Engineering, ITER, Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar, India. Email ID: mihirmohanty@soa.ac.in

such as solar emission, atmospheric temperature etc. The forecasted parameters then used in the model to get PV output power. Otherwise considering the historical data a statistical model is built with help of orthogonal ELM to expect the PV power in short term horizon. It has been already tested by many researchers that the physical method is better than the statistical methods ⁷. In reference⁸ the authors investigated the performance of extreme learning machine with forgetting mechanism (FOS-ELM), which gives partially unsatisfactory results. Many regression models like random forest and support vector regression models are applied which shows the inter relation between input and output variables and the results were validated. The performances of such models is affected by their major drawback that it can degrade the operation in the middle ^{9,10,11}. In reference^{12,13} Radial Basis Function network (RBF) is applied to predict the solar power on daily basis, using the geographical like temperature, humidity and solar irradiance. In reference ^{15,16}the back propagation network (BPN) and artificial neural network (ANN) are applied for short term forecasting and high accuracy was achieved but the computation time was long and these methods are not suitable for complex problems. In all the above research articles reviewed overlooked the time confirmation of the data, and assumed to be that the data should not be useless. But in reality since the training data are time responsive, they need to be updated. A few research concentrated on this fact so far. In the article^{17,18} the researchers have proposed online one day prediction model in which the input parameters are classified based on the climatic condition. Many authors have investigated a two stage prediction of photovoltaic power in which first a statistical normalization of PV power data is achieved and then the forecast of normalized PV power to predict the photovoltaic power¹⁹. However the recent researches

has been focused on the Extreme learning algorithm due to following characteristics,

1. The commutation complexity of ELM is much lower as compare to other machine learning techniques.
2. It has high learning speed as compare to other feed forward learning algorithms.
3. The ELM is a high performing machine learning technique with certain modifications, so far.
4. It needs a small number of hidden layers and they need not be tuned [20].

The major contribution of this work is

1. Orthogonal Extreme learning machine (O-ELM) is applied for short term calculation of a real time existing solar plant power output.
2. The accuracy of different prediction models like, ELM, OS-ELM and O-ELM prediction model are compared.
3. The simulation model shows that this type ELM application is a new method which gives better performance than other forecasting models.

Data collection:

The collection of data from a physical existing Photovoltaic power plant is very vital factor before applying any forecasting technique. The time series past data like irradiance, temperature and power are collected from an existing PV power plant located on the roof top of SOA(deemed to be) university, Bhubaneswar, Odisha, India. (The specification is mentioned in table-1). The entire data set is classified in to two parts such as 80 percent data is used for training and rest 20 % data is used for testing.

Table 1: Specification of Solar Power Plant

SL No	Sspecification	system	Temperature
1.	Type of cell	Polycrystalline	20°25
2.	Type of cell	Polycrystalline	85°80
3.	Type of cel	Polycrystalline	106.25m ²
4.	Longitude		85°80
5.	Area Cover		106.25m ²

Data decomposition Processing:

As presented in the figure – and -- the time series data is decomposed into small components known as intrinsic membership function (IMF). From the decomposition outcome, it is seen that the trend of the high frequency IMFs decomposed by the EMD method is relatively stable, which is favorable to forecast. The fluctuation of low frequency signal is higher than high frequency signals. The objective of using EMD is to improve the prediction precision and stability. After decomposition IMFs contains local properties of the parent signal, in diverse time scales, makes the IMFs as narrow-band signal and justify the following two conditions such as the data set contains equal number of zero cross and acute value, or greater than equals to one. The other condition is the average of local maxima and minima at any point is zero.

The model admits that any part of the new sequence of signals can be explained in the following expression.

$$s(t) = \sum_{i=1}^n \lambda_i(t) + rn(t) \tag{1}$$

The EMD process is completely iterative. It decomposes the signals into IMFs with various magnitude and frequency. The IMF generation satisfies the conditions such as the data set contains equal number of zero cross and acute value, or greater than equals to one. The other condition is the average of local maxima and minima at any point is zero.

The 1st component of IMF is given by,

$$IMF_1(t) = s(t) - a_1(t) \tag{2}$$

IMF₁ is the first IMF of the signal $x(t)$, if not an IMF then is to be considered as original signal and decomposed repeatedly. $kIMF_1$ is considered to be an IMF and denoted as

$$\sigma_1 = kIMF_1 \tag{3}$$

The first IMF is removed from $x(t)$. By using $s(t) - \sigma_1(t) = \rho_1(t)$, r_1 is considered to be the residue of the original signal and other IMFs are obtained $\sigma_1, \sigma_2, \dots, \sigma_n$.

$$\text{Then } \rho_1(t) - \sigma_2(t) = a(t) \tag{4}$$

$$\rho_n(t) - \sigma_n(t) = a(t) \tag{5}$$

Equation (4) and (5) gives the modified form of eqn(1)

The terminating condition for this shifting process was recommended by Huag et.al, a normalized squared difference between the two consecutive shifting operations is essential.

$$S_1 D_k = \sum_{t=0}^T \frac{|IMF_{n(k-1)}(t) - IMF_{nk}(t)|^2}{IMF_{n(k-1)}^2(t)} \tag{6}$$

The shifting process is stopped by any predetermined criteria, by summing all the IMFs and the final residue the signal

$x_n(t)$ can be reconstructed as

$$x_n(t) = \sum_{i=1}^m c_{ni}(t) + r_{nm}(t) \tag{7}$$

Extreme learning Machine technique (ELM):

The extreme learning machine is a single hidden layer ANN with arbitrary hidden neurons. The fundamental nature of ELM includes special from the common accepting of learning, No tuning is required for the hidden layer of SLFN. One of the classic execution of ELMs is to pertain arbitrary iterative nodes in the hidden layer, which may be free of the training data. Different from conventional learning algorithms for neural networks ELM not only tends to achieve the minimum training error but also the least norm of output weights.

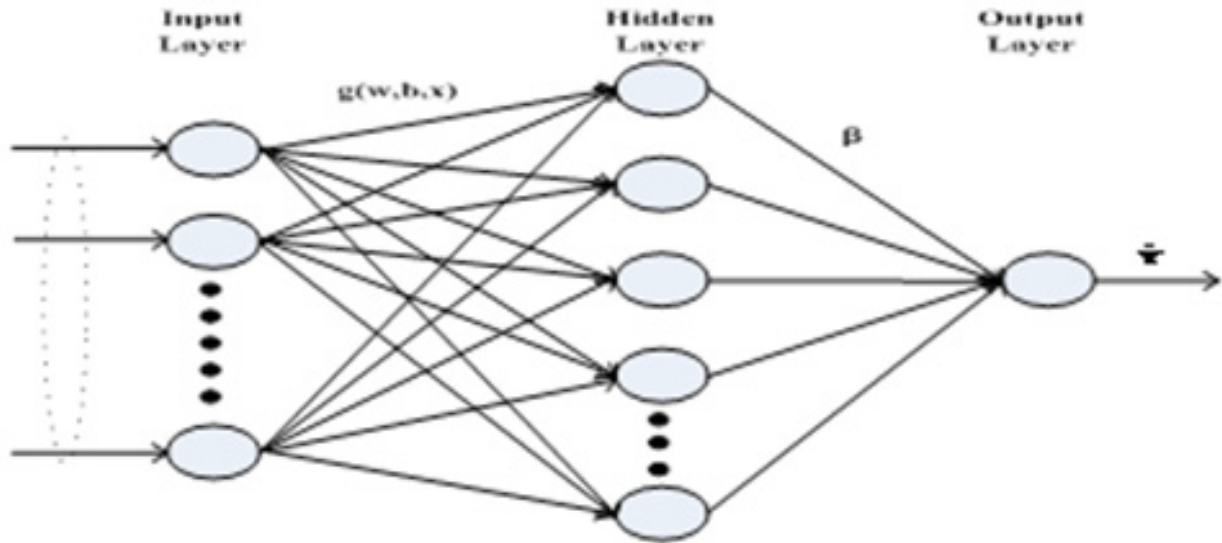


Figure-1: Structure of Conventional ELM

Table-2: The nomenclatures of the prediction model.

Symbols	Nomenclature
L	Number of hidden layer neurons
$N =$	number of different learning samples (x,y) .
$\gamma =$	Output weight vector.
$F =$	Activation function.
$M =$	Hidden layer output matrix
$Y =$	Training data output vector.
$C =$	Regularisation parameter.

The output function of ELM is written as

$$f_L(s_n) = \sum_{i=1}^L \beta_i G(a_i, b_i, s_n) = y_n \tag{8}$$

Where $s \in R^{d \times N}$, $a_i \in R^{1 \times d}$, $b_i \in R$, a_i, b_i are randomly selected matrices and vectors respectively.

γ is the output weight vector which establish the link between output and hidden neuron and φ is the activate function which interlinks between i_{th} random hidden neuron with all input neurons which is a sigmoid function is given by

$$\varphi(a, b, x) = \frac{1}{1 + e^{-ax+b}} \tag{9}$$

Equation (1) can be written in matrix form as

$$M \cdot \gamma = Y \tag{10}$$

Where

$$M = \begin{bmatrix} \varphi(a_1, b_1, s_1) & \dots & \dots & \dots & \varphi(a_L, b_L, s_1) \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \varphi(a_1, b_1, s_N) & \dots & \dots & \dots & \varphi(a_L, b_L, s_N) \end{bmatrix} \tag{11}$$

And

$$\gamma = [\gamma_1 \ \gamma_2 \ \dots \ \gamma_L]^T \quad Y = [y_1 \ y_2 \ \dots \ y_N]^T \tag{13}$$

Then the least square solution of equation (1) is given by

$$\gamma = M^+ Y = M^T (MM^T) Y \tag{14}$$

Where M is the hidden layer matrix with which i_{th} element m_i is the hidden layer output of input vector s_i . Y is the training data output vector. γ is the only parameter to find out in the training process. Here the number of hidden layers must be less than the training samples. To get better the stability and generalise performance of the prediction model a regularisation parameter is to be introduced in the equation (6) as given below.

$$\gamma = M^T \left(MM^T + \frac{1}{C} E \right) Y \tag{15}$$

Online Sequential Extreme Learning Machine Forecasting Model

Different forecasting algorithms have been developed to make the computation faster. For this purpose the classical extreme learning machine algorithm (ELM) is most powerful and efficient forecasting model in which the training speed is some thousand times better than other established forecasting models like, ANN, RBFN etc, in various prediction horizon. However for prediction of non stationary pattern of PV power still requires more accurate prediction. Thus in this work, on line sequential forecasting is tested on a real time solar power plant for prediction of PV power. Unlike ELM machine learning technique, in OS-ELM the data are trained either one by one or block by block. The block size may be fixed or variable.

block size may be fixed or variable.

OS-ELM algorithm:

Step 1: Set initialization of training data. Assume $n = \{(s_i, \varphi_i)\}_{i=1}^n$ as initial data.

- (i) Input weight w_i and bias b_j where $j = 1, 2, \dots, l$. are set arbitraley.
- (ii) The hidden layer output matrix M_0 is calculated.

$$M_0 = \begin{bmatrix} \varphi(w_1 s_1 + b_1) & \dots & \varphi(w_l s_1 + b_l) \\ \vdots & \ddots & \vdots \\ \varphi(w_1 s_n + b_1) & \dots & \varphi(w_l s_n + b_l) \end{bmatrix} \tag{16}$$

(iii) Estimate the initial output weight vector:

$$\gamma_0 = P_0 M_0^T G$$

Where

$$P_0 = (M_0^T M_0)^{-1}$$

$$G = [\varphi_1 \dots \varphi_n]^T$$

(iv) Set $k = 0$.

Step 2: Online study.

- (i) Here $(k + 1)^{th}$ block of new data is $\{(s_i, \varphi_i)\}_{i=\sum_{j=0}^{k+1} n_j}^{i=\sum_{j=0}^{k+1} n_j + 1}$ is ready,

(ii) Compute the fractional hidden layer output matrix M_{k+1} based on the latest data.

$$M_{k+1} = \begin{bmatrix} \varphi(w_1 s_{i=\sum_{j=0}^k n_j + 1} + b_1) & \dots & \varphi(w_l s_{i=\sum_{j=0}^k n_j + 1} + b_l) \\ \vdots & \ddots & \vdots \\ \varphi(w_1 s_{i=\sum_{j=0}^{k+1} n_j} + b_1) & \dots & \varphi(w_l s_{i=\sum_{j=0}^{k+1} n_j} + b_l) \end{bmatrix} \quad G_0 = [\varphi_{i=\sum_{j=0}^k n_j + 1} \dots \varphi_{i=\sum_{j=0}^{k+1} n_j}]^T \tag{17}$$

(iii) Estimate the new P_{k+1} and β_{k+1} based on (i) and (ii).

$$P_{k+1} = P_k - P_k M_{k+1}^T (I + M_{k+1} P_k M_{k+1}^T)^{-1} M_{k+1} \tag{18}$$

$$\gamma^{(k+1)} = \gamma^{(k)} + P_{k+1} M_{k+1}^T (F_{k+1} - M_{k+1} \gamma^{(k)}) \tag{19}$$

(iv) Set $k = k + 1$, and then go back to Step 2.

Data Pre-Processing:

We then normalize the different parameters to adjust to the ELM for batter generalization:

$$\bar{s}_i = \frac{s_i - s_{\min}}{s_{\max} - s_{\min}} \tag{20}$$

Where s_i is the input or output data, while s_{\max} and s_{\min} are the maximum and minimum of the value.

The whole data set is divided into two parts, one set is known as training set containing 80% data for training and other set contains 20% data for testing. The input data was collected from a real time PV power plant (given in table -1)

Orthogonal ELM:

The ELM theory achieves the smallest training error and the norm of the output weight matrix.

$$\sigma(w) = \min_w \|MW - Y\|^2 + \lambda \|W\|^2 \tag{21}$$

Where $\lambda > 0$ is a regularization parameter.

Setting $\frac{d\sigma}{dw} = 0$ (22)

The analytical solution of the above differential equation is given by

$$W^* = (M^T M + \lambda I)^{-1} M^T Y$$

The objective of orthogonal ELM is to formulate the model with some orthogonal constraints.

$$\frac{\min}{W^T W - I} \|MW - Y\|^2 \tag{23}$$

Where $M \in R^{n \times k}$ $W \in R^{k \times c}$ and $Y \in R^{k \times c}$ the data will be preserved in a sub space in metric structure. The OELM model can be formulated with optimization method as described below. Here in the above expressions since $k > c$ it is difficult to get direct solution due to orthogonal constraints.

The optimization of above equation can be done according to following theorem.

A. Theorem:1

The optimal solution of the unbalance orthogonal procrustes problem in equation (23) is similar to that of the following problem.

$$\frac{\min}{\tilde{W}^T, \tilde{W} - 1, Y} \|M\tilde{W} - [Y, Y_1]\|^2 \tag{24}$$

The equation is correspondent of the following

$$\text{Where } \tilde{W} = [W, W_1] \in R^{k \times k}, W_1 \in R^{k \times (k-c)} \text{ and } Y_1 \in R^{n \times (k-c)} \tag{25}$$

From the objective of the equation (24), the optimized solution of the output matrix

$Y_1 = MW_1$, substituting the relation in equation (24) we obtained

$$\frac{\min}{\tilde{W}^T, \tilde{W} - 1, Y_1} \|M\tilde{W} - [Y, MW_1]\|^2 \tag{26}$$

This is equivalent to the following equation

$$\frac{\min}{W^T, W - 1} \|MW - Y\|^2 \tag{27}$$

This concludes the proof.

As per the outcome of theorem-1, the objective of equation (24) can be solved directly instead of UOP.

Nevertheless the minimization equation (24) with respect to \tilde{W} and Y_1 is not possible. Thus one variable is updated by fixing other one.

When fixing Y_1 , $M \in R^{n \times k}$ and $(Y, Y_1) \in R^{n \times k}$

The objective of equation (**) will be simplified by balanced orthogonal procrustes as given below.

$$\frac{\min}{\tilde{W}^T, \tilde{W} - 1} \|M\tilde{W} - [Y, Y_1]\|^2 \tag{28}$$

The above equation can be solved by singular value decomposition method.

$$\text{Let assume SVD of } M^T [Y, Y_1] \text{ is } H^T [Y, Y_1] = \rho \eta \lambda^T \tag{29}$$

Where $\rho \in R^{k \times k}$, $\eta \in R^{k \times k}$ and $\lambda \in R^{k \times k}$

The solution of (^) is given by

$$\tilde{W} = \rho \lambda^T \tag{30}$$

Once \tilde{W} is found, the first c columns of matrix \tilde{W} is assumed to be the output weight matrix W .

With \tilde{W} is fixed, the problem in equation (24) can be simplified as following

$$\frac{\min}{Y_i} \|M[W, W_1] - [YY_1]\|^2 \tag{31}$$

Obviously the solution of the above equation is

$$Y_1 = MW_1 \tag{32}$$

Where W_1 is the last k-c column of \tilde{W}_1 .

The variant orthogonal ELM algorithm is described as following.

Algorithm:

Step-1: Set input training data $x \in R^{d \times n}$ and $Y \in R^{n \times c}$

Step-2: Set output weighted matrix $W \in R^{k \times c}$

Step-3: Select input weight matrix α randomly and hidden layer bias b ;

Step-4: Compute the hidden layer matrix M .

Step-5: concentrate M

Step-6: Set the initialization of Y_1 i.e $Y_1 = 0^{n \times (k-c)}$

Step-7: while not converge do.

Step-8: update \tilde{W} as per the equation (30)

$$W = \tilde{W}(:, 1 : c) \text{ and } W = \tilde{W}(:, 1 : c + 1, k)$$

Step-9: update Y_1 based on (32)

Accuracy Estimation:

The performance of Orthogonal extreme learning machine O-ELM can be evaluated by different error indexes. The errors like mean absolute percentage error (MAPE),mean absolute error (MAE) and root mean square error (RMSE) are calculated as shown below.

$$\varepsilon_{mape} = \frac{1}{N} \left| \frac{d_{actual} - d_{forecasted}}{D_{actual}} \right| \times 100 \tag{33}$$

$$\varepsilon_{mae} = \frac{1}{N} \sum |d_{actual} - d_{forecasted}| \tag{34}$$

$$\varepsilon_{rmse} = \sqrt{\frac{1}{N} \sum_{k=1}^N (d_{actual} - d_{forecasted})^2} \tag{35}$$

Where ‘d’ represent data set.

Result Analysis:

From the various solar powers forecasting results depicted that the EMD based orthogonal ELM produces best forecasting errors, in comparison to the EMD-ELM and OS-ELM prediction model. The decrease in the implementation time by selecting less number of training samples ,where it can be observed that by minimizing the data matrix size from 1400×1400 to 1400×300 thereby performing an inversion of 300×300 matrix, The graphical display of the prediction performance of the EMD-OELM, it is observed that the different error factors are minimum in case of proposed forecasting model.

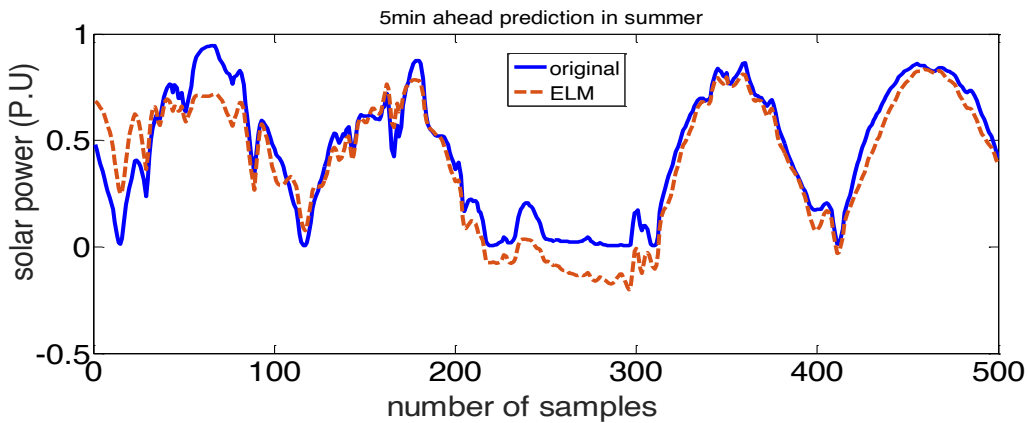


Figure-2: 5minute ahead prediction by conventional ELM

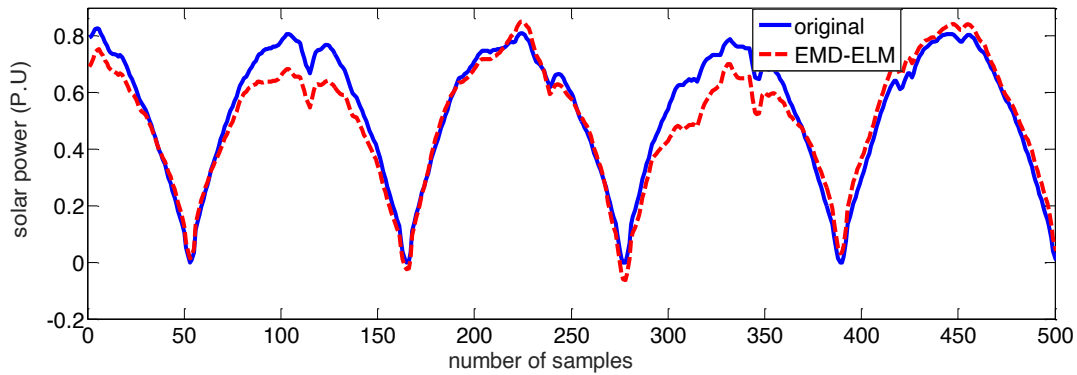


Figure-3: 5minute ahead prediction by conventional EMD- ELM

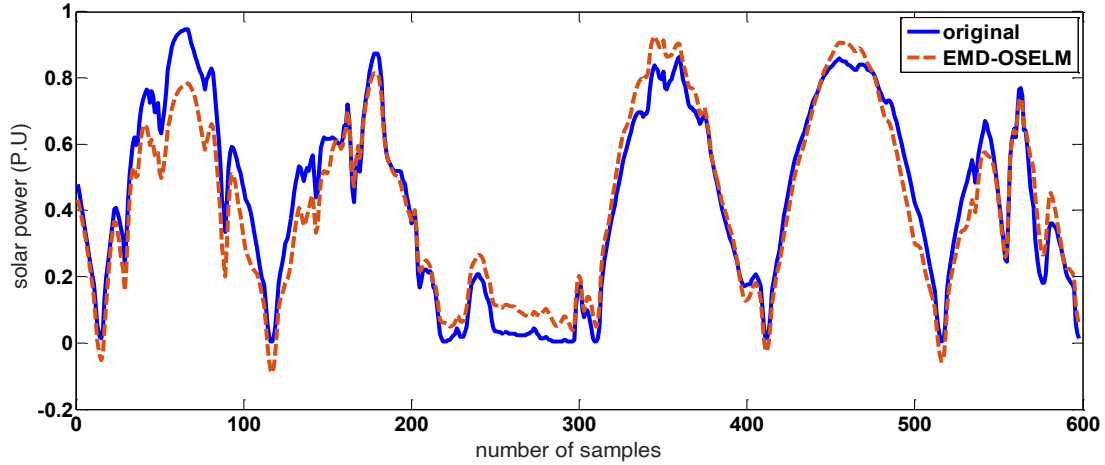


Figure-4: 5minute ahead prediction by OS- ELM

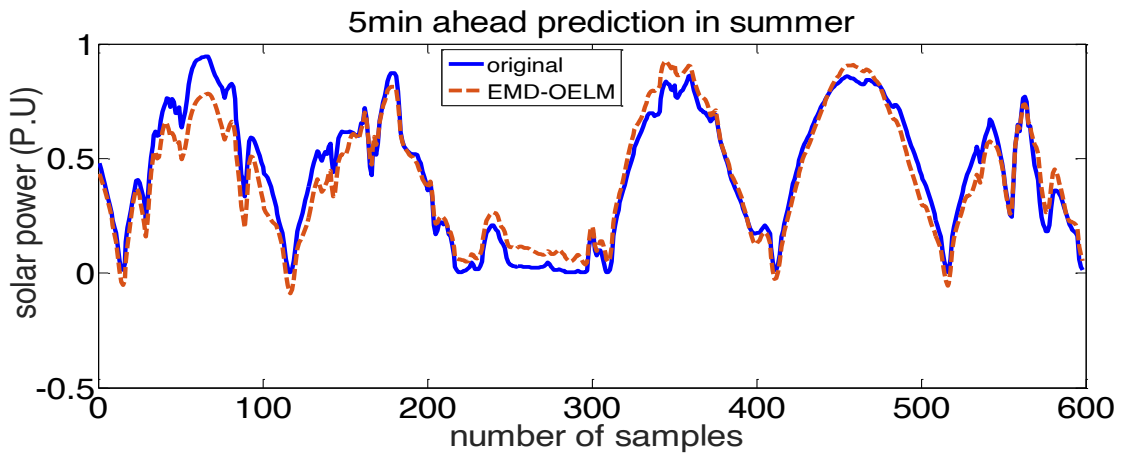


Figure-5:5minute ahead prediction by conventional EMD-O- ELM

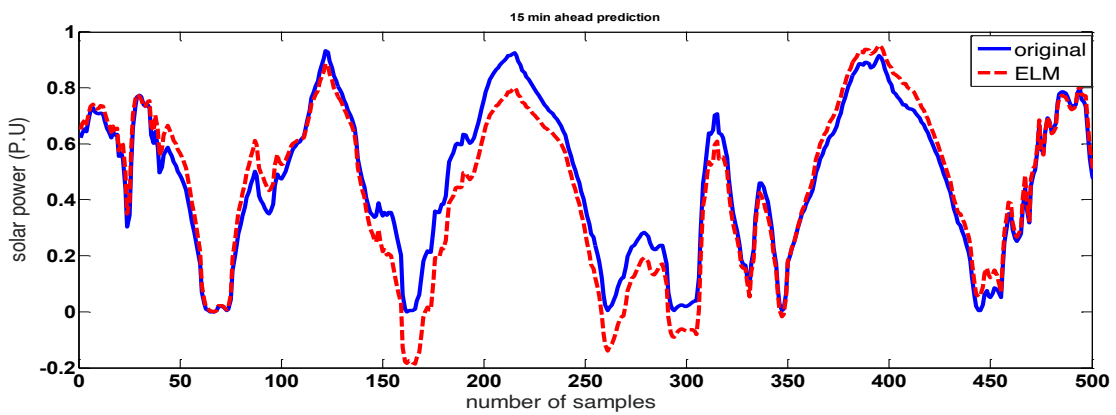


Figure-6: 15minute ahead prediction by conventional ELM

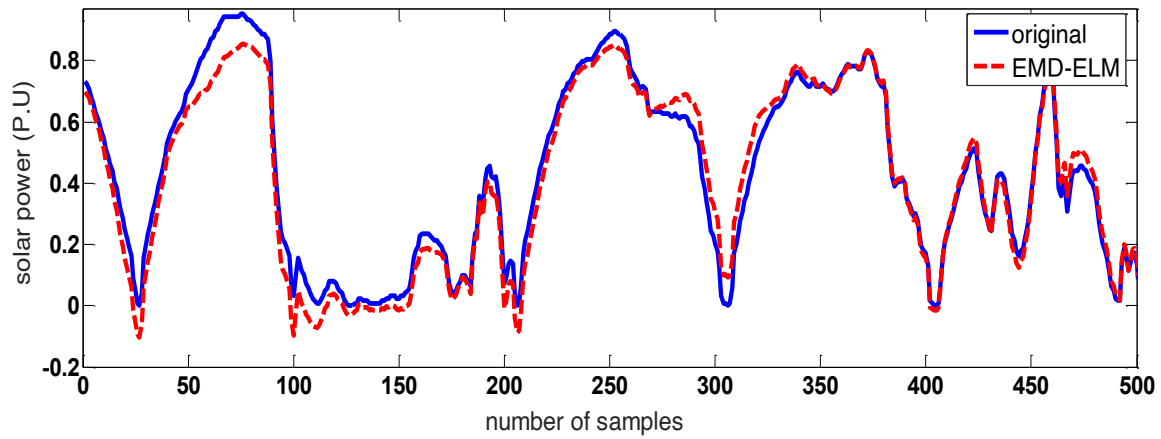


Figure-11: 30 minute ahead prediction by conventional EMD-ELM

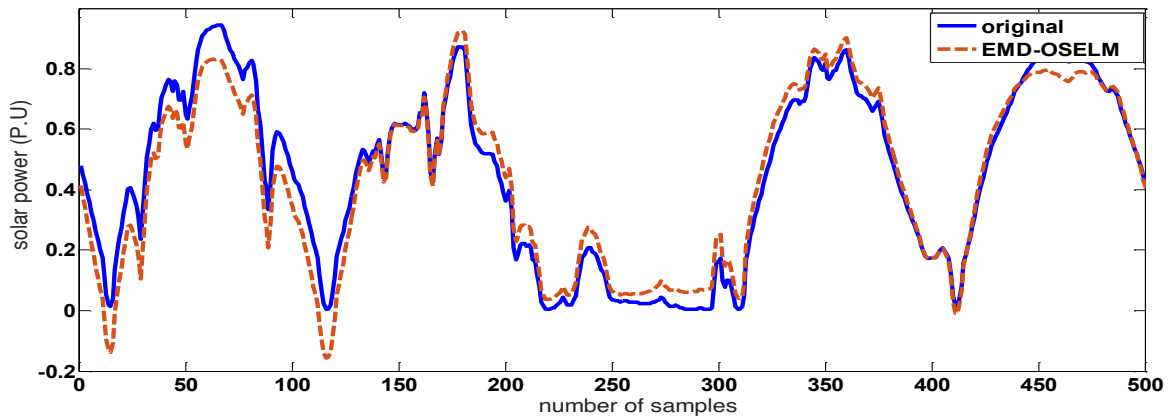


Figure-12: 30 minute ahead prediction by OS-ELM

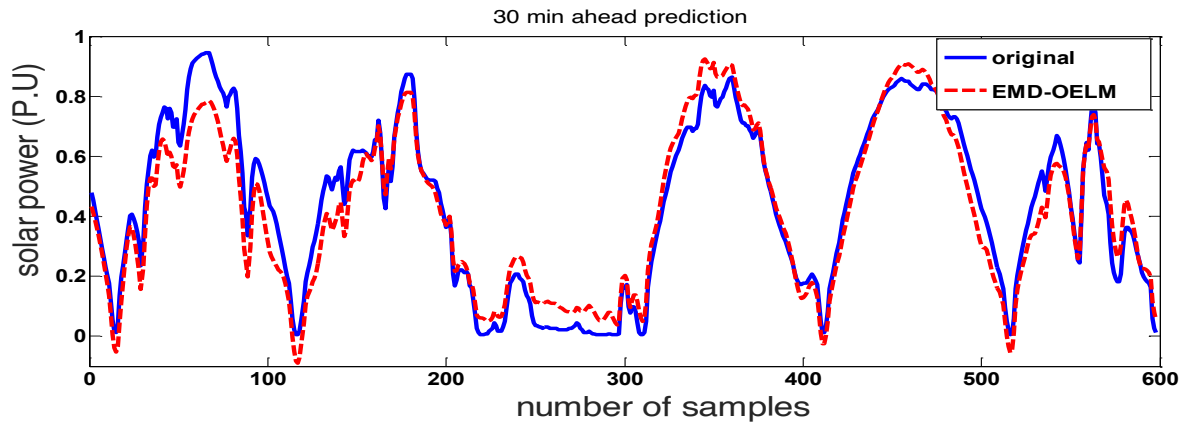


Figure-13: 30 minute ahead prediction by EMD-OELM

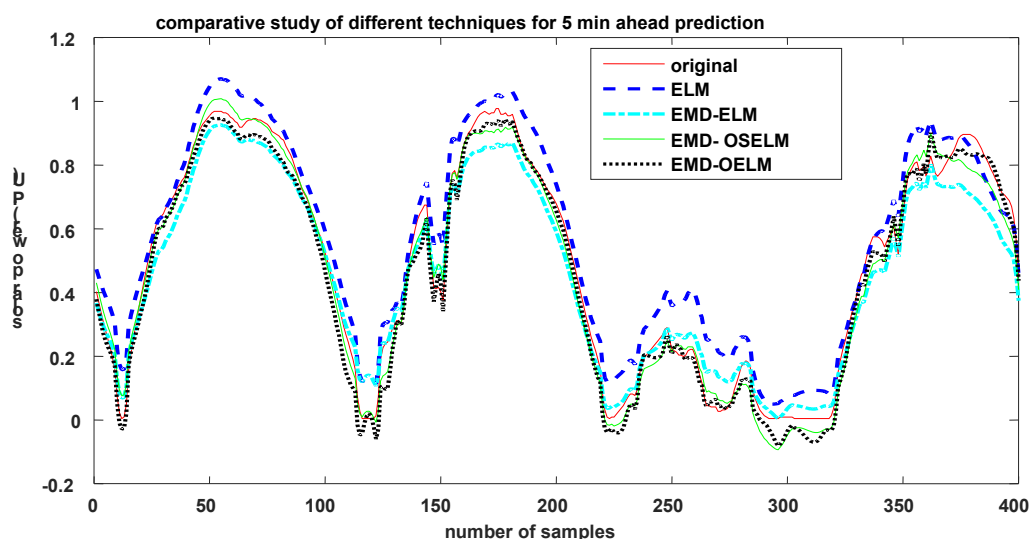


Figure-14: Comparative study of different ELM technique for 5min prediction ahead.

Table-3: Different Error Comparison of different ELM techniques

Time duration	ELM			EMD-ELM			OS-ELM			O-ELM		
	5 min	15 min	30 min	5 min	15 min	30 min	5 min	15 min	30 min	5 min	15 min	30 min
ϵ_{mape}	3.851	3.853	5.621	3.743	5.713	3.812	3.611	4.821	3.243	2.981	4.273	3.174
ϵ_{mae}	0.042	0.038	0.056	0.041	0.036	0.051	0.053	0.039	0.048	0.041	0.033	0.047
ϵ_{rmse}	0.069	0.063	0.102	0.062	0.059	0.101	0.062	0.061	0.097	0.061	0.062	0.096

CONCLUSION

In this paper a novel EMD based orthogonal ELM is proposed to forecast solar power output variations over a time horizon varying from 5 min to 30 minutes ahead. The nonlinearity of the solar power is minimized with the help of decomposition methods namely Empirical Mode decomposition techniques. The proposed method is also compared with OS-ELM and the basic ELM showing clearly the superior prediction performance of the OELM in comparison to ELM and OSELM. The training time can be substantially reduced by using random number of support vectors from the subset of training data with a small reduction in MAPE and other

performance metrics. The detailed validation of the forecasting results for very short term, short term and medium term prediction is done using the data of a local 11.2 KW PV system in the state of Odisha, India.

Conflict of Interest – Nil

Source of Funding- Self

Ethical Clearance – Not Required

REFERENCES

1. Paravalos, C.; Koutroulis, E.; Samoladas, V.; Kerekes, T.; Sera, D.; Teodorescu, R. Optimal Design of Photovoltaic Systems Using High Time-

- Resolution Meteorological Data. IEEE Trans. Ind. Inform. 2014, 10,2270–2279.
2. International Journal of Engineering Research and General Science Volume 5, Issue 5, September-October, 2017 ISSN 2091-2730 66 www.ijergs.org A Review Paper on Solar Energy System Deepak Purohit, Goverdhan Singh, Udit Mamodiya Poornima College of Engineering, Jaipur.
 3. Energy flow management in grid connected PV systems with storage - A deterministic approach Y.Riffonneau†*, S.Bacha† , F.Barruel* , A.Delaille* IEEE Xplorer, 2009.
 4. Paatero, J.V.; Lund, P.D. Effects of large-Scale photovoltaic power integration on electricity distribution networks. *Renew. Energy* 2007, 32, 216–234.
 5. Manoja Kumar Behera, IraniMajumder,Niranjan Nayak,‘Solar photovoltaic power forecasting using optimized modified extreme learning machine technique’ *Engineering Science & Technology, An International Journal, Elsevier, Vol.21, No.3, 2018,pp.428-438.*
 6. Mohamed, A.; Eltawil, M.A.; Zhengming, Z. Grid-Connected photovoltaic power systems: Technical and potential problems - A review. *Renew. Sustain. Energy Rev.* 2010, 14, 112–129.
 7. Graditi, G.S.; Ferlito, S.; Adinolfi, G. Comparison of Photovoltaic plant power production prediction methods using a large measured dataset. *Renew. Energy* 2016, 90, 513–519.
 8. A Short-Term Photovoltaic Power Prediction Model Based on an FOS-ELM Algorithm Jidong Wang *, Ran Ran and Yue Zhou, *Applied science, MDPI, 2017, pp.1-11.*
 9. Zamo, M.; Mestre, O.; Arbogast, P.; Pannekoucke, O. A benchmark of statistical regression methods for short-term forecasting of photovoltaic electricity production. Part II: Probabilistic forecast of daily production. *Sol. Energy* 2014, 105, 792–803.
 10. Frank e. yeboah, robert pyle, christian a. bock hyeng, ‘Predicting Solar Radiation for Renewable Energy Technologies - A Random Forest Approach, *International journal of modern engineering | vol.16, No. 1, 2015,pp100-106.*
 11. . Muhammad Waseem, Ahmad Monjur Mourshed, Yacine Rezgui, ‘Tree-based ensemble methods for predicting PV power generation and their comparison with support vector regression’ *Energy, Elsevier, Vol.164, No.1, 2018, PP. 465-474.*
 12. Mohamed Benghanem, Adel Mellit, ‘Radial Basis Function Network-based prediction of global solar radiation data: Application for sizing of a stand-alone photovoltaic system’ *Energy, Elsevier, 2010, Vol.35, PP3751-3762.*
 13. Usman Opeyemi Lateef, Olumuyiwa Alaba, ‘Electricity Consumption Prediction System Using a Radial Basis Function Neural Network, *Journal of science, Engineering and Technology.2016. Vol.2,PP1.*
 14. Luyao Liu, Deran Liu, Qie Sun, Hailong Li, Ronald Wennersten, ‘Forecasting Power Output of Photovoltaic System Using A BP Network Method’ *Energy Procedia, Vol.142 ,2017,PP 780–786.*
 15. Premalatha Neelamegama, Valan Arasu Amirthamb, ‘Prediction of solar radiation for solar systems by using ANN models with different back propagation algorithms ’ *Journal of Applied Research and Technology, Elsevier, Vol. 14, 2016, PP.206–214.*
 16. Shang, X.X.; Chen, Q.J.; Han, Z.F.; Qian, X.D. Photovoltaic super-Short term power prediction based on bp-Ann generalization neural network technology research. *Adv. Mater. Res.* 2013, Vol.791, PP.1925–1928.
 17. Chen, C.; Duan, S.; Cai, T.; Liu, B. Online 24-h solar power forecasting based on weather type classification using artificial neural network. *Solar Energy, Elsevier, 2011, Vol.85, PP.2856–2870.*
 18. Bacher, P.; Madsen, H.; Nielsen, H.A. ‘Online short-Term solar power forecasting’ *Solar Energy, Elsevier, 2009, Vol.83,PP.1772–1783.*
 19. Huang, G.B.; Zhu, Q.Y.; Siew, C.K. Extreme learning machine: A new learning scheme of feed forward neural networks. In *Proceedings of the IEEE International Joint Conference on Neural Networks, Budapest, Hungary, 25–29 July 2004; pp. 985–990.*

Antibacterial Activities of 5 Plants Against MDR Bacteria Isolated from Clinical Samples at a Tertiary Care Teaching Hospital

Mahesh Chandra Sahu¹, Swayamprabha Sahoo², Smrutipragnya Samal³

¹Assistant Professor, Medical Research Laboratory, ²Research Scholar, Medical Research Laboratory,

³Research Scholar, Department Of Otorhynolaryngology, IMS and SUM Hospital, Siksha O Anusandhan Deemed to be University, K8, Kalinga Nagar, Bhubaneswar, Odisha, India

ABSTRACT

Background: Here 5 plant extracts; *Argemone Mexicana*, *Alangium solivifolium*, *Butea monosperma*, *Combretum albidum* and *Strychnus nuxvomica* were evaluated for antibacterial activities against isolated MDR bacteria.

Materials and method: All the bacteria were isolated from clinical sample and identified with the culture morphology and biochemical test. The antibiotic sensitive pattern was carried out by disc diffusion method and the antimicrobial property of 5 plants were screened by agar diffusion method by agar well diffusion method.

Result: All the 5 plants of different family showing different antimicrobial activity. Antimicrobial activity of 5 plants against MDR bacteria is showing different results.

Conclusion: All the 5 plants showed good antimicrobial activity which can be used as drug after isolation of pure phytocompounds and their toxicity test.

Keywords: MDR, Antibiotic, Bacteria, Medicinal plant, Agar well diffusion

INTRODUCTION

Medicinal plants are the effective source for both traditional and modern medicines, which are genuinely useful for primary health care since many years. According to World Health Organisation (WHO) traditional medicines are safe remedies for both microbial and non-microbial origins.¹ Many antibiotics have become almost obsolete due to drug resistance² and consequently new drugs must be sought for. Herbal treatment is one possible way to treat disease caused by multidrug resistant bacteria.³

Argemone mexicana L. (Papaveraceae) commonly known as prickly poppy, is used as a medicinal plant in several countries. The plant possesses analgesic, narcotic, antispasmodic and sedative properties. The fresh yellow, milky, seed extract contains protein dissolving substances which are effective in the treatment of warts, cold sores, cutaneous infectious, skin diseases, itches,

dropsy jaundice and the smoke of the seeds are used to relieve toothache.^{4,5}

Alangium salvifolium (L.f) Wang belongs to family Alangiaceae. Locally it called as Ankolam⁶. Alangiaceae is a monogeneric family of trees and shrubs found in tropical and subtropical region. There are nearly twenty one species of *Alangium* grouped into four sections *Alangium*, *Conostigma*, *Marlea* and *Rhytidendra*⁷. Antibacterial compound was isolated from the flower of *Alangium salvifolium*⁸. Recent phytochemical studies of this plant resulted in the isolation of several flavanoids, phenolic compound, irridoid glycosides and oxyglucoside.

In ethno-botanical literature of India, several hundreds of plants are known to have the potential to treat many diseases and one of those popular ones is *Butea monosperma* Lam. (*B. monosperma*, family Fabaceae⁹ (Figure 1). *B. monosperma* is traditionally

used for the treatment of inflammatory diseases¹⁰; it is hepatoprotective¹¹, antidiabetic¹², antihelminthic¹³, it possess antitumor, antiulcer activities and wound healing^{14,15}, leaves possess antimicrobial property¹⁶⁻¹⁷, and roots have antispermatic activity¹⁸.

Leaves of the medicinal plant *Combretum albidum* G. Don are used in treating patients with jaundice and its bark is used for treating various skin diseases¹⁹. A decoction of the fruit is used for treating dysentery and diarrhoea²⁰. Thus, *C. albidum* has an established record of ethnobotanical image and Its bark extract also has liver-protective effects²¹.

Strychnos nux vomica belongs to the family Loganiaceae. It is an energetic poison affecting the central nervous system. It's a medicine for paralysis and nervous debility generally²². Traditionally it is used for treating acute diarrhoea, mixed with lemon juice and made into pills and taken orally during dysentery, arthritis, rheumatism and piles²³.

Here 5 plant extracts; Argemone Mexicana, Alangium solivifolium, Butea monosperma, Combretum albidum and Strychnus nuxvomica were evaluated for antibacterial activities against isolated MDR bacteria.

MATERIALS AND METHOD

Bacteria were isolated from collected clinical samples (urine, stool, pus, blood, swabs and body fluids) of inpatient and outpatient departments (IPD and OPD) patients of IMS and Sum Hospital, Bhubaneswar. Isolated bacterial strains were cultured on suitable specialized media, and biochemical identifications of isolated strains along with corresponding reference strains obtained from Microbial Type Culture Collections (MTCC). All bacteria isolated from clinical samples were identified with standard Clinical Laboratory Standard Institute (CLSI) guidelines (CLSI, 2011). Antibiotic susceptibility of clinically isolated bacteria were carried out by the Kirby-Bauer's/ disc-diffusion method.

Collection of plant material

Plants were collected from Kalahandi forest during December 2009 (Table 1). During the collection of plants, 15 hamlets (villages) of Junagarh block of Kalahandi district (Odisha) were surveyed. Junagarh is situated at 19°.10' and 20°.30' north latitude and 82°.30' and 83°.50' east longitude. The survey was done with

a questioner and personal interview, using the snowball technique in survey and sampling (Haines, 1924; Panda and Padhy, 2008)

Antibacterial assays of plant extracts Agar-well diffusion method

An aliquot of 100 µL of plant extract was taken in MHA bacterial culture to know its antibacterial activities. An aliquot of 100 µL 30 µg/mL chloramphenicol with an average diameter of zone of inhibition of 21 mm and 10 % DMSO solution was the reference control; 10 % DMSO solution had no antibacterial activity.

RESULTS

Isolation and identification of bacteria from clinical samples

Twenty four bacterial taxa (18 GN and 6 GP bacteria) were isolated from blood, CS, ED, DC, sputum, stool, swabs and urine. Colony morphology of isolated bacteria and corresponding MTCC strains of GN bacteria simultaneously were noted. All colony morphology of isolated GP bacteria and corresponding MTCC strains simultaneously were noted and biochemical identification of GP cocci, catalase, oxidase and coagulase tests were also performed (Table 3b). Results of tests and morphology of colonies helped the assignment of clinical isolates to suitable taxa, along with used standard strains obtained from Microbial Type Culture Collection (MTCC), Chandigarh.

Antimicrobial activities of medicinal plants

Ethnomedicinal information on 5 plants was documented along with details of modalities about crude extracts as medicine for many ailments (Table 1). Most of these plants were lesser-known/ non-common and are in the use by aborigines for infectious diseases. Apart from these, crude extracts of these 5 plants were also used by the tribal peoples for treating other diseases, such as, allergies, asthma, bronchitis, dyspepsia, leprosy, jaundice, cholera, malaria, rheumatism, nausea, fever, colitis, skin, stomachache, respiratory tract infection, infertility, skin diseases and wound infection, diarrhea and dysentery, etc.

Antibacterial activity of aqueous and ethanol extracts of 5 plants were recorded against 24 MDR bacteria by the agar-well diffusion method (Table 2). All five plants were resulted a significant antibacterial activities against

isolated 24 MDR pathogenic bacteria. *A. mexicana* registered a noticeable antibacterial activity against *A. baumannii*, *C. violaceum*, *K. oxytoca*, *S. marcescens*, *S. paratyphi* A, *S. aureus*, *S. epidermidis* and *S. pyogenes*. Likewise extract of *A. salvifolium*, registered good antibacterial activity against *A. baumannii*, *E. coli*, *K. oxytoca*, *K. pneumonia*, *P. aeruginosa*, *S. marcescens*,

E. faecalis, *S. aureus*, *S. epidermidis*, *S. mutans* and *S. pyogenes*. Similarly *B. monosperma*, *C. albidum* and *S. nuxvomica* had registered significant antibacterial activities against *P. aeruginosa*, *S. dysenteriae*, *E. faecalis*, *S. paratyphi* A, *E. faecalis*, *S. aureus*, *S. mutans* and *S. pyogenes*. (Table 2)

Table 1 Ethnolic medicinal information of 5 plants used

Sl. No.	Name of plant	Name of family	Local name	Parts used	Ethnomedicinal uses
1	<i>Argemone mexicana</i> L.	Papaveraceae	Bada gokhura, Agara (NE)	Stem, leaf, seed	Used for scabies, eye troubles, menorrhoea, spermatorrhoea, jaundice and wound infections. A tea spoon of latex is given every day during jaundice.
2	<i>Alangium salvifolium</i> (L.f.)	Cornaceae	Ankuli (NE)	Root, leaf, seed, bark	Leaves, roots, seeds and the bark of the plant is used in the preparation of decoction and making pills. Leave are used in the treatment of rabies
3	<i>Strychnos nuxvomica</i> L.	Loganiaceae	Kochila (NE)	Leaf	Mixed with lemon juice and made into pills and taken orally during acute diarrhoea, dysentery, arthritis, rheumatism and piles.
4	<i>Butea monosperma</i> Lam.	Fabaceae	Palasa (NE)	Leaf, flower	For blood pressure, flowers are soaked in warm water overnight, filtered and filtrate is taken in empty stomach for a month. One table spoon of decoction is given for 3 days after 5th day of menstruation for conception.
5	<i>Combretum albidum</i> G. Don	Combretaceae	Piluki(NE)	Leaf	It acts as potent antitubercular and used to cure liver and is useful in diarrhoea. It is also used in fever, inflammations, amenorrhoea.

Table 2 Antibacterial activity of aqueous extracts of 5 plants by the agar-well diffusion method against MDR bacteria.

Sl. No.	Bacteria	<i>A. mexicana</i>	<i>A. salvifolium</i>	<i>B. monosperma</i>	<i>C. albidum</i>	<i>S. nuxvomica</i>
	<i>A. baumannii</i>	16	18	18	19	8
	<i>C. violaceum</i>	19	12	14	18	22
	<i>C. freundii</i>	10	15	16	14	14
	<i>E. aerogenes</i>	12	12	12	18	12
	<i>E. coli</i>	12	16	17	19	17
	<i>K. oxytoca</i>	17	16	17	19	17
	<i>K. pneumoniae</i>	12	17	18	8	18
	<i>P. vulgaris</i>	14	14	16	16	14
	<i>P. mirabilis</i>	14	14	14	12	18
	<i>P. aeruginosa</i>	12	20	19	16	17
	<i>S. boydii</i>	13	10	12	16	16
	<i>S. dysenteriae</i>	12	15	15	21	16
	<i>S. flexneri</i>	12	10	18	12	18
	<i>S. sonnei</i>	12	12	13	18	22
	<i>S. marcescens</i>	16	16	18	10	16
	<i>S. typhi</i>	12	15	16	19	14
	<i>S. paratyphi A</i>	16	15	16	16	16
	<i>S. paratyphi B</i>	12	15	16	18	14
	<i>E. faecalis</i>	15	18	15	26	19
	<i>S. aureus</i>	19	20	17	26	20
	<i>S. saprophyticus</i>	14	12	19	24	15
	<i>S. epidermidis</i>	19	16	16	22	22
	<i>S. mutans</i>	12	16	18	25	18
	<i>S. pyogenes</i>	18	19	16	27	22

DISCUSSIONS

The antibiotics used so far against any bacterial pathogen including *P. aeruginosa* are from microbial sources. Gradually, the target bacterium develops resistance to those antibiotics readily and survives. Moreover, crude drugs from eukaryotic systems (as plants) have an array of compounds against which resistance can never be developed in any pathogen.

In fact, eukaryotic compounds in crude extracts when employed against a pathogen, a synergistic effect is achieved with the eventual control of the pathogen; that is how certain plants are reported to be highly successful and popular in managing infections in 'traditional health care systems', worldwide. By the by, the development of scientifically un-approved drugs has proliferated so much that the plant-based crudemedicine trade in local and international markets is popular, worldwide ²⁴. Studies

on crude phyto-extracts in monitoring of antimicrobial activities of plants are of practical importance. Herein, the efficiency of *A. mexicana* in the control of several types of infections in the age-old 'low-cost health-care module' of marginalized and poverty-stricken aborigine-folklore of India in crude plant extract²⁴⁻²⁶; *A. mexicana* belongs to the plant-family, Papaveraceae to which another the most successful medicinal plant, *Papaver somniferum*, (yielding morphine and many more) belongs, in controlling in vitro MDR strains of *P. aeruginosa*. Reminded that it is the causative organism in bacteremic form of pneumonia of aged and immune-compromised patients in bringing 80% mortality²⁷. This study of antibiogram of clinical isolates of *P. aeruginosa* should be helpful to establish appropriate treatment regimen in a situation of changing epidemiology of the organism. More particularly, corneal infections are rapidly progressive and require immediate appropriate chemotherapy for control of the infection²⁸.

In this study we tried to explore the antibacterial property of the ethanolic seed extracts of the *Strychnos nux vomica* seeds. Results showed antibacterial activity and poor antifungal activity by the ethanolic seed extract. Our study contradicted the earlier reports of Gnanavel et al (2012) in which herbal extracts inhibited only the gram positive bacteria²⁹. Whereas in our study we got better inhibition of the seed extract over gram negative bacteria, which marks an important finding as we have proved it again that this plant has got lot of antibacterial activity. R. Mahalingam et al (2011) has proved the exhibition of antibacterial activity of ethyl-acetate and n-butanol root extracts of *Strychnos nux vomica* in which the zone of inhibition ranged from 13 -16mm against tested pathogens³⁰. Antibacterial activity effect of ethanolic extract of bark of the *strychnos nux vomica* was reported earlier, in which *Escherichia coli* was the organism which showed inhibition which was similar in our study also³¹. *Staphylococcus aureus*, *Acinetobacter* sp, *Klebsiella* sp, *P.aeruginosa*, *S.typhi*, *V.cholerae* microbial organisms have shown inhibition to ethanolic and water extracts of *Strychnos nux vomica* leaves and bark whereas *C.fereundii*, *C.violeceum*, *E.coli*, *Proteus* species didn't showed any inhibition as reported in an earlier study³². In our results we didn't see any antimicrobial activity of the ethanolic extract against *Bacillus subtilis*, *Salmonella typhi* and *Proteus*. Antifungal activity against fungal samples like, *Aspergillus niger*, *Aspergillus flavus*, and *Candida albicans* was not promising as we didn't see any

inhibition activity. Previous reports on the same fungi using methanolic and aqueous extracts of *Strychnos nux vomica* leaves showed no antifungal activity, however n-butanol extract have showed promising results. Ethanolic bark extract had registered a good control on National Type Culture Collection bacterial strains (drug sensitive strains of *S. aureus*, *Bacillus cereus*, *P. aeruginosa* and *E. coli*), with the highest sizes of zones of inhibition against the used bacteria, at around 100 mg/mL with the aqueous extract of the plant³³.

Conflict of Interest: There is no conflict of interest

Source of Funding: Nil

Ethical Clearance: Approved from Institutional Ethics Committee

REFERENCES

1. WHO, The promotion , development of traditional medicine. Technical Report Series, 1978, pp. 622.
2. Ekpendu, TO, Akshomeju, AA, Okogun, JI, Antiinflammatory antimicrobial activity, Lett. Appl. Microbiol., 30, 1994, 379-384.
3. Olukoya DK, Idika N, Odugbemi T, Antibacterial activity of some medicinal plants from Nigeria. J. Ethnopharmacol., 39, 1993, 69-72.
4. Chopra RN, Nayar SL , Chopra, Glossary of Indian Medicinal Plants including the supplement: Council of Scientific and Industrial Research, 1986, New Delhi.
5. Santhosh Kumar Singh, Vidya Dhar P,ey, Aradhana Singh , Ch,an Singh, Antibacterial activity of seed extracts of *Argemone mexicana* L. on some pathogenic bacterial strains. Afr. J. Biotechnol. 8, 2009, 7077-7081.
6. Tariqo, S. , A. Javed, 1985. Vitamin C content of Indian medicinal plants-A review literature. Indian Drugs, 23(2): 72-75.
7. Modi, I.A., 1984. Scope of Indigenous drugs in Modern Medicine. The Eastern Pharmacist, 288(24): 39-43.
8. Ray, P.C., 1956. History of chemistry in Ancient , Medical India. Indian Chem. Soc., pp: 36.
9. Kirtikar KR, Basu BD. Indian medicinal plants. 2nd edition. Allahabad: Allahabad Press; 1935, p. 785-788.
10. Shahavi VM, Desai SK. Anti-inflammatory activity

- of *Butea monosperma* flowers. *Fitoterapia* 2008; 79: 82-85.
11. Wagner H, Geyer B, Fiebig M, Kiso Y, Hikino H. Isoputrin, butrin, the anti-hepatotoxic principles of *Butea monosperma* flowers. *Plant Med* 1986; 52: 77-79.
 12. Akhtar MS, Naeem F, Muhammad F, Bhatti N. Effect of *Butea monosperma* (Lam.) Taub. (Palas papra) fruit on blood glucose, lipid profiles of normal, diabetic human volunteers. *Afr J Pharm Pharmacol* 2010; 4: 539-544.
 13. Iqbal Z, Lateef M, Jabbar A, Ghayur MN, Gilani AH. In vivo antihelmintic activity of *Butea monosperma* against trichostrongylid nematodes in sheep. *Fitoterapia* 2006; 77: 137-140.
 14. Khan FM. Ethno-veterinary medicinal usage of flora of greater Cholistan desert (Pakistan). *Pakistan Vet J* 2009; 29: 75-80.
 15. Gavimath CC, Sudeep HV, Ganapathy PSS, Rai SP, Ramachandra YL. Evaluation of wound healing activity of *Butea monosperma* Lam. extracts on rats. *Pharmacol-on-line* 2009; 2: 203-216.
 16. Das S, Khan ML, Rabha A, Bhattacharjya DK. Ethnomedicinal plants of Manas National Park, Assam, Northeast India. *Indian J Trad Know* 2009; 8: 514-517.
 17. Tambekar DH, Khante BS. Antibacterial properties of traditionally used medicinal plants for enteric infections by adivasi's (Bhumka) in Melghat forest (Amravati district). *Int J Pharm Sci Res* 2010; 1: 120-128.
 18. Vasudeva N, Rai G, Sharma SK. Anti-spermatogenic activity of *Butea monosperma* Lam. Kuntze root. *Asian J Bio Sci* 2011; 4: 591-600.
 19. Ganesan S, Ponnuchamy M, Kesavan L, Selvaraj A. Floristic composition, practices on the selected sacred groves of Pallapatty village (reserved forest), Tamil Nadu. *Indian J Tradit Knowl*. 2009;8:154-162.
 20. Karuppusamy S. Medicinal plants used by Paliyan tribes of Sirumalai hills of southern India. *Indian J Nat Prod Resour*. 2007;6:436-442.
 21. Sreedhar S, Prakash Kumar U, Rema Shree AB. Pharmacognostic analysis of stem bark of *Combretum albidum* G. Don; an unexplored medicinal plant. *Pharmacogn J*. 2012;4:13-18.
 22. C Chetan, Anajwala, MP Rajesh, LD Sanjay, J K Jariwala. *J Adv Pharm Technol Res*, 2010,1(2),245-252.
 23. D Dubey, MC Sahu, S Rath, BP Paty, N K Debata, R N Padhy. *Asian Pacific journal of tropical biomedicine*, 2012, S846-S854.
 24. Dubey D, Rath S, Sahu MC, Debata NK, Padhy RN. Antimicrobials of plant origin against multi-drug resistant bacteria including the TB bacterium, economics of plantdrugs-introspection. *Indian J Tradit Know* 2012; 11: 225-233.
 25. Ahmad I, Beg AZ. Antimicrobial, photochemical studies on 45 Indian medicinal plants against multi-drug resistant human pathogens. *J Ethnopharmacol* 2001; 74: 113-123.
 26. Wilcox ML, Graz B, Falquet J. Argemone mexicana decoction for the treatment of uncomplicated falciparum malaria. *Trans R Soc Trop Med* 2007; 101: 1190-1198.
 27. Arenstein AW, Cross SA. Local, disseminated disease caused by *Pseudomonas aeruginosa*. In: Mario C, Mauro B, Herman F. (eds.) *Pseudomonas aeruginosa as an opportunistic pathogen*. New York: Plenum; 1993, p. 223-244.
 28. Kreger AS. Pathogenesis of *Pseudomonas aeruginosa* in ocular diseases. *Rev Infect Dis* 1983; 5: 931-935.
 29. S Gnanavel, R Bharathidasan, R Mahalingam, P Madhanraj, A Panneerselvam. *Asian J Pharm Tech*, 2012, 2(1), 08-11.
 30. R Mahalingam, R Bharathidasan, V Ambikapathy, A. Panneerselvam, *Asian journal of plant science and Research*, 2011,1(3), 86-90.
 31. M Senthilkumar, P Gurumoorthi, K Janardhanan. *Natural product radiance*, 2005, 4(1), 27 – 34.
 32. D Dubey, MC Sahu, S Rath, BP Paty, N K Debata, R N Padhy. *Asian Pacific journal of tropical biomedicine*, 2012, S846-S854.
 33. Lohitha P, Kiran VR, Babu KRM, Nataraj K, Rani PA, Madhavi N, et al. Phytochemical screening, in vitro antimicrobial activity of *Butea monosperma* bark ethanolic and aqueous extract. *Int J Pharm Sci Res* 2011; 1: 150-155.

Isolation and Identification of Dermatophytes with Biomaterials Such as Primers for Early Detection

Kanishka Uthansingh¹, Manoj Kumar Sahu², Pradeep Mallick³, Debasmita Behera⁴, Mahesh Ch Sahu⁵

¹PhD Research Scholar, ²Professor & Head, ³Junior Biostatistcian, Department of Gastroenterology, ⁴Associate Professor, Department of Skin and VD, ⁵Assistant Professor, Department of Medical Research Laboratory, IMS & SUM Hospital, Siksha 'O' Anusandhan Deemed to be University

ABSTRACT

Dermatophyte species are normal keratinophilic organisms in charge of superficial contaminations called dermatophytosis or ringworm and made out of three anamorphic genera, Trichophyton, Microsporum and Epidermophyton. Using a few reciprocal atomic techniques, dermatophytes have been appeared to comprise a homogeneous gathering of species with low hereditary decent variety standing out from high phenotypic heterogeneity. Our aim of the study was to identify dermatophytes with biomaterial such as primers for early detection. Till now much of the studies has been done through polymerase chain reaction and few advance techniques been used .In contrast, in all but a few cases distinction between dermatophyte strains has failed, which has hindered the development of molecular-based epidemiological investigations. Here we focused on specific primers to detect dermatophytes at the earliest.

Key words: Dermatophytes, Primers, PCR, Nucleotides, DNA sequence

INTRODUCTION

Dermatophytes are growths that can attack keratinized tissues, causing diseases of the skin, hair and nails¹. Relatively every human contracts something like one such disease in their lifetime. Because of this high occurrence, more than 500 million US dollars are spent every year on antimycotic treatment against dermatophytes². The predominant species experienced in dermatology are grouped in three genera: Trichophyton, Microsporum and Epidermophyton. Trichophyton in a cutting edge sense contains the anthropophilic species, alongside species tainting tamed creatures³.

Routine methodology for dermatophyte species distinguishing proof depend on examination of the province (pigmentation of the surface and invert sides, geography, surface, and rate of development) and

tiny morphology (size and state of macroconidia and microconidia, spirals, nodular organs, and pectinate branches). Encourage recognizable proof qualities incorporate nourishing necessities (vitamins and amino acids) and temperature resistance, and in addition urease generation, antacid creation of bromocresol purple medium, in vitro hair aperture, and so forth⁴. The particular distinguishing proof of dermatophytes isn't constantly conceivable utilizing these conventional, phonetic approaches⁵⁻⁷. Molecular apparatuses, for example, RFLP, arbitrary intensification of polymorphic DNA and other DNA fingerprinting techniques, have likewise been utilized for the ID of chose dermatophytes⁸⁻¹¹.

In the mid 1980s, nucleic corrosive based strategies were utilized to attempt to determine inquiries regarding the transformative connections between dermatophytes. Other atomic techniques that are not reasonable for central investigations, have been as of late created to encourage the depiction of species and strains. Demonstrative and epidemiological applications are conceived.

In spite of the fact that there has been ongoing advancement in the improvement of a continuous PCR for some dermatophytes¹², there is no report of the

Corresponding Author:

Manoj Kumar Sahu, DM

Department of Gastroenterology,
IMS & SUM Hospital, Siksha O Anusandhan (Deemed to be University) Bhubaneswar, Odisha, India,
Pin-751003, Email: manoj_sahu@soa.ac.in

utilization of transformation filtering approaches. PCR-based SSCP investigation has a dazzling limit with regards to the atomic distinguishing proof of different pathogens¹³, gave appropriate DNA markers being used. The first genotypic study on dermatophytes used the base composition of chromosomal DNA of 34 species belonging to the three genera. It showed unexpected results: all species were found to have G>C molar fractions within a narrow range of 48.7–50.3%¹⁴.

The exact role of drug resistance in treatment failure is not clearly understood. This study was designed to identification of dermatophytes with biomaterials such as primers for early detection.

MATERIALS AND METHOD

This was an absolutely lab based investigation incorporating continuous examples got in the mycology research facility from 200 patients clinically associated with dermatophytosis from the dermatology outpatient division of IMS and SUM Hospital from June 2015-2016. Rehash tests from patients were avoided. Moral leeway from the organization was not required, as the examination consolidated the examples sent for routine parasitic examinations and the concise clinical history (statistic information, clinical introduction, and site of association) fused in the examination was given on the examination order frame sent with the example. No extra clinical history was gathered from the patients, and no follow-up was performed.

Tests got were subjected to coordinate minute examination utilizing 10% KOH for skin scrapings or hair and 20% KOH for nail tests. For essential confinement, the examples were vaccinated in Sabouraud's dextrose agar (SDA) slants and were hatched at 25 °C for 30 days before crediting them as negative for fungi.

Recognizable proof of the disconnects was finished by standard mycological research facility strategies including morphology on SDA and potato dextrose agar (PDA). Slide culture or microculture was done to consider the morphology of microconidia and macroconidia, the nature of the sporulation, the development of chlamydospores, or the exceptional structures, for example, spirals, pectinate, the racquet hyphae on corn dinner agar (CMA) and PDA. Other extraordinary tests were performed where vital including hair aperture test and development on rice grain medium. Biochemical tests with urea hydrolysis, 1% peptone agar, and SDA with 5% NaCl were utilized for species distinguishing proof.

After Isolation of DNA from the respected samples purification and amplification of DNA is required

Purification of amplified DNA

Groups of the suitable size were extracted from the agarose gel. DNA extraction from the extracted gel parts was performed and PCR Clean-up unit as indicated by the maker's directions.

RESULTS AND DISCUSSION

For choice of the best restorative system, recognizable proof of dermatophytes at the sort or species level is important. Since traditional research facility systems for the recognizable proof of dermatophytes is either moderate or then again need enough specificity, for some disconnects, the social qualities were conflicting, and additionally testing was required to affirm their personality¹⁵. Use of nucleic corrosive intensification innovation, has made fast and exact distinguishing proof of dermatophytes conceivable, are required¹⁵.

Table 1. Frequency Distribution of Dermatophytes Identified

Disease	<i>T. rubrum</i>	<i>T. mentagrophytes</i>	<i>E. floccosum</i>	<i>T. verrucosum</i>
T.corporis	25	11	3	0
T. cruris	17	12	6	0
T. unguium	4	12	8	0
T. pedis	1	2	4	0
T. barbae	6	2	0	6
Total	152	39	19	6

Table 2. Dermatophytes found in male and in females patients in this study

Result	Male	Female	Total
Dermatophytes	40	14	54
Non Dermatophytes	37	20	57
Total	77	34	111

Table 3. Standard strains of dermatophytes used in this study

Genus Species	MTCC N/A
<i>T.mentagrophytes var. mentagrophytes</i>	MTCC3272
<i>T.mentagrophytes var. interdigitale</i>	MTCC8475
<i>Microsporum canis</i>	MTCC4473

Table 4. Restriction fragments length polymorphism patterns according to species

Species	BsrDI
Trichophytes rubrum	A
T.mentagrophytes var. mentagrophytes	B*
T.mentagrophytes var. interdigitale	B*
T.tonsurans	B*
Microsporum canis	C
M.gypseum	D

Table 5: Trichophyton soudanense strain ATCC 24583 putative secreted metalloprotease 1 (MEP1)

Gene	Forward primers	Annealing temperature	Reverse primers	Annealing temperature	Size of amplicons
MEP1	CGCAAGGCTCTCAATCTTCC	58.99	TCCAGGTCAGAGCCAAAGAG	59.02	160
	TCTTTGGCTCTGACCTGGAG	59.02	ATGATTTACGCTTGCCCTC	58.90	240
	ACGAAAAGGCCGGAAACTTC	59.05	ATGATGGTTCCAGCCTCGAA	59.09	208
	AGGGCAAGCGTGAAATCATC	58.90	GTAGGTCTTGGGTGGGTTC	59.94	224
	ACAACACTACAGACCAAGCCCA	68.86	GAAGTTTCCGGCCTTTTCGT	59.05	170

Table 6: Trichophyton rubrum strain BMU01672 putative secreted metalloprotease 1 (MEP1) gene, partial cds

gene	Forward primers	Annealing temperature	Reverse primers	Annealing temperature	Size of amplicons
MEP1	CGCAAGGCTCTCAATCTTCC	58.99	TCCAGGTCAGAGCCAAAGAG	59.02	160
	TCTTTGGCTCTGACCTGGAG	59.02	ATGATTTACGCTTGCCCTC	58.90	240
	ACGAAAAGGCCGGAAACTTC	59.05	ATGATGGTTCCAGCCTCGAA	59.09	208
	AGGGCAAGCGTGAAATCATC	58.90	GTAGGTCTTGGGTGGGTTC	58.94	224
	ACAACACTACAGACCAAGCCCA	58.86	GAAGTTTCCGGCCTTTTCGT	59.05	170

Table 7: Arthroderma uncinatum strain ATCC 28454 putative secreted metalloprotease 1 (MEP1) gene, partial cds

Gene	Forward primers	Annealing temperature	Reverse primers	Annealing temperature	Size of amplicons
MEP1	TCACGCAACCTACCAAGTCT	58.95	GGGGATGTCTTGAGGTTCCA	59.01	No bands amplified
	TTGCTCAGTACAACCCCGAT	59.02	CGTGGTTGTTGGTCTGGAAG	59.06	No bands amplified
	ACCGACCAAATGCCAAGAAC	59.04	CCTGGGCGTTCAAATGACA	59.04	No bands amplified
	CTCCCGAATCCAAGCCAATG	58.97	AGGTCAAGGCCAAAGATCCA	58.92	No bands amplified
	GACCCTACCGCAAACCTTTG	59.12	ACTTGGTAGGTTGCGTGAGA	58.95	No bands amplified

PCR RFLP gives a quick and down to earth instrument for distinguishing proof of dermatophyte confines that is free of morphological and biochemical qualities and along these lines improves research facility conclusion of dermatophytosis¹⁶. Atomic systems are more helpful for dermatophyte recognizable proof as they are quick and more delicate. Besides, these techniques depend on hereditary cosmetics, or, in other words than phenotypic portrayal, and they can recognize atypical dermatophytes that couldn't be distinguished by culture-based procedures¹⁷. These genotypic methodologies can recognize the dermatophytes to the species and in addition the strain levels¹⁸⁻¹⁹.

Conflict of Interest: There is no conflict of interest

Source of Funding: Nil

Ethical Clearance: Approved from Institutional Ethics Committee

REFERENCES

- Garber G. 2001. An overview of fungal infections. *Drugs* 61 Suppl 1:1-12.
- Graser Y, Scott J, Summerbell R. 2008. The new species concept in dermatophytes -a 383 polyphasic approach. *Mycopathologia* 166:239-256.
- de Hoog GS, Dukik K, Monod M, Packeu A, Stubbe D, Hendrickx M, Kupsch C, Stielow JB, Freeke J, Goker M, Rezaei -Matehkolaei A, Mirhendi H, Graser Y. 2017. Toward a Novel Multilocus Phylogenetic Taxonomy for the Dermatophytes. *Mycopathologia* 182:5-31.
- K. J. Kwon-Chung, J. E. Bennett Dermatophytoses. In: Kwon-Chung K J, Bennett J E, editors. *Medical mycology*, Philadelphia, Pa: Lea & Febiger; 1992. pp. 105-161
- Liu, D., Coloe, S., Baird, R., Pedersen, J., *J. Med. Microbiol.* 2000, 49, 493-497.
- Brilhante, R. S., Rocha, M. F., Cordeiro, R. A., Rabenhorst, S. H., Granjeiro, T. B., Monteiro, A. J., Sidrim J. J., *J. Appl. Microbiol.* 2005, 99, 776-782
- Gra" ser, Y., Scott, J., Summerbell, R., *Mycopathologia* 2008,166, 239-256.
- Brilhante, R. S., Rocha, M. F., Cordeiro, R. A., Rabenhorst, S. H., Granjeiro, T. B., Monteiro, A. J., Sidrim, J. J., *J. Appl. Microbiol.* 2005, 99, 776-782.
- Gra" ser, Y., el Fari, M., Presber, W., Sterry, W., Tietz, H. J., *Br. J. Dermatol.* 1998, 138, 576-582.
- Kim, J. A., Takahashi, Y., Tanaka, R., Fukushima, K., Nishimura, K., Miyaji, M., *Mycoses* 2001, 44, 157-165.
- Mochizuki, T., Tanabe, H., Kawasaki, M., Ishizaki, H., Jackson, C. J., *J. Dermatol. Sci.* 2003, 32, 25-32.
- Arabatzis, M., Xylouri, E., Frangiadaki, I., Tzimogianni, A., Milioni, A., Arsenis, G., Velegraki, A., *Vet. Dermatol.* 2006,17, 322-326.
- Gasser, R. B., Hu, M., Chilton, N. B., Campbell, B. E., Jex, A. R., Otranto, D., Cafarchia, C. *et al.*, *Nat. Protoc.* 2006,1, 3121-3128.
- Davison FD, Mackenzie DWR, Owen RJ. Deoxyribonucleic acid base compositions of dermatophytes. *J Gen Microbiol* 1980; **118**: 465-

470.

15. D. Liu, S. Coloe, R. Baird, J. Pedersen “Application of PCR to the identification of dermatophyte fungi”, *J Med Microbiol*, 2000.49: 493-497.
16. T. Mochizuki, H. Tanabe, M. Kawasaki, H. Ishizaki, C.J. Jackson “Rapid identification of *Trichophyton tonsurans* by PCR-RFLP analysis of ribosomal DNA regions”. *J Dermatol Sci*. 2003, Jun; 32(1):25-32.
17. Y. Graser, M. Fari, W. Presber, W. Sterry, H. J. Tietz, “Identification of common dermatophytes (*Trichophyton*, *Microsporum*, *Epidermophyton*) using polymerase chain reactions”, *Br. J. Dermatol*. 1998.138:576–582
18. S. M. Abdel-Rahman, , S. Simon, K. J. Wright, L. Ndjountche,, A. Gaedigk, “Tracking *Trichophyton tonsurans* through a large urban child care center: defining infection prevalence and transmission patterns by molecular strain typing”. *Pediatrics* 2006. 118:2365–2373.
19. J. Yu, , Z. Wan, W. Chen, W. Wang, R. Li. Molecular typing study of the *Microsporum canis* strains isolated from an outbreak of tinea capitis in a school. *Mycopathologia*, 2004.157:37–41

Diagnosis of Genetic Analysis of Type 2 Diabetes Mellitus and Diabetic Complications at a Tertiary Care Teaching Hospital

Samapika Bhuyan¹, Kanishka Uthansingh¹, Ishwar Chandra Behera²,
Srikant Kumar Dhar³, Mahesh Chandra Sahu⁴

¹Research Scholar, Medical Research Laboratory, ²Professor, Department of Community Medicine, ³Professor, Department of Medicine, ⁴Assistant Professor, Medical Research Laboratory, IMS and SUM Hospital, Siksha O Anusandhan Deemed to be University, K8, Kalinga Nagar, Bhubaneswar, Odisha, India

ABSTRACT

Background: Type 2 diabetes mellitus (T2DM) is a common multifactorial genetic syndrome, which is determined by several different genes and environmental factors. It now affects 150 million people worldwide but its incidence is increasing rapidly because of secondary factors, such as obesity, hypertension, and lack of physical activity. The genetic study should be carried out to determine the genetic factors involved in type 2 diabetes mellitus.

Aim: To find out the genetic diversity of T2DM with respect to TCF7L2, MTHFR, KCNJ11, FOXO1, CNDP1 gene in comorbidity patients.

Materials and Method: A total of 50 diabetic patient's blood samples were collected and their different clinical tests were evaluated. Five genes (TCF7L2, MTHFR, KCNJ11, FOXO1, CNDP1) associated with T2FM were downloaded from NCBI and their respective primer were designed with primer 3 tool online software. The synthesized primers were used for PCR and amplified products were sequenced with sangers methods and verified in BLAST. After identification of gene, the sequence were submitted through blanket and accession numbers were documented. The genetic diversities were determined with different phylogenetic trees.

Results: Among 50 T2DM patients 12 were selected for genetic analysis with respect to their other comorbidity diseases. Out of 12 patients TCF7L2 primer was amplified with 10 patients samples, MTHFR primer was amplified in 9 patients, CNDP1 primer was amplified in 5 patients, KCNJ11 primer was amplified in 5 patient. There was no amplification with FOXO1 primer. From five primers, the sample amplified with TCF7L2 primer was most. So in our case TCF7L2 gene was present in maximum patients.

Conclusions: The study described here will help to establish whether providing type 2 diabetes genetic risk information in a primary care setting can help improve patients' clinical outcomes, risk perceptions, and/or their engagement in healthy behavior change. In addition, study design features such as the use of existing clinic personnel for risk counseling could inform the future development and implementation of care models for the use of individual genetic risk information in primary care.

Keywords: T2DM, genetic diversity, TCF7L2, MTHFR, KCNJ11, FOXO1, Phylogenetic tree

Corresponding Author:

Dr. Mahesh Chandra Sahu, PhD, NPDF,
Assistant Professor, Medical Research Laboratory,
IMS and SUM hospital, Bhubaneswar,
Mail: mchsahu@gmail.com

INTRODUCTION

Type 2 diabetes (T2D) is a complex multifactorial disorder which occurs due to chronic hyperglycemia, impaired insulin secretion from pancreatic b-cells. Increased glucagon secretion from pancreatic a-cells

and insulin resistance in target tissues is another effect of type 2 diabetes. For which aging populations, increasing prevalence of obesity and physical inactivity happens. The number of patients with T2D has dramatically increased worldwide ¹.

A number of genome-wide association studies in diverse human populations have identified more than 60 common variants and loci associated with risk for T2D ². Basically, many genes perform key regulatory functions in the development of T2DM, which is a polygenic disorder with multiple genes located on different chromosomes contributing to its susceptibility. The analysis of genetic factors associated with T2DM is further complicated by the fact that a variety of environmental factors interact with these genes to produce the disorder. In contrast to T1D and T2D, monogenic diabetes represents a form of non-autoimmune, early onset diabetes that is primarily genetic. Maturity onset diabetes of the young(MODY), first reported in 1974 ³. MODY is estimated to represent 1–2% of diabetes ⁴. More than 40 genetic variations that modify the risk of T2DM development have been identified. Causative genetic variations of several monogenic forms of diabetes, including maturity-onset diabetes of the young, neonatal diabetes and maternally inherited diabetes and deafness were successfully identified using this approach ^{5,6,7}. MODY forms of diabetes occur before the age of 25 years. The first gene causally implicated was coded for the enzyme glucokinase (GCK)⁴. A few years later, two other monogenic forms of diabetes, MODY1 and MODY3, were attributed to mutations in transcription factor genes; the hepatocyte nuclear factor 4 and 1 alpha (HNF4A, HNF1A), respectively ^{8,9}. Numerous reports have been published on the genetics of T2DM with most

recent ones showcasing the effect of SNP’s in various genes corresponding to risk prediction of T2DM such as, gene variants of Transcription factor-7-like 2 (TCF7L2), Methylene Tetrahydrofolate Reductase (MTHFR), Potassium channel (KCNJ11), carnosine peptidase 1 gene(CNDP1), Forkhead transcription factor (Foxo1).

In this study designed specific primers to detect other co-morbidities associated with T2DM. Also correlated with clinical and genetic.

MATERIALS AND METHOD

This is a prospective study and carried out in a tertiary care teaching hospital at IMS and SUM Hospital, Bhubaneswar. In this study all suspected cases of diabetes were undertaken and from the all patient the diagnosed diabetes population were participated for the further genetical study to find out other co-morbidity disease, also compared with the clinical symptoms and conventional diagnosis methods.

For which we collected a total sample of 50 patients in IMS & SUM HOSPITAL, BBSR from march for our study. The samples were collected from different medicine wards of the hospital.

Sample collection procedure

The patient’s 2ml of blood sample was collected in EDTA vials to prevent clotting of blood by nurses of different wards. DNA were isolated and used for PCR amplifications. The previously designed marker (Table 1)analysis were conducted using the genomic DNA collected from patient’s blood samples. From a total of 50 samples, only 12 samples were used for gene analysis.

Table 1: Synthesized forward and reverse primers

SL.NO	OLIGONUCLEOTIDE NAME	SEQUENCE 5’-3’	ANNEALING TEMPERATURE (in °c)	H ₂ O ADDED(µl)
1	TCF7L2 F	GGTAATGCAGATGTGATGAGATCT	59.3	227
	TCF7L2 R	AGATGAAATGTAGCAGCGAAGTGC		221
2	MTHFR F	TGAAGGAGAAGGTGTCTGCGGGA	63.85	230
	MTHFR R	AGGACGGTGCGGTGAGAGTG		249
3	KCNJ11 F	CGAGAGGACTCTGCAGTGAG	60.4	258
	KCNJ11 R	GCTTGCTGAAGATGAGGGTC		259
4	FOXO1 F		65.2	214
	FOXO1 R	CGAAGCCCACAACCCACTGAGCATTT		234
5	CNDP1 F	TCATTGAGGGATGGAAGAG	58.35	239
	CNDP1 R	CTGCGAGATACTGGGTGTCA		268

RESULTS

Sample analysis

In the Dissertation period of 3 months, a total number of 50 blood samples were collected from patients admitted to different medicine wards of IMS & SUM Hospital, Bhubaneswar. The patients detected with T2DM and other co-morbidity diseases were admitted. While collecting sample age groups, sex, clinical tests and diseases of the patients were noted cautiously (Fig 1).

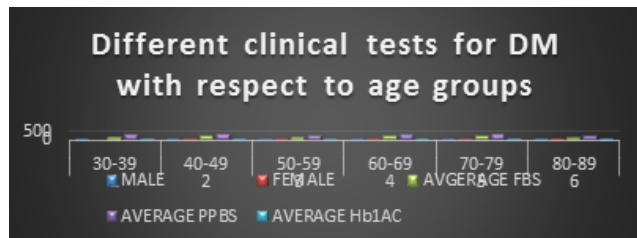


Figure 1. Different clinical tests for DM with respect to age groups

A total number of T2DM patients were screened for FBS, PPBS, Hb1AC. It was revealed that in the age group of 40-49 both FBS and PPBS are high. But in the age group of 70-79 the Hb1AC test is more. Among 50 patients, 33 were male and rest were female. Number of patients with respect to age of male and female were compared with T test and seen that there is no significance among them. Hence T2DM distributed equally in genders

In our study we observed that most of the patients with type 2 diabetes were suffered from HNT. There was patients also had kidney, liver and heart related problems. Some with asthma, migraine, gastric ulcer, neuro dislipidemia, cellulitis, dnp, hypothyroidism related problems. Some of the male had BEP issues(fig 2).

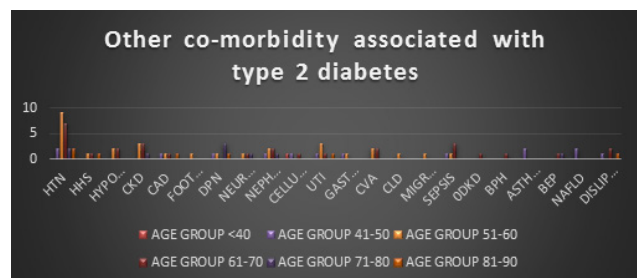


Figure 2. Other co-morbidity associated with type 2 diabetes

For genetic study of 12 patients, 10 different forward and reverse primers were synthesized. The synthesized primers with their nucleotide sequence and length in

base pair were mentioned. The amount of distilled water added (in µl) to use that primers in PCR was noted (Table 1).

PCR amplification result

A good quantity of DNA was revealed. All DNA were diluted to 1 ng/µl for 25µl PCR reactions. No result was revealed in negative control. So it was confirmed that there was no contamination during PCR. Out of 12 samples TCF7L2 primer was amplified with 10 patient's samples (fig 3), MTHFR primer was amplified in 9 patients (fig 4), CNDP1 primer was amplified in 5 patients, KCNJ11 primer was amplified in 5 patients. There was no amplification with FOXO1 primer which mean that there was no morbidities related to this FOXO1 gene in patients we had screened. (fig 4) (Table 2).

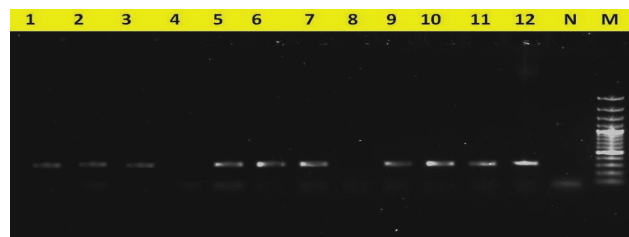


Figure 3. Selected samples were amplified with TCF7L2 primer for identification of disease related to T2D and sequencing

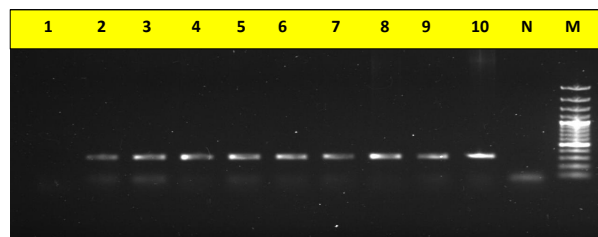


Figure 4. Selected samples were amplified with MTHFR primer for identification of disease related to T2D and sequencing

Table 2: Disease diagnosed by clinical and genetical

SL.NO	PRIMER	Disease	CLINICAL	GENETICAL
1	TCF7L2	T2DM	12	10
2	MTHFR	NEUROPATHY	2	9
3	KCNJ11	DIABETES	12	5
4	FOXO1	OBESITY	3	0
5	CNDP1	DIABETIC NEPHROPATHY	2	5

From the selected 12 patients for clinical study there was 10 patients whose DNA get amplified with TCF7L2 primer, with MTHFR primer was in 9 patients, with KCNJ11 primer was in 5 patients, there was no amplification with FOXO1 primer and with CNDP1 primer was in 5 patients (Table 2).

DISCUSSION

In our study we had taken five genes TCF7L2, MTHFR, KCNJ11, FOXO1 and CNDP1 for gene analysis in T2DM. To identify these genes, a total number of 10 forward and reverse primers were synthesized with the help of NCBI and batch primer 3 tool websites. We observed in maximum patients DNA sample the gene TCF7L2 (SNP marker) with synthesized primers by PCR reactions. Apart from this gene other genes MTHFR, KCNJ11, CNDP1 were also revealed in certain DNA samples with synthesized primers by PCR method. But the genes FOXO1 were not revealed with our synthesized primers.

The Department of Molecular Medicine, University of Texas Health Science Center, USA has done some research to identify TCF7L2-associated combinatorial epigenetic patterns in a diverse set of cell types and they found that for the first time at a genome-wide scale revealed the enhanced transcriptional activity of cell-type-specific TCF7L2 intragenic enhancers in regulating gene expression¹⁰. Tehran University of Medical Sciences, Tehran, Iran investigate the association between MTHFR genotype with diabetic neuropathy to determine whether C677T polymorphism can serve as a useful genetic marker of neuropathy among Iranian patients with type 2 diabetes and found that MTHFR 677 variant confer risk for diabetic neuropathy among Iranian patients with type 2 diabetes¹¹. In another study MTHFR variants were significantly associated with macro albuminuria¹².

Department of Diabetes and Endocrinology, UK aimed to study the effects of a wide range of KCNJ11 mutations and of diabetes duration, in a large sample of patients who attempted to transfer to sulfonylureas from insulin and concluded that Transfer from insulin is successful for most KCNJ11 patients and is best predicted by the *in vitro* response of the specific mutation and the duration of diabetes¹³.

KCNJ11-related neonatal diabetes can almost always be treated with oral SU therapy in place of insulin¹⁴.

Department of Endocrinology, the First Affiliated Hospital of Chongqing Medical University, Chongqing, China aimed to investigate the impact of FOXO1-IRS2 interaction or the 2 genes-environment interactions on T2DM susceptibility in Chinese Han population and concluded that an association of FOXO1 and *IRS2* gene polymorphisms with T2DM in Chinese Han population, supporting FOXO1-obesity interaction as a key factor for the risk of T2DM¹⁵.

CONCLUSION

The disease diagnosis through molecular method is more authentic as compared to conventional method. Here we have diagnosed 50 patients by conventional method and with the help of synthesized primers. We have detected other co morbidity diseases with respect to diabetes. The genetic study will help to establish whether providing type 2 diabetes genetic risk information in a primary care setting can help improve patients clinical outcomes, risk perceptions, and/or their engagement in healthy behavior change. In addition, study design features such as the use of existing clinic personnel for risk counseling could inform the future development and implementation of care models for the use of individual genetic risk information in primary care.

Conflict of Interest: There is no conflict of interest

Source of Funding: Nil

Ethical Clearance: Approved from Institutional Ethics Committee

REFERENCE

1. Chen L, Magliano DJ, Zimmet PZ. The worldwide epidemiology of type 2 diabetes mellitus—present and future perspectives, *Nat Rev Endocrinol.* 2012; 8: 228–6.
2. Bonnefond A, Froguel P. Rare and common genetic events in type 2 diabetes: what should biologists know? *Cell Metab.* 2015; 21(3):357–68.
3. Tattersall RB, Fajans SS. A difference between the inheritance of classical *juvenile-onset and maturity-onset type diabetes of young people.* *Diabetes.* 1975; 24:44–53.
4. Must A, et al. The disease burden associated with overweight and obesity. *JAMA : the journal of the American Medical Association.* 1999; 282:1523–9.

5. Froguel P, Vaxillaire M, Sun F, Velho G, Zouali H, Butel MO, Lesage S, Vionnet N, Clement K, Fougerousse F, Tanizawa Y, Weissenbach J, Beckmann JS, Lathrop GM, Passa PH, Permutt MA, Cohen D. Close linkage of glucokinase locus on chromosome 7p to early-onset non-insulin-dependent diabetes mellitus. *Nature*. 1992; 356:162-4.
6. Vaxillaire M, Froguel P. Monogenic diabetes in the young, pharmacogenetics and relevance to multifactorial forms of type 2 diabetes. *Endocr Rev*. 2008; 29:254-64.
7. Greeley SA, Tucker SE, Worrell HI, Skowron KB, Bell GI, Philipson LH. Update in neonatal diabetes. *Curr Opin Endocrinol Diabetes Obes*. 2010; 17:13-9.
8. Yamagata K, Oda N, Kaisaki PJ, et al. Mutations in the hepatocyte nuclear factor-1alpha gene in maturity-onset diabetes of the young (MODY3). *Nature*. 1996; 384: 455– 58.
9. Yamagata K, Furuta H, Oda N, et al. Mutations in the hepatocyte nuclear factor-4alpha gene in maturity-onset diabetes of the young (MODY1). *Nature*. 1996; 384: 458–60.
10. . Liu Q, Bonneville R, Li T, Jin VX. Transcription factor-associated combinatorial epigenetic pattern reveals higher transcriptional activity of TCF7L2-regulated intragenic enhancers. *BMC genomics*. 2017 Dec; 18(1):375.
11. Hamidi AK, Radfar M, Amoli MM. Association between MTHFR variant and diabetic neuropathy. *Pharmacological Reports*. 2018 Feb 1; 70(1):1-5.
12. Khodaeian M, Enayati S, Tabatabaei-Malazy O, Amoli MM. Association between genetic variants and diabetes mellitus in iranian populations: a systematic review of observational studies. *J Diab Res*. 2015; 2015:21.
13. Babiker T, Vedovato N, Patel K, Thomas N, Finn R, Männikkö R, Chakera AJ, Flanagan SE, Shepherd MH, Ellard S, Ashcroft FM. Successful transfer to sulfonylureas in KCNJ11 neonatal diabetes is determined by the mutation and duration of diabetes. *Diabetologia*. 2016 Jun 1; 59(6):1162-6.
14. Pearson ER, Flechtner I, Njølstad PR, et al. Switching from insulin to oral sulfonylureas in patients with diabetes due to Kir6.2 mutations. *N. Engl. J. Med*. 2006; 355:467–77.
15. Gong L, Li R, Ren W, Wang Z, Wang Z, Yang M, Zhang S. The FOXO1 Gene-Obesity Interaction Increases the Risk of Type 2 Diabetes Mellitus in a Chinese Han Population. *Journal of Korean medical science*. 2017 Feb 1; 32(2):264-71.

Surveillance of Bacteria Associated with UTI and Drug Sensitivity Patterns at a Tertiary Care Teaching Hospital

Srideep Rath¹, Swayamprabha Sahoo¹, Ishwar Chandra Behera²,
Srikant Kumar Dhar³, Mahesh Chandra Sahu⁴

¹Research Scholar, Medical Research Laboratory, ¹Research Scholar, Medical Research Laboratory, ²Professor Department of Community Medicine, ³Professor Department of Medicine, ⁴Assistant Professor, Medical Research Laboratory, IMS and SUM Hospital, Siksha O Anusandhan Deemed to be University, K8, Kalinga Nagar, Bhubaneswar, Odisha, India

ABSTRACT

Background: Urinary Tract Infection (UTI) prevails to be the most common infection among all nosocomial infections. Due to indiscriminate, misuse and over use of antibiotics in ICU, it reveals multidrug resistant (MDR) strains. Proper antibiograms study should be carried out before empirical therapy.

Aim: In this study, we aimed to investigate the common isolates of UTI and their drug susceptibility test and identified the gene responsible for resistance to tigecycline antibiotic.

Materials and method: This study was executed with routine microscopic, identification of organisms and drug sensitivity of isolates from 270 urine samples for a period of six months at Institute of Medical Science and SUM Hospital, Bhubaneswar, Odisha. Bacteria were identified with universal primer (16S rRNA). Bacteria having tigecycline resistant genes were identified using specific primers.

Results: From 270 urine samples, 128 showed significant growth. *P. aeruginosa* was common isolate, followed by *S. aureus*, *E. coli*. In case of fungus, *C. albicans* was common. Bacteria were identified using 16S rRNA primer (8F, 1541R). Drug susceptibility pattern revealed highly resistant to imipenem and azithromycin in case of Gram negative bacteria. However, colistin was sensitive to all. In case of Gram positive cocci, ciprofloxacin and penicillin remained high resistance but chloramphenicol was the most sensitive. For fungal isolates amphotericin and fluconazole remained highly resistant while itraconazole showed high sensitive. By using specific primers (SoxS, acrA and tolC), tigecycline resistant genes were identified in *E. coli* and *Shigella* species.

Conclusion: Empirical use of antibiotic should not be practiced while prescribing drugs. Proper identification and drug susceptibility pattern of organisms should be conducted before prescribing a drug. PCR method should be implemented for early detection of antibiotic resistance patterns.

Keywords: Nosocomial infection, MDR, 16S rRNA, Tigecycline, Empirical therapy, ICU.

INTRODUCTION

Among all nosocomial infections, Urinary tract infection (UTI) prevails to be the most common all

around the globe¹. UTIs are caused by microbial invasion into urinary tract that extends from renal cortex of kidney to the urethral meatus. Many evidences revealed that UTI is solo responsible for high consumption of antibiotic in both community and hospitalized patients¹.

Corresponding Author*

Dr. Mahesh Chandra Sahu, PhD, NPDF,
Assistant Professor, Medical Research Laboratory,
IMS and SUM hospital, Bhubaneswar,
E-Mail: mchsahu@gmail.com

In hospitals prolonged use of catheter increases the chances of UTI. But recurrence of UTI can lead to irreversible damage of the kidneys, resulting in renal hypertension and renal failure². Another type of UTI is

kidney infection, also known as pyelonephritis. But this can be diagnosed by quantitative urine cultures and bit more prolonged course of antibiotic therapy³.

In case of elderly individuals, colonization of bacteria in genitourinary system is common at any time. These bacteria may be associated with symptoms and thus require treatment with an antibiotic. The presence of bacteria in the urinary tract of older adults, without symptoms or associated consequences is also a well-recognized phenomenon, which may not require antibiotics⁴. But use of antibiotics in this context facilitates the emergence of multidrug resistant bacteria. The admittance of old aged patients to hospitals have low immune-competence as compared to adults, which reveals more UTI⁵.

Emergence of multidrug resistant bacteria (MDR) in present world, pose epic difficulties in clinical management by increasing the overall vulnerability of human health particularly in developing countries like India^{6,7}.

Many factors paves the path for emergence of MDR bacteria: first, for quick relieve from infection, use of latest generation form of antibiotic⁸; second, giving less importance to drug history of patient during prescription; third, irregularity in the use of antibiotics by the patient during treatment period; fourth, lower level of dose, far below the 'mutant preventive concentration'⁹; fifth, intake of medicines by patients without a proper prescription¹⁰.

Occurrence of nosocomial infections from intensive care units (ICUs) has also been reported due to the 'severity of infection by one or other pathogen in patients with pestiferous wounds.' Despite of better cleanliness around the hospital environments, device associated infections has also been reported from many hospitals due to human error¹¹.

An important cause of nosocomial infection can be sited as lack of general awareness among the public as well as health care workers. However, awareness can be sprouted among public under an effective medical surveillance system¹². For prevention aseptic general practices must be used and proper antibiotic should be prescribed by proper culture and identification of microorganisms. So microscopic analysis and proper identification should be carried out for better treatment and rule out the prescription of antibiotics.

In this study, the causative organisms for UTI as well as their antibiotic sensitivity pattern was carried out among all patients admitted to neuroscience intensive care unit (NSICU) of a tertiary care teaching hospital in eastern Odisha.

MATERIALS AND METHOD

This prospective study was carried out for a period of 6 months (Jan to June 2018) and this study was approved from the Ethics Committee of our esteemed Institute. A total of 270 urine samples were obtained from Neuroscience Intensive care unit (NSICU), IMS and SUM Hospital, Bhubaneswar, Odisha. All the samples were processed with in 3 hr of collection, for routine microscopic urine were centrifuged at 19,000 RPM for 5 minutes. The pallet was collected and inoculated on Cystine-Lactose-Electrolyte Deficient (CLED), Blood Agar (BA) and MacConkey Agar (MAC) plates and incubated at 37°C for 24 hours. All the bacteria were identified with culture morphology and biochemical tests of conventional methods and antibiotic sensitivity patterns were carried out by disc diffusion methods.

RESULTS

Of the 270 urine samples, 128 (47.4%) showed significant growth. More than 3 colony cultures were taken as contamination. Out of 128 growths, 39.25% had single colony, 7.03% had two colonies and 0.74% had three colonies. (Table 1)

Table 1: Occurrence of colony from single culture.

Sl. No	No. of colony	Frequency	Percentage
1	Single colony	106	39.25
2	Two colonies	19	7.03
3	Three colonies	2	0.74
4	More than three colonies	1	0.37
5	No growth	142	52.29
	Total	270	

Samples were collected from different age groups of both male and female patients, admitted to NSICU. Male patients were more in number than female patients. Age group study revealed that admittance of patients of age group 40-60 had highest (38.1%) percentage among others. (Table 2)

Table 2: Distribution of patients according to age groups.

Sl.no	Age group	No. of males	No. of females	Percentage
1	0-20	7	1	2.9
2	20-40	31	22	19.6
3	40-60	74	29	38.1
4	60-80	61	30	33.7
5	80-100	11	4	5.5
	Total	184	86	

Patients having many diseases were admitted, whereas Diabetic patients were more than others. This study also revealed that female patients with Urinary Tract Infection (UTI) were more in number than male patients. (Table 3)

Tab 3: Distribution of patients according to diseases.

Sl. No	Name of diseases	Number of males	Number of females
1	Diabetes	20	14
2	RTA	17	0
3	SAH	10	3
4	Head injury	18	0
5	ARDS	5	4
6	HTN	13	4
7	CVA	35	12
8	UTI	1	12
9	Others	65	37
	Total	184	86

Routine and microscopic of urine samples concluded that presence of fungus, crystals, pus cell, hyphae and bacteria in case of diabetic patients was more than others. In case of urinary tract infection patients the occurrence of bacteria was high. (Table 4)

Table 4: Routine and microscopic (in %) of urine samples with diseases

Sl.NO	Diseases	Pus cell	RBC	WBC	Fungus	Hyphae	Crystals	Bacteria
1	Diabetes	80	10	30	86	90	100	50
2	RTA	40	20	45	0	0	12.2	0
3	SAH	56	10	20	0	0	19.6	0
4	Head injury	20	0	12	0	0	10	0
5	ARDS	30	0	11.5	12	14	5.5	0
6	HTN	45	0	23	56.5	58.5	21.4	0
7	CVA	55	20	56	45.2	46.1	10.9	22.5
8	UTI	60	10	41	30	36	21.4	56.4
9	Others	88	40	55.3	34.8	40	30.1	10.1

The distribution of gram negative and gram positive isolates is listed in table 5. Of all bacteria, *Pseudomonas sp.* (21.9%) was frequent, followed by *Staphylococcus aureus* (14.6%), *E. coli* (10.9%), *Enterococcus* (9.7%), *Coagulase negative Staphylococcus* (9.7%), *Streptococcus* (8.5%), *Shigella sp.* (7.3%), *Proteus vulgaris* (4.8%), *Acinetobacter sp.* (4.8%), *Gram positive Bacillus* (3.6%), *Serratia sp.* (2.4%) and *Enterobacteraerogenes* (1.2%).

Susceptibility Data

For all gram negative and gram positive bacteria, 16 different antibiotics of different class were used. For gram negative bacteria, 10 class of antibiotics and for gram positive bacteria, 8 classes of antibiotics were chosen.

Gram negative bacteria data

Out of 10 class of antibiotics, gram negative bacteria were highest resistant to macrolids, carbapenems,

aminoglycosides, oxazolidinones. But were least resistant to polymixins class. Class β -lactams showed variable result. *Pseudomonas sp.* showed highest percentage of resistant to all antibiotics except colistin (38.4%) and tigecycline (45%). *Escherichia coli* showed variable percentage of resistant to all classes. Class polymyxins showed highest percentage of susceptible for all gram negative bacteria.

Gram positive bacteria data

Staphylococcus aureus showed highest percentage of resistant to all antibiotics except chloramphenicol (0%). *Streptococcus sp.* and *Gram positive bacillus* showed variable results. But *coagulase negative staphylococcus* showed highest percentage of resistant to all antibiotics as compared to other species. Again class β -lactams, cephalosporins, macrolides and aminoglycosides were least susceptible for all gram positive bacteria. Class 3rd generation cephalosporins and chloramphenicol showed highest percentage of susceptible for all gram positive bacteria. (Table 5)

Table 5: Total number and percentage of isolated organisms.

Sl. No	Name of organisms	Frequency	Percentage
1	<i>Pseudomonas sp.</i>	18	21.9
2	<i>Staphylococcus aureus</i>	12	14.6
3	<i>Escherichia coli</i>	9	10.9
4	<i>Enterococcus</i>	8	9.7
5	CONS	8	9.7
6	<i>Streptococcus</i>	7	8.5
7	<i>Shigella sp.</i>	6	7.3
8	<i>Proteus vulgaris</i>	4	4.8
9	<i>Acinetobacter sp.</i>	4	4.8
10	GPB	3	3.6
11	<i>Serratia marcescens</i>	2	2.4
12	<i>Enterobacteraerogenes</i>	1	1.2
	Total	82	

Note: RTA (Renal tubular acidosis), SAH (Subarachnoid hemorrhage), ARDS (Acute respiratory distress syndrome), HTN (Hypertension), CVA (Cerebrovascular accident), UTI (Urinary tract infection).

DISCUSSION

From the study, it was confirmed that bacteria have evolved to be resistant to different classes of antibiotic¹³.

Increase of antibiotic resistant bacteria had become a global issue because of its capability in causing severe and lethal infection.¹²

Our study revealed that prevalence of gram negative bacteria was higher and *Enterobacteriaceae* family was highest among them. This data was also recorded in many studies of UTIs¹⁴⁻¹⁶.

In this study, *Pseudomonas* sp. was the most frequently isolated microorganism (21.9%). But in other studies *E.coli* was the common isolate^{17,18}. *Staphylococcus aureus* was the second most common isolates in our study (14.6%). But in many studies, other bacteria were common¹⁹. *E.coli* was third isolate (10.9%).

Percentage resistance of all gram negative bacteria to imipenem was higher, which is in accordance with other literatures¹². But in a study all MDR were susceptible for imipenem²⁰. Azithromycin and clarithromycin were also least susceptible for all gram negative bacteria. In our study, resistant percentage of all gram negative bacteria to 3rd generation cephalosporin and amikacin was higher, while in other study, it showed susceptible¹⁷. All studies showed that colistin was susceptible for many gram negative bacteria, which confirms that it can be used as antibiotic for UTIs.

Our article showed that *Pseudomonas* sp. had highest percentage of resistant to all antibiotics than other bacteria, which is in accordance with another study, where *E.coli* and *Klebsiella pneumoniae* being highest isolates were least resistant to many antibiotics than *Pseudomonas* sp. and *Proteus vulgaris*²⁰. An interesting data came out of a study that in ED (Emergency Department) *E.coli* remained the most common pathogen in both MDR and non-MDR UTIs. Among non-MDR UTIs, except ampicillin, other antibiotics used were susceptible. For MDR UTIs, carbapenems (100%) and amikacin (90%) were susceptible²¹. But our study revealed that all organisms were high resistant to both carbapenems and amikacin, which is a matter of discussion that now a days many organisms are evolving to be MDR by being resistant to commonly used antibiotics.

In case of gram positive bacteria, *Staphylococcus aureus* showed resistant to all antibiotics except chloramphenicol. Vancomycin showed variable results. GPB was 100% resistant to vancomycin but *Staphylococcus aureus* showed 50% resistant. Vancomycin was a perfect antibiotic for all gram positive bacteria²². But our study revealed that chloramphenicol is the perfect antibiotic for gram positive bacteria.

In summary, our study suggested that in NSICU maximum number of diabetic patients suffer from UTIs. The UTIs might affect the islet function or blood glucose control in patients with T₂DM. Patients getting admitted

to ICU should go through routine urine checkup. So that infection can be controlled in a least lethal condition. From our study, *Pseudomonas* sp. was highest isolated gram negative bacteria, followed by *Staphylococcus aureus*. Antibiotic susceptibility showed resistant of *Pseudomonas* sp. to commonly used imipenem antibiotic but was susceptible for colistin. *Staphylococcus aureus* showed highest resistant to ciprofloxacin and ofloxacin but was susceptible for chloramphenicol. So when a consultant specialist prescribes antibiotics for UTIs, he/she should go for antibiotic susceptibility test results and select a best antibiotic so that chances of recurrent should be minimal.

CONCLUSION

This study showed that all the isolated organisms were resistant to more than 5 to 6 antibiotics, which is an alarming issue for doctors. Instead of *E.coli*, *Pseudomonas* sp. was highest isolates and resistant of it to many antibiotics confirmed its evolution to MDR. MDR bacteria became a major problem for the doctors because of its life threatening infection. A strict antibiotic prescription should be made to stop this infection. This study can be concluded that in case of gram negative bacteria colistin and in case of gram positive bacteria chloramphenicol can be used as antibiotic.

Conflict of Interest: There is no conflict of interest

Source of Funding: Nil

Ethical Clearance: Approved from Institutional Ethics Committee

REFERENCES

1. Al Sweih N, Jamal W, Rotimi VO. Spectrum and antibiotic resistance of uropathogens isolated from hospital and community patients with urinary tract infections in two large hospitals in Kuwait. *Med Prin and Pract.* 2005;14(6):401-407.
2. Das RN, Chandrashekhara TS, Joshi HS, Gurung M, Shrestha N, Shivananda PG. Frequency and susceptibility profile of pathogens causing urinary tract infections at a tertiary care hospital in western Nepal. *Sing med j.* 2006;47(4):281.
3. Orenstein R, Wong ES. Urinary tract infections in adults. *American family physician.* 1999;59(5):1225-1234.
4. Larsen EH, Gasser TC, Madsen PO. Antimicrobial

- prophylaxis in urologic surgery. *The Uroclin of Nor Ame*. 1986;13(4):591-604.
5. Rath S, Dubey D, Sahu MC, Debata NK, Padhy RN. Surveillance of ESBL producing multidrug resistant *Escherichia coli* in a teaching hospital in India. *Asian Pacific journal of tropical disease*. 2014;4(2):140-149.
 6. Navaneeth BV, Sridaran D, Sahay D, Belwadi MR. A preliminary study on metallo-[beta]-lactamase producing *Pseudomonas aeruginosa* in hospitalized patients. *Ind J of Medical Research*. 2002;116:264.
 7. Varaiya A, Kulkarni N, Kulkarni M, Bhalekar P, Dogra J. Incidence of metallo beta lactamase producing *Pseudomonas aeruginosa* in ICU patients. *Ind J of Medical Research*. 2008;127(4):398.
 8. Suttajit S, Wagner AK, Tantipidoke R, Ross-Degnan D, Sitthi-amorn C. Patterns, appropriateness, and predictors of antimicrobial prescribing for adults with upper respiratory infections in urban slum communities of Bangkok. *Southeast Asian journal of tropical medicine and public health*. 2005;36(2):489.
 9. Ferrari R, Magnani M, Souza RB, Tognim MC, Oliveira TC. Mutant prevention concentration (MPC) of ciprofloxacin against *Salmonella enterica* of epidemic and poultry origin. *Current microbiology*. 2011;62(2):628-632.
 10. Wattal C, Joshi S, Sharma A, Oberoi JK, Prasad KJ. Prescription auditing and antimicrobial resistance at a tertiary care hospital in New Delhi, India. *Journal of Hospital Infection*. 2005;59(2):156-158.
 11. Dubey D, Rath S, Sahu MC, Pattnaik L, Debata NK, Padhy RN. Surveillance of infection status of drug resistant *Staphylococcus aureus* in an Indian teaching hospital. *Asian Pacific journal of tropical disease*. 2013;3(2):133-142.
 12. Sahu MC, Dubey D, Rath S, Debata NK, Padhy RN. Multidrug resistance of *Pseudomonas aeruginosa* as known from surveillance of nosocomial and community infections in an Indian teaching hospital. *Journal of Public Health*. 2012;20(4):413-423.
 13. Akram M, Shahid M, Khan AU. Etiology and antibiotic resistance patterns of community-acquired urinary tract infections in JNMC Hospital Aligarh, India. *Annals of clinical microbiology and antimicrobials*. 2007;6(1):4.
 14. Ben Haj Khalifa A, Khedher M. Frequency and antibiotic resistance in uropathogenic bacteria in the University Hospital TaharSfar of Mahdia. *Rev TunInfectiol*. 2010;4:57-61.
 15. Marzouk M, Ferjani A, Haj Ali M, Boukadida J. Profile and susceptibility to antibiotics in urinary tract infections in children and newborns from 2012 to 2013: data from 1879 urine cultures [in French]. *Arch Pediatr*. 2015;22:505-509.
 16. Smaoui S, Abdelhedi K, Marouane C, Messadi-Akrout F. Antibiotic resistance of community-acquired uropathogenic *Enterobacteriaceae* isolated in Sfax (Tunisia). *Med Mal Infect*. 2015;45:335-337.
 17. Guermazi-Toumi S, Boujlel S, Assoudi M, Issaoui R, Tlili S, Hlaiem ME. Susceptibility profiles of bacteria causing urinary tract infections in Southern Tunisia. *Journal of global antimicrobial resistance*. 2018;12:48-52.
 18. Sibi G, Kumari P, Kabungulundabungi N. Antibiotic sensitivity pattern from pregnant women with urinary tract infection in Bangalore, India. *Asian Pacific journal of tropical medicine*. 2014;7:S116-120.
 19. Prakasam AK, Kumar KD, Vijayan M. A cross sectional study on distribution of urinary tract infection and their antibiotic utilisation pattern in Kerala. *Int J PharmTech Research*. 2012;4(3):1306-1309.
 20. Iqbal R, Majid A, Alvi IA, Hayat A, Andaleeb F, Gul S, Irfan S, Rahman MU. Multiple drug resistance and ESBL production in bacterial urine culture isolates. *American Journal of BioScience*. 2014;2(1):5-12.
 21. Khawcharoenporn T, Vasoo S, Singh K. Urinary tract infections due to multidrug-resistant *Enterobacteriaceae*: prevalence and risk factors in a Chicago Emergency Department. *Emergency medicine international*. 2013;2013.
 22. He K, Hu Y, Shi JC, Zhu YQ, Mao XM. Prevalence, risk factors and microorganisms of urinary tract infections in patients with type 2 diabetes mellitus: a retrospective study in China. *Therapeutics and Clinical Risk Management*. 2018;14:403.

Surveillance of Organisms Associated with CSOM and Otomycosis at a Tertiary Care Teaching Hospital

Swapnarani Sahoo¹, Santosh Kumar Swain,² Smrutipragnya Samal³, Mahesh Chandra Sahu⁴

¹Professor, Department of Otorhinolaryngology, ²Research Scholar, Department of Otorhinolaryngology, ³Assistant Professor, Medical Research Laboratory, IMS and SUM hospital, Siksha "O" Anusandhan University, K8, Kalinganagar, Bhubaneswar, Odisha, India

ABSTRACTS

Background: To isolate causative organisms and drug sensitivity pattern for CSOM associated Otomycosis patients. Bacteria and fungus were identified with conventional macroscopic and microscopic staining procedures.

Materials method: A total 128 samples were collected from ear infection patients and processed those in different agar media for identification of organism and for antibiotic susceptibility test of those organisms was performed against the commonly used antibiotic and antifungal drug

Result: out of 128 samples, a total of 79 organisms were identified as bacteria and 38 organisms were identified as fungus. It was revealed that *C. tropicalis* (41.66%) was predominant in Otomycosis and *aspergillus* sp. (5.55%) was the least causative organism.

Conclusion: The *aspergillus* and *candida* species are the most common fungal isolates and *s.aureus* and *pseudomonas* species are most common bacterial isolates in ear infection. In ear discharging patient both CSOM and Otomycosis can be revealed. So, before treatment the causative organism and their drug sensitivity pattern should be carried out. The empirical therapy should be avoided and for early detection of drug sensitivity pattern PCR method should be implemented.

Keyword: *Candida*, CSOM, antifungal drug, antibiotic susceptible, Otomycosis

INTRODUCTION

In daily clinical practice, the discharging ear are often due to Chronic suppurative otitis media (CSOM) and otomycosis. CSOM is an inflammation of the middle ear cleft, with or without intact tympanic membrane. CSOM is defined as infection of the middle ear that lasts for >3 months and is accompanied by tympanic membrane perforation¹. Otitis media is known to be one of most common childhood infections and a leading reason for antibiotic prescriptions in the developed world². It is one of the most common diseases of all

age groups, especially of childhood. The incidence of CSOM is higher in developing countries, especially among the low socioeconomic strata of the society (with an urban rural ratio of 1:2) because of poor nutrition, improper hygiene, and lack of health education³. The disease is highly prevalent in tropical regions including South Asia⁴.

Fortunately, with progress in medical diagnosis and antibiotic therapy, it is unusual for otitis media to manifest its lethal potential. Nonetheless, a clear understanding of the pathology of otitis media is important for the clinician to be able to distinguish between infection that can be controlled by antibiotics and those that require surgical intervention⁵. However, a systematic review found no clear evidence that antibiotics are effective in preventing the progression of AOM to CSOM even among children who are at high risk for the disease⁶. Fungal infections

Corresponding Author:

Dr. Mahesh Chandra Sahu, PhD

Assistant Professor, Directorate of Medical Research,
IMS and SUM Hospital, Bhubaneswar
Email: mchsahu@gmail.com

superimposed over chronic suppurative otitis media is suspected when the discharging ear does not respond to local antibiotic ear drops⁷.

Incidence of chronic suppurative otitis media has been reported varying from 2.55% to 9.25%. In PGI Chandigarh incidence was 11% in ENT OPD⁸. In the recent year, prevalence of fungal infections including the middle ear and inner ear is on the increase dramatically because of increased use of broad spectrum antibiotics, cytotoxic chemotherapy, increased incidence of diabetes, corticosteroids, immuno-suppressants, tuberculosis and AIDS. In addition to these factors, poor socio-economic status, swimming habits, water supply, scratching the ear canal with infected nail with fungus may also lead to superadded fungus infection^{7,8}. Use of local steroids provoke the incidence of fungal infections. Local steroids therapy lower down resistance, makes a room for fungus growth through external auditory canal⁹.

The present study was carried out to know the incidence of fungal infection in CSOM patients and to evaluate whether the fungus is primary or secondary infection. Also undertaken the drug sensitivity patterns for both isolated bacteria and fungi.

MATERIALS AND METHOD

This prospective study was carried out in IMS and SUM hospital Bhubaneswar from march to June 2018. This study was approved from the institutional ethical committee of the respected institute. The study was carried out on 128 patients attending the outpatient department of otorhinolaryngology.

Processing of sample

The collected samples were processed within 4-6 hours of collection. The samples were first cultured in

blood agar (BA) plate and MacConkey (MAC) plate sabouraud’s dextrose agar (SDA) plate. The inoculated plates were incubated at 37 for 24 hours to 48 hours. Then the samples were kept in incubation with 2ml of NB (Nutrient broth). Then after 24 hours the result of cultured plate was studied and noted. The isolated bacteria were identified by both colony morphology and biochemical characteristics.

Antifungal Screening of isolated fungus

Fungal isolates were tested for antifungal susceptibility testing by using Standard Kirby Bauer’s disc diffusion method. Standard inoculums were made by taking 1-2 colonies and were dip into liquid SDB and put in to shaker for 3 hours. After 3 hours the liquid fungal culture was spread plated on SDA plates or Potato Dextrose Agar (PDA) plates using sterile spreader. Antifungal impregnated disks (Table 4) were placed onto the medium using an automated disk dispenser. SDA/PDA plates were then incubated at room temperature for 48 hours. After 48 hours the clear inhibition zones were measured and interpreted by clinical and laboratory standards to check the resistance pattern of each microbial isolates.

RESULT

Ear infection is mainly caused by bacteria and fungus (CSOM and otomycosis). In this study total number of 128 ear infection patients was enrolled to know the causative organism for it. It was seen that among 128 ear infection patients 74 was from urban and rest 54 from rural area. With diagnosis it was revealed 44 patients were chronic suppurative otitis media (CSOM) and rest 55 were otomycosis. It was also documented as 29 patients were infected with both CSOM and otomycosis (Fig 1).

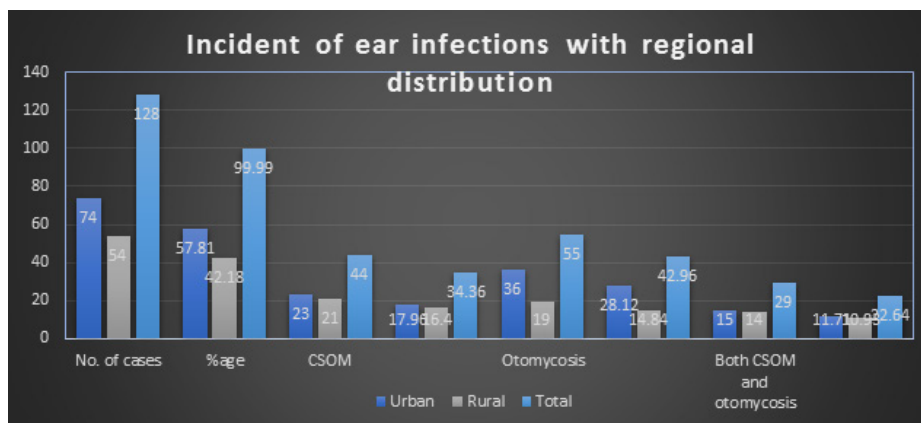


Fig 1: Incident of ear infections with regional distribution

All age group patients were participated in this study and it was found that ear infection is common at all age groups. The duration of discharge was documented with respected to age group. ANOVA test was applied to know role of duration of discharge with respect to age group but it was revealed that statistically it was insignificant with $p=0.25$. So, CSOM and otomycolosis can cause at any age groups (Fig 2).

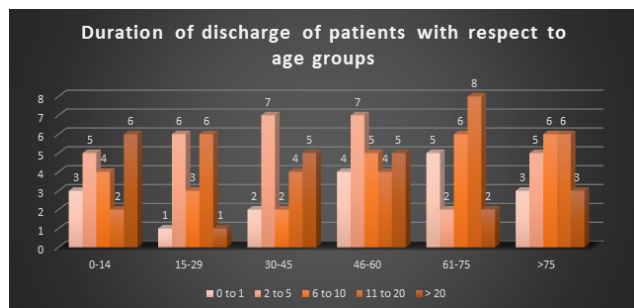


Fig 2: Duration of discharge of patients with respect to age groups

Different types of discharges were found in this study and all type of discharge were documented and it was found that 48 patients were mucopurulent discharge. The nature of discharge in male and female were compared with T-test and it was revealed that there was no significant with respect to discharge as $p=0.91$ with T-test (Fig 3).

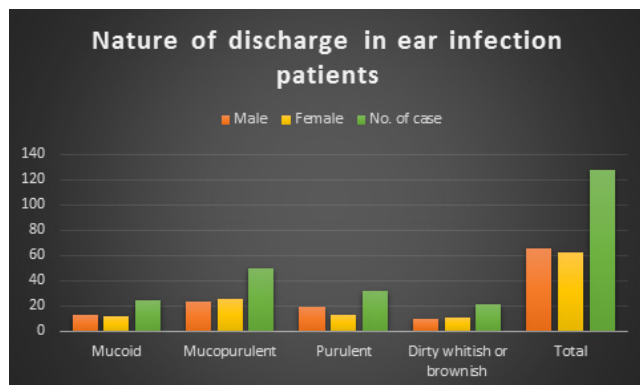


Fig 3: Nature of discharge in ear infection patients

Bacteriological and Fungal Work

All ear swab samples were culture in different agar media to observe the colony, morphology of the organism. It was observed that in 11 samples there was no growth (8.59%) whereas the single colonies were identified with 105 samples. A total no of 117colonies are identified with 128number of ear discharge samples. Among 117 microbial colonies, maximum 82.03% single colonies were found whereas 8 double colonies and 4 three or more colonies were revealed (Fig 4).

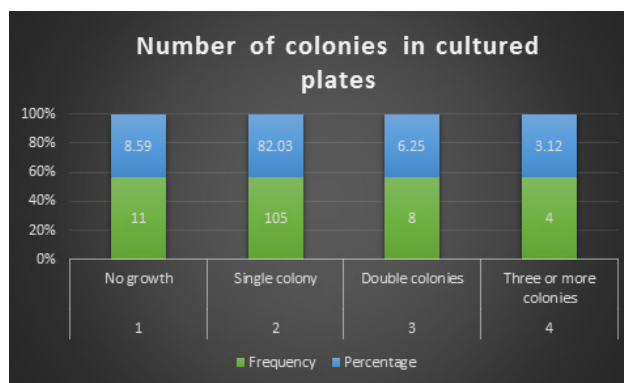


Fig 4: Number of colonies in cultured plates

Grams staining results

Grams staining showed 4 groups of results such as; Gram negative bacteria (GNB), Gram positive cocci (GPC), Gram positive bacilli (GPB) and Budding yeast colony (BYC). Occurrence of BYC was highest among all, followed by GPC, GNB and GPB (Fig5).

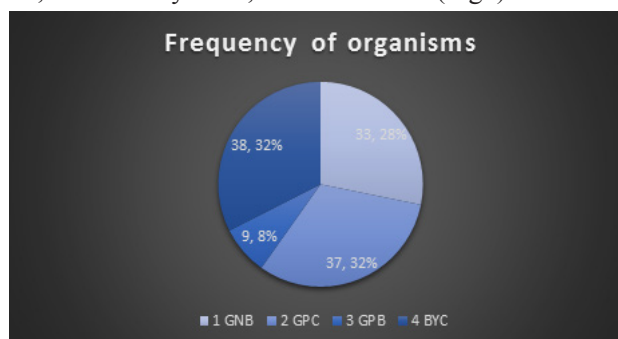


Fig 5: Frequency of organisms

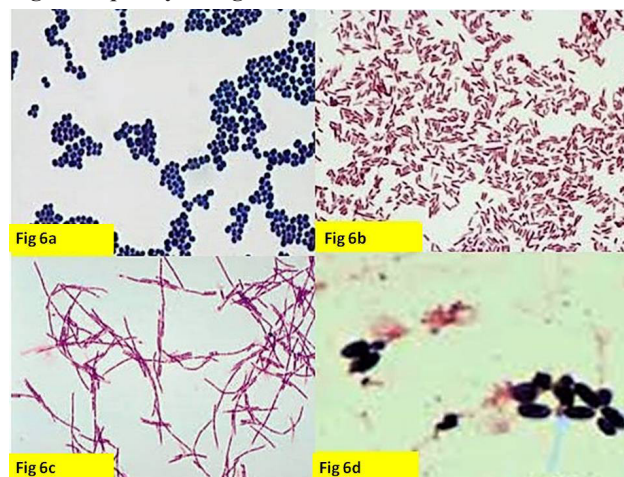


Fig 6: Gram stains result, 6a- GPC, 6b- GNB, 6c- GPB, 6d- BYC.

Lactophenol Cotton Blue Staining of fungi

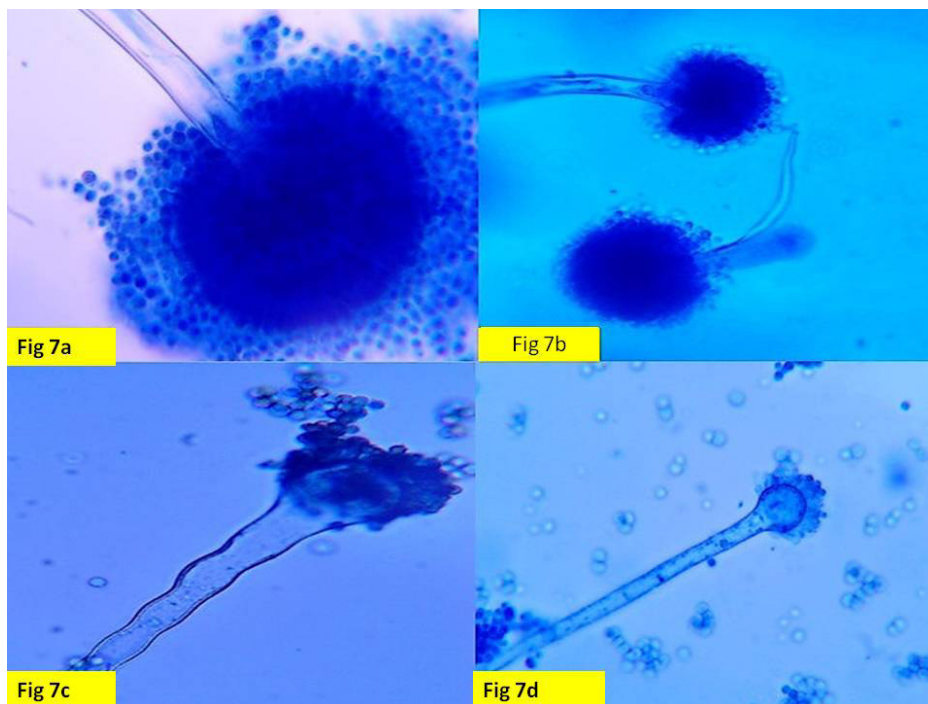


Fig 7: Cotton blue stain of aspergillus

All isolated bacteria were identified with both culture morphology and biochemical test. There was 11 bacterial species were identified in this study. The total number of isolated bacteria were 79 whereas *S. aureus*(22.78%) was predominant followed by *pseudomonas aeruginosa*(21.51%).A total number of 11 different bacteria species were identified from 128 samples. Total number of *Staphylococcus aureus* was

18 (22.78%), *Coagulase negative staphylococcus* was 9 (11.39%), *Pseudomonas* species was 17 (21.51%), *Proteus* species was 4 (5.06%), *Acenetobacter* was 4 (5.06%), *Salmonella* species was 4 (5.06%), *Streptococcus* was 5 (6.32%), *Enterococcus* was 5 (6.32%), *Gram positive bacillus* was 9 (11.39%), *Shigella* sp. was 3 (3.79%) and *Klebsiella* was 1(1.26%) (Fig8).

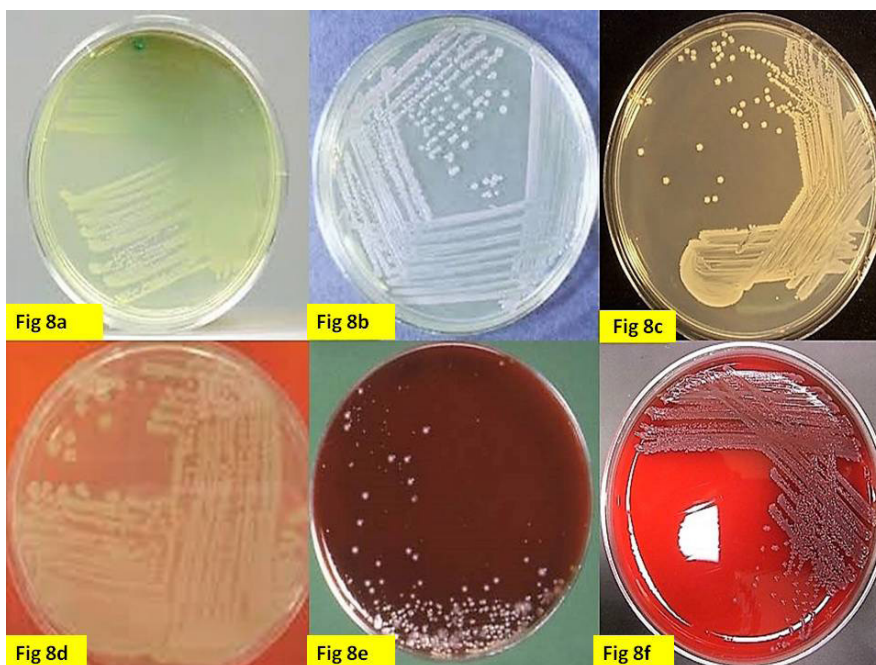


Fig 8: 8a- Pseudomonas on NA, 8b-Klebsiella on NA, 8c-Proteus on NA, 8d-Acinetobacter on NA, 8e- Shigella on BA, 8f- Salmonella on BA.

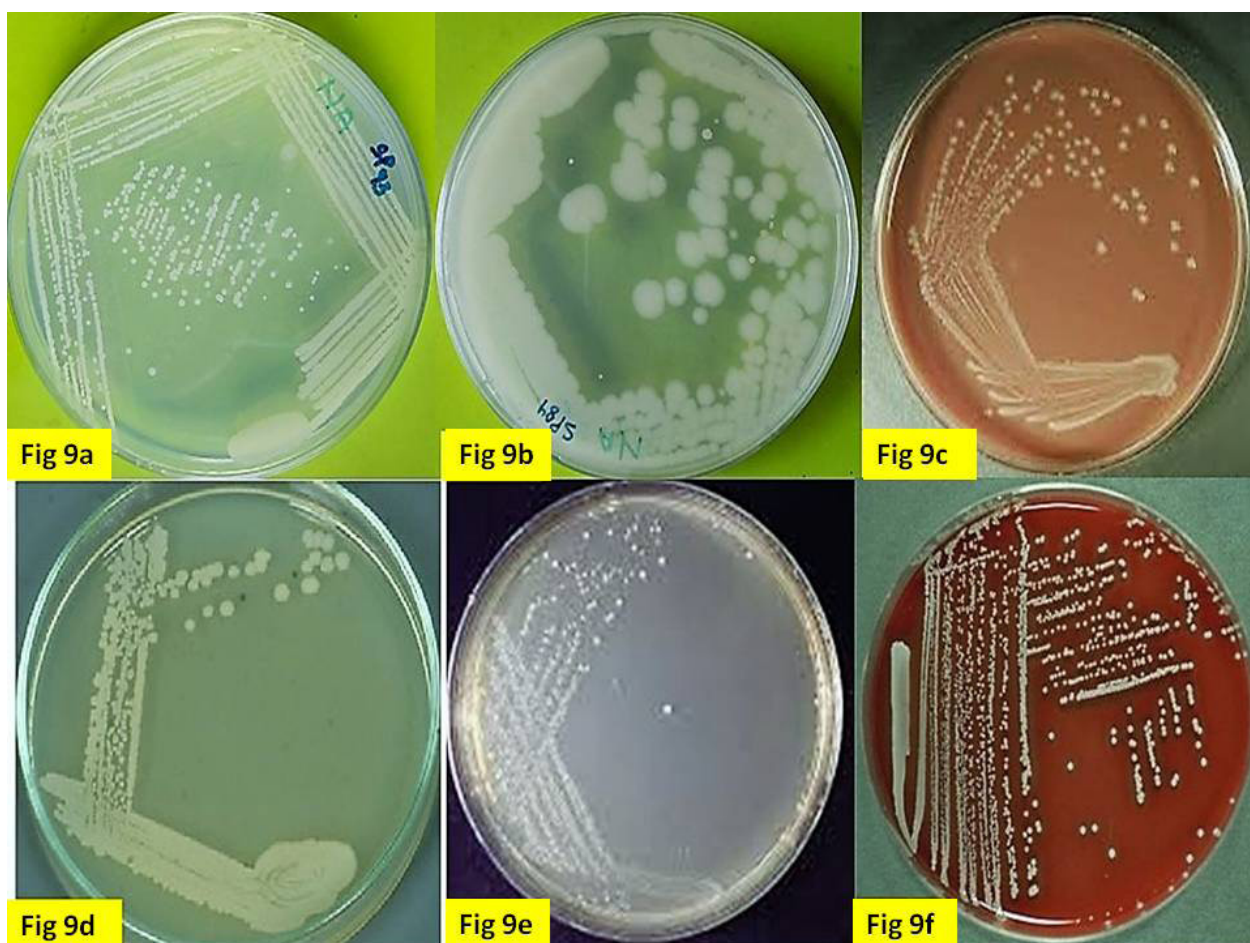


Fig 9: 9a- *Cons.* On NA, 9b- *GPB* on NA, 9c- *Streptococcus* on BA, 9d- *S. aureus* on NA, 9e- *Enterococcus* on NA, 9f- *S. aureus* on BA.

In all otomycosis patients the causative fungi were identified with the culture morphology, microscopic and with specific Candida differential agar medium. It was revealed that *C. tropicalis* (41.66%) was predominant in otomycosis and *aspergillus* sp. (5.55%) was the least causative organism in otomycosis. A total number of 5 fungal strains were identified in this study. There was 25% of *C. albicans*, 41.66% of *C. tropicalis*, 19.44% of *C. glabrata*, 8.33% of *C. krusei* and a total of 5.55% of *aspergillus* sp. were characterized in this study (Fig11).

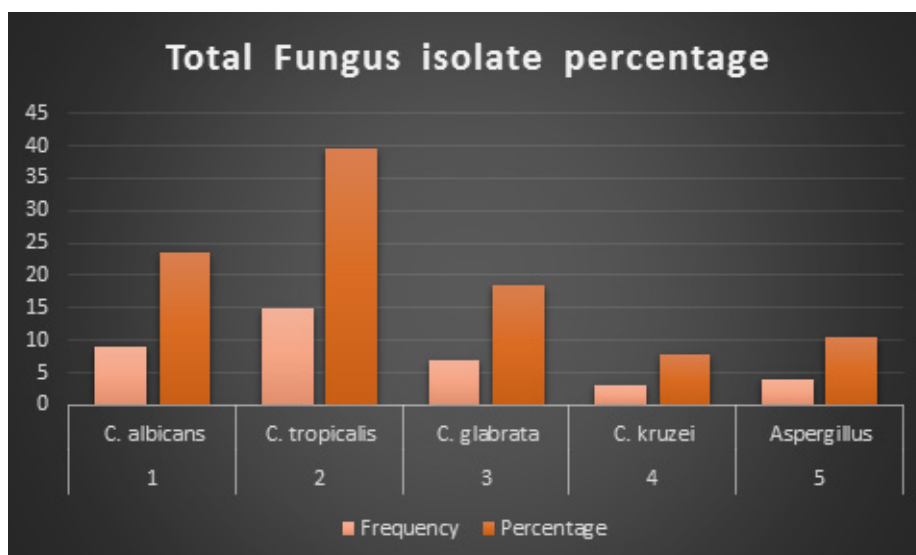


Fig 10: Total Fungus isolate

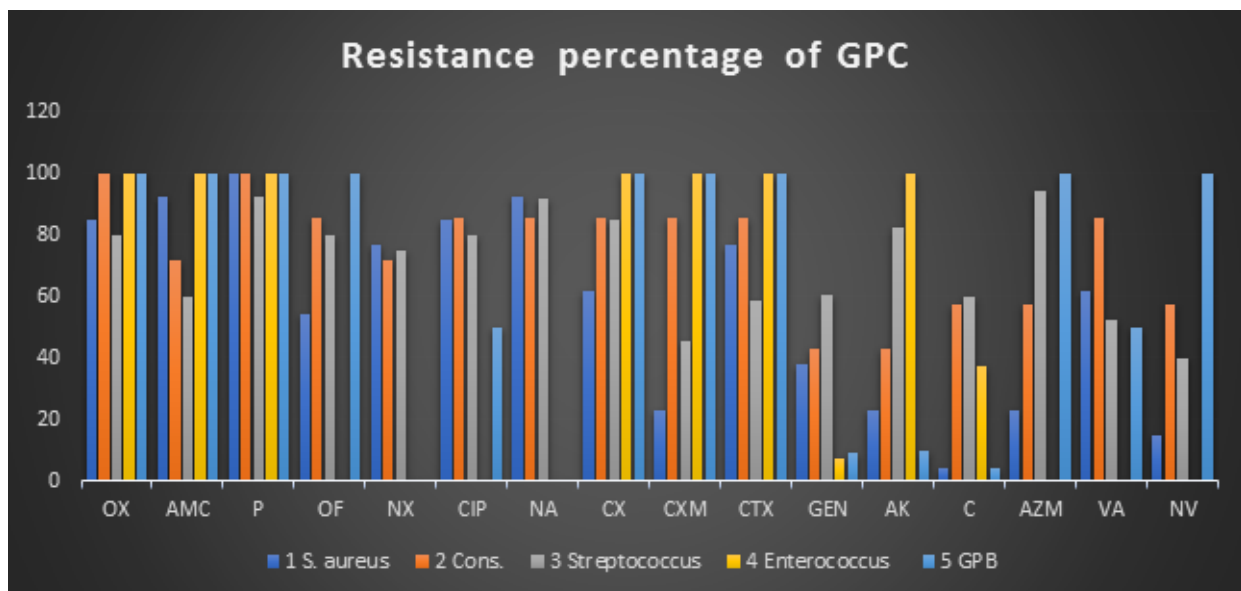


Fig 11:Resistance percentage of GPC

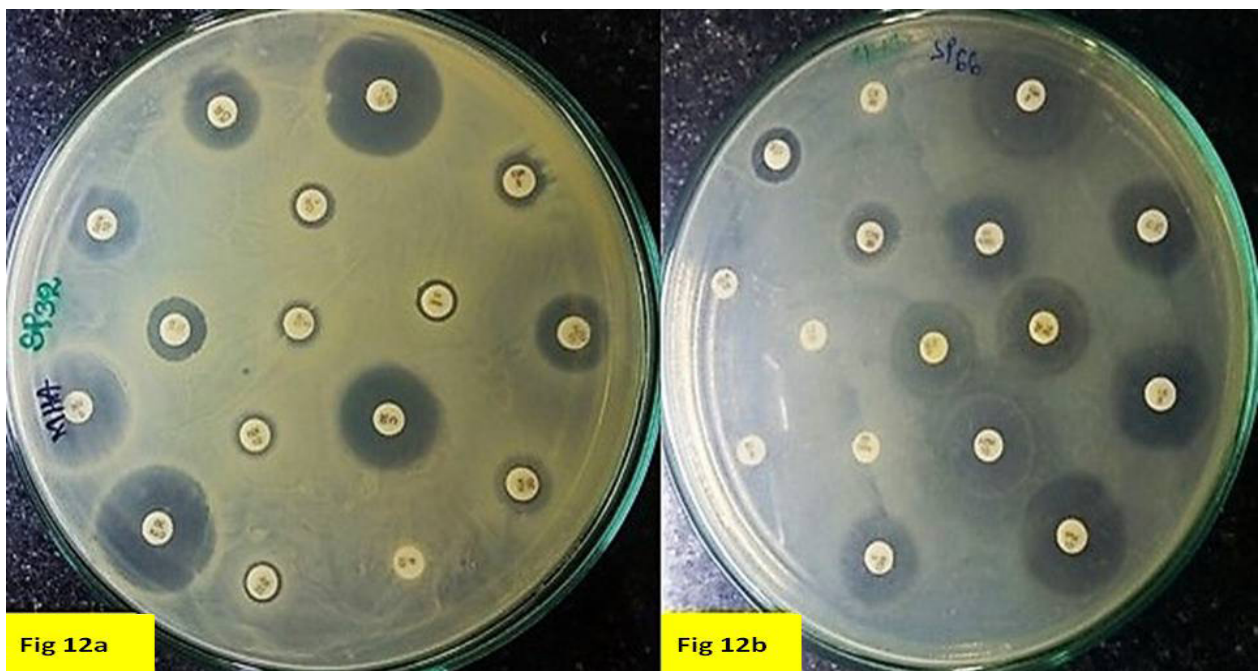


Fig 12: ABST for Gram positive bacteria.

Antibiotic susceptibility for Gram negative bacteria

A total number of 16 antibiotics of 11 classes of antibiotics were screened against gram negative bacteria and it was revealed that clarithromycin was most resistant and ciprofloxacin was more sensitive antibiotic against gram negative bacteria isolated from

ENT discharges. Aminoglycoside group of antibiotics also played an important role to control gram negative bacteria isolated from ear infection. Pseudomonas is highly resistance to amoxiclav and clarithromycin i: e 90% each. *proteous sp.* and *Acinetobacter* were both 100% resistance to azithromycin and colistin. Salmonella sp. was resistance to many antibiotics like amoxiclav, moxifloxacin,cefoxitin and imipenamcilastin (Fig13).

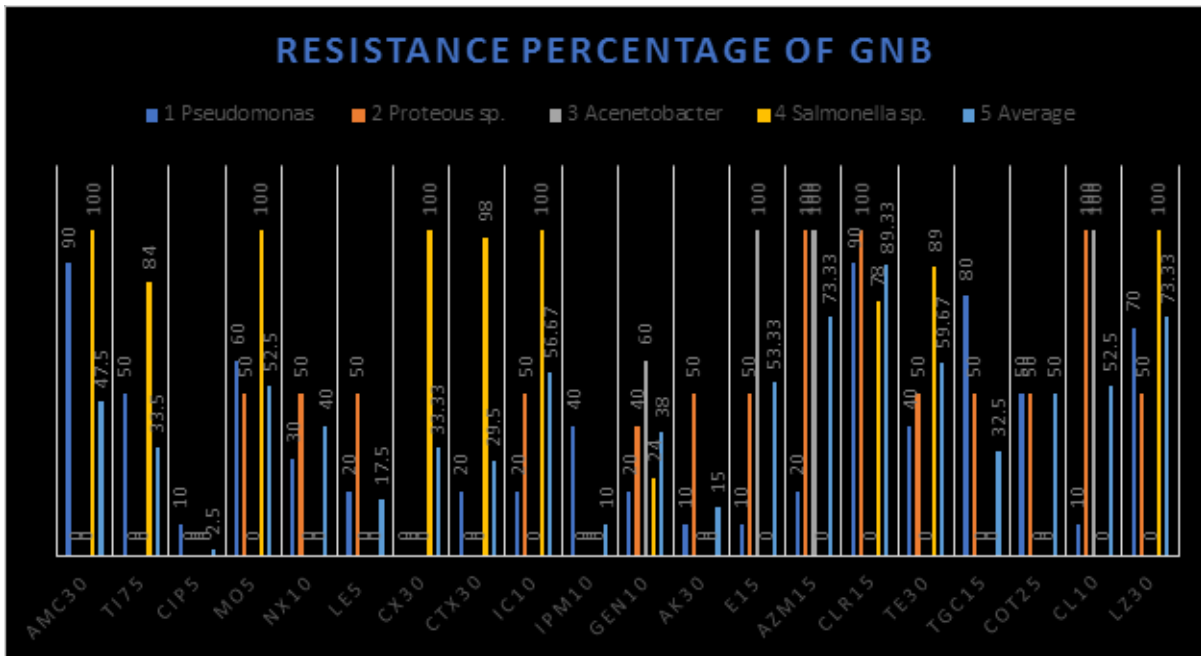


Fig 14:Resistance percentage of GNB

Note: AMC- Amoxyclav, TI- Ticarcillin, CIP- Ciprofloxacin, MO- Moxifloxacin, NX- Norfloxacin, LE- Levofloxacin, CX- Cefoxitin, CTX- Cefotaxime, IC- Imipenem/Cilastin, IPM- Imipenem, GEN- Gentamycin, AK- Amikacin, E- Erythromycin, AZM- Azithromycin, CLR- Clarithromycin, TE- Tetracycline, TGC- Tigecycline, COT- Cotrimaxole, CL- Colistin, LZ- Linezolid.

Antifungal screening test

Five species of fungi were screened with 7 antifungal agents and it was revealed that an average fluconazole

was most resistance against all fungus (87.77%) followed by nystatin(84.31%). It was the most sensitive antifungal agents for all fungal species isolated from ear discharged (68.99%).In this study *C.albicans* were highly resistance to fluconazole i: e 88.89% whereas *C. tropicalis* were highly resistance to nystatin i:e 86.67% and *c. krusei* were 100% resistance to many antifungal agents like nystatin, clotrimazole and fluconazole, *C. glabrata* were highly resistance to clotrimazole and ketoconazole and 100% resistance to fluconazole similarly aspergillus were 100% resistance to three anti-fungal agent i:e amphotericin-B, nystatin and ketoconazole(Fig 15).

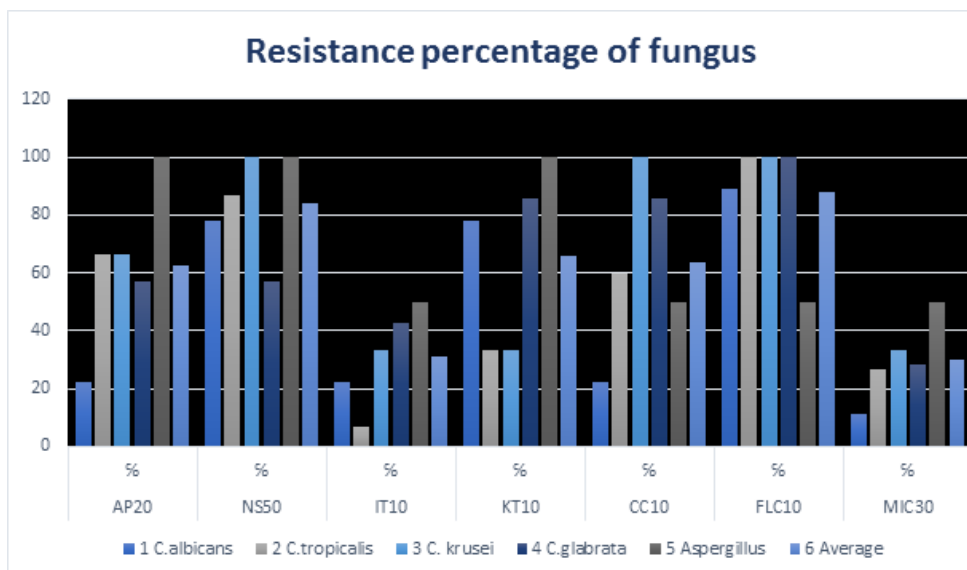


Fig 15: Resistance percentage of fungus

Note: AP-Amphotericin-B, NS-Nystatin, IT-Itraconazole, KT-Ketoconazole, FLC-Fluconazole, MIC-Miconazole



Fig 16: Antifungal screening of *C. albican* and *A. fumigatus*

DISCUSSION

CSOM are common conditions encountered in a general otolaryngology clinic setting and its prevalence has been quoted to range from 9% to 27.2%^{10,11} among patients who present with signs and symptoms of otitis externa and up to 30%^{12,13} in patients with discharging ears. CSOM is the term used to describe a variety of signs, symptoms, and physical findings that result from the long-term damage to the middle ear by infection and inflammation. CSOM is the inflammation of the ear that causes recurrent ear discharge through a perforation of the ear drum¹⁴. It is worldwide in distribution with a higher prevalence in the hot, humid, and dusty areas of the tropics and subtropics^{15,16}. Although rarely life threatening, the disease is a challenging and frustrating entity for both the patients and otolaryngologists as it frequently requires long-term treatment and follow up. Despite this, there could be recurrences. In the present study the highest incidence of fungal CSOM was noted in second and third decades of life (more than 60%), and this observation was concurrent to the studies conducted by various other authors^{16,17}. High exposure of the youngsters to the fungal spores might be responsible for high incidence of fungal infections in this specific age group¹⁸. Among the fungal etiology in CSOM, the most commonly isolated organisms are *Aspergillus* species and

Candida species¹⁹. In the present study, *Candida* species comprised of more than 89% of the total fungal isolates, whereas approximately 10% of the total microorganisms were species of *Aspergillus*. According to Yadav RK et al *Aspergillus* species comprised of more than 45% of the total fungal isolates, whereas approximately 40% of the total microorganisms were species of *Candida* (Reffff). *A. Flavus* and *A. Niger* were the most common *Aspergillus* species. Among the *Candida* species, the most common isolates were *C. tropicalis* and *c. albicans*. Earlier study from India,¹⁶ reported higher isolation rate of *Aspergillus* species as compared to *Candida* species.

Therefore, the frequency of azole-resistant to *Aspergillus* likely underdiagnosed, with a possible risk of unsuitable treatment. In our study, the resistance strains of *Aspergillus* were shown the positive in PCR with the primer designed from gene CYP51A responsible for voriconazole and ERG11 gene responsible for amphotericin b.

CONCLUSION

In ear discharging patient both CSOM and otomycosis can be revealed. So, before treatment the causative organism and their drug sensitivity pattern should be carried out. In case of CSOM associate with otomycosis both antibiotic and antifungal should be

prescribed for better and early treatment. The empirical therapy should be avoided and for early detection of drug sensitivity pattern PCR method should be implemented.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Not required

REFERENCES

- Goycoolea MV, Hueb MM, Ruah C. Otitis media: the pathogenesis approach. Definitions and terminology. *Otolaryngologic Clinics of North America*. 1991 Aug;24(4):757.
- Healy GB, Rosbe KW. Otitis media and middle ear effusions. *Otorhinolaryngology: Head and Neck Surgery*. 15th edition. Baltimore: Williams & Wilkins. 1996:1003-9.
- Kumar H, Seth S. Bacterial and fungal study of 100 cases of chronic suppurative otitis media. *J ClinDiagn Res*. 2011 Nov;5(6):1224-7.
- Parveen S, Rao R. Aerobic bacteriology of Chronic Suppurative Otitis Media (CSOM) in a teaching hospital. *J MicrobiolBiotechnol Res* 2012; 2:586-9.
- Slattery WH. Pathology and clinical course of inflammatory diseases of the middle ear. *Glasscock-Shambaugh surgery of the ear*. 2003;5:428-9.
- Leach AJ, Morris P.S. Antibiotics for the prevention of acute and chronic suppurative otitis media in children. *Cochrane Database of Systematic Reviews* 2006; Issue 4.
- Sen Gupta RP and Kacker SK. Otomycosis. *Ind Jour Med Scien* 1978;32:5-7.
- Sachdev VP, Bhatia JN. A survey of otitis media in PGI Chandigarh. *Indian Journal of Otolaryngology*. 1965 Jun 1;17(2):134-9.
- Goodman LSS and Gilman A (Ed). *The pharmacological basis of therapeutics*. 4th Edition, 1970.
- Z.B.V.D.S Pontes, A. D. F. Silva. E. D. O Lima-Otomycosis; a retrospective study, - *Brazilian Journal of Otorhino laryngology* 2009;75(3);367-70.
- R. Munguia and S. J. Daniel, "Ototopical antifungals and otomycosis: a review. *International Journal of Pediatric Otorhinolaryngology/* 2008 ;72(4): 453-9
- Pradhan B, Tuladhar NR, Amatya RM. Prevalence of otomycosis in outpatient department of otolaryngology in Tribhuvan University Teaching Hospital, Kathmandu, Nepal. *Annals of Otolaryngology & Laryngology*. 2003 Apr;112(4):384-7.
- Barati B, Okhovvat SA, Goljanian A, Omrani MR. Otomycosis in central Iran: a clinical and mycological study. *Iranian Red Crescent Medical Journal*. 2011 Dec;13(12):873.
- Acuin J, World Health Organization. Chronic suppurative otitis media: burden of illness and management options.
- Munguia R, Daniel SJ. Ototopical antifungals and otomycosis: a review. *International journal of pediatric otorhinolaryngology*. 2008 Apr 1;72(4):453-9.
- Talwar P, Chakrabarti A, Kaur P, Pahwa RK, Mittal A, Mehra YN. Fungal infections of ear with special reference to chronic suppurative otitis media. *Mycopathologia*. 1988 Oct 1;104(1):47-50.
- Chander J, Maini S, Subrahmanyam S, Handa A. Otomycosis—a clinico-mycological study and efficacy of mercurochrome in its treatment. *Mycopathologia*. 1996 Jul 1;135(1):9-12.
- Mohanty JC, Mohanty SK, Sahoo RC, Ghosh SK, Chayani N, Mallick B, Kar AK. Clinico-microbial profile of otomycosis in Berhampur. *India journal of otology*. 1999;5(2):81-3.
- Ibekwe AO, Shareef ZA, Benayam A. Anaerobes and fungi in chronic suppurative otitis media. *Annals of Otolaryngology, Rhinology & Laryngology*. 1997 Aug;106(8):649-52.

Early Detection of GI Tract Cancer by Specific Primer(S) as Biomarker: Our Experience

Kanishka Uthansingh¹, Manoj Kumar Sahu¹, Ayaskanta Singh¹, Jimmy Narayan¹,
Manas Kumar Behera¹, Pradeep Mallick¹, Mahesh Ch Sahu²

¹Department of Gastroenterology, ²Medical Research Laboratory, IMS and SUM hospital, Siksha "O"
Anusandhan Deemed to be University, K8, Kalinganagar, Bhubaneswar, Odisha, India

ABSTRACT

Visualization of patients with Gastric malignant growth (GC) is for the most part poor due to the absence of basic, helpful, and noninvasive instruments for GC discovery at the beginning period. The revelation of microRNAs (miRNAs) and their diverse articulation profiles among various types of illnesses has opened another road for tumor finding. The point of the examination was particular preliminaries as a biomarker for early detection of GI tract malignancy.

Method: A total of 232 patients with gastric cancer who underwent gastrectomy and 62 healthy volunteers were prospectively included between Midst of 2017 and June 2018. Peripheral blood samples were collected before gastrectomy, and circulating tumor cells (CTCs) were examined using a centrifugal microfluidic system with a new fluid-assisted separation technique.

Results: In the wake of making a beneficiary working trademark bend to recognize the discriminative CTC esteem required separate patients with gastric malignant growth from solid volunteers, affectability and specificity were about enhanced at a CTC limit of 2 for each 7.5 mL of blood. Of the 232 people with a CTC level ≥ 2 per 7.5 mL of blood, (98%) had gastric malignant growth, and of the 48 people with a CTC level < 2 per 7.5 mL of blood, 65% were solid controls. Likewise, the affectability and specificity for the separation of patients with gastric disease from solid controls were 86.3 % and 92.8%, separately. Be that as it may, the nearness of CTCs was not related with any clinicopathologic highlights, for example, organizing, histologic type, or mucin phenotype.

Keywords: Primer, GI tract, Biomarker, MicroRNA, Malignant

INTRODUCTION

Gastric cancer is the third leading cause of cancer death in the world ^{1,2,3}. Over 8.2 million people die of cancer each year due to the inaccessibility of appropriate detection procedures and treatments ⁴.

Colorectal cancer (CRC) is the third most common cancer in the world. It accounts for nearly 50,000 deaths

each year and is the second leading cause of cancer-related death ^{5,6}. Though qualified consideration and screening programs assume critical jobs in the survival of patients with Colorectal cancer (CRC), careful resection in the beginning period is the best treatment and drags out the survival of patients. Tragically, beginning time CRCs are hard to identify on account of less indications

The proteome of circulating blood has been applied to detect biomarkers for CRC such as carcinoembryonic antigen (CEA) and carbohydrate antigen 19-9 (CA19-9), but its sensitivity and specificity, especially for early stage colorectal cancer, seems to be insufficient⁷.

The components basic chemoresistance in gastric tumor are not by any stretch of the imagination known,

Corresponding Author:

Dr. Manoj Kumar Sahu

Department of Gastroenterology,
IMS & SUM Hospital, Siksha O Anusandhan (Deemed
to be University) Bhubaneswar, Odisha, India, Pin-
751003, Email: manoj_sahu@soa.ac.in

yet the accompanying instruments have been accounted for: diminished intracellular medication collection as well as expanded medication efflux, expanded nucleotide extraction repair action, avoidance of apoptosis, initiation of a few flagging pathways and the presence of putative disease undeveloped cells. Another hypothesis for chemosensitivity is the malignancy undeveloped cell theory: a little level of growth cells, the remaining disease cells or the putative tumor undifferentiated organisms, are impervious to chemotherapy-interceded cell murdering, and turn into the hotspot for tumor backslide. On the off chance that the administrative instruments for keeping up this cell populace are found, specialists disturbing the components might be utilized to create novel techniques to treat gastric growth.

GC is a heterogeneous ailment in which every malignancy persistent displays a particular hereditary and sub-atomic profile. Sadly, in spite of the fact that a various investigations has been led on atomic biomarkers, the majority of the distinguished biomarkers bombed in the approval thinks about. Nearly patients with cutting edge GC still can't be treated with a focused on treatment and as of now no indicative markers can be seen for optional anticipation. For having the capacity to utilize GC related biomarkers in clinical consideration of patients, extensive survey to decide the heading for distinguishing the exact biomarker pinpoint that can be investigated for the customized treatment.

Therefore, new methods and novel diagnostic biomarkers are urgently required for mass surveys of early events of CRC.

The bad prognosis is the result of the aggressive biological character of the tumor, a lack of reliable diagnostic techniques for early-stage detection and absence of effective individualized treatment⁸.

The components basic chemoresistance in gastric tumor are not by any stretch of the imagination known, yet the accompanying instruments have been accounted for: diminished intracellular medication collection as well as expanded medication efflux, expanded nucleotide

extraction repair action, avoidance of apoptosis, initiation of a few flagging pathways and the presence of putative disease undeveloped cells. Another hypothesis for chemosensitivity is the malignancy undeveloped cell theory: a little level of growth cells, the remaining disease cells or the putative tumor undifferentiated organisms, are impervious to chemotherapy-interceded cell murdering, and turn into the hotspot for tumor backslide. On the off chance that the administrative instruments for keeping up this cell populace are found, specialists disturbing the components might be utilized to create novel techniques to treat gastric growth.

Of the numerous elements related with long haul survival of gastric malignancy patients, strategies of gastrectomy and fundamental treatment have been examined extensively. Albeit less examined, biologic varieties in gastric tumors among races may to some degree drive a portion of the watched survival inconsistencies. Later sub-atomic portrayals of gastric adenocarcinomas exhibit a huge sub-atomic heterogeneity in this growth.⁹

MATERIAL AND METHOD

Patients and Specimens The study was approved by the Institutional Review Board and IMS & SUM Hospital, Bhubaneswar, Odisha. Written consent for using the samples for research purposes was obtained from all patients. Gastric carcinoma tissues were obtained from department of Gastroenterology from the concerned procedure area A to total of 236 patients from the the same department. The eligibility criteria of the current study were as follows: (1) a pathologic examination confirming the presence of gastric cancer and experienced radical surgery, (2) complete basic clinical data, (3) the absence of any prior treatment for cancer, and (4) no serious complications or other malignant disease. There were 78 males and rest females. Relevant clinical pathologic features (Table 1) were all obtained from the patients' files. Tumor stage was classified according to the 7th Union International Cancer Control (UICC) TNM staging system¹⁰.

Table 1: Mucin expression in gastric cancer according to the level of circulating tumor cells

	CTC<2 (n=17)	CTC2 (n=99)	P value
Muc expression, n (%)			1.000
Negative	12(14)	72(86)	
Positive	5(16)	27(84)	
MUC5AC expression, n (%)			0.397
Negative	7(19)	29(81)	
Positive	10(12)	70(88)	
MUC6 expression, n (%)			1.00
Negative	13(15)	75(85)	Negative
Positive	4(14)	24(86)	
CD10 expression, n(%)			1.00
Negative	16(15)	88(85)	
positive	1(8)	11(92)	
Mucin Phenotype, n (%)			0.606
Gastric type	7(12)	53(88)	
Intestinal type	3(13)	21(87)	
Null type	4(22)	14(70)	

Table 2: Gastric cancer primary cancer

	Normal (N=4)	Pan Ins (N=20)	Stage-1 (N=38)	Stage-II (N=78)	stageIII (N=5)	Stage IV (N=2)
Meian survival (months)		137.3	42.4	17.8	13.9	19.6
Male	3(75%)	9(45%)	9(23.7%)	44 (57%)	1(20%)	2(100%)
female	1(25%)	11(55%)	29(76.3%)	34(43%)	4(80%)	0.0%
Well differentiated		9(45%)	3(7.9%)	4(5.1%)	1(20%)	0(0%)
Moderately differentiated		8(40%)	23(60.5%)	41(52%)	4 (40%)	1(50%)
Poorly Differentiated		3(15%)	12(31.6%)	33(42%)	4 (40%)	1(50%)

Table 3: Sensitivity and specificity of CACAT2 and CDH1 in gastric cancer patients blood sample

		GACAT2		CDH1	
Gasstic cancer		Sensitivity			
	stage	n	Estimated value	95% CI	Estimated value
I	10	90% (9/10)	66-91%	90%(9/10)	33-63%
II-IV	32	75% (24/32)		34%(11/32)	
Total	42	79% (33/42)		48%(20/42)	
		Specificity (%)			
		Estimated value	95% CI	Estimated value	95% CI
Normal	26	86%	76-100%	92%	82-100%

Table 4: Homo sapiens gastric cancer antigen Zg14 mRNA, partial cds

Sl no	gene	Forward primers	Annealing temperature	Reverse primers	Annealing temperature	Size of amplicons
	Zg14	AGAGAGCCACCCTGTGAAGA	59.99	CCTCCTTGGCCTTAGCTTCT	59.98	152
		AGAGAGCCACCCTGTGAAGA	59.99	CTCCTCCTTGGCCTTAGCTT	59.98	154
		AGAGAGCCACCCTGTGAAGA	59.99	CTCCTCCTTGGCCTTAGCTT	59.98	151
		GAGAGCCACCCTGTGAAGAG	59.99	CTCCTCCTTGGCCTTAGCTT	59.98	153
		TTTTTCATCCCAAGCCAGTTC	60.05	TTCCTCAGCGATCTTCTGGT	59.98	241

Table 5: AY039239.1 Homo sapiens gastric cancer antigen Ga55 (TACC1) mRNA, partial cds

Sl no	gene	Forward primers	Annealing temperature	Reverse primers	Annealing temperature	Size of amplicons
	TACC1	AGAAGGCAAAGTCGCGTTTA	60.02	GATGGCCATCCCTATTAGA	59.88	178
		GGTGTCTGGAAGGGTTCAA	59.94	GAGCTGCACTTCAGCCTT	59.90	187
		GAATCACCCAAGAAGGCAAA	60.05	CTCCTCCTTGGCCTTAGCTT	59.88	188
		ATCCACGTCATGTGGTCAGA	59.96	TCTGGCACGTCTCCTTCTCT	60.14	153
		AGAAGGCAAAGTCGCGTTTA	60.02	CCAGCTGATTTCTGACCACA	59.83	229

DISCUSSION

CONCLUSIONS AND FUTURE

PERSPECTIVES

Plasmacytoma variation translocation 1 is a nearly very much described oncogenic lncRNA, which is up-controlled in malignant growths, particularly in numerous stomach related framework tumors, which incorporates oesophageal disease, GC, HCC, CRC and PC. We checked on GACAT2 communication with DNA, RNA, and in addition related proteins in event of stomach related framework malignant growths. It is enticing to guess that GACAT2 may hinder authoritative strides in various stomach related framework malignant growth suppressive and oncogenic pathways. GACAT2

could advance tumor cell multiplication, movement and attack. GACAT2 up-direction is generally connected with poor visualization. GACAT2 will be a possibly helpful biomarker for conclusion and restorative focuses of stomach related framework tumors. Be that as it may, there is still absence of the autonomous associate investigation for approval. Along these lines, multicentre studies will be required, which can improve the clinical utility of GACAT2 as a compelling biomarker¹⁰.

Competing Interests: The authors have declared that no competing interest exists.

Conflict of Interest: There is no conflict of interest

Source of Funding: Self

Ethical Clearance: Approved from Institutional Ethics Committee

REFERENCES

1. J. Ferlay, I. Soerjomataram, R. Dikshit et al., "Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012," *International Journal of Cancer*, vol. 136, no. 5, pp. E359–E386, 2015.
2. H. A. Park, S. Y. Nam, S. K. Lee et al., "The Korean guideline for gastric cancer screening," *Journal of the Korean Medical Association*, vol. 58, no. 5, p. 373, 2015.
3. C. Hamashima, D. Shibuya, H. Yamazaki et al., "The Japanese guidelines for gastric cancer screening," *Japanese Journal of Clinical Oncology*, vol. 38, no. 4, pp. 259–267, 2008
4. McGuire S. *World Cancer Report 2014*. Geneva, Switzerland: World Health Organization, International Agency for Research on Cancer, WHO Press, 2015. *Adv Nutr* 2016;7:418–9
5. Garcia-Bilbao A, Armananzas R, Ispizua Z, Calvo B, Alonso-Varona A, et al. (2012) Identification of a biomarker panel for colorectal cancer diagnosis. *BMC Cancer* 12: 43.
6. Murakoshi Y, Honda K, Sasazuki S, Ono M, Negishi A, et al. (2011) Plasma biomarker discovery and validation for colorectal cancer by quantitative shotgun mass spectrometry and protein microarray. *Cancer Sci* 102: 630–638.
7. Duffy MJ, van Dalen A, Haglund C, Hansson L, Holinski-Feder E, et al. (2007) Tumour markers in colorectal cancer: European Group on Tumour Markers (EGTM) guidelines for clinical use. *Eur J Cancer* 43: 1348–1360.
8. Lambert R, Hainaut P (2007) The multidisciplinary management of gastrointestinal cancer. *Epidemiology of esophagogastric cancer. Best Pract Res Clin Gastroenterol* 21: 921–945.
9. Tumor Genome Atlas Research Network. Extensive sub-atomic portrayal of gastric adenocarcinoma. *Nature*. 2014;513:202– 9, Cristescu R, Lee J, Nebozhyn M, et al. Sub-atomic examination of gastric tumor distinguishes subtypes related with unmistakable clinical results. *Nat Med*. 2015;21:449– 56.
10. Edge SB, Compton CC (2010) The American Joint Committee on Cancer: the 7th edition of the AJCC cancer staging manual and the future of TNM. *Ann Surg Oncol* 17: 1471–1474

Efficacy of Meaning Centered Group Psychotherapy to People Living with HIV on their Quality of Life at Selected Art Centre of Odisha

Sasmita Das¹, Anusuya Khatua², Mahesh Chandra Sahu³

¹Associate Dean ,SUM Nursing college, ²Msc Nursing Student, ³Assistant Professor, Medical Research Laboratory, IMS and SUM Hospital, Siksha O Anusandhan (Deemed to be University) K8, Kalinga Nagar, Bhubaneswar-751003, Odisha, India

ABSTRACT

Backgrounds: Since the human immunodeficiency virus was first discovered in 1983, several treatment options have been developed. With an increased prevalence of people living with HIV on life-long Highly Active antiretroviral therapy should be required. This research intends to fill the gaps in the conceptual approach of quality of life of people living with HIV through meaning centered group psychotherapy.

Materials and Method: Non Probability Purposive Sampling technique was used and samples were patients taking ART medication in ART center Bhubaneswar. The selection criteria were; People living with HIV those are present at the time of data collection and Clients who are willing to participate in the study. We excluded People living with HIV those were not present at the time of data collection and clients who are not willing to participate in the study.

Results: It is revealed that relationship of quality of life within selected demographic variables and paired t-test was used for comparison between pre test and post test quality of life, correlation between pre test and post test both quality of life in experimental group.

Conclusions: The findings conclude that the meaning centered group psycho therapy developed by the researcher was found to be helpful in improvement of quality of life of people living with HIV.

Keywords: HIV, psycho therapy, Chi-square test and Anova.

INTRODUCTION

Since the human immunodeficiency virus was first discovered in 1983, several treatment options have been developed. With an increased prevalence of people living with HIV on life-long Highly Active Antiretroviral Therapy, it is becoming increasingly important to determine which factors contribute to a better quality of life. While people are living longer, they may be living with increased health-challenges related to HIV disease,

the side effects of treatment or emerging concurrent morbidities related to HIV or aging. Hence, despite living longer, individuals may not always be 'living well'. Quality of life has become an essential outcome to consider in the overall health and well-being of people living with HIV. Several factors have been identified as contributing to better quality of life among people living with HIV, including social support , spiritual well-being , education level, not being an injecting drug user and having good adherence to Highly Active Antiretroviral Therapy¹. Hope-oriented group therapy improves quality of life in men suffering from HIV².

Meanwhile, other factors such as HIV-related stigma , non-disclosure of one's HIV status have been reported to negatively affect quality of life. Due to the strong

Corresponding Author:

Dr. Mahesh Chandra Sahu, PhD, NPDF,
Assistant Professor, Medical Research Laboratory,
IMS and SUM hospital, Bhubaneswar,
Mail: mchsahu@gmail.com

relationship between quality of life and many important indicators for treatment success, quality of life has been widely applied in evaluating the impact of HIV-related interventions among different populations³.

Greater use of maladaptive coping strategies was associated with lower levels of energy and social functioning. Interventions aimed at developing adaptive coping strategies and improving pain management may improve functional aspects of quality of life in persons living with HIV/AIDS⁴. As it has widely been recognized that psychological support is vital for improves of quality of life. Meaning centered group psychotherapy intervention programs are strongly encouraged to improve quality of life. This research intends to fill the gaps in the conceptual approach of quality of life of people living with HIV through meaning centered group psychotherapy.

Aim

MATERIALS AND METHOD

Study design

Pre experimental one group pre test post test design adopted to achieve the objectives. The design can be represented as pretest-treatment-post test.

Samples and data collection

A total of 45 people participated in the study; however, 40 were finally chosen and others were excluded due to inadequate responses. To verify the statistical power of our sample size, the formula $N = (Z^2 \times P \times P) / e^2$ was used. By using the above formula, the sample size was $N = 30$ where Z value was 1.96. In this research, out of every 50 people, 1 people is affected with HIV. So, 'p' value is 1/50 or 0.020 and 'e' is called tolerable error, which was 0.05. However, for uniformity & availability, we had taken the sample size of 40. Therefore, our sample size seemed appropriate.

The content validity of the tool was established by giving it to five experts and the reliability of this tool was calculated by using Cronbach's alpha formula and found that "r"=0.74, which was statistically reliable for the study.

The procedure and purpose of data collection was explained to the samples in detail. If they agreed to participate in the study, they were asked to provide written

informed consent. Data were collected anonymously to protect the participants' rights and privacy. It was agreed that the data would not be used for other purposes. They were also informed that they could quit at any time during data collection. Pre-test was conducted to assess their quality of life. The time duration was approximately 25 minutes and the questionnaire was collected back by the investigator. Meaning centered group psychotherapy is an eight-week (90 minutes weekly sessions) group intervention, which used a mix of didactics, discussions and experiential exercises that are centred around particular themes related to meaning and HIV. Evaluation will be done by conducting post test on the 9th week, after meaning centered group psychotherapy by using the same questionnaire for to assess the quality of life.

Description of tools

The WHOQOL-Brief (Field Trial Version) produces a profile with four domain scores and two individually scored items about an individual's overall perception of quality of life and health. The four domain scores are scaled in a positive direction with higher scores indicating a higher quality of life. The four domains are physical domain, psychological domain, social domain and environmental domain. The question scores of the respondents on all the 26 questions of the BREF ranged from 1 to 5. This indicated that the whole spectrum of the 5-point scales was utilized in the reflection of quality of life of the subjects.

RESULTS

The distribution of subjects according to demographic variables

The distribution of subjects according to demographic variables represents that (65%) are female, (35%) are male, most (30%) of people are of age group above 45yrs, (27.5%) of sample are 35-44yrs, (20%) of sample are 25-34 yrs, (12.5%) of sample are 18-24 yrs and (10%) of sample are 11-17yrs age group, (27.5%) of sample are unmarried, (65%) of sample are married and (7.5%) of sample are divorced or widow, no one of sample are illiterate, 25% of sample are elementary, 65% of sample are middle or high and 7.5% are university level of education, 10% of sample had prison history, 17.5% of sample had intravenous drug use, 65% of sample had unprotected sex and 7.5% of sample had blood transfusion risk factors, 17.5% of sample through

intravenous drug, 65% of sample through unprotected sex, 10% of sample through vertical and 7.5% of sample had unknown mode of transmission, 87.5% of sample had treated with HAART (Highly active antiretroviral therapy) and 12.5% of sample had untreated with HAART, 42.5% of sample had more than Rs/-10000, 42.5% of sample had less than Rs/-10000 and 6.25% of sample had no income per month. 85% of sample are employed and 15% of sample are unemployed or retired.

Pre-test quality of life

In general health domain, 62.5% of sample were having poor general health, 37.5% of sample were having average general health and no one of total sample were having good general health. In pre test quality of life domain-1 i.e. physical health 77.5% of sample were having poor physical health, 22.5% of sample were having average physical health and no one among the sample were having good physical health. In pre test quality of life domain-2 i.e. psychological health 85% of sample were having poor psychological health, 15% of sample were having average psychological health and no one among the sample were having good psychological health. In pre test quality of life domain-3 i.e. social health 77.5% of sample were having poor social health, 22.5% of sample were having average social health and no one among the sample were having good social health. In pre test quality of life domain-4 i.e. environmental health 85% of sample were having poor environmental health, 15% of sample were having average environmental health and no one among the sample were having good environmental health. In pre test quality of life 87.5% of sample were having poor quality of life, 12.5% of sample were having average quality of life and no one among the sample were having good quality of life. **Post-test quality of life.**

In general health domain, 62.5% of sample were having good general health, 37.5% of sample were having average general health and no one of total sample were having poor general health. In post test quality of life domain-1 i.e. physical health 52.5% of sample were having good physical health, 47.5% of sample were having average physical health and no one among the sample were having poor physical health. In post test quality of life domain-2 i.e. psychological health 60%

of sample were having good psychological health, 40% of sample were having average psychological health and no one among the sample were having poor psychological health. In post test quality of life domain-3 i.e. social health 60% of sample were having good social health, 40% of sample were having average social health and no one among the sample were having poor social health. In post test quality of life domain-4 i.e. environmental health 77.5% of sample were having average environmental health, 22.5% of sample were having good environmental health and no one among the sample were having poor environmental health. In post test quality of life 22.5% of sample were having good quality of life, 77.5% of sample were having average quality of life and no one among the sample were having good quality of life. Hence in pre test most of the samples were in poor quality of life and no one were having poor quality of life.

Comparison of pre test quality of life with post test quality of life.

The mean score of pre test general health is 37.5 where the mean score of post test general health is 78. So there is increase of general health in post test than the pre test. The mean score of pre test physical health is 38.5 where the mean score of post test physical health is 76.14. There is increase of physical health in post test than the pre test. The mean score of pre test psychological health is 36.58 where the mean score of post test psychological health is 79.33. There is increase of psychological health in post test than the pre test. The mean score of pre test social health is 37.33 where the mean score of post test social health is 79.83. There is increase of social health in post test than the pre test. The mean score of pre test environmental health is 35.87 where the mean score of post test environmental health is 75.18. There is increase of environmental health in post test than the pre test. The mean score of pre test quality of life is 35.67 where the mean score of post test quality of life is 74.36. There is increase of quality of life in post test than the pre test.

Effect of meaning centered group psychotherapy on quality of life through paired t-test

Table 1-Paired t test calculation for effectiveness of meaning centered group psychotherapy

ITEM	MEAN	DF	SD	PAIRED t TEST	INFERENCE
Quality of life (pre test)	35.67	39	25.0071	t=4.4681 p=0.05	extremely significant
Quality of life (post test)	74.36538				

The above Table-1, represented that there is extremely significant relation in quality of life, which means the meaning centered group psychotherapy is effective for improving quality of life of people living with HIV.

Association of post test quality of life with selected demographic variables

The chi square association of post test quality of life with selected demographic variables was obtained. No demographic variables were statistically significant with quality of life.

Association of quality of life within selected demographic variables by Anova test

The “p” value of gender and marriage is 0.33 and 0.18 which is more than 0.05. here it is proved that there is no association of quality of life within gender and marriage status. The “p” value of gender and risk factor is 0.65 and 0.55 which is more than 0.05. here it is proved that there is no association of quality of life within gender and risk factor. The “p” value of gender and HAART is 0.29 and 0.12 which is more than 0.05. here it is proved that there is no association of quality of life within gender and HAART. The “p” value of marriage and risk factor is 0.24 and 0.20 which is more than 0.05. here it is proved that there is no association of quality of life within marriage and risk factor. The “p” value of marriage and HAART is 0.36 and 0.19 which is more than 0.05. here it is proved that there is no association of quality of life within marriage and HAART. The “p” value of risk factor and HAART is 0.25 and 0.12 which is more than 0.05. Based on the above findings it is proved that there is no association of quality of life within risk factor and HAART.

DISCUSSION

The goal of this study was to investigate the efficacy

of group meaning centered psycho therapy of people living with HIV quality of life. In general, the obtained results show that group meaning centered psycho therapy led to improvement of patients’ quality of life, which is consistent with the results of other studies on people living with HIV’s quality of life. Analysis of pre test and post test for quality of life reveals that there is marked improvement in quality of life in post test than pre test.

In a study on the effect of peer education on the QOL of breast cancer patients after surgery, showed an increase in patients’ QOL after the intervention⁵.

In 2012, a study conducted on the effects of lung cancer complications on the patients and their caregivers showed that the patients, their caregivers, and their professional caregivers were all under the influence of cancer-related complications, faced QOL reduction, and needed supportive interventions⁶. In a literature review study on the promotion of quality and quantity of cancer patients’ showed that group psychotherapy influenced not only the patients’ quality of life but also their quantity of life and led to more survival of these patients, reduction of their pain, reduction of their mood disorders, and improvement of their quality of life. All the above-mentioned studies obtained results consistent with those of the present study, although they were not methodologically similar⁷.

Test results revealed that group meaning centered psychotherapy led to improvement of patients’ quality of life. In the reviewed studies, group meaning centered hope therapy had been administered, but a meta-analysis on the social-psychological care among the caregivers of cancer patients and they found that caregivers’ stress can result in sleep disorders and changes in their physical health and immunity system function⁸. Group meaning centered hope therapy in either patients’ group or families’ group led to improvement of patients’ QOL,

which is consistent with the results of other studies on cancer patients' QOL⁹⁻¹².

CONCLUSION

There was significant improvement of quality of life of people living with HIV. Meaning centered group psycho therapy is found to be useful for improving quality of life of people living with HIV. The findings conclude that the meaning centered group psycho therapy developed by the researcher was found to be helpful in improvement of quality of life of people living with HIV.

Conflict of Interest: There is no conflict of interest

Source of Funding: Nil

Ethical Clearance: Approved from Institutional Ethics Committee

REFERENCES

1. Korthuis P, Spirituality and the dying patient. *Journal of HIV*. 1989 ; 18: 1989- 2002.
2. Puchalski C, and Romer, A.L. Taking a spiritual history allows clinicians to understand patients more fully. *Journal of Palliative Medicine*. 2000; 3: 129-137.
3. Mehdi H.G, George, L.K. and Peterson, B.L. Religiosity and remission of depression in medically ill older patients. *American Journal of Psychiatry*. 2007 ; 155: 536-542.
4. Korthuis P. Spirituality and the dying patient. *Journal of HIV*, 18, 1989- 2002.
5. Puchalski C, Romer AL. Taking a spiritual history allows clinicians to understand patients more fully. *Journal of palliative medicine*. 2000 Mar 1;3(1):129-137.
6. McClain CS, Rosenfeld B, Breitbart W. Effect of spiritual well-being on end-of-life despair in terminally-ill cancer patients. *The lancet*. 2003 May 10;361(9369):1603-1607.
7. Sharif F, Abshorshori N, Hazrati M, Tahmasebi S, Zare N. Effect of peer-lead education on quality of life of mastectomy patients. *J Iran Inst Health Sci Res*. 2012;11:703–710.
8. Ellis J. The impact of lung cancer on patients and carers. *Chronic respiratory disease*. 2012 Feb;9(1):39-47.
9. Blake-Mortimer J, Gore-Felton C, Kimerling R, Turner-Cobb JM, Spiegel D. Improving the quality and quantity of life among patients with cancer: A review of the effectiveness of group psychotherapy. *Eur J Cancer*. 1999;35:1581–1586.
10. Northouse L, Williams A-l, Given B, Mc Corkle R. Psychosocial Care for Family Caregivers of Patients with Cancer. *J Clin Oncol*. 2012;30:1227–1234.
11. Yao Y, Li H, Liu L, Zhao L, Xu L, Sun J. Study on the effect of feiji decoction for soothing the liver combined with psychotherapy on the quality of life for primary lung cancer patients. *Zhongguo Fei Ai Za Zhi*. 2012;15:213–217.
12. Spiegel D, Morrow GR, Classen C, Raubertas R, Stott PB, Mudaliar N, Riggs G. Group psychotherapy for recently diagnosed breast cancer patients: A multicenter feasibility study. *Clinical Trial Multicenter Study Research Support, Non-U.S. Gov't Research Support, U.S. Gov't, P.H.S. Psychooncology*. 1999;8(6):482–493.

Survey on Gene Selection Methodologies based on Filter, Wrapper, Embedded and Hybrid Approaches

Suchishree Panda¹, Kaberi Das², Debahuti Mishra³

¹Research Scholar, ²Associate Professor, Department of Computer Science and Engineering, ³Professor, Department of Computer Science and Engineering, Orissa Engineering College, Odisha, India

ABSTRACT

Gene selection has become a most elementary tool for processing high dimensional data. It is an important pre-processing step which is essential for microarray analysis and classification. DNA microarray technique is applied for analyzing large number of genes at a time, by which the expression levels of the genes are determined. Selection of genes applying high dimensional gene expression data is primary and most important work for accurate disease prediction and classification. Gene expression data are in the form of matrix and usually it contains irrelevant, redundant and noisy data, so the study and analysis of data faces problematic situation. Most important and primary purpose of gene selection methods is to get rid of from the problem of curse of dimensionality, enhance the performance and efficiency of classification algorithms by eliminating irrelevant genes and reduction of noise. This paper describes the various gene selection methods declaring with their relevant pros and cons. It also denotes a review on few gene selection methods, mainly those that have been proposed in last few years.

Keywords: DNA microarray, Gene selection, High dimensionality, Gene expression

BACKGROUND

The new microarray technology has made the life of scientists easier by enabling them to determine the utterance of height of numerous genes. Now-a-days, the microarray technology plays a vital role in terms of assisting the physicians in the diagnosis of diseases by incorporating appropriate treatment strategies for the patients. The microarray technology is proving to be a major breakthrough in cancer diagnosis because of the platform it provides to compare the gene expressions of cancer and healthy cells. Classification of sample as “diseased” or “not-diseased” has become a huge challenge in biomedical studies over the years. This helps in designing precise models to diagnose cancer. The classification through microarray gene expression

data is extremely hard, as thousands of gene expressions are carried by each sample. The high dimensionality of the data with a limited number of samples often cause poor performance in categorization, hence this particular concept is popularly known as the curse of dimensionality in statistical pattern identification.

Microarray Data for Gene Expression

The inherent parts in living creature are known as Genes. The genes are part of an acid that named deoxyribonucleic which contains the knowledge about ribonucleic acid and elements of protein. Genes are the basic block which builds any living creature. The generation of protein is a two-step sequence: The step one is called as ‘transcription’, explains the way a gene within a DNA is shown by alienating its vital information to messenger acid of ribonucleic. The step two, called as “translation”, relate that protein is synthesis following decrypting details from the mRNA by Ribosomes. This cycle which helps a gene to be described as proteins is called ‘gene expression’. Genes are generated from microarray technology. Gene expression profile is an organized matrix of gene expression data. Rows of the

Corresponding author:

Debahuti Mishra

Professor, Department of Computer Science and Engineering, Siksha ‘O’ Anusandhan Deemed to be University, Bhubaneswar, Odisha, India
E-mail: debahutimishra@soa.ac.in

matrix denote genes and the column of the matrix denotes samples.

Importance of Gene Selection

Major drawbacks of Gene Microarray Data are the “Curse of Dimensionality”. It comprises of a few specimen, although these will have large amount of genes. It has been found that a large number of genes are not important and an overhead which are not helpful for determination of cancer, only a little count of genes may be important. To build a faster method for precise determination of cancer the important pre-processing step is to select the genes. Gene selection methods in this prospect are apparently comprehensive solutions to develop a faster solution for categorizing cancers. The issues often appear when the data is not clear and comprises limited features is called over generalization problem.

Traditional approach for gene selection

Filter Approach



Figure 1. Filter approach to gene selection.

According to the Filter approach each genes are individually evaluated to get the best result. Genes having best analytical value are preferred or taken into consideration in filter approach. Filter is an approach where genes are only selected depending upon performance measuring, it does not related to the data modeling algorithm. Aim of Filter method is to rank the genes individually according to the weight vector and select the best gene. Classifiers have no role in the filter approach, so it a classifier independent approach. Genes having best analytical value are preferred or taken into consideration in filter approach.

Pros: - Data set that contains high dimensional value can be easily evaluated by applying filter approach. Complexity of filter approach is very much low.

Cons:-There is no role of classifier performance and inter dependency of genes in filter gene selection approach, so it is not a surprising matter that the classifier performance is low in filter selection approach. Also in filter selection approach redundant genes may be found because there is no interdependency between genes.

L.Beretta *et al.* (2011) found the modified version of ReliefF i.e SReliefF and Turned sReliefF algorithm to overcome the time analysis deficiency in the year of 2011. This approach also helps in selecting suitable

genes in existence of right- censored genes in the data set. In this work they also compare both the proposed algorithm (SReliefF and Turned sReliefF) by applying on the cancer microarray dataset. They found that both the method had discerning capability even when the given data set have small sample size. When assumed data set were small then Turned sReliefF is better than SReliefF¹

Zijiang Yang *et al.* (2011) presented a new innovative Partial least Square (PLS) approach, which is based on three indicators (VIP, VEG, IEG). They trial the innovatively proposed method by implementing it on MIT acute myeloid leukemia/acute lymphoblastic leukemia, which is a two category dataset and smallroundbluecelltumors (SRBCT), which comes under multicategory datasets. In this work they found that the proposed method can deal with both the two category and multicategory dataset with high efficiency. And also the proposed algorithm can handle the data with high dimension and small sample size².

Debahuti Mishra *et al.* (2011) analyze the outcome of two approaches based on Signal-to noise ratio (SNR), for choosing markers genes from the Leukemia dataset. In the first attempt they apply the K-means clustering and SNR ranking and further in the second approach they use only the SNR ranking for choosing the genes. They use KNN, SVM, PNN and FNN as classifier.

After comparing according to the first attempt they got the result like, 100%, 96%, and 96% with SVM, KNN & PNN respectively for five number of genes, 2.17 with FNN for 10 number of genes and again on second approach 96%, 96% and 62% with SVM, KNN and PNN for 5 number of genes, 2.52 with FNN for 10 number of genes³.

To improve the stability of choosing genes Guoyin Wang *et al.* (2013) proposed an EMDBSWA-efficient mean deviation based sample weighting algorithm. In this work they execute a sequence of analysis with four regularly studied public data set (Colon, leukemia, prostate, Lung). They analyze the proposed method with the margin based sample weighting method and state of the art ensemble framework using ReliefF as the base algorithm. Result revealed that the proposed method achieve more balanced gene sets than others⁴.

A method was proposed by Devi Arockia Vanitha *et al.* (2015) for choosing informative genes by using Mutual Information (MI) a type of filter approach. The performance of the newly invented method is measured by applying it on 2 cancer microarray data set, Colon cancer and Lymphoma. They use SVM as the classifier and measure the result of the classifier by using (LOOCV)-Leave –one-out cross validation. From

the experiment they observe that the proposed algorithm shorten the size of the data set on the basis of choosing informative genes⁵.

Wenyan Zhong *et al.* proposed (2017) a distance based gene selection method called Bhattacharyya distance applicable for two group classification issue. Colon cancer and Leukemia data set were used to measure the accuracy and efficiency of the discussed method. In this work they use SVM as a classifier with the chosen genes. And also they compare the newly invented method B/SVM, with other frequently used method such as SVM-RFE and SWKC/SVM. Result revealed that B/SVM performed better than other two method⁶.

In this work Ryan J. Urbanowicz *et al.* (2018) had replaced Relief- based algorithms (RBA) with other gene selection algorithms. In this work first they broadly studied type of gene selection and replace RBA in that place. Next step they announce original Relief method with its working principle. Lastly the ReliefF algorithm in described with its procedure. They arrange a compared summary of RBA algorithms along with its policies, functionality, contributions, time complexity, adaptation to key data features, and its software accessibility⁷.

Wrapper Approach

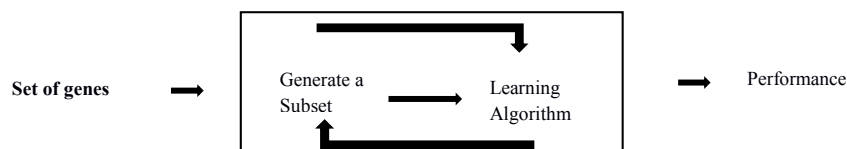


Figure 2. Wrapper approach to gene selection

In Wrapper approach a predicted model is used for gene selection by scoring the genes. Classifier performance is taken as a measure concern for evaluating the genes in Wrapper approach. Wrapper approach are given as two categories deterministic approach and stochastic approach. SFS (Sequential Forward Selection) and SBE (Sequential backward elimination) are the method comes under deterministic approach category and RHC (Randomized hill climbing), ACO (Ant colony optimization), GA (Genetic algorithm) and such optimization based algorithm are comes under stochastic approach.

Pros:-Classifier performance is very high.It gives more accurate gene subset from filter method.

Cons:-Search space complexity is very high for the data set with high dimension. It leads to high time complexity. Wrapper approach not much useful for dimensionally high data set because of nature wise this approach is computationally high. This method is quite slower than filter as it uses classifiers.

A new method called LEAF- Leave one-out Forward selection was proposed by Kentaro Fukuta *et al.* (2010) because of its usefulness for searching genes which provide related information for cancer classification. The

proposed approach is based on forward selection method which was incorporated with the LOOCV concept. This method provides DPS which indicates the discrimination power score of the related genes. They had applied the new method on three leukemia based data set i.e. ALL/AML, ALL/MLL and MLL/AML for measuring the working efficiency of the approach. Result proved that this method is as useful as a powerful to search or define marker genes⁸.

Aiguo Wang (2014) proposed an IWSS-Incremental wrapper based gene subset selection, to get more accurate classification result compare to filter method. In this work they tried to scale down the complexity of time related to wrapper based gene selection method using KNN as the classifier. Experiment on six microarray dataset was done to measure the efficiency of the proposed algorithm. The data set used are SRBCT, Leukemia1, Leukemia2, DLBCL, Prostate, and Ovarian⁹.

A. Sylvia Selva Rani *et al.* (2015) invented a new algorithm for gene selection. The newly proposed algorithm is Binary Bat Algorithm (BBA). It is an unsupervised wrapped based algorithm for selecting the subset of optimal gene set. The accuracy of the proposed algorithm was compared with other existing gene selection method like, GA-Genetic Algorithm, PSO-RR-Particle Swarm Optimization with Relative Reduct, Quick Reduct and ACO-Ant Colony Optimization [30]. DT-Decision tree, MP-multilayer perceptron, SVM are used as classifier in this work. Revealed that this proposed algorithm provides more accuracy when equated with other optimization process¹⁰.

Thanh Trinh *et al.* (2016) proposed a method based on Random forest method for gene selection i.e FRF (frequency-based Random forest). In this work they used Breiman's random forest code to design a random forest model according to the given high dimensional data set. They set the rule that according to the threshold value the gene are selected. In this work they take 19 data set into account to test and measure the efficiency of the proposed method. They compare their method with other methods like, Guide Regularized Random Forest (GRRF), weighted subspace random forest (WSRF). They proved in their analysis that random forest model for gene selection is efficient¹¹.

A SPEA-Strength Pareto Evolutionary Algorithm was proposed by Swagatam Basu *et al.* (2017). This

algorithm was applicable for choosing informative genes which can provide best gene subset for analyzing disease. They collect the data set of colon cancer and applied with some classifiers to measure the accuracy of the proposed method. In future SPEA can be extended to SPEA2¹².

Bhavna Srivastava *et al.* (2014) presented a comparative study between filter method and wrapper method. They use RF-ReliefF which is the extension of Relief algorithm as the filter and RGSSA-Randomized gene subset selection algorithm as wrapper method for comparison. Cancerous data sets taken in this work are Ovarian, Lymphomas and Leukemia. Some most useful classifiers are also have major role in this work to define the particular disease that are SVM, NB, DA, NN, ABMI, GB, RB, BAG. This work give more confidence to the researchers to use SVM as a classifier¹³.

Optimization algorithms used for Gene Selection

Yajie Liu *et al.* (2013) explain the study of TLPSO- two-layer particle swarm optimization and its establishment for better accuracy in term of classify the uncertain samples of tanning data set. They had taken 3 microarray gene expression data sets which contains Leukemia, DLBCL and Tumor data set having multiclass problem to test the efficiency of the proposed method. In this work they also compare the secured result of TLPSO with PSO. Result revealed that TLPSO algorithm performed better accuracy than PSO in the sense of global searching capability and classification of genes with large number of samples¹⁴.

Ahmed Ibrahim Hafez *et al.* (2015) proposed a new method named CSO- chicken swarm optimization, for gene selection. The proposed method was applied on 18 datasets such as BC-Breast-Cancer, Breast-EW, Congress-EW, Exactly, Exactly2, Heart-EW, Ionosphere-EW, Krvskp-EW, Lymphography, M-of-n, Penglung-EW, Sonar-EW, Spect-EW, Tic-tac-toe, Vote, Waveform-EW, Wine-EW and Zoo, to select the best gene subset from the data set. The data sets used in this work are drawn from UCI Repository. They compare the outcome of the proposed method with most popularly used GA and PSO algorithm to study the performance, which proves that CSO can achieve good result than other two methods¹⁵.

Again Ahmed Ibrahim Hafez (2016) suggested another algorithm named SCA- sine cosine algorithm

for improvement in gene selection. They also compare the result of SCA with GA and PSO to measure the efficiency and to know which one is better for gene selection. And they proved that SCA is performed better than GA and PSO by implementing it on 18 microarray cancer based data sets that are BC-Breast-Cancer, Breast-EW, Congress-EW, Exactly, Exactly2, Heart-EW, Ionosphere-EW, Krvskp-EW, Lymphography, M-of-n, Penglung-EW, Sonar-EW, Spect-EW, Tic-tac-toe, Vote, Waveform-EW, Wine-EW and Zoo¹⁶.

Hossam M. Zawbaa *et al.* (2016) proposed a new method named MFO- Moth-flame optimization, for gene selection. The proposed method was applied on 18 datasets such as BC-Breast-Cancer, Breast-EW, Congress-EW, Exactly, Exactly2, Heart-EW, Ionosphere-EW, Krvskp-EW, Lymphography, M-of-n, Penglung-EW, Sonar-EW, Spect-EW, Tic-tac-toe, Vote, Waveform-EW, Wine-EW and Zoo, to select the best gene subset from the data set. They compare the outcome of the proposed method with most popularly used GA and PSO algorithm to study the performance, which proves that MFO can achieve good result than other two methods, but it consume more time¹⁷.

Madhu Sudana Rao Nalluri (2017) introduced a method to reduce the risk of analyzing gene subset. The invented method was AFSSO- Artificial Fish Swarm Optimization algorithm. This method was applied on 9 different data sets (SRBCT, Hepatitis, Wine, Parkinsons, Glass, Bupa, Movement, Svmguide3, and Churn) to measure the rate of performance. Data sets used here are having both binary classes and multiple classes. This algorithm gives better performance for the data sets having fewer genes. In this work they use SVM as classifier¹⁸.

R.Ranjani Rani and Dr.D.Ramyachitra (2017) got 100% result by applying KHO- Krill Herd Optimization for gene selection. In this work they use RF- Random Forest technique as classifier with KHO algorithm. Here in this work ten (Ovarian, Leukemia, Colon, Lymphoma, DLBL, CNS, SRBCT, Lung, Prostate, Breast Cancer) different microarray data set were used to calculate the effectiveness of the suggested method. They compared the proposed technique with other famous surviving approaches such as PSO/SVM, PSO/RF, FSO/SVM and FSO/RF¹⁹.

Embedded Approach

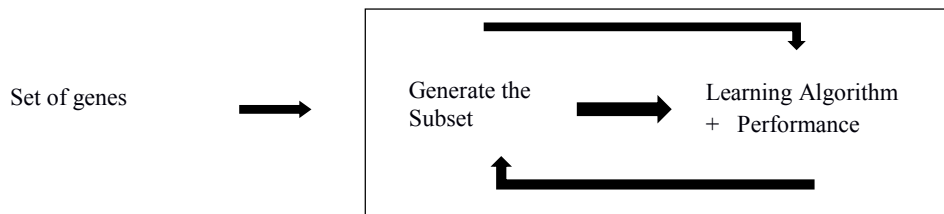


Figure 3. Embedded approach to gene selection

Embedded methods are of special case for wrapper methods, and during the construction of a classifier gene selection is conducted. When a gene selection technique is inserted with a learning algorithm is called an embedded method. Embedded methods are faster than wrappers and make the gene selection more efficient for the learning algorithm with which that they collaborate. Embedded methods are used by taking the benefits of the model dataset for problem diagnosis and for choosing appropriate gene which is most important one. Methods like decision tree and neural network are comes into this category. Computational complexity of

embedded method is very high.

After a lot of researches Ho Sun Shon, Kenu Ho Ryu (2010) invent a gene selection method which is based on a combined filter method embedded with a lasso regression model. It means that in first phase by using filter method some of the significant genes are selected, and further stage LASSO model was applied. In this work the experimental data are two class Leukemia data set (ALL & AML). The researchers found that LASSO model gives best performance from other existing model²⁰.

Edmundo Bonilla-Huerta *et al.* (2016) proposed a two stage approach for gene selection and classification. Multiple Fusion Filters are combinely applied in the first stage for preliminary gene selection. Then in the second stage by using an embedded GA, TS and SVM most relevant subset of genes are chosen. This proposed method is tested on four microarray data sets (Leukemia, Colon, Lung, CNS, and DLBCL). Embedded approach obtain small gene subset with high accuracy²¹.

Muthukrishnan R and Rohini R (2016) explores regression methods for gene selection, OLS regression, ridge regression and the LASSO regression. Experimental result shows that LASSO gives better performance than other²².

MI-B-ASGL (Mutual information-based Adaptive Sparse Group Lasso) method was proposed by Juntao Li, Wenpeng Dong, and Deyuan Meng (2017) for choosing genes. Efficiency and accuracy have been measured on three type of cancer datasets i.e. colon, lung and prostate. Result revealed this proposed method can increase the accuracy of both classification and gene selection²³.

Hybrid Approach

None of the gene selection method are capable of to solve the whole problem alone. So to overcome this problem some ensemble approaches are found. This type of assembling approaches are called hybrid method and the results of this method are integrated.

Pros:-Performance as well as accuracy is higher than filter method. Computational complexity is far better than wrapper method. Flexible and robustness is high on high dimensional data.

Cons:-This is a classifier specific method. This approach depends on the combination of different feature selection method.

Yukyee Leung and Yeungsam Hung (2010) introduced a hybrid method based on MFMW (multiple-filter multiple-wrapper). They proposed this method to overcome the drawbacks of SFSW-single-filter-single-wrapper. In this work they compare this two method i.e MFMW and SFSW by doing the experiment on 6 microarray cancer data set (Leukemia, Colon, Breast tumors, lymphoma, prostate and lung cancer). Results shows that MFMW is better than SFSW²⁴.

Piyushkumar A. Mundra and Jagath C. Rajapakse

(2010) proposed a hybrid gene selection method based on both MRMR and SVM. Here in this work first MRMR is used for electing the maximum relevant and minimum relevant genes from the total data set and then they tries to remove the least significant genes by using SVM-RFE. The proposed method gives best result as compared to MRMR or SVM-RFE. They used 4 data set (Colon, Leukemia, Prostate and hepato) to do the experiment²⁵.

Mohd Saberi Mohamad (2010) invented a three stage gene selection method. In this work they use GR or IG as a filter method for preliminary selection of gene subset. In the next step they use MOGASVM as hybrid method to select the closest gene subset among the preliminary gene set. The third step is to measure the frequency of each gene in the near optimal gene subset. The proposed three-stage gene selection method was tested on three tumor based data sets (MLL data set, SRBCT data set and Colon data set) that contain both two class and multiclass of tumor samples. This method avoid over fitting problem with high accuracy²⁶.

Feihu Yang *et al.* (2011) proposed an algorithm for gene selection named RF-MI, which is applicable for multiple class. At first they had applied ReliefF algorithm on the total data set and further they used MI for more clarification. They compared the proposed algorithm with ReliefF and GR solely and got the result that the proposed algorithm is better than the two sole method. Experiments obtained on UCI data set. Compared result revealed that the proposed algorithm have lower time complexity as well as lower space complexity²⁷.

S. Nikumbh *et al.* (2012) proposed two Hybrid methods one is BBO – RF-(Biogeography – based Optimization) – Random Forests and another one is BBO – SVM for gene selection. Outcome of the proposed algorithm was tested on 3 cancer based microarray gene data set that are colon, Breast, Leukemia. Result proved that the proposed method is easy to implement, and also both of the method are robust and flexible²⁸.

In a study Bo Liao *et al.* (2014) invented a method for choosing best gene subset named LSLS- locality sensitive Laplacian score. This is a supervised method for gene selection. The presented method was combined LSLS and a wrapper based method i.e sequential forward selection or sequential backward selection for further refinement of genes. They had worked on six cancerous

data set that are: - Prostate, AML-ALL Leukemia, DLBCL, Lung Cancer, MLL Leukemia and SRBCT. The researcher compared their proposed method with other predefined methods such as KW+SVM, Relieff+SVM, SPFS+SVM and got to know that their method was shown best result for Lung, SRBCT, and Prostate data sets²⁹.

Saima Rathore *et al.* (2014) proposed a feed forward gene selection procedure. In their study they used two gene selection algorithms one after another that mean that the outcome the first method (Chi-square) was fed as input to the second (mRMR), which is named as feed forward. They measure the accuracy of the proposed method by applying it on three standard colon cancerous data set³⁰.

J.Cao (2015) invented a gene selection method based on SVDD-Support vector data description. As SVDD can only consider the problem with target class only to overcome this problem a new method was proposed in this work called as MSVDD. It can applied to multiclass microarray data set. And also a RFE introduced to remove non related genes. So all total the new method is MSVDD-RFE. To validate the efficiency of the proposed method they applied it on five microarray datasets that are Leukemia, colon, Leukemia3, Novartis and lung cancer. This method revealed the result with high accuracy and low time complexity³¹.

Hanaa Salem *et al.* (2015) proposed a combined method of IG-Information gain and DGA-Deep Genetic Algorithm for gene selection. In this work they first applied IG-(INFORMATION GAIN) for selecting genes and then uses GA-(genetic algorithm) for gene reduction. Finally they used GP for cancer classification. To evaluate the accuracy of the proposed method they applied it on seven different data sets and also outcome is compared with six recently invented methods. Data sets taken into consideration are Lung-cancer- Ontario, Lung cancer-Michigan, Leukemia, Colon, Central nervous system, DLBCL, Prostate. The outcome shows that the new method was capable for classification accuracy maximization and number of chosen genes against other approaches are minimized³².

F. Vafae *et al.* (2016) proposed a two phase hybrid gene selection method. In the first phase Fisher Criterion belongs to filter approach, is used as to reduce the initial genes, further in second phase a Hybridization of CLA-

(Cellular Learning automata) and ACO-(Ant colony Optimization) belong to wrapper approach is used to find the set of features which improve the classification accuracy. In this work they evaluate the proposed method on 4 microarray data sets (lung cancer, colon cancer, prostate cancer, leukemia)³³.

Atiyeh Mortazav *et al.* (2016) invented a novel gene selection method which is the combination of two filter based gene selection method, named as MI-mutual information and FR-Fisher ratio. A Shapley index used in this work to measure the power of each gene. And lastly they had applied a forward selection scheme to weight individual gene according to the scoring function. The outcome of the novel method was compared with other popularly used gene selection algorithms such as FR-Fisher ratio, mRMR-minimum redundancy maximum relevance, and cooperative game based gene selection. The average classification accuracy on eleven microarray data sets (Brain Tumor2, Leukemia1, Leukemia2, Lung Cancer, SRCBT, 11Tumors, 14 Tumors, 9 Tumors, Brain Tumor1, Prostate Tumor, and DLBCL) proved that the proposed approach improves both average accuracy and average stability compared to other approaches³⁴.

Elnaz Pashaei proposed (2016) RFR-BBHA in this study. In this approach, BBHA combined with RFR-Random Forest Ranking was applied to perform gene election. Experiment based on four cancer microarray data set (Colon, CNS-Central Nervous System, ALL-AML, MLL) shows that the proposed approach revealed higher classification accuracy by obtaining less number of genes. Bagging with 10-fold cross validation is used as classifier to classify the related disease³⁵.

A combined method for gene reduction which contains both gene extraction and gene selection was investigated by Thuy Hang Dang *et al.* (2016). It is a systematic gene reduction framework. To operate the invented framework they used PCA- Principle component analysis as gene extraction and DT- Decision tree as gene selection. In this work multi-layer perceptron was used as gene classification at last. To measure the accuracy researchers had taken three data sets (Leukemia, Prostate, and DLBCL). They proved that gene extraction is also an important step with gene selection to get best gene subset³⁶.

L. Gao *et al.* (2017) presented a method for gene selection based on hybrid approach i.e. Information

gain-support vector machine (IG-SVM) by applying on 5 cancerous microarray data sets (lung, colon, prostate, leukemia, DLBCL). They apply and compared different filter methods (IG, Gain ratio, ReliefF, Correlation) to filtering out irrelevant and redundant genes, and result revealed that IG was best as compared to other, then for further removing of redundant genes, they used SVM by eliminate the noisy data from the datasets more effectively. In the final step informative genes are selected by IG-SVM, given as the input to the LIB-SVM classifier³⁷.

S. Singh *et al.* (2017) proposed a novel algorithm, which is based on execution flow of various data reduction filter like low variance filter (LVF), low entropy filter (LVF), etc. This reduction filters are combined to get the optimum number of gene set. This proposed method is a three stages gene selection process. First stage is based on removing noise from the total data set. Second stage they tries to remove the missing values by using KNN (K Nearest neighbor). In last step the suggested algorithm works by combining the various data reduction filters and performs six dissimilar types of execution flows. The performance of the proposed algorithm is verified by applying on three dissimilar types of gene expression data set i.e lung, breast and prostate³⁸.

L. Mengdi *et al.* proposed a ReliefF PSO algorithm in the year of 2018, which consist of two part. In the first part they calculate the weight vector of all individual genes by using the Relief method and remove the genes which are irrelevant for the classification. In the second part to access the best subset of gene, they use PSO algorithm to identify the redundant genes and also remove it. Performance of the proposed algorithm was figured out by applying this on four cancer data set i.e. Colon cancer, SRBCT, Leukemia, Lung cancer. They compare their proposed algorithm with other algorithms like ReliefF, mRMRReliefF, CFS, FCBF and result revealed that ReliefF PSO best from others³⁹.

Y. Sun *et al.* (2018) presented a CEMFE-(Cross-entropy based multi-filter ensemble) method, for the classification of gene data set. In this work they first use multiple filtering method (SNR, TS and PC) to choose the relevant gene subset. Secondly they use the Cross Entropy method to examine the gene which are independent and relevant. In conclusion to select the best gene subset they use the forward feature selection method which is a wrapper based approach. They

evaluated the algorithm by applying this on five types of cancer data set (colon, prostate, leukemia, lymphoma and lung). They used SVM, KNN and NB as classifier to classify the gene. Result revealed that the proposed algorithm gives high accuracy as well as it select less genes from others⁴⁰.

Kavitha K R *et al.* (2017) proposed a hybrid gene selection method using both FCBF (Fast Correlation-Based Filter) and SVM-RFE. In the first step they apply the FCBF to remove the prominent genes from the total dataset and further they had applied SVM-RFE to figure out the genes which are not relevant for the classification. They aimed to classify the Leukemia data set in their work. They had compared the proposed method with SVM-RFE and proved that the proposed method took less time than SVM-RFE⁴¹.

D.Pavithra and Mr.B.Lakshmanan (2017) presented a hybrid method based on both filter (Mutual information) and wrapper (Genetic Algorithm) method. Colon cancer dataset is taken as input gene set for classification. This method performs well. Decision tree (C4.5) used for classification of the chosen genes⁴².

CONCLUSION

This paper delivers review of gene selection procedures using gene expression data. It describes the DNA microarray, the difficulties involved in the method of gene selection including high dimensional data, irrelevant, redundant and noisy data. It provides the details of gene selection methods using Filter, Wrapper, Embedded and hybrid. Gene selection in which genes are taken as features is a significant job. As the subgroup of useful and promising genes acquired after applying different gene selection methods. These are used by different classifiers to reach best classification accuracy, disease prediction etc. This paper argues the classification of gene selection methods with its advantages and disadvantages. Many researchers put vast and creative efforts in filter, wrapper and embedded methods. Hybrid method which combines the advantages of both filter and wrapper proves to give favorable results. Thus the encroachment of hybrid methods for gene selection can be considered auspicious. In recent years most of the gene selection work were done using hybrid method as it achieve best result compared to others.

Conflict of Interest – Nil

Source of Funding- Self**Ethical Clearance – Not Required****REFERENCES**

- [1] Lorenzo Beretta and Alessandro Santaniello. Implementing ReliefF filters to extract meaningful features from genetic lifetime datasets. Elsevier Inc 2011; 389-395.
- [2] Guoli Ji, Zijiang Yang and Wenjie You. PLS-Based Gene Selection and Identification of Tumor-Specific Genes. Elsevier Inc 2011; 41(6): 830 – 841.
- [3] Debahuti Mishra and Barnali Sahu. A Signal-to-noise Classification Model for Identification of Differentially Expressed Genes from Gene Expression Data. 3rd International Conference on Electronics Computer Technology 2011; 2: 204-208.
- [4] Guoyin Wang, Juan Gao and Feng Hu. A stable gene selection method based on Sample Weighting. 26th IEEE Canadian Conference on Electrical and Computer Engineering (CCECE) 2013; 1-4.
- [5] Devi A. Vanitha C, Devaraj D and Venkatesulu M. Gene Expression Data Classification using Support Vector Machine and Mutual Information-based Gene Selection. Elsevier Inc 2015; 47(6): 13-21.
- [6] Wenyan Zhong, Xuewen Lu and Jingjing Wu. Feature Selection for Cancer Classification Using Microarray Gene Expression Data. Biostatistics and Biometrics Open Access Journal 2017; 13(2).
- [7] Ryan J. Urbanowicz, Melissa Meeker, William LaCava, Randal S. Olson and Jason H. Moore. Relief Based Feature Selection: Introduction and Review. Elsevier Inc 2018; 85: 189-203.
- [8] Kentaro Fukuta, Tomomasa Nagashima and Yoshifumi Okada. LEAF: Leave-One-Out Forward Selection Method for Cancer Classification Using Gene Expression Data. IEEE/ACIS 9th International Conference on Computer and Information Science 2010; 31 – 36.
- [9] Aiguo Wang, Ning An, Guilin Chen, Lian Li and Gil Alterovitz. Accelerating incremental wrapper based gene selection with K-Nearest-Neighbor. IEEE International Conference on Bioinformatics and Biomedicine (BIBM) 2014; 21 – 23.
- [10] A. Sylvia Selva Rani and R.R. Rajalaxmi. Unsupervised Feature Selection Using Binary Bat Algorithm. 2nd International Conference on Electronics and Communication Systems (ICECS) 2015; 451 – 456.
- [11] Thanh Trinh, DingMing Wu, Salman Salloum, Tung Nguyen and Joshua Z. Huang. A frequency-based gene selection method with random forests for gene data analysis. IEEE RIVF International Conference on Computing & Communication Technologies, Research, Innovation, and Vision for the Future (RIVF) 2016; 193 – 198.
- [12] Swagatam Basu, Sunanda Das, Sujata Ghatak and Asit Kr. Das. Strength pareto evolutionary algorithm based gene subset selection. International Conference on Big Data Analytics and Computational Intelligence (ICBDAC) 2017; 79-85.
- [13] Bhavna Srivastava, Rajeev Srivastava and Mahesh Jangid. Filter vs. Wrapper approach for optimum gene selection of high dimensional gene expression dataset: An analysis with cancer datasets. International Conference on High Performance Computing and Applications (ICHPCA) 2014; 1-6.
- [14] Yajie Liu , Xinling Shi , Baolei Li , Lian Gao , Changxing Gou , Qinhu Zhang and Yunchao Huang. Comparative study of two-layer particle swarm optimization and particle swarm optimization in classification for tumor gene expression data with different dimensionality. 6th International Conference on Biomedical Engineering and Informatics 2013; 524-529.
- [15] Ahmed I. Hafez , Hossam M. Zawbaa , E. Emary , Hamdi A. Mahmoud and A. Ella Hassanien. An innovative approach for feature selection based on chicken swarm optimization. 7th International Conference of Soft Computing and Pattern Recognition (SoCPaR) 2015; 19-24.
- [16] Ahmed I. Hafez, Hossam M. Zawbaa, E. Emary and A.Ella Hassanien. Sine cosine optimization algorithm for feature selection. International Symposium on INnovations in Intelligent SysTems and Applications (INISTA) 2016; 1-5.
- [17] Hossam M Zawbaa, E. Emary, B. Parv and M. Sharawi. Feature selection approach based

- on moth-flame optimization algorithm. IEEE Congress on Evolutionary Computation (CEC) 2016; 4612 – 4617.
- [18] Madhu Sudana Rao Nalluri , T SaiSujana , K Harshini Reddy and V Swaminathan. An efficient feature selection using artificial fish swarm optimization and svm classifier. International Conference on Networks & Advances in Computational Technologies (NetACT) 2017; 407 – 411.
- [19] R. Ranjani Rani and D. Ramyachitra. Krill Herd Optimization algorithm for cancer feature selection and random forest technique for classification. 8th IEEE International Conference on Software Engineering and Service Science (ICSESS) 2017; 109-113.
- [20] Ho Sun Shon, Kenu Ho Ryu and Kyung-Sook Yang. Feature Selection of Gene Expression Data Using Regression Model. 10th IEEE International Conference on Computer and Information Technology 2010; 1442 – 1447.
- [21] Edmundo Bonilla-Huerta, Alberto Hernandez-Montiel, Roberto Morales-Caporal and Marco Arjona-Lopez. Hybrid Framework Using Multiple-Filters and an Embedded Approach for an Efficient Selection and Classification of Microarray Data. IEEE/ACM Transactions on Computational Biology and Bioinformatics 2015; 13(1): 12-26.
- [22] R Muthukrishnan and R Rohini. LASSO: A feature selection technique in predictive modeling for machine learning. IEEE International Conference on Advances in Computer Applications (ICACA) 2016; 18-20.
- [23] Juntao Li, Wenpeng Dong and Deyuan Meng. Grouped Gene Selection of Cancer via Adaptive Sparse Group Lasso Based on Conditional Mutual Information. IEEE/ACM Transactions on Computational Biology and Bioinformatics 2017; 1-1.
- [24] Yukyee Leung and Yeungsam Hung. A Multiple-Filter-Multiple-Wrapper Approach to Gene Selection and Microarray Data Classification. IEEE/ACM Transactions on Computational Biology and Bioinformatics 2008; 7(1): 108-117.
- [25] Piyushkumar A. Mundra and Jagath C. Rajapakse. SVM-RFE with MRMR Filter for Gene Selection. IEEE Transactions on NanoBioscience 2009; 9(1): 31-37.
- [26] Mohd S. Mohamad, Sigeru Omatu , Safaai Deris and Michifumi Yoshioka. A Three-Stage Method to Select Informative Genes from Gene Expression Data in Classifying Cancer Classes. International Conference on Intelligent Systems, Modelling and Simulation 2010; 158-163.
- [27] Feihu Yang, Weiqing Cheng, Renfu Dou and Ningning Zhou. An improved feature selection approach based on ReliefF and Mutual Information. International Conference on Information Science and Technology 2011; 246-250.
- [28] Sarvesh Nikumbh, Shameek Ghosh and V. K. Jayaraman. Biogeography-based informative gene selection and cancer classification using SVM and Random Forests. IEEE Congress on Evolutionary Computation 2012; 1-6.
- [29] Bo Liao, Yan Jiang, Wei Liang, Wen Zhu, Lijun Cai and Zhi Cao. Gene Selection Using Locality Sensitive Laplacian Score. IEEE/ACM Transactions on Computational Biology and Bioinformatics 2014; 11(6): 1146-1156.
- [30] Saima Rathore, Muhammad A. Iftikhar and Mutawarra Hussain. A novel approach for automatic gene selection and classification of gene based colon cancer datasets. International Conference on Emerging Technologies (ICET) 2014; 42-47.
- [31] Jin Cao, Li Zhanga, Bangjun Wang, Fanzhang Li and Jiwen Yanga. A fast gene selection method for multi-cancer classification using multiple support vector data description. Journal of Biomedical Informatics 2014; 53: 381-389.
- [32] Hanaa Salem, Gamal Attiya and N. El-Fishawy. Gene expression profiles based Human cancer diseases classification. 11th International Computer Engineering Conference (ICENCO) 2015; 181-187.
- [33] Fatemeh V. Sharbaf, Sara Mosafer and Mohammad H. Moattar. A hybrid gene selection approach for microarray data classification using cellular learning automata and ant colony optimization. Genomics 2016; 107(6): 231-238.
- [34] Atiyeh Mortazavi and Mohammad H. Moattar. Robust Feature Selection from Microarray Data Based on Cooperative Game Theory and

- Qualitative Mutual Information. *Advances in Bioinformatics* 2016; 2016.
- [35] Elnaz Pashaei, Mustafa Ozen and Nizamettin Aydin. Gene selection and classification approach for microarray data based on Random Forest Ranking and BBHA. *IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI) 2016*; 308-311.
- [36] Thuy H. Dang, Trung D. Pham, Hoai L. Tran and Q. Le Van. Using dimension reduction with feature selection to enhance accuracy of tumor classification. *International Conference on Biomedical Engineering (BME-HUST) 2016*; 14-17.
- [37] Lingyun Gao, Mingquan Ye, Mingquan Ye, Xiaojie Lu, and Daobin Huang. Hybrid Method Based on Information Gain and Support Vector Machine for Gene Selection in Cancer Classification. *Genomics Proteomics Bioinformatics* 2017; 15(6): 389-395.
- [38] Abhishek and Shailendra Singh. A Novel Algorithm to Preprocess Cancerous Gene Expression Dataset for Efficient Gene Selection. *2nd International Conference for Convergence in Technology (I2CT) 2017*; 632-635.
- [39] Mengdi Liu, Liancheng Xu, Jing Yi and Jie Huang. A Feature Gene Selection Method Based on ReliefF and PSO. *10th International Conference on Measuring Technology and Mechatronics Automation 2018*; 298-301.
- [40] Yingqiang Sun, Chengbo Lu and Xiaobo Li. The Cross-Entropy Based Multi-Filter Ensemble Method for Gene Selection. [www.mdpi.com/journal/genes2018;9\(5\)](http://www.mdpi.com/journal/genes2018;9(5)).
- [41] K. R. Kavitha, Ajith Gopinath and Midhun Gopi. Applying Improved SVM Classifier for Leukemia Cancer Classification using FCBF. *International Conference on Advances in Computing, Communications and Informatics (ICACCI) 2017*; 61-66.
- [42] D. Pavithra and Mr.B.Lakshmanan. Feature Selection and Classification in gene expression cancer data. *International Conference on Computational Intelligence in Data Science (ICCIDS) 2017*; 1-6.
- [43] Mallick PK, Mishra D, Patanaik S, Shaw K. A Novel Supervised Gene Clustering Approach By Mining Interdependent Gene Patterns. *International Journal Of Pharma And Bio Sciences*. 2016; Volume -7.

An Approach to Predict Hypertension based on Handwritten Manuscript

Seema Kedar¹, D. S. Bormane²

¹Dept. of Computer Engineering, JSPM's Rajarshi Shahu College of Engineering, S.P.P.U, Pune, India,

²Professor, Dept. of Electronics and Telecommunication, AISSMS College of Engineering, Pune, India

ABSTRACT

Background/Objectives: Hypertension is leading cause of deaths all over the world as it leads to heart, kidney and brain damage. Most of the Indian population is not health conscious. Around 58% urban and 75% rural Indians are not aware of their hypertensive status. As per survey in 2013, there is increase of 138% in deaths due to hypertension in India in comparison with number of deaths in 1990. This paper presents an approach for predicting hypertension using handwritten manuscript which is based on science of handwriting analysis. Handwriting analysis is the ancient science which is used to predict personality, emotional state and health conditions of the writer. As per the science of handwriting analysis, the handwriting strokes of the person remains same throughout the life. Handwriting is recognized as being unique to each individual. It is not related to gender and age. Handwriting analysis is used to understand PRE-ILLNESS warnings which appear in the handwriting much before the disease symptoms can be detected by any modern equipment or tests. In this paper, an approach for predicting hypertensive people based on handwritten manuscript is presented. The proposed system extracts eighteen writing features such as Euler number, number of right and left slant lines, number of horizontal and vertical lines, total length of horizontal and vertical lines, total length of left and right slant lines, overall image size, top margin, right margin, bottom margin, left margin, spacing between the words and lines, font size, and letter slant from a handwritten manuscript. Three different feature sets namely geometric, graphological and integrated feature set have been formed using extracted writing features.

Methods/Statistical analysis: This study uses a dataset of 150 handwritten manuscripts of hypertensive people and 150 of control group people. The performance of the system has been evaluated with different size datasets and for each feature set.

Findings: The proposed approach provides maximum 93.30% sensitivity, 92.2% specificity, 92.75% accuracy, 92.25% positive predictive value, 93.30% negative predictive value, positive likelihood ratio 12.52, negative likelihood ratio 0.07 using support vector machine classifier with integrated feature set.

Improvements/Applications: Extremely useful in healthcare centers and individual health analysis.

Keywords: *Handwritten manuscript, writing features, handwriting analysis, geometric features, graphological features, integrated feature set.*

INTRODUCTION

Globally 7.5 million deaths occur due to Hypertension [1]. Hypertension is one of the leading causes for premature deaths and disability worldwide. It is global health challenge as it leads to chronic kidney disease and cardiovascular disease [2]. Hypertension is the most important risk factor for the heart disease.

It is the need of time to take necessary steps for early prediction of hypertension, and develop techniques which are cost effective and easily available.

Prediction, control and treatment of hypertension are very important for the prevention of consequent heart and kidney diseases. Most of the governments across the globe are creating awareness about hypertension among

the people. Efforts are taken to reduce mortality counts due to hypertension. Early detection and appropriate treatment is the key to fight against this disease.

Various approaches have been used by researchers to predict possibility of heart disease using soft computing approaches based on parameters like cholesterol, sex, resting blood pressure, fasting blood sugar, age, chest pain type, resting ECG, exercise induced angina, maximum heart rate, old peak, slope, and number of vessels colored [3, 4, 5, 6]. There is no single computerized approach available to predict hypertension.

As per the research done in the University of Plymouth, England, the health conditions are revealed through writing features [7]. Based on the science of handwriting analysis, the handwriting of person shows pre-illness warnings [8]. People suffering from same disease have similar writing features also referred as graphological features like margin, slant, size, spacing between the words and lines, baseline etc.

This paper presents an approach to predict hypertension using support vector machine (SVM)

classifier based on handwritten manuscript. The proposed system extracts ten geometric features such as Euler number, number of right and left slant lines, number of horizontal and vertical lines, total length of horizontal and vertical lines, total length of left and right slant lines, and overall image size from a written manuscript. It also extracts eight graphological features such as top margin, right margin, bottom margin, left margin, spacing between the words and lines, font size, and letter slant from the manuscript. These features are used to predict whether the writer is healthy (control group) or hypertensive person using SVM classifier.

The remainder of the paper is organized as follows: first the brief overview of proposed system is given. The experimental results are discussed in next section. The last section concludes the paper.

Proposed Approach

The proposed system works in four stages namely scanning, preprocessing, feature extraction and classification as shown in Figure 1.

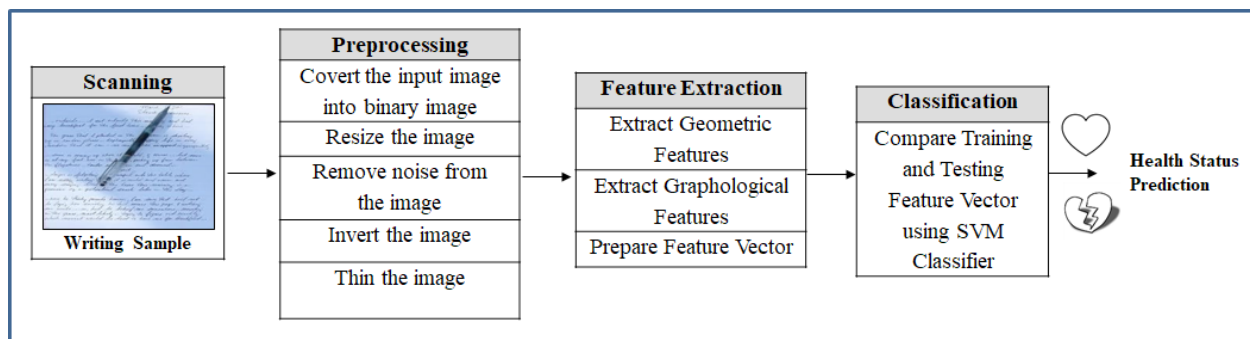


Figure 1. Block diagram of proposed system

1) Scanning:

This stage converts the input handwritten manuscript collected on A4 size white paper into JPEG image using the scanner. This scanned image is given as input to the preprocessing stage.

2) Preprocessing:

The scanned image is preprocessed so as to reconstruct it, remove noise from it and to improve the accuracy of algorithms applied on it. This stage converts the scanned image into gray scale. The grayscale image is converted into binary image. Further the binary image is resized and noise is removed from it. This image is

then inverted and finally thinned.

3) Feature extraction:

This stage extracts geometric and graphological features required for effective classification using SVM [9, 10, 11]. Three different feature sets namely geometric, graphological, and integrated feature set are formed using extracted features. Different feature sets with related features are given in Table 1.

4) Classification:

The proposed approach uses SVM classifier for classification of input data. Initially the system

prepares training feature vector using all images from training dataset. While preparing the training feature vector, the proposed algorithm reads the input image from training data set and preprocesses it. Then as per requirement it either extracts geometric or graphological or both geometric and graphological features from the preprocessed image and forms the feature set using respective features. If the input image belongs to control group category it adds the label 'CG' to newly created feature set else it adds the label 'Hypertension' to it.

This feature set is added into training feature vector. This process is repeated for all the images in training dataset. During testing, the system reads the test image from testing dataset. It preprocesses the test image and prepares the testing feature vector for it by extracting geometric or graphological or both geometric and graphological features as per requirement. The SVM classifier compares both training and testing feature vectors and predicts whether the writer is control group or hypertensive person.

Table 1. Feature Sets

Sr. No.	Feature Set	No. of Features	Features
1.	Geometric feature set	10	Euler number, number of right and left slant lines, number of horizontal and vertical lines, total length of horizontal and vertical lines, total length of left and right slant lines, and overall image size.
2.	Graphological feature set	8	Top margin, right margin, bottom margin, left margin, spacing between the lines, spacing between the words, letter slant, and letter size.
3.	Integrated feature set	18	Euler number, number of right and left slant lines, number of horizontal and vertical lines, total length of horizontal and vertical lines, total length of left and right slant lines, and overall image size, top margin, right margin, bottom margin, left margin, spacing between the lines, spacing between the words, letter slant, and letter size.

EXPERIMENTAL RESULTS AND DISCUSSION

The proposed approach has been implemented using a system with Intel i5 processor, 8.00 GB RAM, 64-bit operating system, and Matlab R2014a. A database of 300 handwritten manuscripts has been prepared by collecting handwritten manuscripts from hypertensive and control group people. The authenticity of the data has been verified while collecting the data from various clinics under the guidance of doctors. The dataset contains 150 manuscripts of hypertensive people and 150 of control group people.

Performance analysis of SVM with different feature sets

The performance of SVM classifier is evaluated for geometric, graphological and integrated feature sets using dataset *Set1* given in Table 2. The *Set1* contains 300 handwritten manuscripts. The *Set1* is partitioned into training dataset with 200 manuscripts, 100 of hypertension and 100 of control group class, and testing dataset with 100 handwritten manuscripts, 50 of hypertension and 50 of control group (CG) class.

Table 2. Dataset *Set1* Details

Health Status	No. of Training Samples	No. of Testing Samples	Total Samples
CG	100	50	150
HBP	100	50	150

The confusion matrix shown in Table 3 is prepared based on results obtained for geometric, graphological and integrated feature sets using SVM classifier.

Table 3. Confusion Matrix for geometric, graphological and integrated feature sets

		Predicted Class for					
		Geometric Feature Set		Graphological Feature Set		Integrated Feature Set	
		Hypertension	CG	Hypertension	CG	Hypertension	CG
Actual Class Values	Hypertension (50)	31 (TP)	19 (FN)	44 (TP)	6 (FN)	46 (TP)	4 (FN)
	CG (50)	11 (FP)	39 (TN)	6 (FP)	44 (TN)	3 (FP)	47 (TN)
Total (100)		42	58	50	50	49	51

To evaluate performance of SVM classifier accuracy, specificity, sensitivity, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (LR+) and negative likelihood ratio (LR-) have been computed separately for geometric, graphological and integrated feature sets. Specificity and sensitivity shows the diagnostic accuracy of a test. The terms PPV and NPV represent the probability of disease. Test with specificity, sensitivity, PPV, and NPV greater than 90% has got high credibility. LR+ and LR- are more useful clinically to measure diagnostic accuracy. To rule in or rule out diagnoses, LR+ greater than 10 and LR- less than 0.1 provides strong evidence.

performance of the proposed system when used with different feature sets. For geometric feature set, sensitivity was found to be 62%, specificity 78%, PPV 62% and NPV 67%, LR+ 2.82 and LR- 0.49. This shows that the results obtained using only geometric features are sometimes useful clinically. For graphological feature set, sensitivity was found to be 88%, specificity 88%, PPV 88% and NPV 88%, LR+ 7.33 and LR- 0.14. This indicates that the test performed using graphological features are often useful. In case of integrated feature set, sensitivity was found to be 92%, specificity 94%, PPV 94% and NPV 92%, LR+ 15.33 and LR- 0.085. This indicates that the test performed using integrated feature set is highly credible and very useful test clinically.

Following Figure 2 and Figure 3 represents the

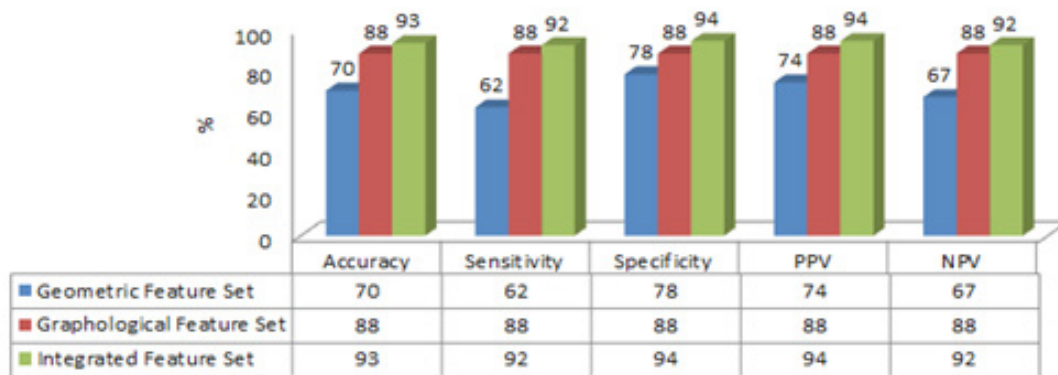


Figure 2. Performance analysis of SVM classifier for different feature sets

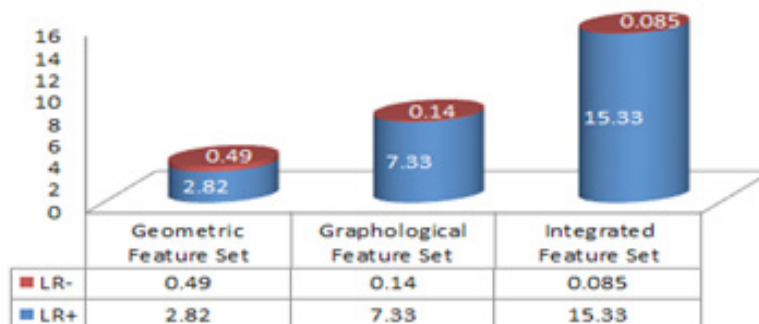


Figure 3. Featuresetwise Likelihood Ratios

Performance analysis using different data sets

As SVM classifier gives good performance with integrated features set, the performance of proposed system is further evaluated with integrated feature set using three more datasets. The second set *Set2* contains 3/4 of total images i.e 225 images for training and 1/4 of total images i.e 75 images for testing. The third set *Set3* contains 4/5 of total images i.e 240 images for training and 1/5 of total images i.e 60 images for testing. The fourth set *Set4* contains 5/6 of total images

i.e 250 images for training and 1/6 of total images i.e 50 images for testing. The performance of the proposed system with integrated feature set using different data sets is shown in Figure 4 and Figure 5. It gives average 93.30% sensitivity, 92.2% specificity, 92.75% accuracy, PPV 92.25%, NPV 93.30%, LR+ 12.52, LR- 0.07. Thus, sensitivity, specificity, PPV and NPV values are above 90%, LR+ is above 10 and LR- is below 1. This shows that the proposed approach outperforms with any database size.

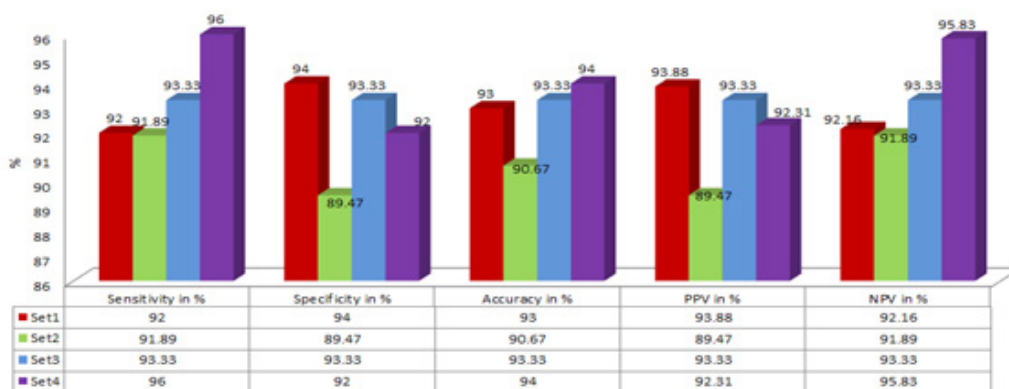


Figure 4. Performance analysis of SVM with integrated feature set using different datasets

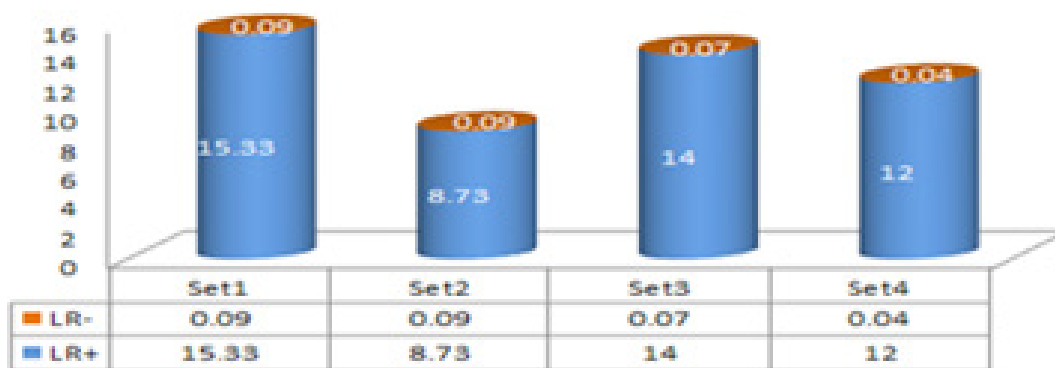


Figure 5. Likelihood Ratios for different datasets.

CONCLUSION

The proposed approach uses SVM classifier to predict hypertension based on handwritten manuscript. The SVM classifier outperforms with integrated features set. With 93.30% sensitivity, 92.2% specificity, 92.75% accuracy, 92.25% PPV, 93.30% NPV, LR+ 12.52, LR-0.07, this approach appears to be an excellent for predicting the healthy and hypertensive people. With geometric features, the proposed approach does

not give satisfactory results, but when it is used with graphological features or the combination of geometric and graphological features, it gives satisfactory results. This proves that graphological features reveal health status. The graphological features have been selected for this research by assuming the science of graphology which says that the people suffering from same disease have similar kinds of writing features and this has been proved through this research. From this, we can conclude

that the health status is reflected through handwriting of the person if the writer writes in relax and comfortable environment. Thus, the proposed approach is a novel technique for prediction of hypertension. To the best of our knowledge, this is first attempt for predicting hypertension using SVM classifier based on handwritten manuscript.

REFERENCES

1. www.who.int
2. Vaclav Monhart, Hypertension and chronic kidney diseases, Elsevier Education in Cardiology, 2013.
3. Vikas Chaurasia et al., Early Prediction of Heart Diseases Using Data Mining Techniques, Caribbean Journal of Science and Technology, Vol.1, 208-217, 2013.
4. Noura Ajam, Heart Diseases Diagnoses using Artificial Neural Network, Network and Complex Systems, Vol.5, No.4, 2015.
5. Preeti Gupta, Bikrampal Kaur, Accuracy Enhancement of Artificial Neural Network using Genetic Algorithm, International Journal of Computer Applications, Vol. 103, No. 13, 2014.
6. T.Manju; K.Priya; R.Chitra, 2013. HEART DISEASE PREDICTION SYSTEM USING WEIGHT OPTIMIZED NEURAL NETWORK, International Journal of Computer Science and Management Research Vol. 2, 2013.
7. What Your Handwriting Says About Your Health, available at <http://zoomhealth.net>.
8. <http://www.handwritingexplore.com>
9. M. Blumenstein; B. K. Verma; H. Basli, A Novel Feature Extraction Technique for the Recognition of Segmented Handwritten Characters, 7th International Conference on Document Analysis and Recognition, Edinburgh, Scotland: pp.137-141, 2003.
10. Dinesh Dileep, A Feature Extraction Technique based on Character Geometry for Character Recognition, Amrita School of Engineering, Kollam, Kerala, INDIA.
11. D. John Antony, Personality profile through handwriting analysis, O. F. M. Cap, Anugraha Publications, Tamilnadu, India, 2008.

Analysing the Causes of Cyclonic Severity in Bay of Bengal and Its Effects in Biotic Species Using XGBoost Algorithm

S Karthick¹, D Malathi², Ramraj¹, Yashwant K¹

¹Dept of SWE, SRM IST, Chennai, India, ²Dept of CSE, SRM IST, Chennai, India

ABSTRACT

The severity of the cyclone depends on the amount of the pressure drop in the centre and the rate at which it increases outwards. The importance for the prediction of cyclone intensity ⁷ is growing day by day. In this paper we are addressing about the four type of severity of cyclone - Depression(D), Deep Depression(DD), Cyclonic Storm(CS), Super Cyclonic Storm (SCS). The objective of the work is predicting the cyclone severity using the wind speed, latitude, longitude of the pressure. When the severity is predicted well in advance then it will be very useful for the disaster management for proper planning. In this paper we are applying Xgboost model of linear regression for prediction. Xgboost is a gradient boosting algorithm which is based on decision tree. The model is trained with the dataset of 10 years (1990 – 2000) containing latitude, longitude and pressure drop of the cyclones occurred in Bay of Bengal (BOB) along with the date and time. Added to this, Cyclone or hurricane causes many hindrance to the Biotic Species including Land and Sea animals, plants, etc.,

Keywords: *Decision Trees, Gradient Boosting, Xgboost, Feature Score*

INTRODUCTION

Indian sub-continent is one of the most vulnerable regions of cyclone in the world. It has a coast line of totally 7516 km (5400 km along the mainland; 132 km in Lakshadweep; and 1900 km in Andaman and Nicobar Islands), which covers nearly 10% of the world's Tropical Cyclones ^{8,9}. The data Analysis for the period 1980-2000 shows that on an average, annually 370 million people are exposed to cyclone in India. In the pre-monsoon season, the chance for cyclone is about 25% around the Arabian Sea and 30% around the Bay of Bengal. The aftermath of cyclones results in large number of deaths and heavy loss of private and public properties. Thus, prediction of cyclone severity is highly crucial.

Until now, various machine learning techniques such as decision tree ⁴, SVM ⁵, random forest ⁶, etc. are used to predict the severity of cyclone. In this work, we

are going to apply the XGBOOST algorithm to predict its severity in Bay of Bengal. The paper is organised as follows: Section 2 will have an overview about other various machine learning methods used for cyclone prediction Section 3 will discuss about the XGBOOST methodology Section 4 will show the result of the experiment with XGBOOST

METHOD

About the Algorithm

Before starting with Xgboost we should know what a decision tree is and how it works. A decision tree is basically a uses a tree like model for decisions and their possible consequences, including chance event outcomes, resource costs, etc. It is one way to display an algorithm that only contains conditional control statements.

Corresponding Author:

S. Karthick

Assistant Professor, Department of Software Engineering, SRMIST, karthik.sa@ktr.srmuniv.ac.in

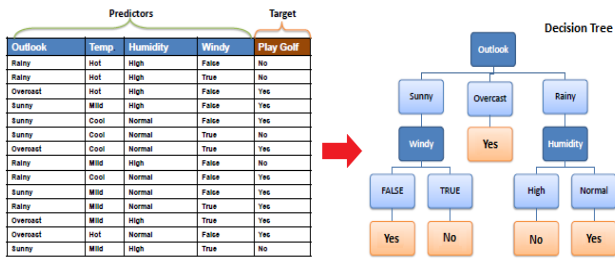


Fig. 1 Dataset and Architecture of prediction using Decision Tree

The dataset in Fig.1 contains various events in which player will play or not play golf on a given day. When we train the classifier it classifies the events just like the graph shown in the image. For example, on a particular day suppose outlook is overcast temperature is high humidity is high and wind speed is low. When the decision tree gets this type of input it goes through each possible case in the tree and finally generates output in this case it will give yes. This is how decision trees work.

Random forest is an algorithm in which we rely on prediction from multiple trees. We first train multiple classifiers with dataset and then test the prediction made by them. It generally has a greedy approach so as to get the optimum solution. Accuracy is generally higher in random forests than compared to decision trees since random forests make prediction based on results from multiple trees and the most optimum solution is selected.

Xgboost works somewhat similar to decision trees; the difference is that it adds score to each node of the tree and evaluates based on the score generated.

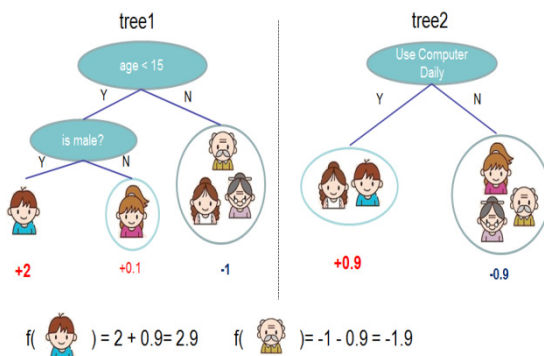


Fig. 2 Addition of score to decision tree nodes-Xgboost

As shown Fig.2, at each node we add a certain score. At the time of evaluation these scores are added and based on the scores decision are made. Before we proceed further we need to check how much accurate prediction our model gives. For this we define an objective function. An objective function is a function which measures accuracy of a model on a given dataset.

An objective function has basically two parts: First is the loss function which tells how predictive our model is and second is the regularization function which helps to avoid over fitting.

This is the general equation for objective function:

$$obj(\theta) = L(\theta) + \Omega(\theta) \tag{1}$$

Here $L(\theta)$ is the loss function and $\Omega(\theta)$ is the regularization function. Now a question arises as how are the scores assigned to each node. After renormalizing the tree we can write the objective value of t-th tree as:

$$obj(t) = \sum_{j=1}^T T[(\sum_{i \in I_j} g_i)w_j + 2(\sum_{i \in I_j} h_i + \lambda)w_j^2] + \gamma T \tag{2}$$

Basically, for a given tree structure, we push the statistics g_i and h_i to the leaves they belong to, sum the statistics together, and use the formula to calculate how good the tree is. This score is like the impurity measure in a decision tree, except that it also takes the model complexity into account. ¹

A. SVR for predicting Tropical cyclone

[Dataset: <http://www.bom.gov.au>; <http://www.esrl.noaa.gov/psd/data/gridded/>]

There is huge amount of data present in these datasets. There is a large amount of data present in the above datasets. They have been recorded over different times. They don't follow same scale. So, first thing to be done is to standardise them. The data is then divided into two parts: 28 years and 12 years. The 28 years is used for training our predictor while the 12 year is used for testing the predictor. SVR operates in high dimensions. Each observation is mapped into m-dimensional feature space. A model is then created using the SVR model equation. All the calculations are done using Weka. In SVR there arose a situation for development of different types of predictors in total 48 different predictors. To solve this issue we applied initial variable selection was employed using linear regression, which reduced 48 predictors to 6. Further the six predictors were tested on the dataset and their general properties were checked out. Optimal ones were picked. This again reduced the number of predictors from 6 to 3. Linear, polynomial and radial basis functions were evaluated for SVR. After substantial experiment with 406 kernels, the radial function with $\gamma = 0.73$ and $C = 1$ were having optimal generalization properties.

SVR has been applied successfully in predicting the development of tropical cyclones. Compared to multi linear regression model, SVR has improvised the accuracy by ~40%. 5

A. Decision Trees for modelling rainfall prediction

[Dataset:ftp ncdc.noaa.gov/pub/data/g sod/2014/.]

The dataset is first divided into two parts: one for training and the other part for testing the predictor. During the training process the predictor is provided with the training dataset. The predictor learns from the dataset and finds relation between values between different features that were provided. The model is then tested for its accuracy by comparing the predicted value by the predictor with the actual value present in the test dataset. Feature selection is a very important task before you train the task. It is good to have many features but the features should be relevant. Irrelevant features do not make much sense and can harm by reducing the accuracy. Though the performance vector depicts accuracy as 100%, when we compare the actual and target data, we find that the success rate for the year 2014 is 80.67. 4

B. Automated weather event analysis with C4.5 classifier 10

[Dataset:http://www.wunderground.com/history/airport/ KCQT/2015/1/1/CustomHistory.html]

C 4.5 is a classifier used to build decision tree classification system. It builds decision tree based on information entropy from the training data set. Information entropy is basically how much information is present in an event. C 4.5 makes decision when it gets the highest information gain based on the formula, $I(\text{gain}) = H(\text{event}) - H(\text{Event} | \text{Feature})$ From the experiments that were conducted it is clear that C4.5 can classify weather events using the weather information. It is able to predict the weather with minimal amount of error and lower number of features as compared to other classification methods.3

C. Radar emitter classification using XGBOOST

[Dataset: For the purpose of this research, large radar signals data set with 268,545 samples is collected in the database. The dataset includes 50 different types of radar emitters.]

Here we first use data in radar database, then select the features from the database and then process each attribute with special process set. Then we randomly select 80% of the samples in the data set as training set, 20% as test set, and assure that each class is contained in the training set and test set with the same proportion. These two sets are used to train supervised classification model. With supervised learning, parameters of classification model can be adjusted to the best state. The new intercepted signals then can be recognised after attributes pre-processing. XGBOOST is a gradient tree boosting algorithm which has shown results for many state of the art results on machine learning algorithm. The main idea of this gradient tree boosting is that the result is not predicted just by a single tree classifier but by multiple tree classifiers. The loss function and penalty term is also considered while training the classifier 2. This type of problem can also be solved using evolutionary algorithms 12

Algorithm:

1. Input Dataset.
2. After proper pre-processing the dataset is passed for training.
 - a. The classifier looks for important features first and then accordingly introduce best possible splits needed. It generally follows a greedy approach for finding the most optimal split since this approach is fast.1
 - b. After splitting percentile value is assigned at each split by using the approximate algorithm during the training of the dataset. 1
3. Based on these percentile values these scores are assigned at each split .[1]
4. Based on the scores ranks are allotted to these splits.
5. At the time of predicting an event the scores are added to predict which event is going to happen.
6. While dealing with real time data there are many issues inside the dataset like empty space, unreasonable zeroes added in place of missing values.
 - a. For a normal decision tree this events can be misleading.

b. But Xgboost creates a separate path for these kind of events and predicts based on the scores related to previous events.1

7. Accuracy score is calculated.

How Random Forests work:

Before starting with Random forests we should have a rough idea of ensembles. An ensemble is a set of classifiers that learn a target function, and their predictions are combined to classify new examples. In random forests algorithm we rely on predictions from multiple decision trees. An ensemble consists of multiple decision trees i.e. it has multiple classifiers. In the dataset we train each classifier with the present dataset. The ensembles use a divide and conquer approach to classify. With this we can classify the dataset and values present more precisely thereby giving better accuracy as compared to other algorithms.

The XGBOOST tuned classifier has shown significantly improved results than compared to general machine learning algorithm like SVM. Weighted XGBOOST method achieves 98.3% accuracy on our test set, while the classic support vector machine (SVM) and RVM methods get 89.1 and 79.6% accuracy, the gradient boost gets 91.9% accuracy, and DBN achieves 95.4% accuracy.

RESULTS AND DISCUSSION

In the experiment we have taken following parameters into consideration while training latitude, longitude, CI no, pressure, wind and pressure drop. The xgboost algorithm is implemented in python and runs on ubuntu 14 LTS machine having 4GB RAM. The following graphs show the feature importance in the algorithm. xgb.importance() function tells importance of each feature by calculating the feature score or f score.

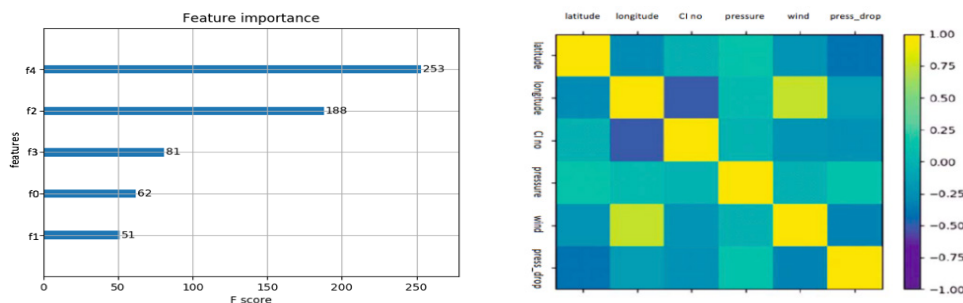


Fig. 3 Feature importance based on Fscore

From Fig. 3 shown, it is clear that feature f4 i.e. pressure is having the highest importance. After training the Xgboost classifier with the dataset we get following results as shown in the images below:

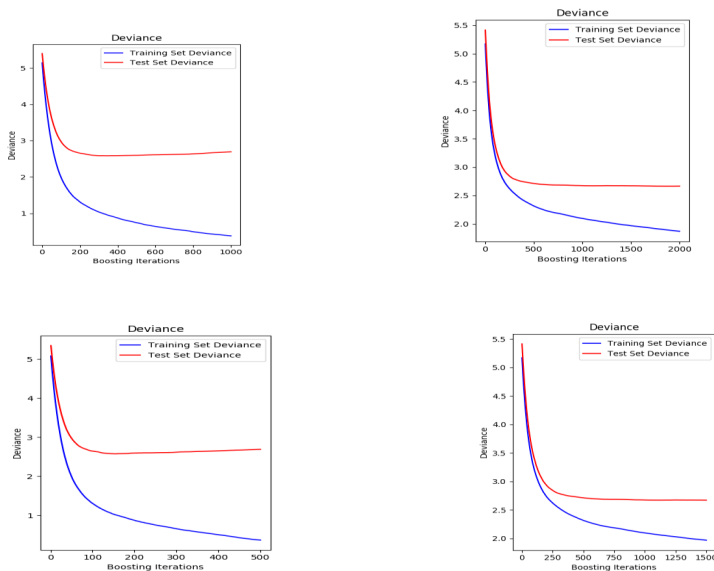


Fig.4. Deviations after booting iteration

The images in Fig.4 show deviations after different boosting iterations. From figure it is clear that we get least number of deviations after 1500 iterations. Any further increase and the deviation increases and lower than this deviation is clearly high. So we get most optimum deviation after 1500 iterations. Beyond this the variance increases further due to overfitting.

Many Plants got devastated due the severity of cyclone or hurricane ¹¹ over the coast of Bay of Bengal. Species also affected by migrating it's place from one to another due to the severity in the sea during cyclone.

CONCLUSION

In this paper we have implemented Xgboost to predict the cyclonic severity at Bay of Bengal. On comparing with other classifiers from different models, we have found that it has generated accurate results. On training the classifier beyond certain extent we can see that variance increases as discussed in the result section. The issues can be optimized by regularizing the dataset thereby preparing a real fit data.

Source of Funding: Self

Conflict of Interest: Nil

REFERENCES

1. Tianqi Chen, Carlos Guestrin. XGBoost: A Scalable Tree Boosting System. University of Washington, San Francisco, CA, USA; 2016.
2. Wenbin Chen, Kun Fu, Jiawei Zuo, Xinwei Zheng, Tinglei Huang, Wenjuan Ren. Radar Emitter Classification For Large Dataset Using Weighted Xgboost. IET Journals ISSN 1751-8784 Received on 19th December 2016 Accepted on 17th March 2017 E-First on 9th June 2017 doi: 10.1049/iet-rsn.2016.0632 www.ietdl.org
3. Nasimul Hasan, Md. Taufeeq Uddin, Nihad Karim Chowdhary. Automated Weather Event Analysis with Machine Learning. International Conference on Innovations in Science, engineering and Technology (ICISSET) proceedings; 2016.
4. G.M.Nasira and A Geetha. Data Mining For Meteorological Applications : Decision Trees For Modeling Rainfall Prediction. IEEE International Conference on Computational Intelligence and Computing ; 2014
5. Michael B Richman and Lance M Leslie. Machine Learning Approach To Seasonal Prediction of Tropical Cyclone. Missouri University of Science and Technology; 2012, doi: 10.1016/j.procs.2012.09.069.
6. John K. Williams and D. A. Ahijevych, C. J. Kessinger, T. R. Saxen, M. Steiner and S. Dettling. A machine learning approach to finding weather regimes and skillful predictor combinations for short-term storm forecasting. 6th Conference on Artificial Intelligence Applications to Environmental Science & 13th Conference on Aviation, Range and Aerospace Meteorology, At New Orleans, LA; 2016.
7. Bister, M., and K.A. Emanuel. Dissipative heating and hurricane intensity. Meteor. Atmos. Phys, 1998; (65): 233–240.
8. Camargo, S. J., and A. H. Sobel. Western North Pacific tropical cyclone intensity and ENSO. J. Climate, 2005; 18:2996–3006.
9. Chan, J. C. L. Tropical cyclone activity in the northwest Pacific in relation to the El Niño–Southern Oscillation phenomenon. Mon. Wea. Rev, 1985; 113: 599–606.
10. Fahad Sheikh, S. Karthick, D. Malathi, J. S. Sudarsan, C. Arun. Analysis of Data Mining Techniques for Weather Prediction. Indian Journal of Science and Technology. 2016;9(38), DOI: 0.17485/ijst /2016/v9i38/101962, October.
11. Liza S. Comita, Maria Uriarte, Jill Thompson, Inge Jonckheere, Charles D. Canham and Jess K. Zimmerman. Abiotic and biotic drivers of seedling survival in a hurricane-impacted tropical forest. Journal of Ecology, 2009; 97: 1346–1359, DOI: 10.1111/j.1365-2745.2009.01551.
12. Sivakumar V, Rekha D. Underwater acoustic sensor node scheduling using an evolutionary memetic algorithm, Journal of Telecommunications & Information Technology. 2018;1:88–94.

Call for Papers / Article Submission

The editor invites scholarly articles that contribute to the development and understanding of all aspects of Public Health and all medical specialities. All manuscripts are double blind peer reviewed. If there is a requirement, medical statistician review statistical content. Invitation to submit paper: A general invitation is extended to authors to submit papers papers for publication in IJPHRD.

The following guidelines should be noted:

- The article must be submitted by e-mail only. Hard copy not needed. Send article as attachment in e-mail.
- The article should be accompanied by a declaration from all authors that it is an original work and has not been sent to any other journal for publication.
- As a policy matter, journal encourages articles regarding new concepts and new information.
- Article should have a Title
- Names of authors
- Your Affiliation (designations with college address)
- Abstract
- Key words
- Introduction or back ground
- Material and Methods
- Findings
- Conclusion
- Acknowledgements
- Interest of conflict
- References in Vancouver style.
- Please quote references in text by superscripting
- Word limit 2500-3000 words, MSWORD Format, single file

All articles should be sent to: **editor.ijphrd@gmail.com**

Send all payment to :

Institute of Medico-Legal Publications

Logix Office Tower, Unit No. 1704, Logix City Centre Mall

Sector- 32, Noida - 201 301 (Uttar Pradesh)

Mob: 09971888542, Ph. 0120- 429 4015, E-mail: editor.ijphrd@gmail.com,

Website: www.ijphrd.com



Indian Journal of Public Health Research & Development

CALL FOR SUBSCRIPTIONS

About the Journal

Print-ISSN: 0976-0245 **Electronic - ISSN:** 0976-5506, **Frequency:** Monthly

Indian Journal of Public Health Research & Development is a double blind peer reviewed international Journal. The frequency is **Monthly**. It deals with all aspects of Public Health including Community Medicine, Public Health, Epidemiology, Occupational Health, Environmental Hazards, Clinical Research, Public Health Laws and covers all medical specialities concerned with research and development for the masses. The journal strongly encourages reports of research carried out within Indian continent and south east Asia.

The journal has been assigned international standards (ISSN) serial number and is indexed with Index Copernicus (Poland). It is also brought to notice that the journal is being covered by many international databases.

Journal Title	Print Only
Indian Journal of Public Health Research & Development	INR 9000

NOTE FOR SUBSCRIBERS

- Advance payment required by cheque/demand draft in the name of **"Institute of Medico-Legal Publications"** payable at New Delhi.
- Cancellation not allowed except for duplicate payment.
- Claim must be made within six months from issue date.
- A free copy can be forwarded on request.

Our Contact Info:

Institute of Medico-Legal Publications

Logix Office Tower, Unit No. 1704, Logix City Centre Mall
Sector- 32, Noida - 201 301 (Uttar Pradesh)

Mob: 09971888542, Ph. 0120 429 4015, E-mail: editor.ijphrd@gmail.com

Website: www.ijphrd.com

Published, Printed and Owned : Dr. R.K. Sharma

Printed : Printpack Electrostat G-2, Eros Apartment, 56, Nehru Place, New Delhi-110019

Published at: Institute of Medico Legal Publications Pvt. Ltd., Logix Office Tower, Unit No. 1704, Logix City Centre Mall Sector- 32,
Noida - 201 301 (Uttar Pradesh) Editor : Dr. R.K. Sharma, Mobile: + 91 9971888542, Ph. No: +91 120- 429 4015